WESTERN CATCHMENT MUSIC MODELLING BY KING + CAMPBELL. SEE EXHIBITS 08C TO 08F

BIOFILTRATION AREA 1500m² SEE DETAIL AT EXHIBIT 08B

DUCHESS GULLY

BIOFILTRATION/ DETENTION AREA 210m²

SW

NW

OCEAN DRIVE

ABEL TASMAN DRIVE

DETENTION PROVIDED TO ENSURE PRE AND POST DEVELOPMENT DISCHARGE REMAIN THE SAME TO EXISTING DRAINAGE CHANNEL

BIOFILTRATION (200m²) AND DETENTION BASIN 13 200m³

C1

C2

BIOFILTRATION/ DETENTION AREA 560m²

RAINBOW BEACH

BIOFILTRATION/ DETENTION AREA 750m²

C3

C4

FIONA CRES

OCEAN DRIVE

MALAST

MIDDLE ROCK POINT

EASTERN CATCHMENT MODELLED BY MARTENS & ASSOCIATES FOR STORMWATER QUALITY, DETENTION AND GROUNDWATER RECHARGE TO PROVIDE STORMWATER MANAGEMENT INSTALLATIONS THAT MITIGATE POTENTIAL IMPACTS ON GROUNDWATER AND SURFACE WATER CONDITIONS WITHIN OR NEAR TO THE SEPP 26 RAINFOREST. SEE EXHIBITS 08G TO 08J

RECOMMENDATIONS FOR TRENCHING AND ROADS WITHIN DEVELOPMENT AREA (MARTENS):

- On hillsopes excavation should preferably not exceed 2.5m below ground level.
- On lower slopes (below RL12.5m) excavations > 1m in depth (other than deep infiltration pits) should be plastic lined and backfilled with low permeability materials.
- Roads in low lying areas (below RL12.5m) to be constructed assuming groundwater table is close or within subgrade materials.

LEGEND

- EXTENT OF CONCEPT PLAN APPLICATION
- EXISTING CADASTRAL BOUNDARIES
- 12.5m EXISTING CONTOUR
- SEPP 26 BOUNDARY (AS GAZETTED)
- STORMWATER CATCHMENT BOUNDARIES
- BIOFILTRATION AND BIORETENTION BASINS TO INCLUDE VARIABLE OR EXCHANGEABLE ORIFICE OR WEIR PLATES TO ADJUST FLOW RATES TO THE RECHARGE PITS. BASINS WITHIN THE EASTERN CATCHMENT TO INCLUDE DEEP STORMWATER INFILTRATION PITS IN ACCORDANCE WITH MARTENS PLAN 12 SEDGE PLANTING IN BASIN
  - ISOLEPSIS NODOSA
  - CARESSA APPRESSA
- OVERLAND FLOW DIRECTION
- APPROX. DISCHARGE POINTS
- STORMWATER DETENTION BASIN WITH BIOFILTRATION (AS ABOVE)
- C1 - C4 EASTERN CATCHMENT
- REGENERATION AND REVEGETATION AREA
- GROUND RIFFLING OR MINOR CONTOURING WITHIN REVEGETATED AREAS TO ENSURE MAXIMUM INFILTRATION

CAUTION

This plan has been prepared for the purpose of a concept plan application. The information shown herein is only reliable for the above purpose. It should not therefore be used for any other purpose without verification.

N

K+C REF: L:\14898_MILLAND_SEAWIDE\Planning\ 4898P_Exhibits.dwg - A3(L)- Ex 8 SW, 25- Feb- 2011, kimw

KING + CAMPBELL

King & Campbell Pty Ltd
www.kingcampbell.com.au
A: PO Box 243 Port Macquarie NSW 2444
T: 02 6586 2555
F: 02 6583 4064
E: info@kingcampbell.com.au

REV.	DATE	DESCRIPTION
A	23.03.2010	ISSUED FOR INFORMATION
B	28.06.2010	ISSUED FOR EA
C	07.07.2010	ISSUED FOR EA
D	19.07.2010	ISSUED FOR EA
E	11.10.2010	ISSUED FOR EA - OVERLAND FLOW DIRECTIONS ADDED
F	15.02.2011	ISSUED FOR EA - SUBMISSIONS REPORT

DATUM: AHD SCALE: 1:4000 @ A3

0 100

PROJECT NO:	4898
DA NO.:	
DESIGNED BY:	ES/MT
DRAWN BY:	MW
CHECKED BY:	PJR
DATE CREATED:	FEB 2010

DRAWING TITLE: EXHIBIT 08A: STORMWATER CONCEPT PLAN

PROJECT: LOT 1 DP 374315 & LOT 4 DP615261 OCEAN DRIVE, PORT MACQUARIE

CLIENT: MILLAND PTY LTD & SEAWIDE PTY LTD

DRAWING NO:	SHEET:	REVISION:
4898P_Exhibits.dwg	1	F

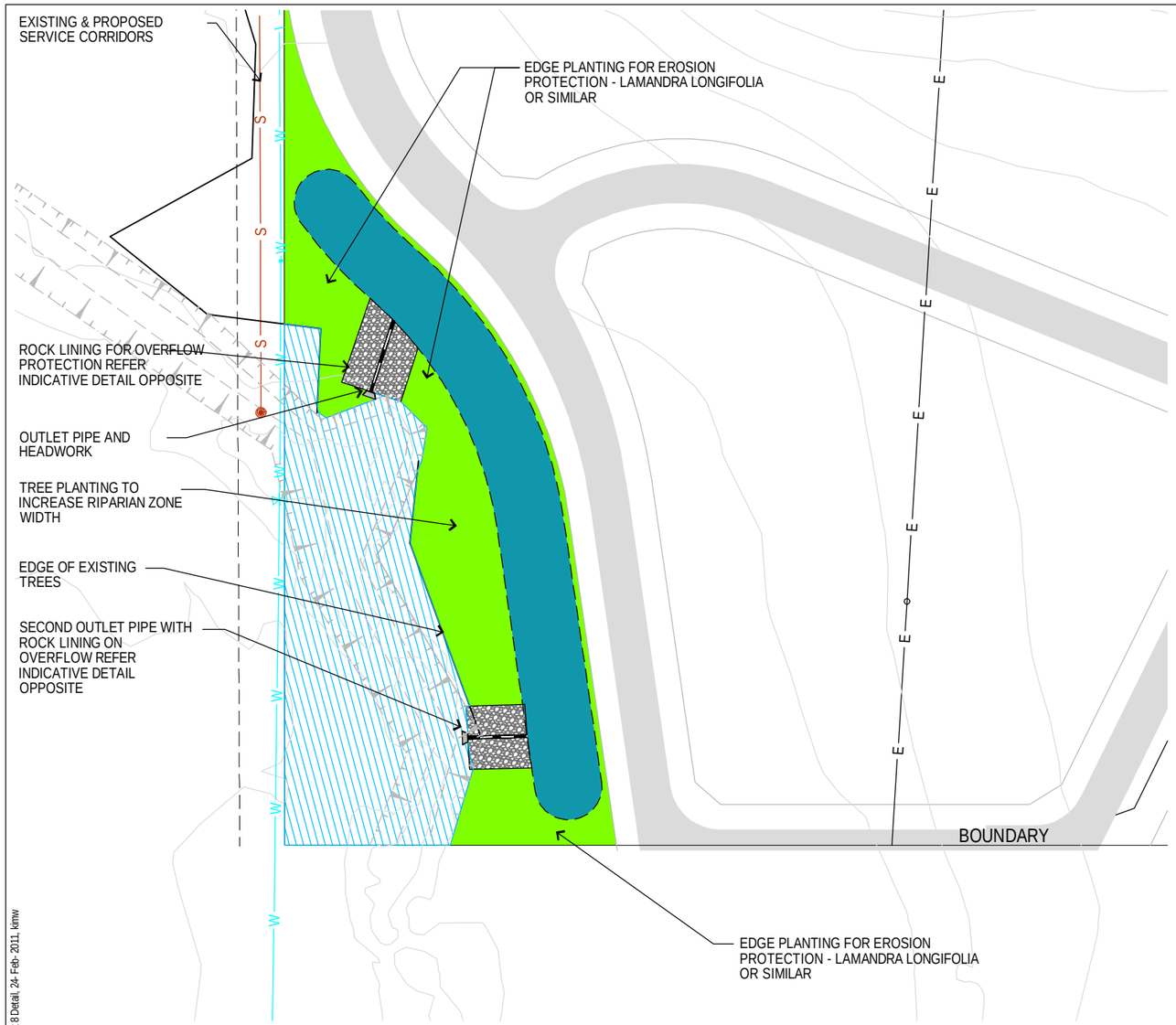
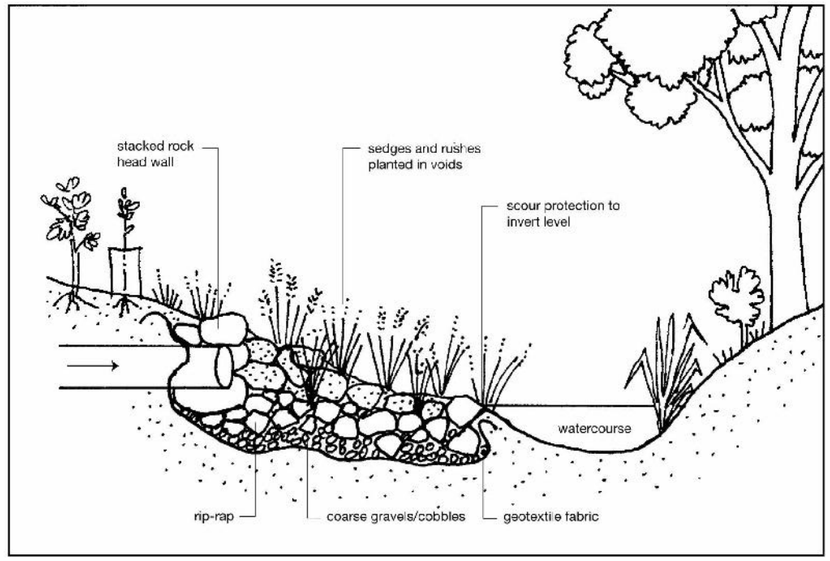


PHOTO 1: EXAMPLE OF RECENTLY CONSTRUCTED BIOFILTRATION BASIN WITH A WIDTH OF APPROXIMATELY 4m



DETAIL 1: INDICATIVE OUTLET DETAIL (DECCW - GUIDELINES FOR CONTROLLED ACTIVITIES OUTLET STRUCTURES, FEBRUARY 2008)

LEGEND

- EXISTING CADASTRAL BOUNDARIES
- EASEMENT
- TOP OF BANK
- PMHC ALS 1M CONTOURS
- S — SEWER MAIN
- W — WATER MAIN

- REVEGETATION TO BE UNDERTAKEN IN ACCORDANCE WITH STAGE 2 VEGETATION MANAGEMENT PLAN
- FOREST (RIPARIAN)
- BIOFILTRATION BASIN - SEDGE PLANTING IN BASIN
  - ISOLEPSIS NODOSA
  - CARESSA APPRESSA

CAUTION

This plan has been prepared for the purpose of a concept plan application. The information shown herein is only reliable for the above purpose. It should not therefore be used for any other purpose without verification.

N

K+C REF: L:\14898_MILLAND_SEAWIDE\Planning\ 4898P_Exhibits.dwg - A3(L)- Ex 8 Detail, 24- Feb- 2011, kmw

KING + CAMPBELL

King & Campbell Pty Ltd
www.kingcampbell.com.au
A: PO Box 243 Port Macquarie NSW 2444
T: 02 6586 2555
F: 02 6583 4064
E: info@kingcampbell.com.au

REV.	DATE	DESCRIPTION
A	07.07.2010	ISSUED FOR EA
B	14.10.2010	ISSUED FOR EA
C	15.02.2011	ISSUED FOR EA - SUBMISSIONS REPORT

DATUM: AHD SCALE: 1:1000 @ A3

0 25

NOTE: DO NOT SCALE OFF DRAWINGS. USE FIGURED DIMENSIONS ONLY. REPORT ANY DISCREPANCIES TO THE AUTHOR. THIS DRAWING, BEING THE PROPERTY OF KING & CAMPBELL PTY LTD, IS PROTECTED BY COPYRIGHT AND MUST NOT BE USED , REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE WRITTEN PERMISSION OF KING & CAMPBELL PTY LTD.

PROJECT NO:	4898
DA NO.:	
DESIGNED BY:	PJR
DRAWN BY:	MW
CHECKED BY:	PJR
DATE CREATED:	FEB 2010

DRAWING TITLE: EXHIBIT 08B: INDICATIVE SOUTH WESTERN BIOFILTRATION BASIN DETAIL

PROJECT: LOT 1 DP 374315 & LOT 4 DP615261 OCEAN DRIVE, PORT MACQUARIE

CLIENT: MILLAND PTY LTD & SEAWIDE PTY LTD

DRAWING NO:	SHEET:	REVISION:
4898P_Exhibits.dwg	2	C

CAUTION

This plan has been prepared for the purpose of a concept plan application. The information shown herein is only reliable for the above purpose. It should not therefore be used for any other purpose without verification.

K+C REF: L:\14898_MILLAND_SEAWIDE\Planning\ 14898_DrainsData.dwg - A3(L)- Ex 8 W(a) 24- Feb- 2011. kmw

KING + CAMPBELL

King & Campbell Pty Ltd
www.kingcampbell.com.au
A: PO Box 243 Port Macquarie NSW 2444
T: 02 6586 2555
F: 02 6583 4064
E: info@kingcampbell.com.au

REV.	DATE	DESCRIPTION
A	06.07.2010	ISSUED FOR INFORMATION
B	07.07.2010	ISSUED FOR EA
C	14.10.2010	ISSUED FOR EA

DATUM: AHD SCALE: NOT TO SCALE

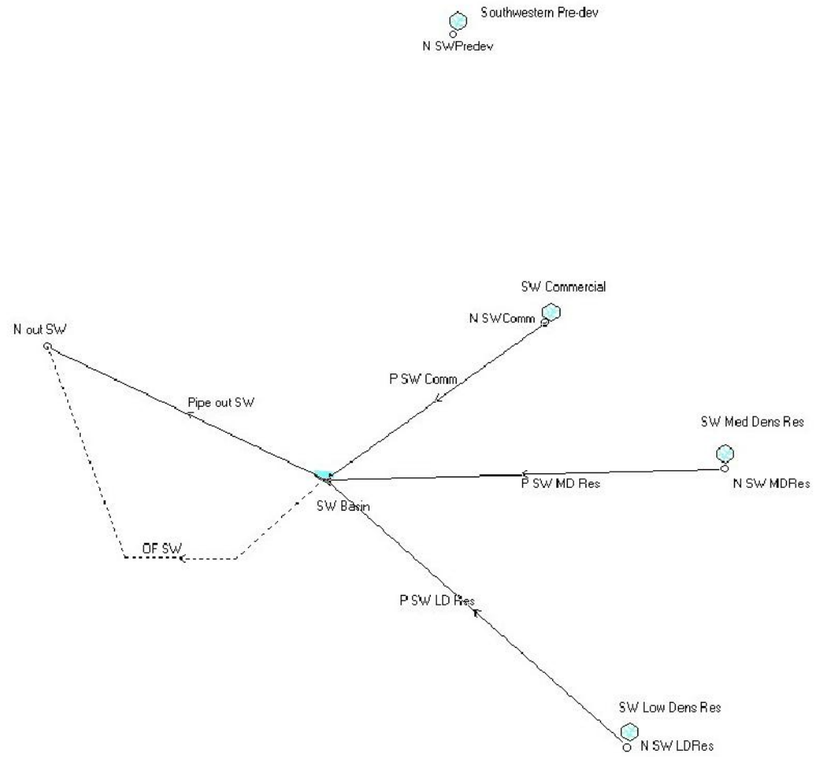
PROJECT NO:	4898
DA NO.:	
DESIGNED BY:	ES/MT
DRAWN BY:	MW
CHECKED BY:	PJR
DATE CREATED:	FEB 2010

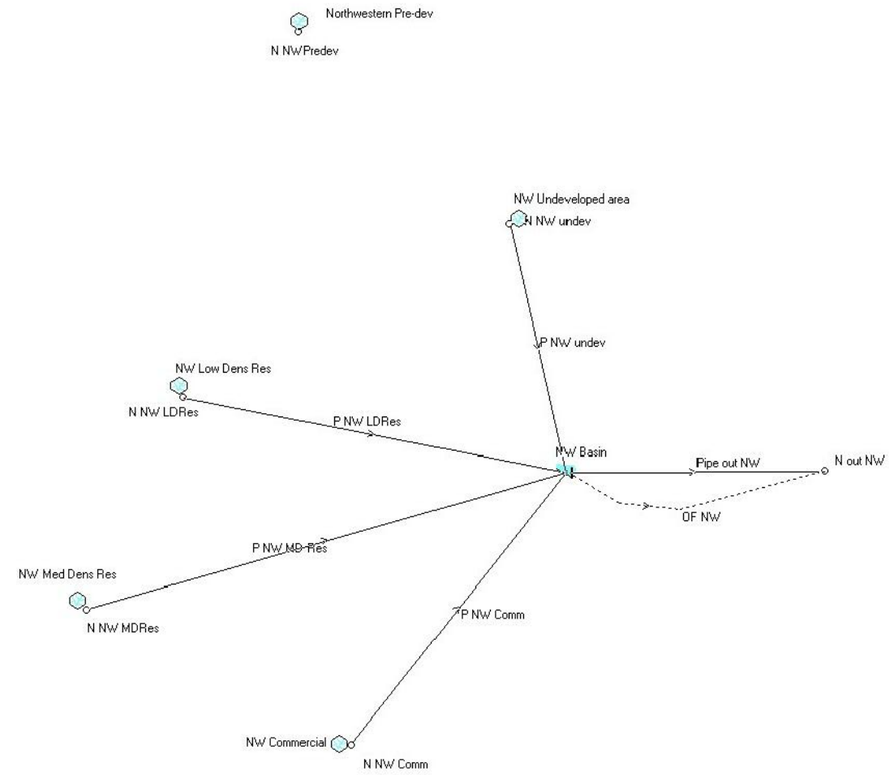
DRAWING TITLE: EXHIBIT 08C: WESTERN CATCHMENTS
MUSIC MODEL SETUP POST DEVELOPMENT

PROJECT: LOT 1 DP 374315 & LOT 4 DP615261
OCEAN DRIVE, PORT MACQUARIE

CLIENT: MILLAND PTY LTD & SEAWIDE PTY LTD

DRAWING NO:	SHEET:	REVISION:
14898_DrainsData.dwg	3	C





CAUTION

This plan has been prepared for the purpose of a concept plan application. The information shown herein is only reliable for the above purpose. It should not therefore be used for any other purpose without verification.

K+C REF: L:\14898_MILLAND_SEAWIDE\Planning\ 14898_DrainsData.dwg - A3(L) Ex 81W(0), 24-Feb-2011, kmw

KING + CAMPBELL

King & Campbell Pty Ltd
www.kingcampbell.com.au
A: PO Box 243 Port Macquarie NSW 2444
T: 02 6586 2555
F: 02 6583 4064
E: info@kingcampbell.com.au

REV.	DATE	DESCRIPTION
A	06.07.2010	ISSUED FOR INFORMATION
B	07.07.2010	ISSUED FOR EA
C	14.10.2010	ISSUED FOR EA

DATUM: AHD SCALE: NOT TO SCALE

PROJECT NO:	4898
DA NO.:	
DESIGNED BY:	ES/MT
DRAWN BY:	MW
CHECKED BY:	PJR
DATE CREATED:	FEB 2010

DRAWING TITLE: EXHIBIT 08D: WESTERN CATCHMENTS DRAINS MODEL LAYOUT

PROJECT: LOT 1 DP 374315 & LOT 4 DP615261 OCEAN DRIVE, PORT MACQUARIE

CLIENT: MILLAND PTY LTD & SEAWIDE PTY LTD

DRAWING NO:	SHEET:	REVISION:
14898_DrainsData.dwg	4	C

STORMWATER PRE DEVELOPMENT INFLOW DATA "DRAINS"

PIT / NODE DETAILS			Version 9										
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id
N SWPred	Node					5		0		246.667	-125		1
N NWPred	Node					10		0		666.548	-111.153		2

DETENTION BASIN DETAILS													
Name	Elev	Surf. Area	Init Vol. (c	Outlet Typ	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL

SUB-CATCHMENT DETAILS													
Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %
Southwes	N SWPred	10.23	0	100	0	0	0	0	0	500	0	0	5
Northwes	N NWPred	10.46	0	100	0	0	0	0	0	350	0	0	4.5

STORMWATER PRE DEVELOPMENT OUTPUTS

DRAINS results prepared 08 July, 2010 from Version 2009.09

PIT / NODE DETAILS				Version 8
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)

SUB-CATCHMENT DETAILS				
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)
Southwestern Pre-dev	3.206	0	3.206	0
Northwestern Pre-dev	3.708	0	3.708	0

Outflow Volumes for Total Catchment (0.00 impervious + 20.7 pervious = 20.7 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 10 minutes storm, Coastal Region	8034.62	5046.82 (62.8%)	0.00 (0.0%)	5046.82 (62.8%)
AR&R 100 year, 20 minutes storm, Coastal Region	12207.1	8646.88 (70.8%)	0.00 (0.0%)	8646.88 (70.8%)
AR&R 100 year, 30 minutes storm, Coastal Region	15310.6	11200.31 (73.2%)	0.00 (0.0%)	11200.31 (73.2%)
AR&R 100 year, 1 hour storm, Coastal Region	21931.4	16759.83 (76.4%)	0.00 (0.0%)	16759.83 (76.4%)
AR&R 100 year, 2 hours storm, Coastal Region	27724.6	21030.85 (75.9%)	0.00 (0.0%)	21030.85 (75.9%)

CAUTION

This plan has been prepared for the purpose of a concept plan application. The information shown herein is only reliable for the above purpose. It should not therefore be used for any other purpose without verification.

KING + CAMPBELL

King & Campbell Pty Ltd
www.kingcampbell.com.au
A: PO Box 243 Port Macquarie NSW 2444
T: 02 6586 2555
F: 02 6583 4064
E: info@kingcampbell.com.au

REV.	DATE	DESCRIPTION
A	06.07.2010	ISSUED FOR INFORMATION
B	07.07.2010	ISSUED FOR EA
C	14.10.2010	ISSUED FOR EA

DATUM: AHD SCALE: NOT TO SCALE

PROJECT NO:	4898
DA NO.:	
DESIGNED BY:	ES/MT
DRAWN BY:	MW
CHECKED BY:	PJR
DATE CREATED:	FEB 2010

DRAWING TITLE: EXHIBIT 08E: WESTERN CATCHMENTS
DRAINS MODEL PRE DEVELOPMENT INPUT & OUTPUTS

PROJECT: LOT 1 DP 374315 & LOT 4 DP615261
OCEAN DRIVE, PORT MACQUARIE

CLIENT: MILLAND PTY LTD & SEAWIDE PTY LTD

DRAWING NO:	SHEET:	REVISION:
14898_DrainsData.dwg	5	C

DRAINS POST DEVELOPMENT INPUTS

PIT / NODE DETAILS			Version 9										
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id
N SWComm	Node					24		0		279.861	-227.778		29
N out SW	Node					5.5		0		101.62	-236.458		12
N SW MDRes	Node					20		0		344.167	-280		30
N SW LDRes	Node					6		0		309.167	-380		31
N NW Comm	Node					24		0		686.667	-385		32
N out NW	Node					11		0		868.981	-279.861		13
N NW MDRes	Node					21		0		585	-333.333		33
N NW LDRes	Node					12		0		622.14	-251.743		34
N NW undev	Node					12		0		747.5	-185		489117

DETENTION BASIN DETAILS													
Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL
SW Basin	4.5	2000	0	Culvert	0.5					201.157	-283.912	No	
	4.75	2000											
	5	2000											
	5.5	2000											
	6	2000											
NW Basin	9.6	2200	0	Culvert	0.5					769.495	-280.209	No	
	10	2200											
	10.5	2200											
	11	2200											
	12	2200											

SUB-CATCHMENT DETAILS													
Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %
SW Commercial	N SWComm	0.68	90	10	0	5	0	0					
SW Med Dens Res	N SW MDRes	1.27	75	25	0	5	0	0					
SW Low Dens Res	N SW LDRes	8.28	60	40	0	0	0	0	300	20	0	5	2
NW Commercial	N NW Comm	0.73	90	10	0	5	0	0					
NW Med Dens Res	N NW MDRes	0.24	75	25	0	5	0	0					
NW Low Dens Res	N NW LDRes	7.56	60	40	0	0	0	0	300	20	0	5	2
NW Undeveloped area	N NW undev	1.83	0	100	0	0	0	0	0	200	0	0	2

PIPE DETAILS													
Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From
P SW Comm	N SWComm	SW Basin	20	5	4.5	2.5	RCP Class 2	600	610	0.6	NewFixed	1	N SWComm
Pipe out SW	SW Basin	N out SW	20	4.5	4.4	0.5	RCP Class 2	375	375	0.6	NewFixed	5	SW Basin
P SW MD Res	N SW MDRes	SW Basin	20	5	4.5	2.5	RCP Class 2	600	610	0.6	NewFixed	1	N SW MDRes
P SW LD Res	N SW LDRes	SW Basin	20	5	4.5	2.5	RCP Class 2	600	610	0.6	NewFixed	5	N SW LDRes
P NW Comm	N NW Comm	NW Basin	20	10.7	10.5	1	RCP Class 2	600	610	0.6	NewFixed	1	N NW Comm
Pipe out NW	NW Basin	N out NW	10	9.6	9.5	1	RCP Class 2	600	610	0.6	NewFixed	2	NW Basin
P NW MD Res	N NW MDRes	NW Basin	20	10.7	10.5	1	RCP Class 2	600	610	0.3	NewFixed	1	N NW MDRes
P NW LDRes	N NW LDRes	NW Basin	20	10.7	10.5	1	RCP Class 2	600	610	0.6	NewFixed	3	N NW LDRes
P NW undev	N NW undev	NW Basin	20	10.7	10.5	1	RCP Class 2	600	610	0.6	NewFixed	3	N NW undev

CAUTION

This plan has been prepared for the purpose of a concept plan application. The information shown herein is only reliable for the above purpose. It should not therefore be used for any other purpose without verification.

DRAINS POST DEVELOPMENT OUTPUTS

DRAINS results prepared 08 July, 2010 from Version 2009.09

PIT / NODE DETAILS				Version 8	
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)
N SWComm	5.51		0.53		
N out SW	4.78		5.337		
N SW MDRes	5.67		0.976		
N SW LDRes	5.9		5.908		
N NW Comm	11.3		0.569		
N out NW	10.11		1.802		
N NW MDRes	11.3		0.184		
N NW LDRes	12.35		5.395		
N NW undev	11.3		0.094		

SUB-CATCHMENT DETAILS					
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)
SW Commercial	0.53	0.481	0.049	5	0
SW Med Dens Res	0.976	0.749	0.227	5	0
SW Low Dens Res	5.908	3.705	2.294	6.3	5.47
NW Commercial	0.569	0.517	0.052	5	0
NW Med Dens Res	0.184	0.142	0.043	5	0
NW Low Dens Res	5.395	3.382	2.094	6.3	5.47
NW Undeveloped area	0.094	0	0.094	0	335.95

Outflow Volumes for Total Catchment (11.9 impervious + 8.68 pervious = 20.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 10 minutes storm, Coastal Regic	7995.78	6576.83 (82.3%)	4504.25 (97.4%)	2072.58 (61.5%)
AR&R 100 year, 20 minutes storm, Coastal Regic	12148.1	10225.78 (84.2%)	6905.17 (98.3%)	3320.60 (64.8%)
AR&R 100 year, 30 minutes storm, Coastal Regic	15236.6	12894.26 (84.6%)	8691.01 (98.6%)	4203.25 (65.4%)
AR&R 100 year, 1 hour storm, Coastal Region	21825.4	18689.08 (85.6%)	12500.74 (99.1%)	6188.34 (67.2%)
AR&R 100 year, 2 hours storm, Coastal Region	27590.6	23669.91 (85.8%)	15834.22 (99.3%)	7835.69 (67.3%)

PIPE DETAILS					
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P SW Comm	0.53	2	5.506	5.414	AR&R 100 year, 20 minutes storm, Coastal Region
Pipe out SW	1.163	2.1	5.047	4.775	AR&R 100 year, 20 minutes storm, Coastal Region
P SW MD Res	0.976	3.3	5.669	5.414	AR&R 100 year, 20 minutes storm, Coastal Region
P SW LD Res	5.908	4	5.905	5.414	AR&R 100 year, 20 minutes storm, Coastal Region
P NW Comm	0.569	2	11.301	11.301	AR&R 100 year, 20 minutes storm, Coastal Region
Pipe out NW	1.797	3.1	10.267	10.11	AR&R 100 year, 2 hours storm, Coastal Region
P NW MD Res	0.184	0.6	11.303	11.301	AR&R 100 year, 20 minutes storm, Coastal Region
P NW LDRes	5.395	6.2	12.352	11.301	AR&R 100 year, 20 minutes storm, Coastal Region
P NW undev	0.094	0.1	11.301	11.301	AR&R 100 year, 2 hours storm, Coastal Region

CHANNEL DETAILS					
Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS					
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV
OF SW	5.337	5.337	2.545	0.456	0.42
OF NW	1.802	1.802	2.545	0.246	0.16

DETENTION BASIN DETAILS					
Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
SW Basin	5.41	1834.8	6.5	1.163	5.337
NW Basin	11.3	3745.5	3.598	1.797	1.802

K+C REF: L:\14898_MILLAND_SEAWIDE\Planning\ 14898_DrainsData.dwg - A3(L)- Ex8 W(d) 24-Feb-2011 kimw

KING + CAMPBELL

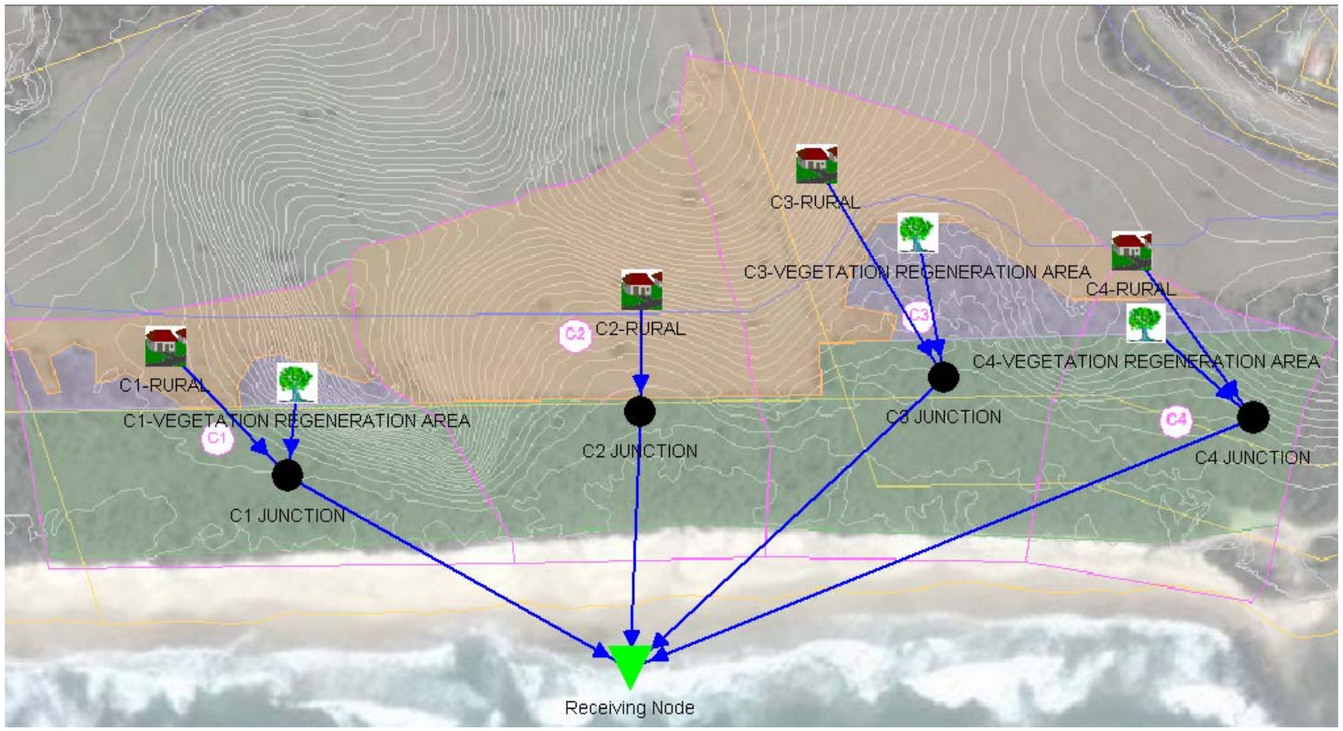
King & Campbell Pty Ltd
www.kingcampbell.com.au
A: PO Box 243 Port Macquarie NSW 2444
T: 02 6586 2555
F: 02 6583 4064
E: info@kingcampbell.com.au

REV.	DATE	DESCRIPTION
A	06.07.2010	ISSUED FOR INFORMATION
B	07.07.2010	ISSUED FOR EA
C	14.10.2010	ISSUED FOR EA

DATUM: AHD SCALE: NOT TO SCALE

PROJECT NO:	4898	DRAWING TITLE:	EXHIBIT 08F: WESTERN CATCHMENTS DRAINS MODEL POST DEVELOPMENT INPUT AND OUTPUTS
DA NO.:			
DESIGNED BY:	ES/MT	PROJECT:	LOT 1 DP 374315 & LOT 4 DP615261 OCEAN DRIVE, PORT MACQUARIE
DRAWN BY:	MW		
CHECKED BY:	PJR	CLIENT:	MILLAND PTY LTD & SEAWIDE PTY LTD
DATE CREATED:	FEB 2010		

DRAWING NO:	SHEET:	REVISION:
14898_DrainsData.dwg	6	C



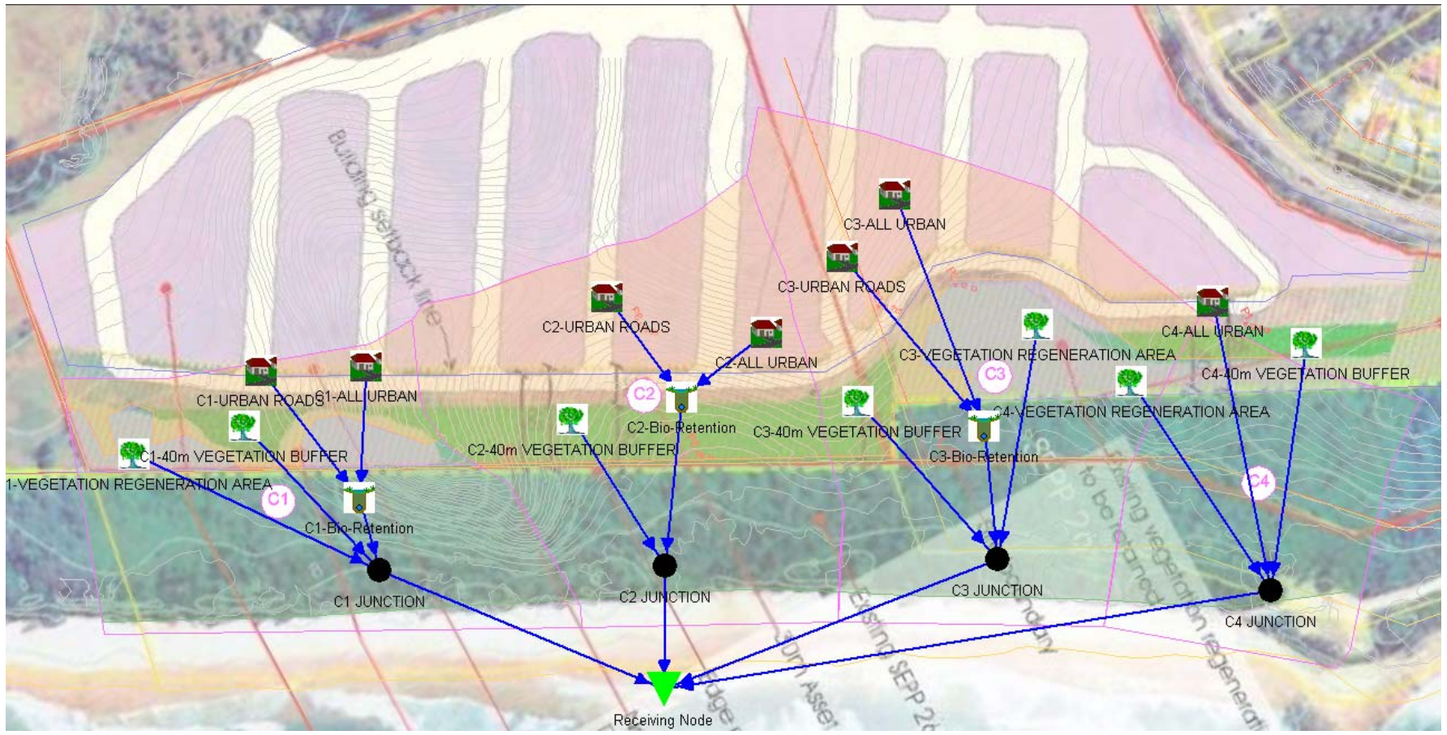


EXHIBIT 08G EASTERN CATCHMENTS (REPRODUCED FROM SHEET 6 OF 11 MARTENS & ASSOCIATES REPORT APPENDIX D).

REV.	DESCRIPTION	DATE	ISSUED
1.0	DRAFT	26.06.09	DMM

BAR SCALE
0 40 80 120 160 200
UNITS - METRES
SCALE - 1:2000 @ A1 1:4000 @ A3

DESIGNED:	DMM
DRAWN/REVIEWED:	BR
PAPER SIZE:	A1/A3
DATUM:	NA
HORIZONTAL RATIO:	1:4000 @A3 1:2000 @ A1
VERTICAL RATIO:	1:4000 @A3 1:2000 @ A1

CLIENT/ PROJECT
HASTINGS COUNCIL

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in mm unless otherwise specified.

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
6/37 Leighton Place, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: http://www.martens.com.au

TITLE:
MUSIC MODEL SET-UP
TOP - PRE-DEVELOPMENT
BOTTOM - DEVELOPED WITH TREATMENT

SHEET 6 OF 11 SHEETS

PROJECT MANAGER: DR D. MARTENS

DRAWING NUMBER: P0601504JD04-V1.TCW

PRE-DEVELOPMENT

POST-DEVELOPMENT

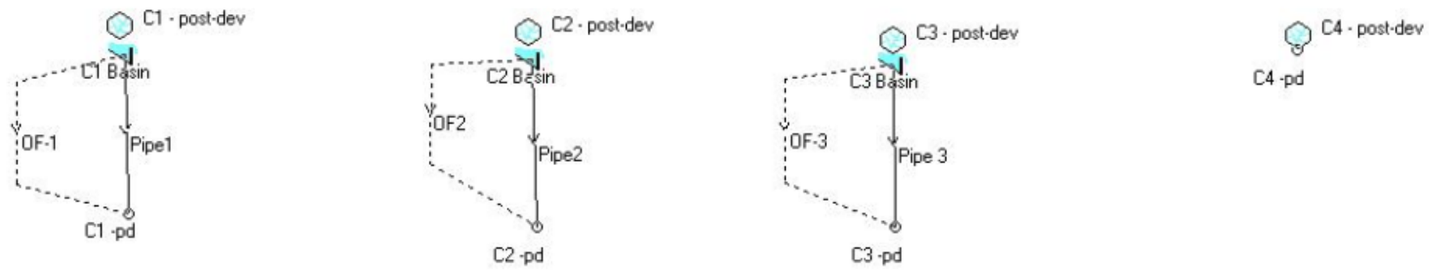


EXHIBIT 08H EASTERN CATCHMENTS (REPRODUCED FROM SHEET 7 OF 11 MARTENS & ASSOCIATES REPORT APPENDIX D).

REV.	DESCRIPTION	DATE	ISSUED
1.0	DRAFT	26.06.09	DMM

BAR SCALE

DESIGNED: DMM | DATUM: NA
DRAWN/REVIEWED: BR | HORIZONTAL RATIO: NA
PAPER SIZE: A1/A3 | VERTICAL RATIO: NA

CLIENT/ PROJECT: HASTINGS COUNCIL

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in mm unless otherwise specified.

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
6/37 Leighton Place, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: http://www.martens.com.au

TITLE: DRAINS MODEL SET-UP

PROJECT MANAGER: DR D. MARTENS

DRAWING NUMBER: P0601504JD04-V1.TCW

SHEET 7 OF 11 SHEETS

DRAINS PRE-DEVELOPMENT MODEL INPUT DETAILS

PIT / NODE DETAILS			Version 9										
Name	Type	Family	Size	Ponding	Pressure	Surface	Max Pond	Base	Blocking	x	y	Bolt-down	id
				Volume	Change	Elev (m)	Depth (m)	Inflow	Factor			lid	
				(cu.m)	Coeff. Ku			(cu.m/s)					
C1pre-node	Node					NA		0		60.671	93.454		53061608
C2pre-node	Node					NA		0		132.57	91.736		53061856
C3pre-node	Node					NA		0		198.089	91		53061857
C4pre-node	Node					NA		0		274.405	89.527		53061858
DETENTION BASIN DETAILS													
Name	Elev	Surf. Area	Init Vol. (c	Outlet Typ	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL
SUB-CATCHMENT DETAILS													
Name	Pit or	Total	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass
	Node	Area	Area	Area	Area	Time	Time	Time	Length	Length	Length	Slope(%)	Slope
		(ha)	%	%	%	(min)	(min)	(min)	(m)	(m)	(m)	%	%
C1 - pre-dev	C1pre-node	0.647	0	100	0	0	10	0					
C2 - pre-dev	C2pre-node	2.597	0	100	0	0	11.4	0					
C3 - pre-dev	C3pre-node	2.954	0	100	0	0	11.96	0					
C4 - pre-dev	C4pre-node	0.352	0	100	0	0	5.33	0					
PIPE DETAILS													
Name	From	To	Length	U/S IL	D/S IL	Slope	Type	Dia	I.D.	Rough	Pipe Is	No. Pipes	Chg From
			(m)	(m)	(m)	(%)		(mm)	(mm)				
DETAILS of SERVICES CROSSING PIPES													
Pipe	Chg	Bottom	Height of	Chg	Bottom	Height of	Chg	Bottom	Height of	etc			
	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc			
CHANNEL DETAILS													
Name	From	To	Type	Length	U/S IL	D/S IL	Slope	Base Widt	L.B. Slope	R.B. Slope	Manning	Depth	Roofed
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)	

DRAINS RESULTS FOR 1 IN 100 YR ARI STORM (PRE-DEVELOPMENT)

DRAINS results prepared 22 June, 2009 from Version 2008.07									
PIT / NODE DETAILS				Version 8					
Name	Max HGL	Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint		
		HGL	Flow Arriving	Volume	Freeboarc	(cu.m/s)			
			(cu.m/s)	(cu.m)	(m)				
SUB-CATCHMENT DETAILS									
Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm		
	Flow Q	Max Q	Max Q	Tc	Tc	Tc			
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)			
C1 - pre-dev	0.434	0	0.434	0	10	0	AR&R 100 year, 20 minutes stor		
C2 - pre-dev	1.613	0	1.613	0	11.4	0	AR&R 100 year, 20 minutes stor		
C3 - pre-dev	1.835	0	1.835	0	11.96	0	AR&R 100 year, 20 minutes stor		
C4 - pre-dev	0.259	0	0.259	0	5.33	0	AR&R 100 year, 20 minutes stor		
Outflow Volumes for Total Catchment (0.00 impervious + 6.55 pervious = 6.55 total ha)									
Storm	Total Rain	Total Runoff	Impervious Runoff	Pervious Runoff					
	cu.m	cu.m (Runoff %)	cu.m (Runoff %)	cu.m (Runoff %)					
AR&R 100 year, 15 minutes storm, average 200 mm/h, Zone 1	3275	2805.15 (85.7%)	0.00 (0.0%)	2805.15 (85.7%)					
AR&R 100 year, 20 minutes storm, average 177 mm/h, Zone 1	3864.5	3360.66 (87.0%)	0.00 (0.0%)	3360.66 (87.0%)					
AR&R 100 year, 25 minutes storm, average 161 mm/h, Zone 1	4393.96	3855.69 (87.7%)	0.00 (0.0%)	3855.69 (87.7%)					
AR&R 100 year, 30 minutes storm, average 148 mm/h, Zone 1	4847	4275.10 (88.2%)	0.00 (0.0%)	4275.10 (88.2%)					
PIPE DETAILS									
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm				
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)					
CHANNEL DETAILS									
Name	Max Q	Max V	Chainage	Max	Due to Storm				
	(cu.m/s)	(m/s)	(m)	HGL (m)					
DETENTION BASIN DETAILS									
Name	Max WL	MaxVol	Max Q	Max Q	Max Q				
			Total	Low Level	High Level				
CONTINUITY CHECK for AR&R 100 year, 20 minutes storm, average 177 mm/h, Zone 1									
Node	Inflow	Outflow	Storage Change	Difference					
	(cu.m)	(cu.m)	(cu.m)	%					
C1pre-node	332.43	332.43	0	0					
C2pre-node	1331.78	1331.78	0	0					
C3pre-node	1514.86	1514.86	0	0					
C4pre-node	181.59	181.59	0	0					
Run Log for P0601504JX03_V2.drn run at 10:16:03 on 22/6/2009									

EXHIBIT 08I EASTERN CATCHMENTS (REPRODUCED FROM SHEET 8 OF 11 MARTENS & ASSOCIATES REPORT APPENDIX D).

REV.	DESCRIPTION	DATE	ISSUED
1.0	DRAFT	26.06.09	DMM

BAR SCALE

DESIGNED: DMM | DATUM: NA
DRAWN/REVIEWED: BR | HORIZONTAL RATIO: NA
PAPER SIZE: A1/A3 | VERTICAL RATIO: NA

CLIENT/ PROJECT: HASTINGS COUNCIL

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in mm unless otherwise specified.

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
6/37 Leighton Place, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: http://www.martens.com.au

TITLE: DRAINS MODEL
PRE-DEVELOPMENT INPUTS AND OUTPUT

PROJECT MANAGER: DR D. MARTENS
DRAWING NUMBER: P0601504JD04-V1.TCW

SHEET 8
OF 11 SHEETS

DRAINS POST-DEVELOPMENT MODEL INPUT DETAILS

PIT / NODE DETAILS			Version 9								
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y
C1 -pd	Node					10		0		61.309	13.604
C3 -pd	Node					10		0		200.592	10.954
C4 -pd	Node							0		273.62	43.051
C2 -pd	Node					10		0		135.514	10.954

DETENTION BASIN DETAILS											
Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y
C1 Basin	10	0	0	Culvert	0.5					60.671	42.413
	10.6	210									
C3 Basin	10	0	0	Culvert	0.5					200.297	40.695
	10.6	1490									
C2 Basin	10	0	0	Culvert	0.5					134.213	43.803
	10.85	560									

SUB-CATCHMENT DETAILS											
Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)
C1 - post-dev	C1 Basin	0.647	79	21	0	5	10	0			
C3 - post-dev	C3 Basin	2.954	79	21	0	5	10	0			
C4 - post-dev	C4 -pd	0.352	0	100	0	0	5.33	0			
C2-post-dev	C2 Basin	2.597	81	19	0	5	10	0			

PIPE DETAILS											
Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is
Pipe1	C1 Basin	C1 -pd	10	10	9.5	5	Concrete, not under roads	225	225	0.3	NewFixed
Pipe 3	C3 Basin	C3 -pd	10	10	9.5	5	Concrete, not under roads	450	450	0.3	NewFixed
Pipe 2	C2 Basin	C2 -pd	10	10	9.5	5	Concrete, not under roads	450	450	0.3	NewFixed

DETAILS of SERVICES CROSSING PIPES										
Pipe	Chg	Bottom Elev (m)	Height of Servic (m)	Chg (m)	Bottom Elev (m)	Height of (m)	Chg (m)	Bottom Elev (m)	Height of (m)	etc

CHANNEL DETAILS											
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Widt (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n

OVERFLOW ROUTE DETAILS											
Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Dept Major Sto (m)	SafeDepth Minor Sto (m)	Safe DxV (sq.m/sec	Bed Slope (%)
OF-1	C1 Basin	C1 -pd	1	10.6	5	1.7	Grassed swale with 1:4 sideslopes	0.5	0.4	1	5
OF-3	C3 Basin	C3 -pd	1	10.6	5	1.7	Grassed swale with 1:4 sideslopes	0.5	0.4	1	5
OF-2	C2 Basin	C2 -pd	1	10.85	5	1.7	Grassed swale with 1:4 sideslopes	0.5	0.4	1	5

DRAINS RESULTS FOR 1 IN 100 YR ARI STORM (POST-DEVELOPMENT)

DRAINS results prepared 22 June, 2009 from Version 2008.07

PIT / NODE DETAILS				Version 8			
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboarc (m)	Overflow (cu.m/s)	Constraint
C1 -pd	9.62		0				
C3 -pd	9.68		0				
C2 -pd	9.7		0				

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Sto
C1 - post-dev	0.487	0.4	0.087	5	10	0	AR&R 100
C3 - post-dev	2.224	1.826	0.398	5	10	0	AR&R 100
C4 - post-dev	0.258	0	0.258	0	5.33	0	AR&R 100
C2-post-dev	1.963	1.646	0.316	5	10	0	AR&R 100

Outflow Volumes for Total Catchment (4.95 impervious + 1.60 pervious = 6.55 total ha)

Storm	Total Rainfa cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 15 minutes storm, average 200 mm/h, Zone 1	3275	3070.63 (93.8%)	2424.70 (98.0%)	645.93 (80.7%)
AR&R 100 year, 20 minutes storm, average 177 mm/h, Zone 1	3864.5	3643.84 (94.3%)	2870.05 (98.3%)	773.79 (81.9%)
AR&R 100 year, 25 minutes storm, average 161 mm/h, Zone 1	4393.96	4156.20 (94.6%)	3270.04 (98.5%)	886.16 (82.5%)
AR&R 100 year, 30 minutes storm, average 148 mm/h, Zone 1	4847	4593.40 (94.8%)	3612.30 (98.6%)	981.10 (82.8%)

PIPE DETAILS						
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm	
Pipe1	0.405	3.3	10.116	9.616	AR&R 100 year, 25 minutes stor	
Pipe 3	1.818	4.4	10.179	9.679	AR&R 100 year, 25 minutes stor	
Pipe 2	1.607	4.7	10.2	9.7	AR&R 100 year, 25 minutes stor	

CHANNEL DETAILS						
Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm	

OVERFLOW ROUTE DETAILS							
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V
OF-1	0	0	1.262	0	0	0	0
OF-3	0	0	1.262	0	0	0	0
OF-2	0	0	1.262	0	0	0	0

DETENTION BASIN DETAILS							
Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level		
C1 Basin	10.54	35.3	0.405	0.405	0		
C3 Basin	10.59	303.2	1.818	1.818	0		
C2 Basin	10.82	163.3	1.607	1.607	0		

CONTINUITY CHECK for AR&R 100 year, 25 minutes storm, average 161 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
C1 Basin	412.83	412.82	0	0
C1 -pd	412.82	412.82	0	0
C3 Basin	1884.84	1884.8	0.01	0
C3 -pd	1884.8	1884.8	0	0
C4 -pd	195.86	195.86	0	0
C2 Basin	1662.68	1662.65	0.01	0
C2 -pd	1662.65	1662.65	0	0

Run Log for P0601504JX03_V2.drn run at 10:16:03 on 22/6/2009

EXHIBIT 08J EASTERN CATCHMENTS (REPRODUCED FROM SHEET 9 OF 11 MARTENS & ASSOCIATES REPORT APPENDIX D).

REV.	DESCRIPTION	DATE	ISSUED
1.0	DRAFT	26.06.09	DMM

BAR SCALE

DESIGNED: DMM | DATUM: NA
DRAWN/REVIEWED: BR | HORIZONTAL RATIO: NA
PAPER SIZE: A1/A3 | VERTICAL RATIO: NA

CLIENT/ PROJECT: HASTINGS COUNCIL

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in mm unless otherwise specified.

martens & Associates Pty Ltd
Consulting Engineers
Environment
Water
Geotechnical
Civil
6/37 Leighton Place, Hornsby, NSW 2077 Australia Phone: (02) 9476 9999 Fax: (02) 9476 8767
Email: mail@martens.com.au Internet: http://www.martens.com.au

TITLE: DRAINS MODEL
POST-DEVELOPMENT INPUTS AND 100YR OUTPUT

PROJECT MANAGER: DR D. MARTENS
DRAWING NUMBER: P0601504JD04-V1.TCW

SHEET 9 OF 11 SHEETS