

**DCE**

dalton consulting engineers

# STORMWATER STRATEGY

## LINDUM VALE



FOR

Joint venture partners:



**AUGUST 2015**

**REF: 11604**

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<b>Revision No.</b>	4
<b>Date:</b>	August 2015
<b>Description:</b>	Stormwater Strategy v4
<b>Prepared:</b>	J Baumann AN: 401080
<b>Reviewed:</b>	J McGrath AN: 371134
<b>Approved:</b>	T Liakopoulos AN: 884308

## PREAMBLE

The Stormwater Strategy for the proposed Lindum Vale Precinct Structure Plan (PSP) details the selected option for drainage. The selected option is based on investigations into alternative water sensitive urban design (WSUD) for drainage servicing undertaken at the request of Hume City Council and the Metropolitan Planning Authority. Please refer to see *Lindum Vale Stormwater Strategy, version 3* (DCE, June 2015) for full details of the previous investigations.

## EXECUTIVE SUMMARY

The proposed Lindum Vale development at Mickleham Road, Mickleham will consist of approximately 1,500 residential lots. This stormwater strategy informs the PSP for the development.

The site is divided into two defined stormwater catchments (northern and southern). An external catchment west of Mickleham Road contributes runoff to the northern catchment. The discharge point for the northern catchment is to an existing reserve to the east of the Lindum Vale site. The southern catchment will discharge to Melbourne Water's nominated discharge point at Mount Ridley Road.

The development will be designed to convey major event runoff overland within roadways and drainage reserves for storm events up to and including the 100-year annual recurrence interval (ARI) event. Major event runoff from the external catchment also will be conveyed overland through the proposed development. The northern catchment will drain to a retention basin within a drainage reserve on the eastern boundary of the Lindum Vale site.

Three options for the design of the retention basin have been investigated; see *Lindum Vale Stormwater Strategy, version 3* (DCE, June 2015). The selected design protects the maximum number of trees on site while minimising fill. It incorporates the following elements:

- Retention basin located below existing surface requires an embankment up to 3.4 m high (0.4 m above existing surface).
- Inundation levels for downstream properties to be lowered.
- Fill required to grade internal roads to the retention basin, with the exception of the north-east corner of the site
- The north-east corner will drain safely overland via existing and future roads through the neighbouring development, minimising fill.

The minor event pit-and-pipe networks will be designed for the 5-year ARI event as per Hume City Council requirements. The minor drainage networks will outfall to stormwater treatment wetlands (northern catchment) and to the nominated discharge point at Mount Ridley Road (southern catchment).

Treatment for runoff from the northern catchment (up to the three-month ARI event) will be through a system of sediment basins and wetlands. These will be located within the drainage reserve and integrated with the retention basin and existing trees. Preliminary MUSIC modelling suggests that the combined surface area of the wetlands and sediment basins required to treat the northern catchment runoff is approximately 3.1 ha. The size and layout of the wetlands will be further refined as

the layout is finalised and WSUD measures are fully investigated during the design phase of the subdivision.

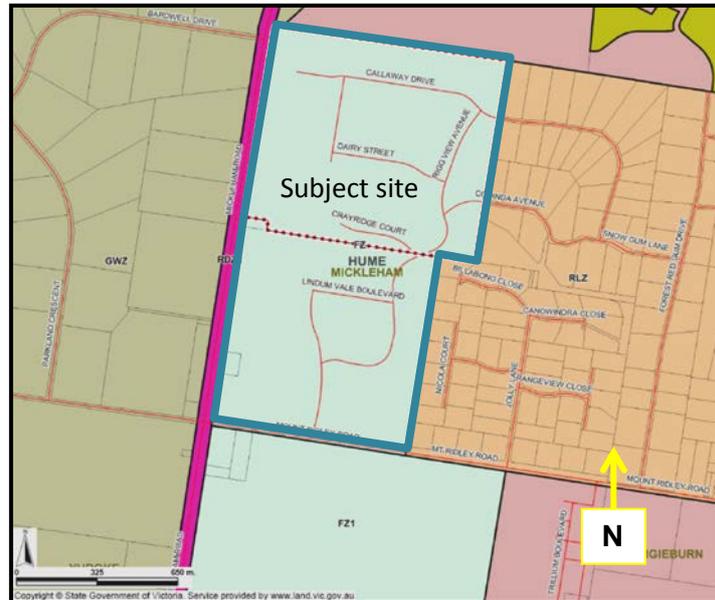
DCE recommends that payment of stormwater quality contributions for the southern catchment as part of Melbourne Water's Aitken Creek Drainage Scheme will be more economical than providing on-site treatment for this portion of the site.

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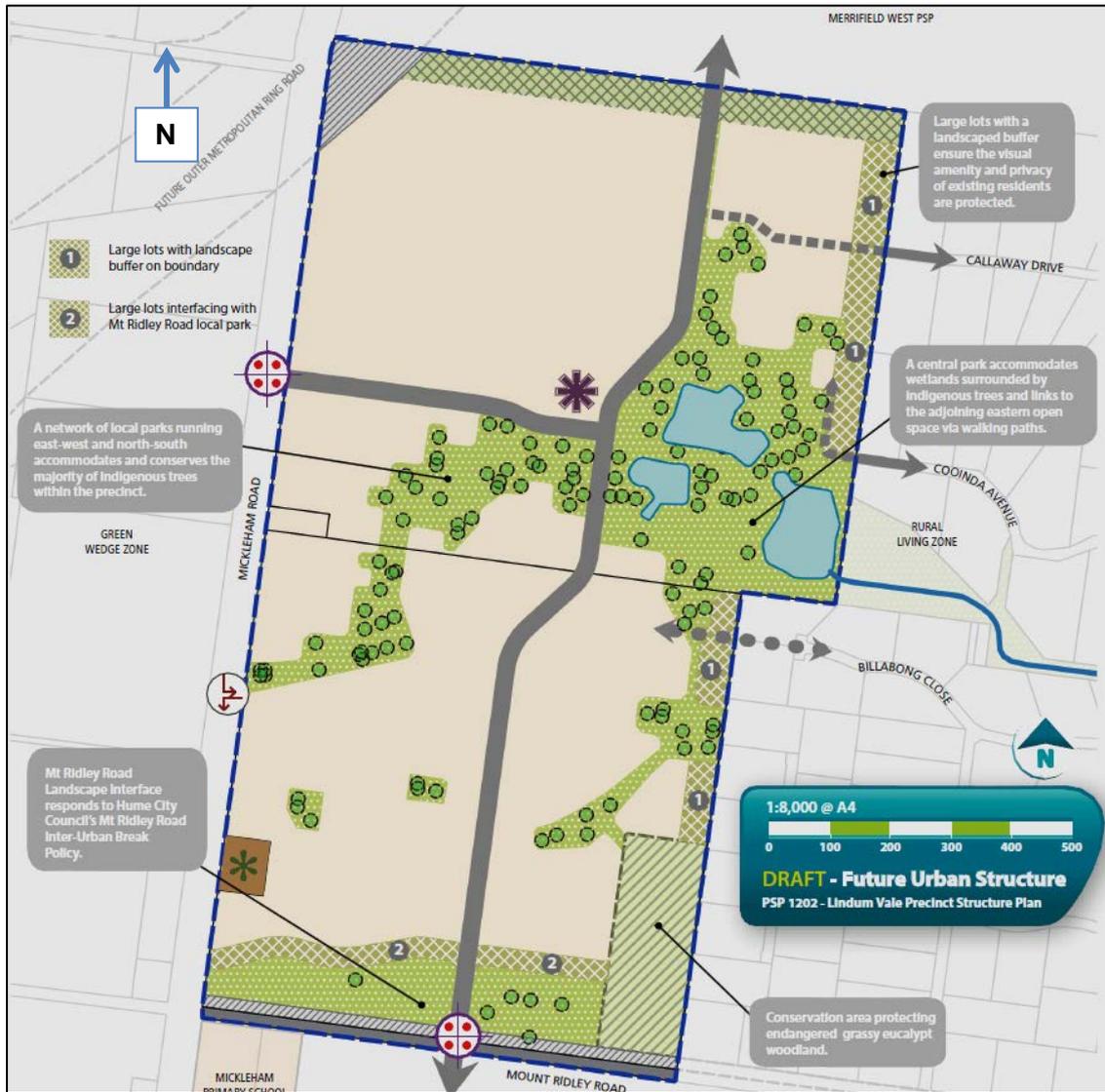
# 1. INTRODUCTION

This report details the stormwater management strategy for the development of the Lindum Vale residential development at Mickleham Road, Mickleham. The subject site is located within the City of Hume. A planning scheme amendment in 2012 brought the Lindum Vale site within the Urban Growth Boundary, and the site is currently zoned for farming use.



**Figure 1—Existing zoning of the Lindum Vale site**

The stormwater strategy is to inform the Precinct Structure Plan (PSP) for the proposed development. The proposed development is for approximately 1,500 residential lots. The draft PSP layout is shown in Figure 2. A full-size image of the draft PSP is included in Appendix A.



**Figure 2—Proposed Lindum Vale PSP**

## 2. EXISTING CONDITION

The subject site is rural in nature. It is bounded by Mickleham Road to the west, an overhead electricity transmission easement to the north, Mount Ridley Road to the south and existing semi-rural development to the east. There is established vegetation on the site including numerous red gum trees.

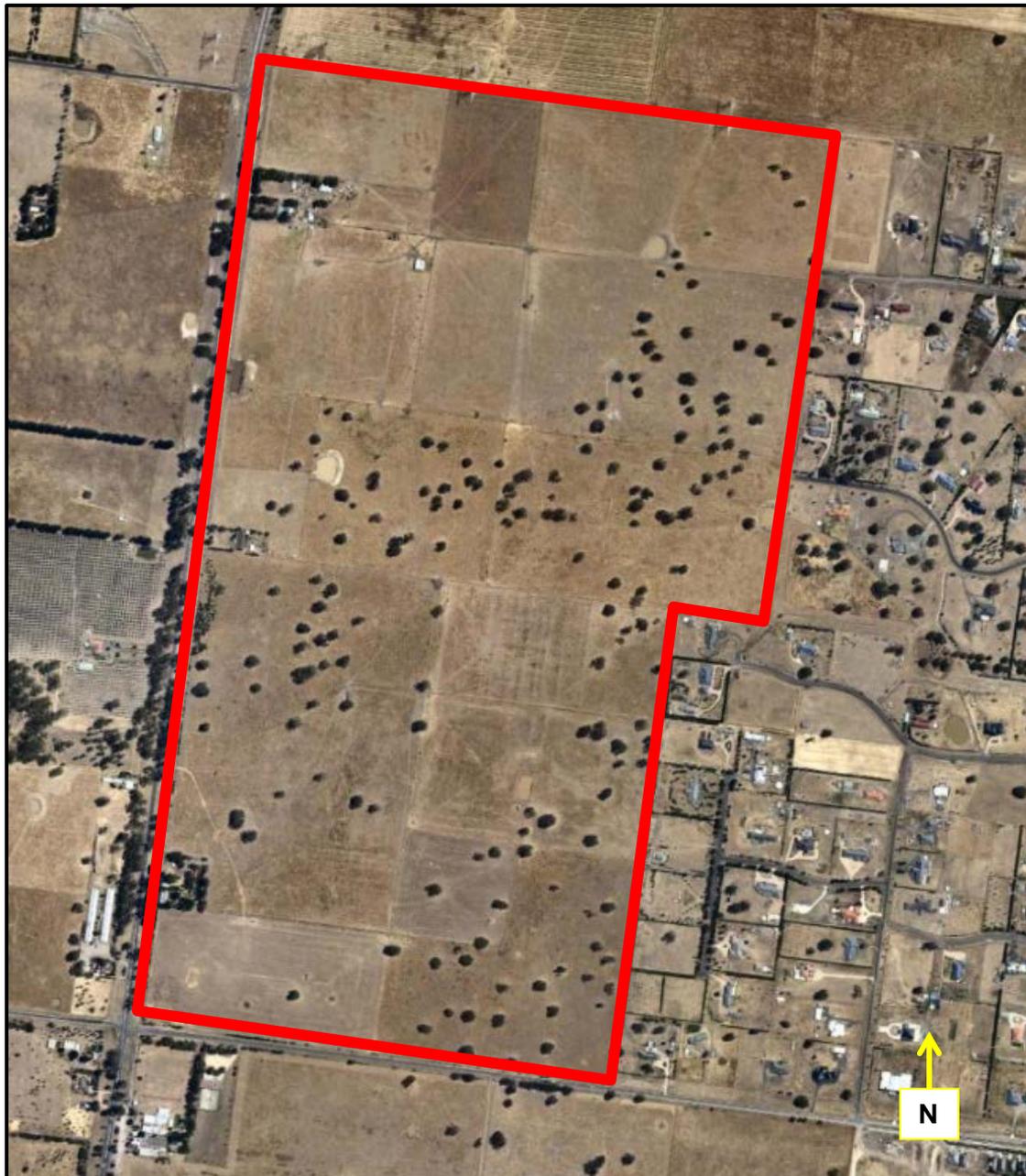


Figure 3—Aerial of the Lindum Vale site

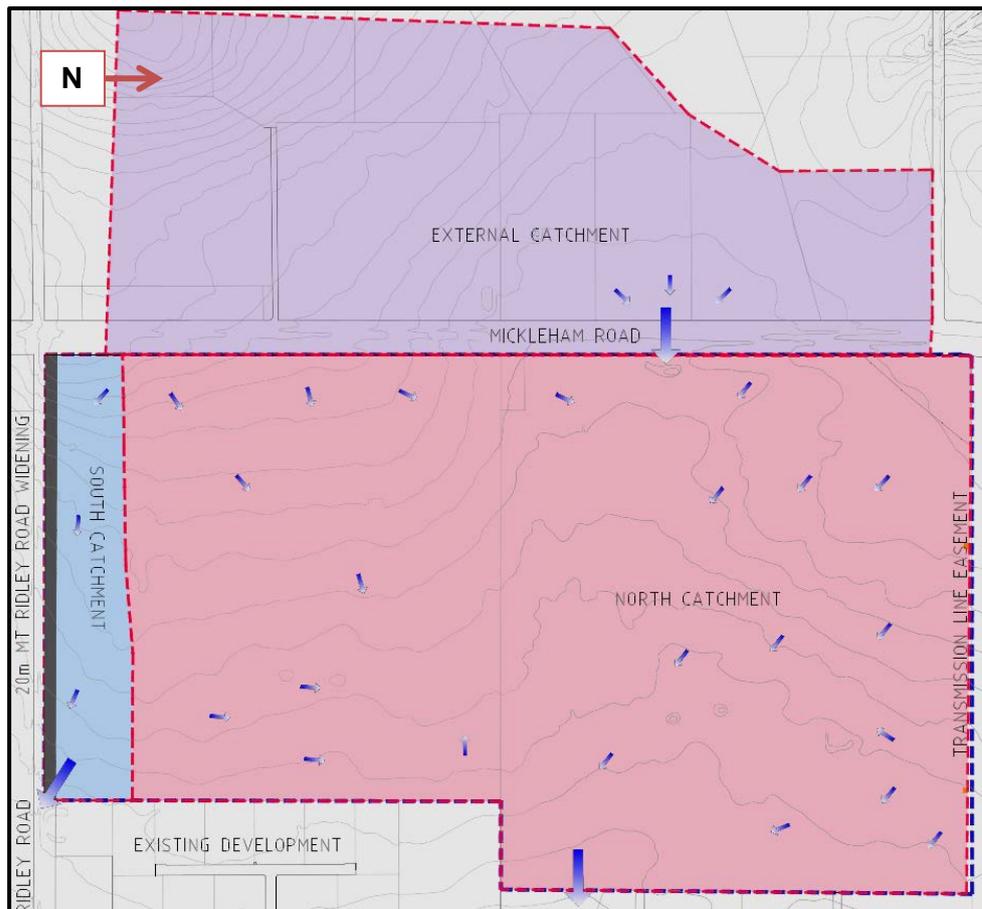
## 2.1. Stormwater Catchments

The site generally slopes from west to east. A high point traverses the site approximately 150 m from the southern property boundary, dividing the site into southern and northern catchments.

The southern catchment is approximately 12 ha in size and grades southeast to Mount Ridley Road.

The northern catchment is approximately 130 ha in size and grades east. A shallow gully runs from west to east across the centre of the site (within the northern catchment) conveying flows from culverts beneath Mickleham Road to the reserve at the eastern boundary of the site. The catchments are shown in Figure 4. A large plan of the existing stormwater catchments is included as Appendix B.

As shown in Figure 4, the external catchment on the western side of Mickleham Road drains to the low point at the Mickleham Road culverts which convey runoff to the subject site. The size of this catchment is approximately 74 ha. It is currently rural in nature and outside the Urban Growth Boundary. No allowance has been made in the proposed Lindum Vale stormwater infrastructure for the external catchment to become developed.



**Figure 4—Existing Catchments**

## 2.2. Existing Stormwater Outlet

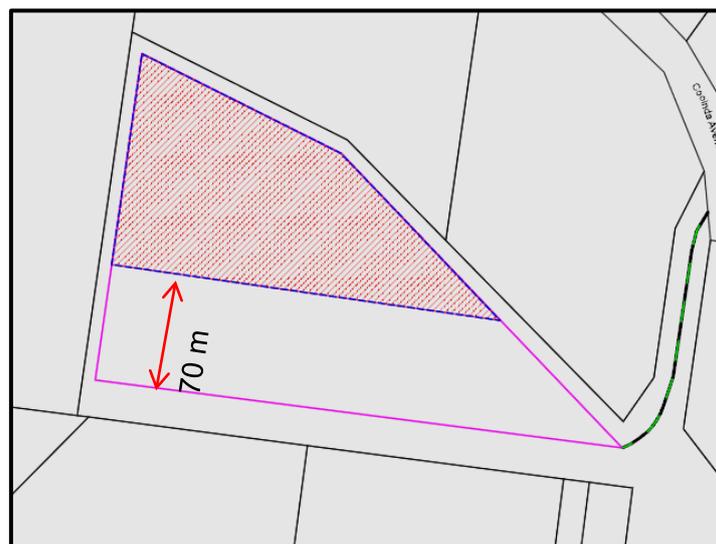
The southern catchment outlets to shallow swale drains on Mount Ridley Road. This portion of the subject site is within Melbourne Water's Aitken Creek Drainage scheme, and as part of the scheme works, an outlet will be constructed beneath Mount Ridley Road.

The outlet for the northern catchment is to an existing reserve east of the site. The reserve forms the headwaters of Malcolm Creek. An aerial image of this reserve, outlined in yellow, is shown in Figure 5.

A portion of the reserve immediately downstream of Lindum Vale has been designated a vegetation offset site for the development of 120 Vineyard Road, Sunbury. The vegetation offset overlay covers all but the southern 70 m of the reserve as shown in Figure 6.



**Figure 5—Reserve downstream of the Lindum Vale site**



**Figure 6—Vegetation offset overlay in adjacent reserve**

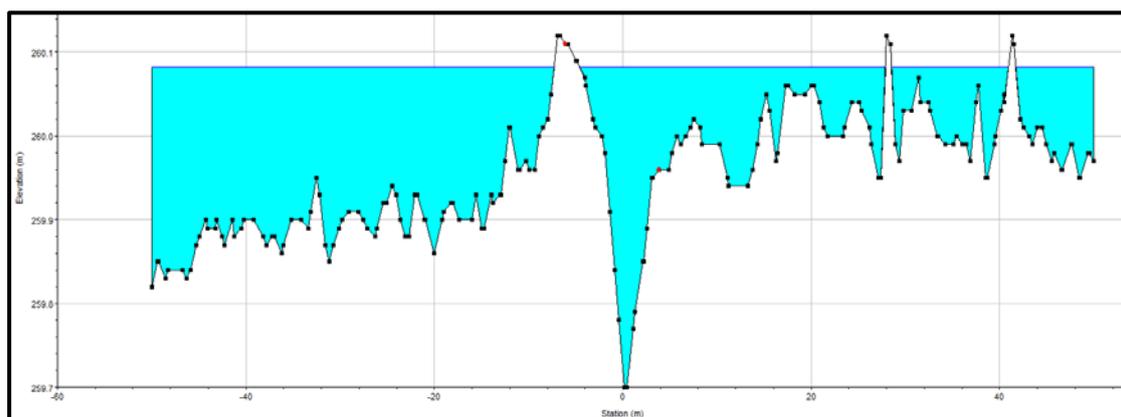


**Figure 7—Poorly defined channel downstream of the Lindum Vale site**

The drainage channel immediately downstream of the subject site is poorly defined as shown in Figure 7. The poorly defined channel presents existing drainage issues for adjacent landowners.

Figure 8 shows the sheet flow conditions at the downstream (eastern) boundary of the Lindum Vale site for the existing rural catchment, based on HEC-RAS hydraulic modelling for flows derived from RORB software, as detailed in Section 5 of this report. Under existing conditions, during a major 100-year ARI event, the runoff from Lindum Vale and upstream catchments flows across a wide area.

From approximately 350 m downstream of the Lindum Vale boundary, the reserve has been shaped to form a wide, shallow channel.



**Figure 8—Existing overland flow conditions at the downstream boundary**

### 3. STORMWATER STRATEGY

Three stormwater strategy options have been assessed; see 'Lindum Vale Stormwater Strategy, version 3' (DCE, June 2015). The selected stormwater strategy is designed to protect the maximum number of trees on site. The stormwater strategy includes opportunities for passive irrigation.

The stormwater strategy will require works within the drainage reserve adjacent to the downstream (eastern) boundary of the Lindum Vale site. The works will be confined to the 70-m wide area of the reserve not covered by the vegetation offset overlay. A plan of the stormwater strategy works is shown in Figure 9, and full-size plans are included in Appendix C.

Additionally, the stormwater strategy is based on the assumption that overland flow only from the north-east corner of the Lindum Vale site can be discharged to the existing drainage in Callaway Drive. Minor flows from the north-east corner will be piped to the central drainage reserve for treatment.

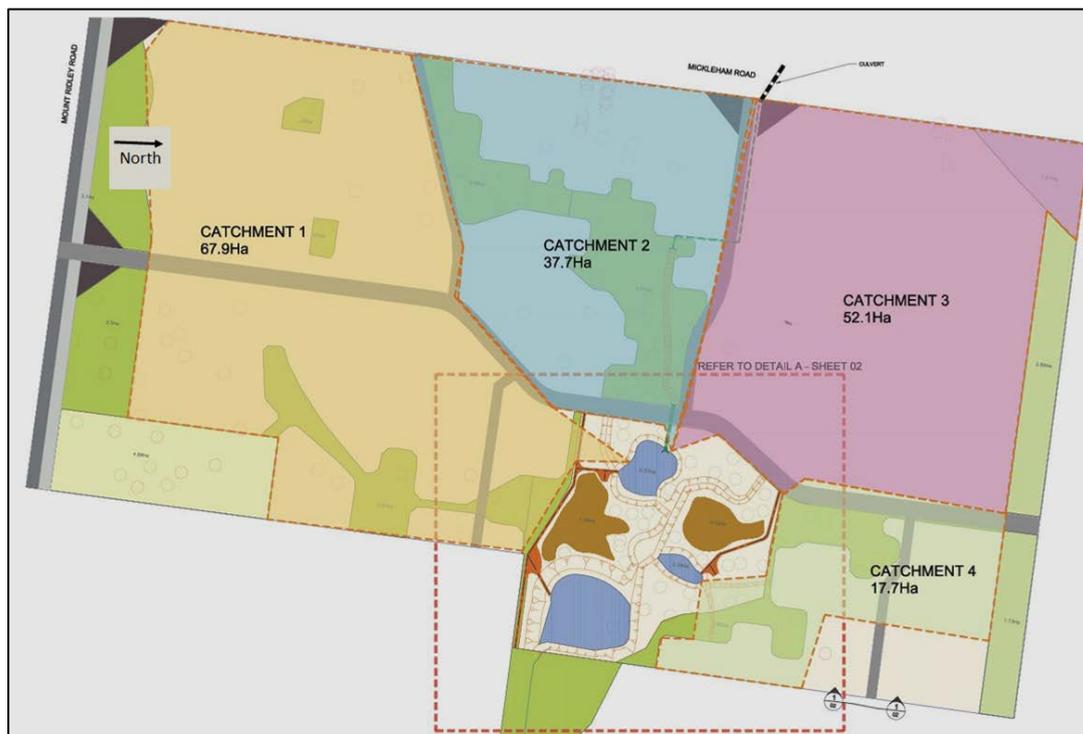


Figure 9—Stormwater strategy plan

#### 3.1. Major Event Drainage

Major event drainage infrastructure will be sized for the 100-year Annual Recurrence Interval (ARI) event.

##### 3.1.1. Southern Catchment

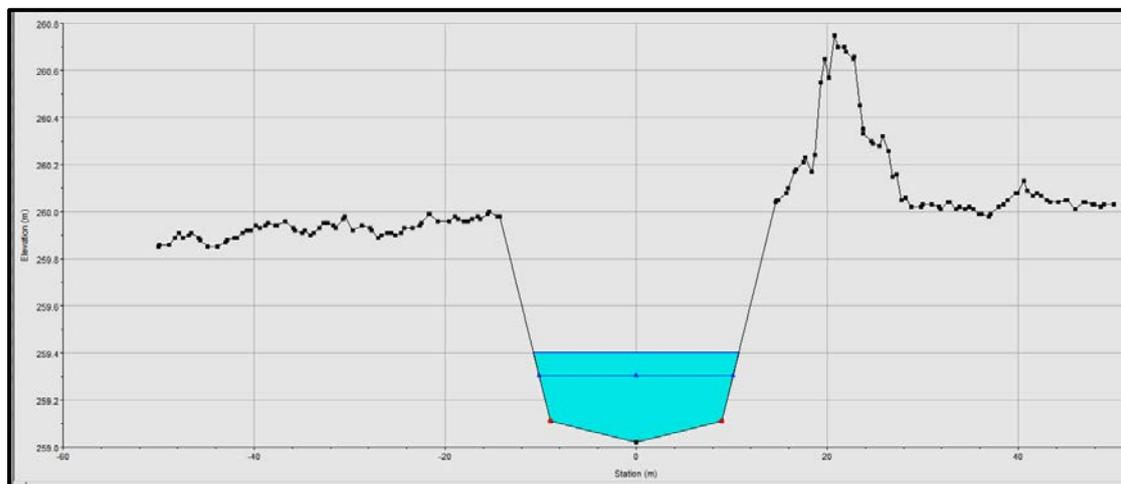
Major event runoff from the southern catchment of the site will be conveyed overland to Melbourne Water's nominated discharge point at Mount Ridley Road.

### 3.1.2. Northern Catchment

Major event runoff generated from the northern catchment will be conveyed overland along roadways to the retention basin.

Major event flows from the external catchment, which enter the subject site at the low point in Mickleham Road, will be conveyed overland along roadways through Lindum Vale. At the main north-south road, the overland flows will discharge to the drainage reserve and will be conveyed overland to the retention basin. A high-flow urban waterway will direct the flow to the retention basin.

The retention basin will be formed by excavating within the reserve. A low embankment at the eastern boundary of the site will separate the retention basin from a downstream urban waterway which will grade out for approximately 300 m within the existing adjacent reserve. The urban waterway will be sized to safely convey the 100-year ARI flows from the retention basin and provide a minimum of 600 mm of freeboard to adjacent downstream properties. Preliminary design indicates that a 1-m deep waterway with a base width of 18 m can convey the major event flow (Figure 10). Such an urban waterway, including a maintenance access path, will fit within the available reserve. The waterway will be designed and landscaped to meet Melbourne Water guidelines for constructed urban waterways. The construction of the downstream urban waterway will alleviate existing inundation issues for some adjacent properties.



**Figure 10—Indicative section of an urban waterway downstream of the site**

The north-east corner of the site naturally grades to the east. The natural fall of the land will be retained in the development design. Existing flows to the north-east are large, and capacity exists to re-route some major-event stormwater flow. Major event flows will be retained via oversized drainage infrastructure, and overland flow will be directed east down the existing Callaway Drive, as summarised in Table 1. Full calculations and safety assessments are included as Appendix D.

**Table 1—Distributed runoff**

Outfall location	Existing catchment	Developed catchment	Approximate number of lots that can drain to the easement*
Drainage ditches at Callaway Drive (North-east of Lindum Vale)	13.3 ha	3.3 ha	46

\*DCE has assumed a development density of 14 lots per ha, excluding roads

### 3.1. Retention Basin Design

Based on the assumption that an urban waterway is created within the adjacent reserve, the retention basin (and associated outlet) is able to be deepened. The preliminary design specifications for the retention basin have been determined using hydrological modelling using RORB software. The specifications are sketched in Figure 12 and listed in Table 2.

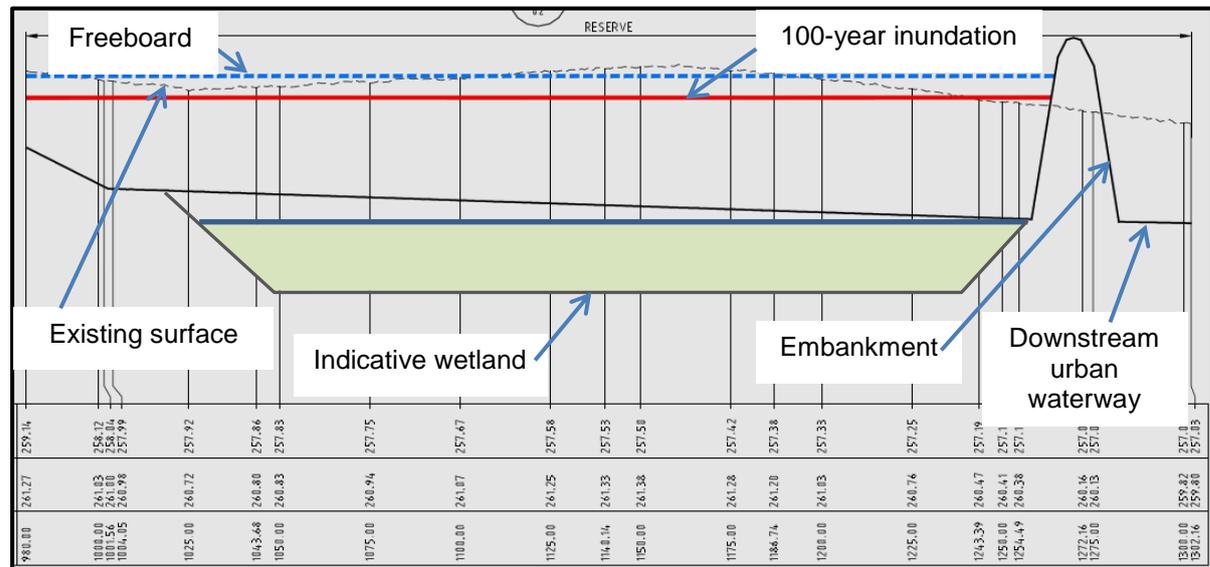


Figure 11—Indicative retention basin section

Table 2—Retention basin preliminary design specifications

Maximum embankment height	3.4 m
Embankment height above existing surface	0.4 m
Overflow weir 1 level/dimensions	259 m AHD / 0.5 m
Overflow weir 2 level/dimensions	259.5 m AHD / 1 m
Overflow weir 3 level	260.7 m AHD
Pipe outlet dimensions	2 x 900 mm diameter
Pipe outlet invert	257.4 m AHD
100-year inundation level	260.53 m AHD
100-year freeboard level	261.13 m AHD

### 3.2. Minor Event Drainage

The minor event drainage network will be designed for the 5-year ARI event.

The minor event flows from the development will be conveyed via pit-and-pipe infrastructure. The piped network will discharge to sediment basins prior to flows entering the wetlands. The wetlands will be set deeper than the existing surface to provide cover for the piped network.

The proposed high-flow urban waterway through the reserve provides several possibilities for location and depth of the wetlands. Some parts of the wetland will be able to outlet to the high-flow urban waterway. A high flow bypass for much of the

wetland will be possible, and the treatment train will mostly be located offline. It is likely, however, that at least part of the wetland will extend to below the invert of the high-flow urban waterway, and a piped outlet to the downstream urban waterway will be required. The pipe will pass beneath the retention basin embankment and continue to the east, parallel to the urban waterway, until it daylight's approximately 250 m downstream.

## 4. STORMWATER MODELLING

The sizing of the retention basin has been based on stormwater modelling undertaken using RORB software. A RORB model of the Malcolm Creek Catchment previously prepared by Hyder for the development of Craigieburn was provided by Melbourne Water. Minor amendments to the model were made including adding a retention basin at the Lindum Vale site boundary and adjusting the catchment sizes to reflect the proposed grading of the site.

Using RORB, the maximum flow at various locations in the Lindum Vale site in the existing and developed conditions was calculated. The retention basin and outlet configuration were sized to ensure downstream developed flow rates will be at or below existing flow rates. DCE can provide copies of the existing and developed conditions RORB models upon request.

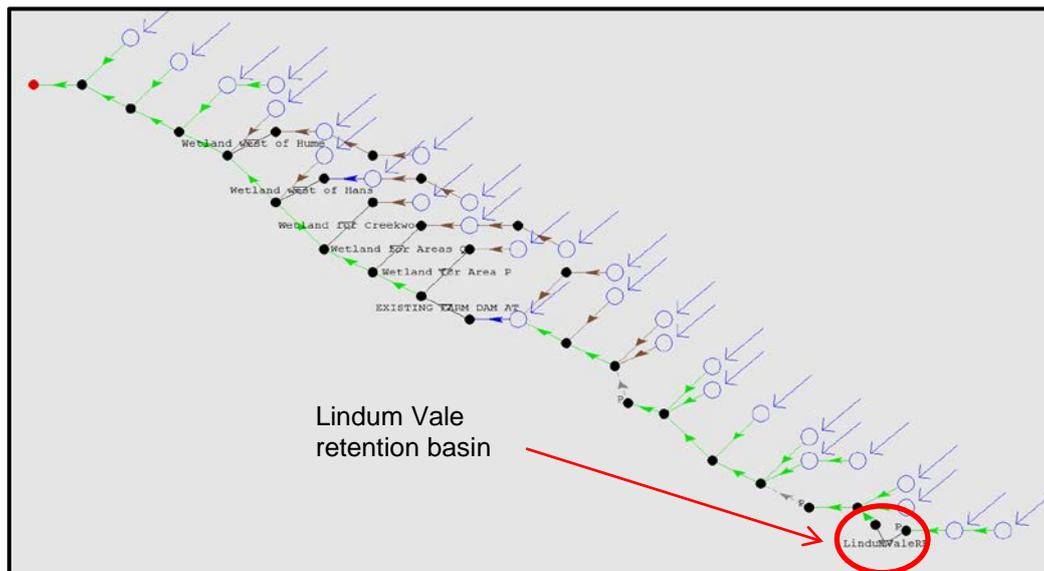


Figure 12—Malcolm Creek RORB model

Table 3—RORB results summary

	Existing Condition	Developed Condition
Flow at downstream (east) boundary	10.2 m <sup>3</sup> /s	10.14 m <sup>3</sup> /s
Retention basin outlet pipe diameter (mm)	-	2 x 900 mm
Retention basin invert		257.4 m AHD
100-year ARI storage required	-	39.8 ML
Retention basin 100-year ARI inundation level	-	260.53 m AHD
Retention basin 100-year ARI freeboard level	-	261.13 m AHD

## 5. STORMWATER QUALITY

Runoff from storm events up to the 3-month ARI requires treatment to achieve best practice targets as per Clause 56 of the *Planning and Environment Act, 1987* and the Best Practice Environmental Management Guidelines (BPEMG). These are summarised in Table 4.

**Table 4—BPEMG stormwater treatment targets**

Consideration	Objective
Total Nitrogen (TN)	45% reduction from typical urban loads
Total Phosphorus (TP)	45% reduction from typical urban loads
Total Suspended Solids (TSS)	80% reduction from typical urban loads
Litter	70% reduction from typical urban loads
1.5-year ARI discharge	Maintain at pre-development levels

Preliminary modelling of the site has been undertaken using MUSIC software to determine the approximate stormwater treatment footprint required to achieve the BPEMG treatment targets.

### 5.1. Stormwater Treatment

Runoff from the development up to the 5-year ARI event will be captured using a pit and pipe network. Runoff from the northern catchment will be conveyed to wetlands within the retention basin on the site. Treatment for flows up to the three-month event will be through a sediment basin and wetland system. Flows greater than the three-month event will pass through the sediment basins, but flows greater than the three-month event will bypass the wetlands to minimise the risk of scour within the wetland. The bypass will be achieved by hydraulic control structures such as weirs or orifice pits.

The indicative size of the sediment basins and wetlands required to achieve the BPEMG targets for each of the northern and southern catchment are presented in Table 5. The areas are based on a development fraction impervious of 75% (medium densities in Melbourne Water's *MUSIC Guidelines*, 2010) at the Lindum Vale site and are preliminary only. The stormwater quality design will be refined when the development layout has progressed further.

**Table 5—Indicative treatment areas and treatment achieved**

	Northern catchment	Southern catchment
Sediment pond area (m <sup>2</sup> )	2,850	280
Wetland macrophyte zone area (m <sup>2</sup> )	28,500	2,800
Total treatment area (m <sup>2</sup> ), excluding batters	31,350	3,080
Total Nitrogen (TN) removed	45.3%	45.7%
Total Phosphorus (TP) removed	70.5%	68.8%
Total Suspended Solids (TSS) removed	84.8%	82.3%
Litter removed	100%	100%

The wetland serving the northern catchment will include provision for sediment dewatering areas and maintenance access and will be designed with consideration of the established trees within the reserve.

The 12-ha southern catchment is within Melbourne Water's Aitken Creek Drainage Scheme. Contributions can be paid for centralised treatment as part of the scheme in lieu of provision of stormwater treatment infrastructure within the site. The contributions payable for each stage within the southern catchment will vary based on development densities and the final areas of conservation and landscape reserves; however, maximum indicative contributions for the entire southern catchment are as shown in Table 6 (current at 19 August 2015).

**Table 6—Indicative Drainage Scheme contributions for the southern catchment**

	No on-site treatment	Full on-site treatment
Hydraulic Contribution	\$ 518,616	\$ 518,616
Water Quality Contribution	\$ 193,200	\$ 0
Total Contribution	\$ 711,816	\$ 518,616

It is unlikely that the southern treatment train sized using MUSIC (Table 5), could be constructed for less than \$193,200. DCE therefore recommend that payment of stormwater contributions for the southern catchment is likely to be more economical than providing treatment on-site.

## 6. WATER SENSITIVE URBAN DESIGN

Throughout the planning process, DCE have investigated a variety of integrated water cycle management options for the Lindum Vale development. The investigations and results are detailed in *Lindum Vale Stormwater Strategy, version 3* (DCE, June 2015), the previous version of this report.

## **APPENDIX A: Draft PSP Plan**

100 0 100 200 300 400 m



MERRIFIELD WEST PSP

FUTURE OUTER METROPOLITAN RING ROAD

- 1 Large lots with landscape buffer on boundary
- 2 Large lots interfacing with Mt Ridley Road local park

Large lots with a landscaped buffer ensure the visual amenity and privacy of existing residents are protected.

CALLAWAY DRIVE

A central park accommodates wetlands surrounded by indigenous trees and links to the adjoining eastern open space via walking paths.

A network of local parks running east-west and north-south accommodates and conserves the majority of indigenous trees within the precinct.

COOINDA AVENUE

GREEN WEDGE ZONE

RURAL LIVING ZONE

MICKLEHAM ROAD

BILLABONG CLOSE



Mt Ridley Road Landscape Interface responds to Hume City Council's Mt Ridley Road Inter-Urban Break Policy.

1:8,000 @ A4



**DRAFT - Future Urban Structure**

PSP 1202 - Lindum Vale Precinct Structure Plan

Conservation area protecting endangered grassy eucalypt woodland.

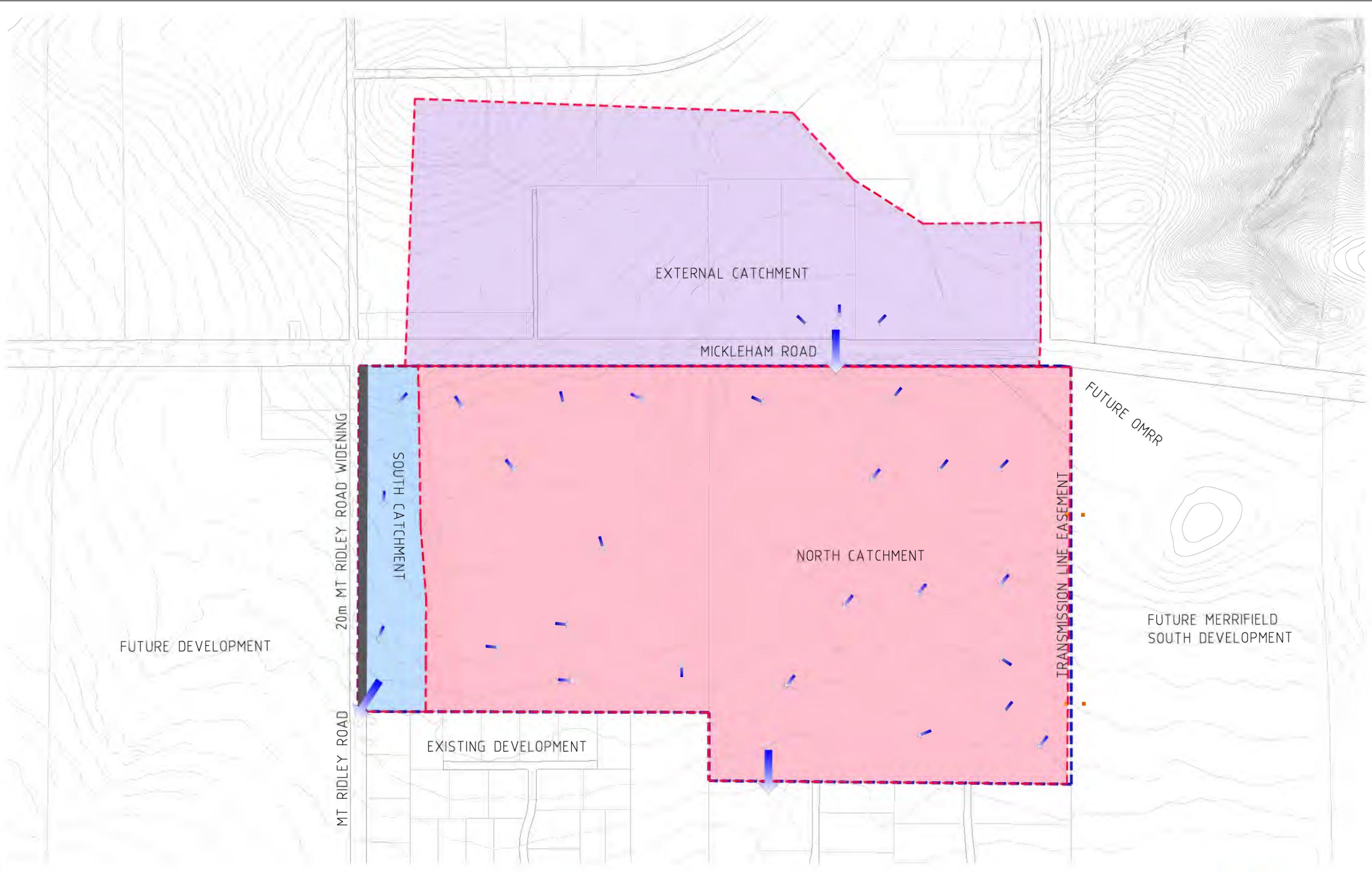
MICKLEHAM PRIMARY SCHOOL

MOUNT RIDLEY ROAD

- |                                  |                                  |                                      |
|----------------------------------|----------------------------------|--------------------------------------|
| precinct boundary                | connector street                 | local park                           |
| residential                      | existing road connections        | conservation area                    |
| wetlands                         | future road connections          | utilities easement                   |
| drainage                         | potential future road connection | heritage site (former Parnell's Inn) |
| existing government school       | signalled intersection           | rural residential interface          |
| public acquisition overlay (PAO) | left in, left out intersection   | existing tree                        |
| existing road reserve            | local convenience centre         |                                      |

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## **APPENDIX B: Existing Conditions Catchment Plan**



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 11604\_Servicing\_Strategy\_V2.dwg - 11/05/2015  
 Date/Time: Tue Sep 30, 2014 - 8:50am - r10509

**NOT TO BE USED FOR CONSTRUCTION**

REV	AMENDMENTS	DATE	APPD.
C	ISSUED FOR STORMWATER STRATEGY	30/09/14	TL
B	REVISED FOR SERVICING STRATEGY V2	12/06/13	TL
A	ISSUED FOR SERVICE STRATEGY REPORT	05/11/12	TL

Drawn PM Date 05/11/12  
 Designed -  
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 AN  
 Verified -  
 Date -  
 AN  
 Audited -  
 Date -  
 AN  
 Approved -  
 Date -  
 AN  
 Written dimensions to take precedence over scale.  
 Contractor shall check and verify all dimensions on site.  
 Discrepancies to be brought to the attention of the Superintendent.

**LEGEND**

- PROPOSED MAIN DRAIN
- SOUTH CATCHMENT
- NORTH CATCHMENT
- EXTERNAL CATCHMENT
- PROPOSED CONSTRUCTED WATERWAY AND WETLAND
- FLOW DIRECTION

Joint venture partners:  
  
 Coords: MGA  
 Levels: AHD  
 Hor 1:4000 0m 40m 80m 160m 240m  
 Scale @ A1/A3

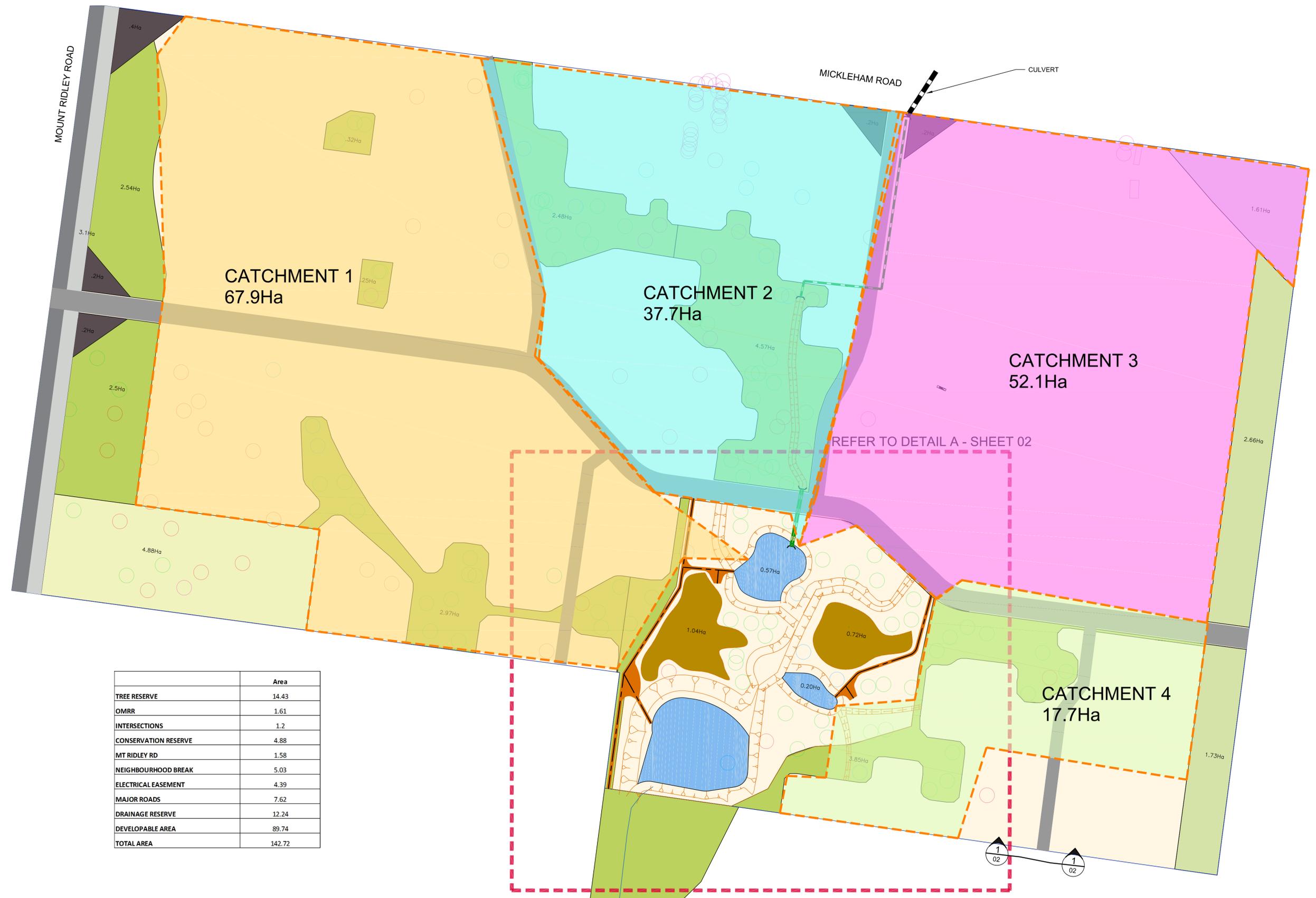
**LINDUM VALE DEVELOPMENT**  
 LOT 7 & 8 MICKLEHAM ROAD  
 MICKLEHAM  
 STORMWATER STRATEGY  
 EXISTING CONDITIONS  
 Drawing No. 11604SS05 Rev C  
 Sheet No. 05 PRELIMINARY  
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 ABN 78 428 221 049

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## **APPENDIX C: Stormwater Strategy Concept Drawings**

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 Date/TIME: Fri, Aug 07, 2015 - 3:22pm --James.Campbell--



	Area
TREE RESERVE	14.43
OMRR	1.61
INTERSECTIONS	1.2
CONSERVATION RESERVE	4.88
MT RIDLEY RD	1.58
NEIGHBOURHOOD BREAK	5.03
ELECTRICAL EASEMENT	4.39
MAJOR ROADS	7.62
DRAINAGE RESERVE	12.24
DEVELOPABLE AREA	89.74
<b>TOTAL AREA</b>	<b>142.72</b>

NOT TO BE USED FOR CONSTRUCTION  
 REVISION IN PROGRESS

A	FOR DISCUSSION PURPOSES ONLY	06/08/15	TL
REV	AMENDMENTS	DATE	APP'D.

Drawn - Date -  
 Designed JC  
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 Date -  
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 Written dimensions to take precedence over scale.  
 Contractor shall check and verify all dimensions on site.  
 Discrepancies to be brought to the attention of the Superintendent.

**LEGEND**

OFFFALL DRAIN	TREE TO BE REMOVED
AVAILABLE WETLAND FOOTPRINT	BATTER
EXISTING TREES	AVAILABLE SED POND DRYING AREA

Coords: MGA  
 Levels: AHD  
 Hor 1:2500 0m 25m 50m 100m 150m  
 Scale @ A1/A3 1:2500/1:5000

MAB gpc  
 LINDUM VALE  
 MOUNT RIDLEY ROAD, MICKLEHAM  
 STORMWATER PLANNING - OPTION 3  
 11604.53SK01  
 Drawing No. 11604.53SK01 Rev A  
 Sheet No. 01 PRELIMINARY  
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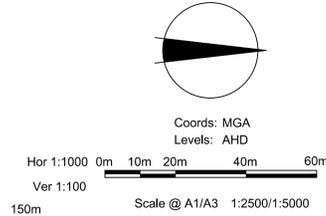
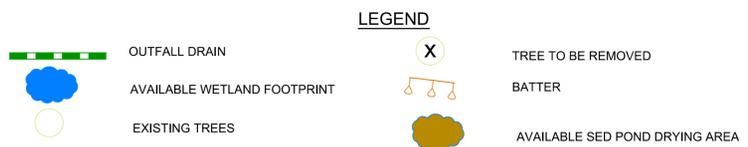


DETAIL A

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 REVISION IN PROGRESS

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 Designed JC  
 Date 05/08/15  
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 Approved -  
 Date -  
 AN  
 Written dimensions to take precedence over scale.  
 Contractor shall check and verify all dimensions on site.  
 Discrepancies to be brought to the attention of the Superintendent.



**MAB | gpc**  
**LINDUM VALE**  
**MOUNT RIDLEY ROAD, MICKLEHAM**  
**STORMWATER PLANNING - OPTION 3**  
**11604.53SK02**  
**Drawing No. 11604.53SK02 Rev A**  
 Sheet No. 02 PRELIMINARY  
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REV	AMENDMENTS	DATE	APP'D.
A	FOR DISCUSSION PURPOSES ONLY	06/08/15	TL

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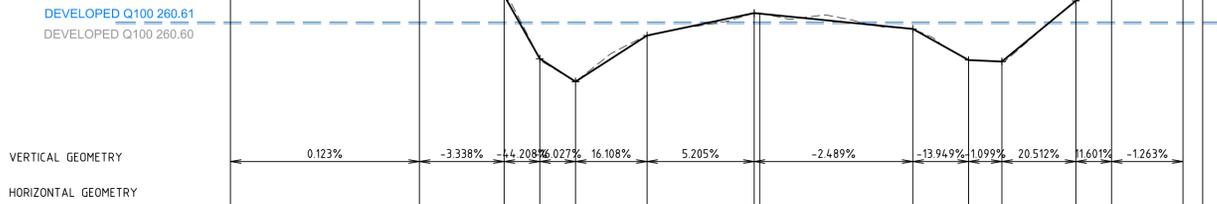
## **APPENDIX D: Distributed Runoff Calculations, Plans and Results**

VERTICAL GEOMETRY  
HORIZONTAL GEOMETRY

DATUM RL260

EXISTING SURFACE RL	260.814	260.790	260.867	260.789	260.433	260.311	260.334	260.493	260.600	260.768	260.749	260.592	260.448	260.540	260.730	260.797	260.797
DESIGN SURFACE RL		260.790	260.867	260.789	260.433	260.311	260.334	260.493	260.600	260.768	260.721	260.592	260.448	260.540	260.730	260.797	260.797
CHAINAGE	0.00	1.12	10.12	11.19	11.92	12.26	12.89	13.34	14.41	18.71	20.00	23.49	25.16	26.23	27.31	30.00	30.01

**SECTION 01**  
EX. CALLAWAY DRIVE  
CH0.000



DATUM RL257

EXISTING DESIGNLINE RL	258.873	258.873	258.880	258.800	258.352	258.190	258.516	258.671	258.671	258.562	258.342	258.332	258.161	258.879	258.853	258.820
DESIGNLINE RL	258.873	258.880	258.800	258.352	258.190	258.516	258.671	258.671	258.562	258.342	258.332	258.161	258.879	258.853	258.820	
DESIGNLINE CHAINAGE	0.00	5.36	7.76	8.77	9.78	11.81	16.84	15.00	19.34	20.92	21.86	23.86	24.97	26.99	27.55	

**SECTION 02**  
EX. CALLAWAY DRIVE  
CH220.000

dev	LINDUM VALE ARI								h <sub>100</sub> mm/hr	Q <sub>100</sub> m <sup>3</sup> /s
	a	b	c	d	e	f	g			
100	3.900116	-0.653951	-0.041036	0.005992	0.002167	0.000158	-0.000123			
Catchment/Point	Length m	Slope %	n	Tc mins	Area ha	C	Ae ha	ΔAe ha	I <sub>100</sub> mm/hr	Q <sub>100</sub> m <sup>3</sup> /s
<b>Section 1</b>										
1. Catchment to Callaway Dve Existing	960	1.0	0.030	31.79	13.26	0.28	3.73		73.54	0.76
1. Catchment to Callaway Dve Developed	470	1.0	0.020	21.71	3.70	0.72	2.66		91.68	0.68
<b>Section 2</b>										
1. Catchment to Callaway Dve Existing	1180	1.0	0.030	34.05	13.26	0.40	5.30		70.57	1.04
1. Catchment to Callaway Dve Developed	690	1.0	0.020	23.98	6.70	0.72	4.82		86.66	1.16
									<b>Total</b>	

LINDUM VALE DEVELOPMENT      EXISTING CALLAWAY DRIVE

CULVERT  
D/WAY

CULVERT  
D/WAY

CULVERT  
D/WAY

CULVERT  
D/WAY

VERTICAL GEOMETRY  
HORIZONTAL GEOMETRY

DATUM RL256

EXISTING SURFACE RL	260.746	260.379	260.091	260.064	259.940	259.940	259.826	259.603	259.462	259.320	259.282	259.129	258.919	258.815	258.427	258.288	258.287	258.205	258.089	258.004	257.955	257.776	257.697	257.418	257.240	257.150		
DESIGN SURFACE RL	260.746	260.379	260.091	260.064	259.940	259.940	259.826	259.603	259.462	259.320	259.282	259.129	258.919	258.815	258.427	258.288	258.287	258.205	258.089	258.004	257.955	257.776	257.697	257.418	257.240	257.150		
CHAINAGE	0.00	0.14	20.00	35.59	40.00	59.57	60.00	63.19	63.69	100.00	120.00	140.00	145.49	160.00	180.00	180.37	200.00	205.60	205.83	220.00	240.00	254.51	260.00	280.00	300.00	320.00	340.00	350.00

**LONGITUDINAL SECTION EXISTING CALLAWAY SWALE**  
HORIZONTAL 1 IN: 500  
VERTICAL 1 IN: 50

**NOT TO BE USED FOR CONSTRUCTION**  
**REVISION IN PROGRESS**

Drawn - Date -  
Designed JC  
Date 05/08/15  
AN  
Verified -  
Date -  
AN  
Audited -  
Date -  
AN  
Approved -  
Date -  
AN  
Written dimensions to take precedence over scale.  
Contractor shall check and verify all dimensions on site.  
Discrepancies to be brought to the attention of the Superintendent.

**LEGEND**

- OUTFALL DRAIN
- AVAILABLE WETLAND FOOTPRINT
- EXISTING TREES
- TREE TO BE REMOVED
- BATTER
- AVAILABLE SED POND DRYING AREA

Coords: MGA  
Levels: AHD

Hor 1:100 0m 1m 2m 4m 6m  
Vert 1:25 0m 0.25m 0.5m 1.0m 1.5m  
Scale @ A1/A3 1:2500/1:5000

**MAB gpc**  
**LINDUM VALE**  
**MOUNT RIDLEY ROAD, MICKLEHAM**  
**STORMWATER PLANNING - OPTION 3**  
**11604.53SK03**  
**Drawing No. 11604.53SK03 Rev A**  
Sheet No. 03 PRELIMINARY  
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11604.53SK03.dwg 11604.53SK03  
Date/Times: Fri Aug 07, 2015 - 3:22pm --James.Campbell--