Appendix 5 – Stormwater Strategy

Contents

Definitions

AEP	Annual Exceedance Probability
OSD	On-site Stormwater Detention
Rational Method	A method of estimating the runoff at a specific point and time by means of the rational formula $Q = C.I.A/360$, where C is a runoff coefficient based on type of surface, I is the rainfall intensity in mm/hour, and A is the area in hectares.
WSUD	Water Sensitive Urban Design
AS3500.3	Australian Standard for Plumbing and Drainage – Stormwater Drainage

The orifice diameter will be determined in the detailed design phase and is dependant on the amount of head in the orifice pit (subject to detailed design of the retarding basins). Each orifice will be designed to let out a maximum flow rate equivalent of the 20% AEP pre-development flow for each catchment during a post-development 20% AEP event.

A summary of the OSD computations for the road reserves is shown below.

	CATCHMENT A		CATCHMENT B	
	20% AEP PRE-DEVELOPMENT	20% AEP POST DEVELOPMENT	20% AEP PRE-DEVELOPMENT	20% AEP POST DEVELOPMENT
Catchment Area (Ha)	1.25		1.929	
Coefficient of Runoff	0.14	0.52	0.14	0.54
Time of Concentration (min)	9	6	11	6
Rainfall Intensity (mm/h)	68	99	54	99
Flow (m^3/s)	0.048	0.168	0.062	0.244
Detention Volume Required (m^3)	51		83	

The above computations allow for the superlot to be developed as medium density rediential.

c. Major Flows

The surface of the proposed allotments will be designed such that the development is free flowing towards the stormwater pits and road reserves to ensure no damage to private property occurs. Pits and pipes will be designed to convey flows in a 20% AEP event.

Roads will act as overland flow paths for events greater than the 20% AEP and be designed to meet flood safety criteria (maximum flood depth of 0.3m, maximum velocity of 1.5m/s and maximum d x v of $0.3m^2/s$) for the 1% AEP event.

d. Water Sensitive Urban Design

To address the WSUD requirements for stormwater quality treatment post development, a MUSIC model has been produced based. MUSIC is a software tool used to measure the pollutant loads on stormwater networks based on development and the reduction of pollutants based on various treatment options. Refer to Appendix E for model layout and pollutant reduction results.

The model comprises of rainwater tanks, which would be plumbed to each dwelling for reuse in toilet flushing, laundry and irrigation. The allocated reuse volume for each lot is 2,000 litres and a reuse rate of 150 litres per day is assumed.

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Runoff from the balance of lots and road reserves will be treated using a bioretention system in each catchment, which is located in the base of the retarding basins. Storm flows will infiltrate through the filter media within the bioretention systems and be directed to the piped stormwater network via a series of agi drains.

All runoff from both catchments will discharge into the swale/depression at the western and northern boundaries of the site.

The following table shows the targets that are required to be met in order to satisfy the best practice guidelines[2] against the performance of the proposed treatment cycle (via tanks):

	Target	Projected Performance
Reduction in suspended solids	80%	90.0%
Reduction in total nitrogen	45%	56.4%
Reduction in total phosphorous	45%	53.8%

The MUSIC model demonstrates best practice targets are met. And makes allowance for the superlot to be developed as medium density residential.

4. CONCLUSION

A drainage system is to be included in the development in accordance with the Infrastructure Design Manual that conveys minor flows in subsurface drainage pipes and allows major flows to discharge through the catchments to the existing waterways west and north of the site (or 1% AEP pipe if no overland flow path is available).

Detention is to be provided that will reduce the storm flows to pre-development flow rates in a 20% AEP event.

WSUD best practice guidelines will be achieved by directing storm flows from roofs to water tanks and balance land to bioretention systems.

5. REFERENCES

1 Infrastructure Design Manual (version 5.10), *Local Government Infrastructure Design Association*, 11 January 2018.

2 WSUD ENGINEERING PROCEDURES STORMWATER, CSIRO PUBLISHING, 2005

3 SPEL are a leading provider in Australia of Stormwater Treatment products

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APPENDIX B – Proposed Development

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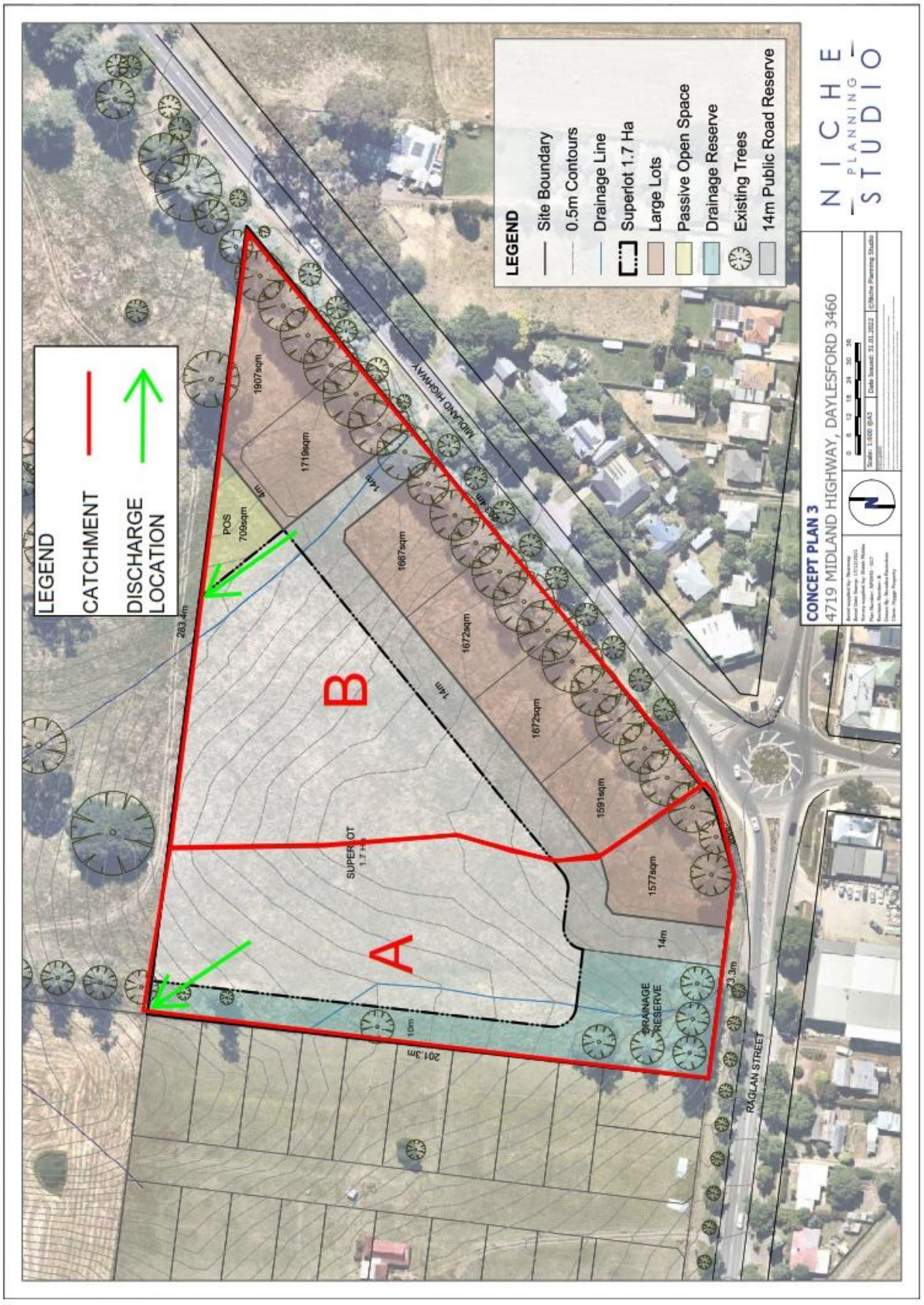
APPENDIX C – Catchment Plan



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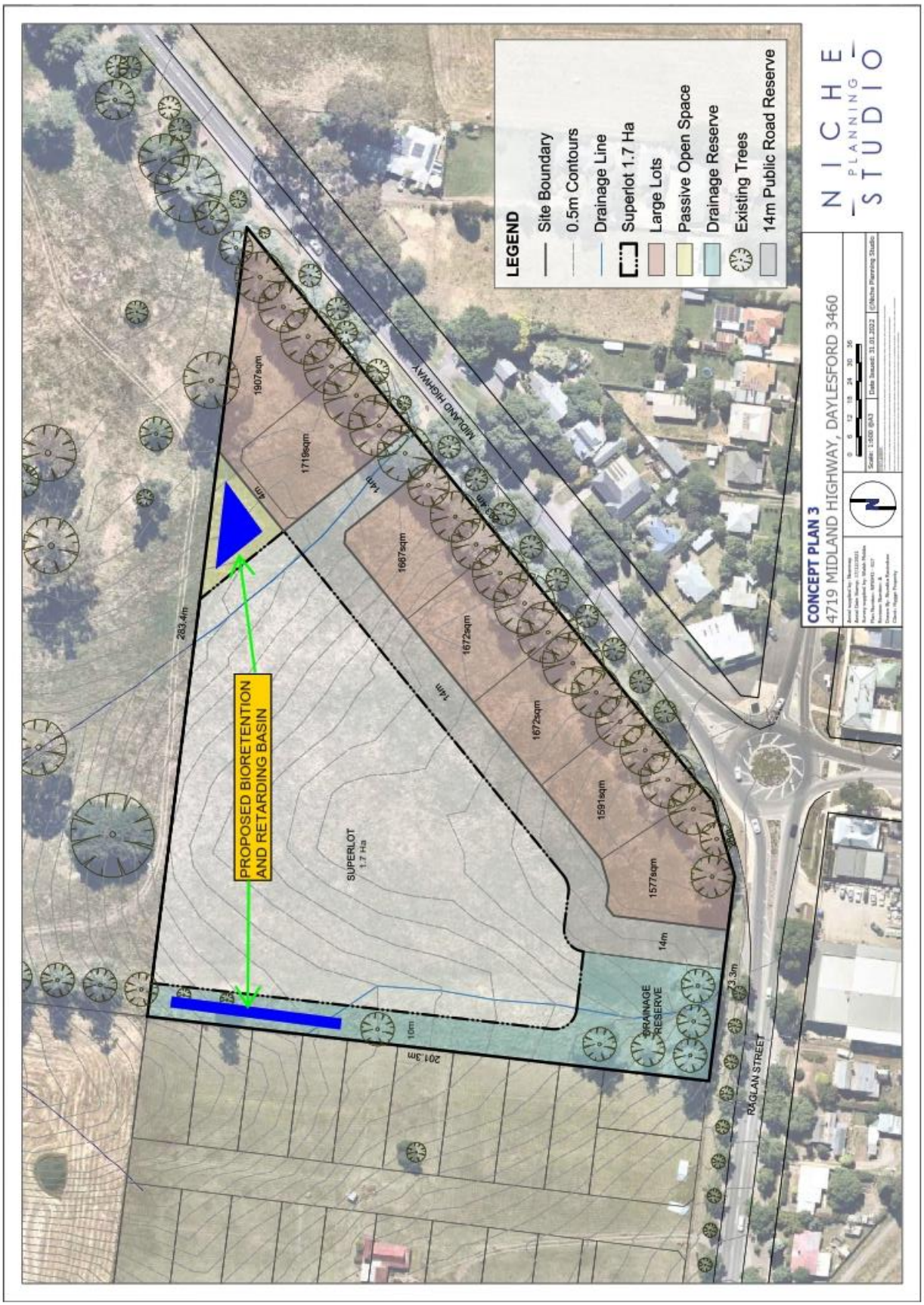
APPENDIX D – Retarding Basin Plan



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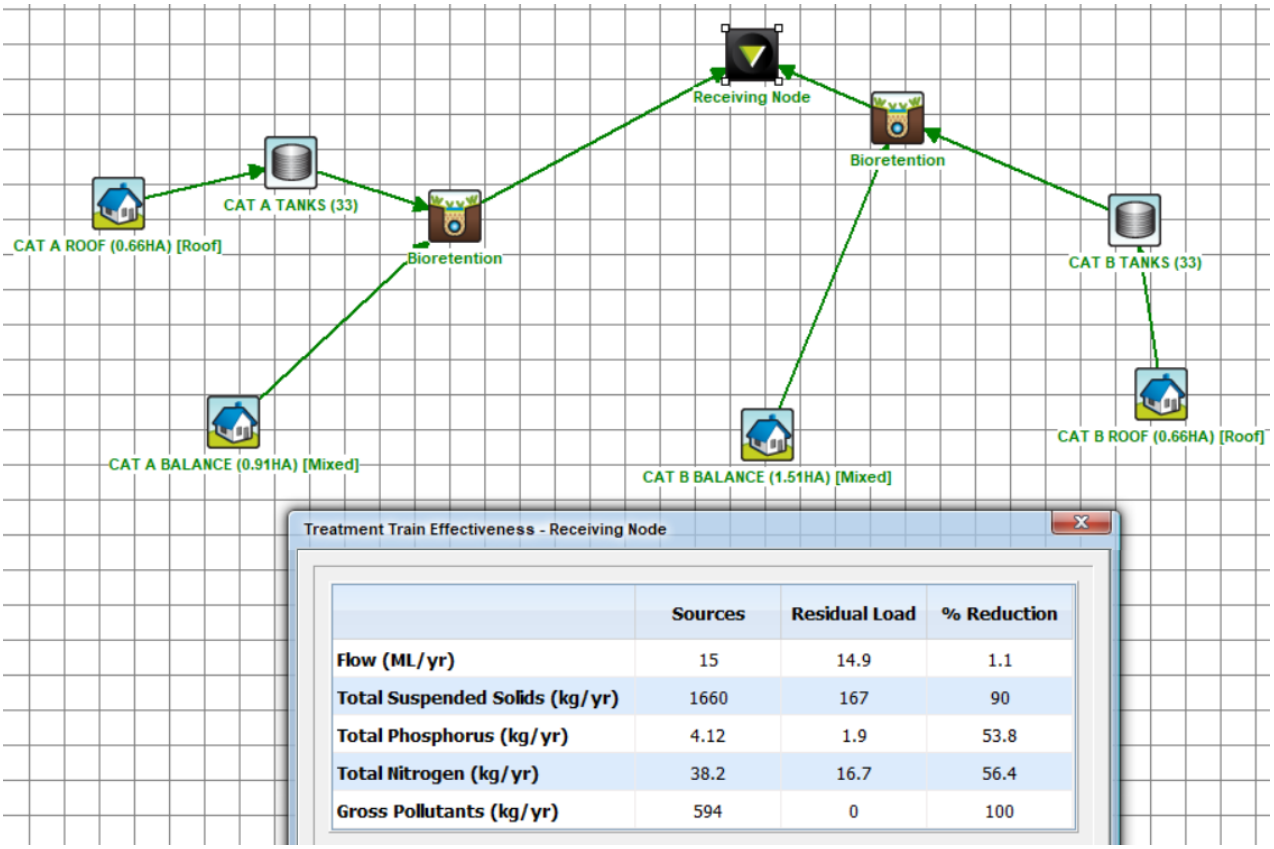
APPENDIX E – MUSIC Model



Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	15	14.9	1.1
Total Suspended Solids (kg/yr)	1660	167	90
Total Phosphorus (kg/yr)	4.12	1.9	53.8
Total Nitrogen (kg/yr)	38.2	16.7	56.4
Gross Pollutants (kg/yr)	594	0	100

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