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VERSION C
WATER & ENVIRONMENT

Proposed Industrial Development 813-913 Wallgrove Rd, Horsely Park

Stormwater Concept Plan

COMMERCIAL IN CONFIDENCE

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DOCUMENT CONTROL

X122584-01C

Issue	Date	Issue Details	Author	Checked	Approved
C	April 2015	Revised to reflect new road layour	PG/RB	PG	PG
B	August 2015	For DA	RB	PB	
A	July 2013	Internal Review	RB	PB	

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1 INTRODUCTION

Brown Consulting has been engaged by Gazcorp Pty Ltd to develop a stormwater concept plan for a proposed industrial development at 813 – 913 Wallgrove Road, Horsely Park. This concept plan covers stormwater quality and quantity management issues to support the Development Application (DA) for the subdivision of 15 lots and proposed internal access road. The site is situated within the Local Government Area of Fairfield City Council. The locality sketch of the study area is shown in **Figure 1.1** below.

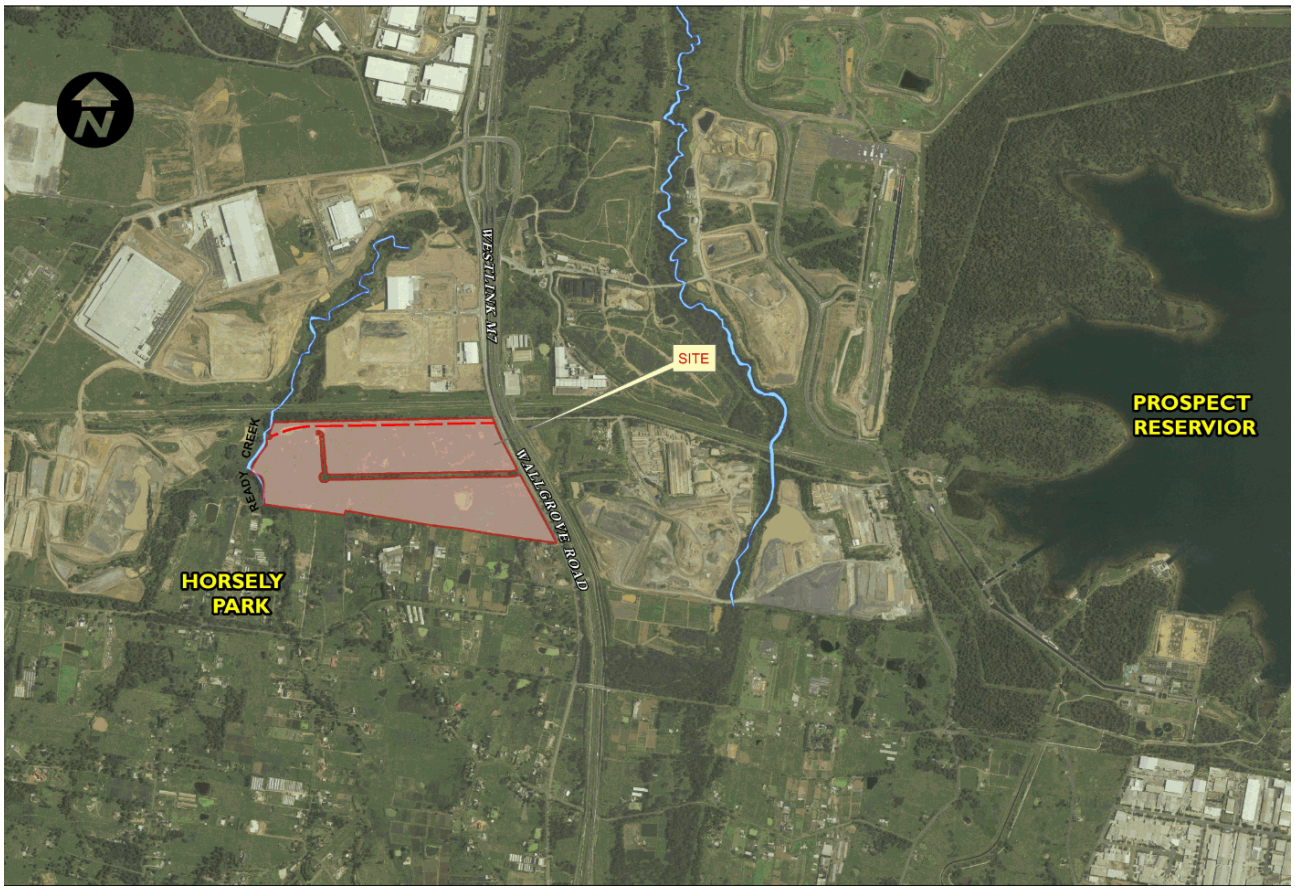

Figure 1.1: Locality Sketch

1.1 NOTE ABOUT THIS REVISION

Please note, this version of the Stormwater Concept Plan revises basin volumes to reflect revised internal road alignments and grading plans.

This version also realigns a proposed drainage swale that was noted to clash with electricity transmission towers.

1.2 DESCRIPTION OF THE STUDY AREA

The site is bordered by Wallgrove Road and Western Sydney Toll Road M7 at the east, Ready Creek at the west, and Sydney Catchment Authority pipeline at the northern boundary. Currently the site is used as grazing pasture land for cattle and horses.

The proposed development consists of 15 industrial lots with an internal access road to provide access to the proposed lots from Wallgrove Road. There is a future RMS Road reserve shared in part by the site, which will eventually run along the northern boundary of the site to be commissioned at a future stage. The general layout plan of the site is shown in **Figure 1.2** below.

Figure 1.2: The Proposed Layout Plan of the Site

1.3 OBJECTIVES

The proposed development will alter the natural catchment boundaries and increase the amount of stormwater runoff produced within the site.

A stormwater detention strategy is required to ensure that there is no net increase in stormwater discharge rates at each of the three principle outlets to neighbouring lands.

The objectives of the Stormwater Concept Plan for the subdivision prescribes detention basins that will meet the requirements of the *Fairfield Development Concept Plan (November, 2010)*; *Urban Area Onsite Detention Handbook (February, 1997) for water quantity and Sydney Metropolitan Catchment Management Authority, Interim Reference Guidelines for South East Queensland Concept Design Guidelines for WSUD* for water quality management.

The objectives of this study is:

- To provide stormwater concept design of trunk drainage for the overall site
- To provide a concept sizing of detention storage requirement to match pre-development flows from the site.
- To demonstrate that the proposed stormwater treatment strategy meet the pollution reduction targets outlined in the *Sydney Metropolitan Catchment Management Authority, Interim Reference Guidelines for South East Queensland Concept Design Guidelines for WSUD*.
- To provide an interim stormwater concept design for the interim Stage 1 of works for the site.

2 HYDROLOGY

2.1 CATCHMENT AREAS

The total site area is 52.38 ha which currently drains to three principle outlets:

Outlet 1 - The South Eastern principle subcatchment is **14.12ha** in size and drains to existing box culvert located under Wallgrove Road eventually drains to Eastern Creek.

Outlet 2 – The North Eastern subcatchment which is **13.0ha** in size, drains to north eastern corner of the site via an existing swale drain which then drains under the SCA pipeline.

Outlet 3 – The western subcatchments is the largest principle catchment area which is **26.0ha** in size and drains directly to Reedy Creek.

There are two external upstream catchment areas draining to the site:

External SE - The South Eastern external catchment is **74.71ha** in area, which drains through the south-eastern corner of the site which combines with the internal catchment areas of the site draining to Outlet 1.

External SW - The South Western external catchment is **5.6ha** in area, which drains through the site along to southern boundary and eventually discharges to Reedy Creek at the south-western corner of the site.

Stormwater runoff for the existing and proposed catchment conditions was modelled using the *XP-RAFTS* (version SP1, 2009) hydrological package. The Sub-catchments for the model were delineated using CatchmentSIM GIS based program based on a combination of 5m DEM of Smoothed ALS data supplied by the NSW Department of Lands and land survey of the site. The existing internal and external catchment areas shown in **Appendix A**.

2.2 MODEL PARAMETERS

Intensity Frequency Duration (IFD) data were obtained from *Fairfield City Council, Stormwater Drainage Policy (Sept 2002).* Hydrological modelling for the study area was undertaken for 5y and 100 year ARI events of storm durations from 10 minutes to 72 hours.

The Initial and Continuous Loss (IL/CL) model was adopted for modelling in *XP-RAFTS* and the parameters recommended in *Australian Rainfall and Runoff –Volume 2* (Institution of Engineers, Australia, 1987) we adopted for this study and are shown in **Table 2.1** below.

Table 2.1: Design Loss Rates

Item	*Pervious Area Loss*	*Impervious Area Loss*
Initial Loss (mm)	10	1
Continuing Loss (mm/hr)	2.5	0

A fraction impervious of 5% and 90% was adopted for undeveloped and developed (industrial) areas respectively. The model input and output data for XP-RAFTS is provided in **Appendix B**.

2.3 RESULTS OF MODELLING

2.3.1 EXISTING CONDITIONS

The peak flows for exiting catchment conditions were analysed using *XP-RAFTS* and the modelled peak flows and critical storm duration are shown in **Table 2.2** below for 5 year and 100 year ARI design storm events. Refer to Drawing 01 in **Appendix A** for sub-catchment references and outlet locations.

Table 2.2: Existing Peak Flows

Node	***Peak Flow (m^3/s)***	
	5 Year	***100 Year***
OUT 1	2.40 [2 hours]	4.60 [2 hours]
OUT 2	2.30 2 hours]	4.00 [2 hours]
OUT 3	3.40 [2 hours]	6.80 [2 hours]

Note: [ ] denotes critical storm duration in hours.

The peak flow rates presented in Table 2.2 above at each discharge point of the site determine the Permissible Site Discharge (PSD) for the development. Refer to **Appendix B** for detailed results. The upstream catchments are not included in this study. Refer to Report and flood mapping BMT WBM.

2.3.2 DEVELOPED CONDITIONS – WITH NO DETENTION

The peak flows for developed catchment conditions without detention are shown in **Table 2.3** below for 5 year and 100 year ARI design storm events. Refer to Drawing 02 in **Appendix A** for sub-catchment references and outlet locations.

Table 2.3: Developed Peak Flows (No Detention)

Node	*Peak Flow (m^3/s)*	
	5 Year	*100 Year*
OUT 1	5.51 [25min]	8.41 [15min]
OUT 2	3.84 [25min]	5.84 [15min]
OUT 3	9.64 [25min]	14.70 [15min]

The results in Table 2.3 above indicate that, without detention, the development increases the peak flows at the discharge points of the site above the PSD rates, due to the increase in the impervious area of the catchment. On-site Detention is required for the development.

2.4 ON-SITE DETENTION

2.4.1 PERFORMANCE TARGETS

Performance Targets as required for storm water quantity as outlined in *Fairfield City Council, Urban Area On Site Detention handbook (February, 1997)* are summarised below in **Table 2.4**.

Table 2.4: Performance Targets for storm water Quantity

Reduction of peak flows to pre-development levels	5y and 100y ARI

2.4.2 DETENTION REQUIREMENTS

The overall stormwater quantity management strategy for the site is for each lot of the subdivision to provide an individual OSD system incorporated into their respective internal drainage systems. Each lot will have Site Storage Requirement (SSR) and Permissible Site Discharge (PSD) based on a lot area basis as summarised in **Table 2.5**.

Table 2.5: Summary of On-Site Detention Requirements

Attribute	*5Y ARI*	*100Y ARI*
PSD*, ($m^3/s/ha$)	0.105 [0.10]	0.23 [0.20]
SSR*, (m^3/ha)	220 [232]	315 [345]

Note:

1. PSD and SSR are to be provided at a rate of the total Lot Area
2. [ ] PSD and SSR to be provided only for proposed Catchment 3 which is sensitive to pre - developed Catchment Flow at outlet

The PSD and SSR for each lot has been determined to compensate for internal road areas which will not have detention basins. The PSD and SSR for each lot will also accommodate catchments that bypass basins such as earthworks batters and landscaping areas which naturally bypasses detention. An allowance of up to 20% bypass has been factored into determining the PSD and SSR.

The actual arrangement of the detention tanks is subject to detailed design of each lot, however. For purposes of determining site SSR, a below ground detention tank with two stage outlet control structure was modelled for the OSD with no High Early Discharge (HED) included.

2.4.3 RESULTS OF MODELLING WITH DETENTION

The peak flows, critical storm durations and storage requirement for developed catchment conditions with on-site detention is summarised in **Table 2.6**. Refer to **Appendix B** for detailed model output.

Table 2.6: Summary of On-Site Detention Modelling Results

Outlet	*Total Storage Required (m^3)*		*Storage Requirement Rate, SSR (m^3/ha)*		*Permissible site Discharge, PSD (m^3/s/ha)*		*Peak Discharge At Outlet (m^3/s)**	
	5Y	*100Y*	*5Y*	*100Y*	*5Y*	*100Y*	*5Y*	*100Y*
OUT 1	2,740	3,845	220	315	0.105	0.230	2.4	4.6
OUT 2	2,295	3,225	220	315	0.105	0.230	1.8	3.5
OUT 3	4,950	7300	235	345	0.100	0.200	3.4	6.8
TOTAL	9,255	12,990	220	315	0.105	0.230	-	-

Note:* Peak Discharge is total discharge at each outlet and includes 20% area bypass OSD.

2.4.4 COMPARISON WITH PRE AND POST DEVELOPMENT FLOWS

A comparison of pre and post developed with detention flows is presented in **Table 2.7** below. **OUT 1**, **OUT 2** and **OUT 3** represent the existing discharge points from the site.

Table 2.7: Comparison of Pre and Post Development Peak Flow Rates (with OSD)

ARI	*OUT 1*		*OUT 2*		*OUT 3*	
	Pre-dev (m^3/s)	*Post-dev (m^3/s)*	*Pre-dev (m^3/s)*	*Post-dev (m^3/s)*	*Pre-dev (m^3/s)*	*Post-dev (m^3/s)*
5	2.4 [2 hrs]	2.4 [1.5 hrs]	2.0 [2 hrs]	1.8 [1.5 hrs]	3.4 [2 hrs]	3.4 [1.5hrs]
100	4.6 [2 hrs]	4.6 [1.5hrs]	4.0 [2 hrs]	3.5 [1.5 hrs]	6.8 [2 hrs]	6.8 [1.5 hrs

Table 2.7 above shows that applying the proposed SSR and PSD rates to all lots attenuates the runoff from the post developed catchments to the existing flows at the discharge points from the site for 5 year and 100 year ARI. The OSD proposed for the lots provides adequate attenuation of flows to compensate for the roads and other bypass areas.

3 MANAGEMENT OF MAJOR AND MINOR FLOWS

Runoff from lots is generally directed to the internal access road drainage system. Inter-allotment drainage is to be provided for lots draining away from the road. Stormwater is to be generally conveyed through a below ground stormwater drainage network contained within the internal access road reserves. Peak discharges from the site is not to exceed the existing pre-development flow rate from the site. Detention requirements are described in more detail in **Section 2**.

3.1 MINOR FLOW MANAGEMENT

Stormwater runoff from Lots will be directed to a trunk drainage system for minor storm events in a conventional pit and pipe system. Each lot is required to have its own on site detention and water quality treatment to manage water quantity and quality at the outlet.

3.2 MAJOR FLOW MANAGEMENT UP TO 100 YEAR ARI

Flows in excess of the piped system capacity will be conveyed through the site to the nominated discharge pipes as overland flow along the internal access roads and temporary trunk drainage channels in place. The OSD system at each lot is designed in such a way to reduce post to pre developed peak flows for up to 100 year ARI and as such under normal operation of OSD systems, the major flows would be contained within the piped drainage system. Overland flow paths will be provided only as an emergency overflow provision for instances of blockage or OSD system failure.
The stormwater concept plan for the site is shown in **Appendix A**.

3.3 TEMPORARY CONVEYANCE STRUCTURES

During the development of the proposed site, the road drainage system under the future RMS road reserve located at the northern boundary of the site will not be planned as constructed until after the full development of the site. The proposed lots 1 to 2 and lots 11 to 15 will have their own individual OSD systems and be connected into the future road drainage system. As a temporary interim measure, two swales (Swale No 2 and Swale No 3) are proposed to convey 100 year ARI peak flows in place of the road drainage system. The swales will be contained within the area of the site reserved for the future road and will be decommissioned upon construction of the road drainage system. Refer to **Stormwater Concept Plan Drawing** provided in **Appendix A**. The proposed dimensions and hydraulic calculations of the temporary swales are summarised below in **Table 3.1**.

Table 3.1: Summary of Temporary Swales

Swale No	*Depth (m)*	*Base Width (m)*	*Batter (1:X)*	*Slope (%)*	*Q (m3/s)*	*Flow Depth (m)*	*Freeboard (mm)*	*Top Width (m)*
3	1.15	2.0	4.0	1.0	4.0	0.65	500	11
4	1.15	4.0	4.0	1.0	5.0	0.65	500	13

3.4 CONVEYANCE OF EXTERNAL CATCHMENTS

The two external catchment areas draining through the site are to be conveyed via vegetated swales and have been designed to for storms up to 100 year ARI based on flow information supplied by BMT WBM. The dimensions of the proposed vegetated swales located at South East (Swale No.1) and West (Swale No. 4) of site are summarised in **Table 3.2** below. Refer to **Stormwater Concept Plan Drawing** provided in **Appendix A** for locations of the respective swales.

Table 3.2: Dimensions of Swale for Upslope Diversion

Swale No.	*Depth (m)*	*Base Width (m)*	*Batter (1:X)*	*Slope (%)*	*Top Width (m)*
1	1.5	3.0	4	0.5	20
2	1.1	2.0	3	2.0	8.6

The hydraulic modelling of the proposed swales draining the external catchment areas has been undertaken by BMT WBM. Refer to report and flood maps by BMT WBM.

4 STORMWATER QUALITY TREATMENT

4.1 PERFORMANCE TARGETS

The proposed treatment strategy for the site is such that the development site is capable of reducing export loads to the requirements of the *Sydney Metropolitan Catchment Management Authority, Interim Reference Guideline for the South East Queensland Concept Design Guidelines for WSUD*. These target reduction rates are as referred to in the *Director General's Environmental Assessment Requirements* for the site and are provided in **Table 4.1** below.

Table 4.1: Reduction Rate Targets for Water Quality Treatment.

Parameter	***Percentage Reduction (%)***
Reduction in mean annual load of Total Gross Pollutant (GP)	90%
Reduction in mean annual load of Total Suspended Solids (TSS)	85%
Reduction in mean annual load of Total Phosphorous (TP)	65%
Reduction in mean annual load of Total Nitrogen (TN)	45%

4.2 STORMWATER TREATMENT STRATEGY

The stormwater treatment strategy for the overall site is to provide the majority of treatment as on-site treatment measures to within individual lots through adopting Waters Sensitive Urban Design (WSUD) principles. The access road is to provide primary treatment with Gross Pollutant Traps (GPTs). The removal rates to be employed by WSUD within the individual lots are to provide compensatory removal of pollutants for the access road such that the overall treatment of the site meets the removal rate targets presented in **Table 4.1**.

4.2.1 ONSITE TREATMENT FOR INDIVIDUAL LOTS

The stormwater treatment strategy for each individual lot is subject to the future development and building layout, however to compensate for the access road and bypass areas, the individual lots will need to achieve the following minimum reductions rate targets through WSUD:

- **Gross Pollutants 92%**
- **Suspended Sediments 89%**
- **Total Phosphorous 70%**
- **Total Nitrogen 49%**

4.2.2 GROSS POLLUTANT TRAPS (GPT'S)

The proposed gross pollutant traps for the access road area will be placed in line of the trunk drainage system prior to discharge into specific outlet to remove litter, debris and sediment. While the pollutant capture efficiency of various traps may vary, as a conservative measure for modelling purposes, it is assumed that the GPT will be capable of

removing of the following as per typical treatment performance provided in *Sydney Catchment Authority, A guide to the Use of MUSIC in Sydney's Drinking Water Catchment ()*:

- Gross Pollutants 90%
- Suspended Sediments 65%
- Total Phosphorous 15%
- Total Nitrogen 14%

The selection of the proprietary device is subject to detailed design, however the selection of the GPT will need to ensure the device is capable of removing the above reduction rate targets.

4.3 MUSIC MODELLING

1.1.1 Modelling Parameters

The performance of the proposed water quality treatment strategy has been modelled using the *MUSIC V5* water quality model. The parameters adopted for *MUSIC* modelling are provided in **Appendix C**.

4.3.1 MUSIC MODELLING NETWORK

A generic node was modelled to represent the WSUD removal rates to be applied to individual lots. Catchment areas were separated according to surface types with pollutant generation parameters assigned according to surface type. The music modelling adopted for this strategy lumped catchment areas representing total lot roof area, car park and loading area, taking into consideration bypassing catchment areas and road area such that the assessment of reduction rate covers the overall site. The music modelling network is shown in **Figure 4.1** below.

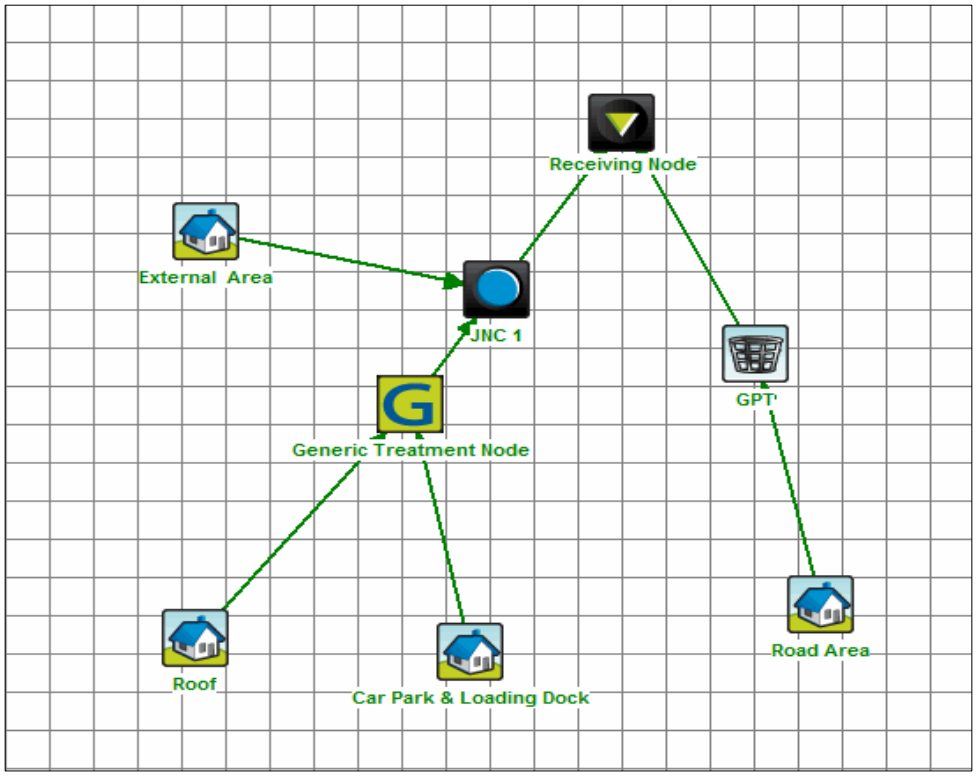

Figure 4.1: Music Model Network for Overall Site.

4.3.2 MUSIC MODELLING RESULTS

Table 4.2 shows the removal rates for the overall water quality treatment for the site. Refer to **Appendix C** for MUSIC model output.

Table 4.2: Results of MUSIC Modelling for Stormwater Treatment Strategy No 1 for Site

Parameter	*Proposed Removal Targets for Road*	*Modelled Removal Rates for Lots*	*Modelled Removal Rates for Site*	*Required Removal rates**
TSS	65%	89%	86.4%	85%
TP	15%	70%	65.6%	65%
TN	14%	49%	46.0%	45%
Gross Pollutant	90%	92%	90.8%	90%

Note:

* Performance targets as required in *Interim Reference Guideline for the South East Queensland Concept Design Guidelines for WSUD*

Table 4.2 shows the proposed removal rates for the future lots are capable of removing the pollutant loads below the required target removal rates for TSS, TP, TN and Gross Pollutants in *Interim Reference Guideline for the South East Queensland Concept Design Guidelines for WSUD*.

5 STAGE 1 INTERIM WORKS

5.1 ON-SITE DETENTION FOR STAGE 1

Stage 1 involves the construction of the central access road and the development of Lot 10 only. OSD is to be provided for Lot 10 under the SSR and PSD requirements to be applied to all lots

Temporary detention is to be provided for the access road until future lots are developed and OSD is incorporated on those lots.

Once the remaining lots have been developed, the temporary detention basins can be removed.

The **Stormwater Concept Plan** for Stage 1 is provided in **Appendix A**.

The interim detention strategy for Stage 1 was modelled using *XP-RAFTS*. A comparison of pre and post developed flows with detention is presented in **Table 5.1** below where, **OUT 1**, **OUT 2** and **OUT 3** represent the existing discharge points from the site.

It should be noted that, an addition outlet identified as **OUT 3a** will drain undeveloped catchments for the stage 1 interim strategy. There will be no increase in flows from this catchment. Under the ultimate strategy, this drainage line will only drain external catchments through the site (Swale number 2) and all internal catchments will drain to OUT 3. Refer to Drawing No. 05 in Appendix A for outlet locations.

Table 5.1: Comparison of Pre and Post Development Peak Flow Rates (with OSD)

ARI	***OUT 1***		***OUT 2***		***OUT 3***		***OUT 3a***	
	Pre-dev (m^3/s)	***Post-dev (m^3/s)***	***Pre-dev (m^3/s)***	***Post-dev (m^3/s)***	***Pre-dev (m^3/s)***	***Post-dev (m^3/s)***	***Pre-dev (m^3/s)***	***Post-dev (m^3/s)***
5	2.4 [2 hrs]	2.35 [2 hrs]	2.0 [2 hrs]	2.0 [2 hrs]	3.4 [2 hrs]	3.40 [2 hrs]	0.8 [2 hrs]	0.7 [2 hrs]
100	4.6 [2 hrs]	4.50 [2 hrs]	4.0 [2 hrs]	3.98 [2 hrs]	6.8 [2 hrs]	6.78 [2 hrs]	1.6 [2 hrs]	1.4 [2 hrs]

Table 5.1 shows that the interim detention strategy for the site is capable of attenuating peak flows discharging from the site to existing peak flows for 5 years to 100 year ARI.

5.2 STORMWATER QUALITY TREATMENT

The drainage strategy for Stage 1 incorporates temporary catch drains to separate runoff from undeveloped catchments from the stage 1 development footprint. It is proposed to provide a temporary 600 mm diameter pipe culvert under the access road which will drain the undeveloped catchments under the access road and around stormwater treatment basins.

The treatment strategy for Stage 1 is to be with a combination of internal treatment devices for lot 10 and temporary bio retention basins for the access road. Once the future lots have been developed at a future stage, the on lot treatment system provided on all the lots will compensate for the access road catchment and the temporary basins can be decommissioned.

The target removal rate for Lot 10 proposed to be achieved through a combination of bioretention in car park areas, Enviropods located within gully pits for Hardstand areas and finally whole site routing through in line GPTs with Stormfilter treatment system fitted to the OSD tanks. Refer to the **Stormwater Concept Plan** for Stage 1 provided in **Appendix A**. The internal drainage of Lot 10 is subject to detailed design however the sizing of the treatment systems used for MUSIC modelling to achieve the target removal rates for Stage 1 is provided in **Appendix C**.

5.2.1 MUSIC MODELLING NETWORK

The music modelling adopted for the stage 1 interim strategy lumped catchment areas representing total lot roof area, car park and hardstand (loading) area, taking into consideration external catchment areas and road area such that the assessment of reduction rate covers Stage 1 site. The music modelling network for stage 1 is shown in **Figure 5.1** below.

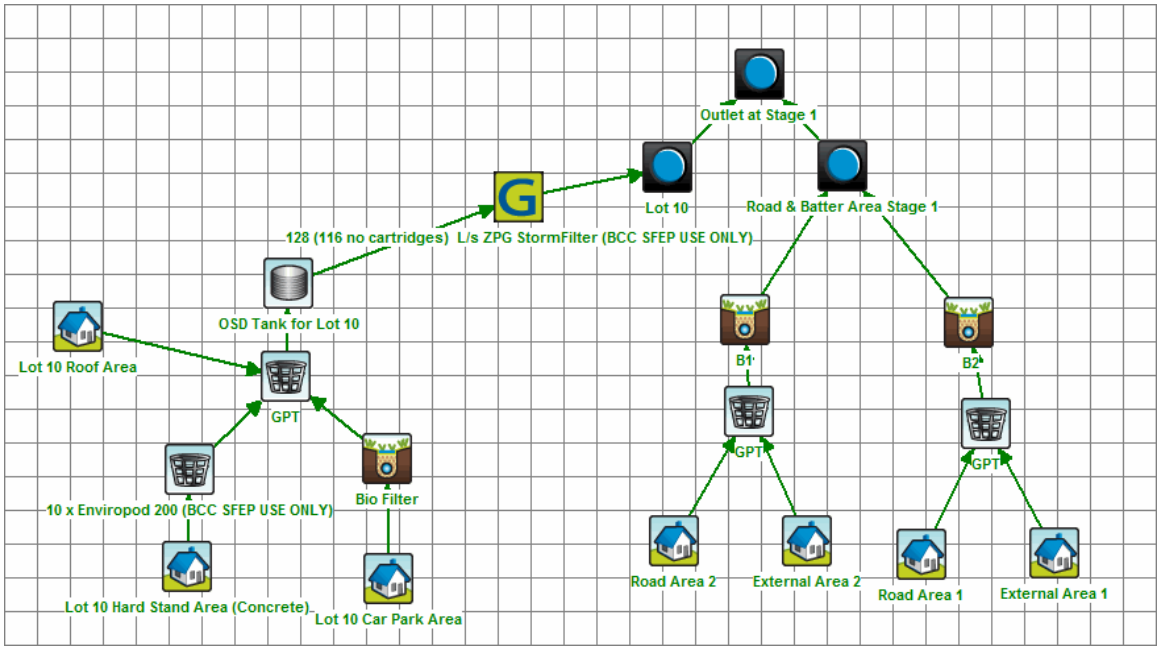

Figure 5.1: Music Model Network for Stage 1

5.2.2 MUSIC MODELLING RESULTS

Table 5.2 shows the removal rates for the overall water quality treatment for the site. Refer to **Appendix C** for *MUSIC* model output.

Table 5.2: Results of MUSIC Modelling for Stormwater Treatment Strategy for Stage 1

Parameter	***Proposed Removal Targets for Lot 10***	***Modelled Removal Rate using Treatment Strategy for Lot 10***	***Modelled Overall Removal Rate for Road Area***	***Modelled Removal Rates for Site***	***Required Removal rates****
TSS	89%	93%	91.5%	92.6%	85%
TP	70%	69.2%	65.0%	68.0%	65%
TN	49%	51.9%	50.2%	51.5%	45%
Gross Pollutant	92%	100%	100%	100.0%	90%

Note:

* Performance targets as required in *Interim Reference Guideline for the South East Queensland Concept Design Guidelines for WSUD*

Table 5.2 shows that, the stormwater treatment strategy for Stage 1 is capable of removing the pollutant loads below the required target removal rates for TSS, TP, TN and Gross Pollutants in *Interim Reference Guideline for the South East Queensland Concept Design Guidelines for WSUD*.

6 CONCLUSION

It is concluded that the proposed Stormwater Concept Plan for the site:

- Provides on-site detention (OSD) strategy capable of reducing developed peak flows to pre-developed flows from the site for 5 year to 100 year ARI design storm events for the ultimate developed site as well as the Interim Stage 1 to manage stormwater quantity discharging from the site.
- Provides stormwater treatment strategy which is capable of reducing pollutant loads of TSS, TP, TN and gross pollutants to the reduction targets outlined in the *Sydney Metropolitan Catchment Management Authority, Interim Reference Guidelines for South East Queensland Concept Design Guidelines for WSUD*.

7 REFERENCES

Fairfield City Council, Urban Area OnSite Detention handbook (February, 1997)

Fairfield Town Centre, Development Control Plan (November, 2010)

Fairfield City Council, Stormwater Drainage Policy (September, 2002)

Sydney Metropolitan Catchment Management Authority, Interim Reference Guideline for the South East Queensland Concept Design Guidelines for WSUD.

Sydney Metropolitan Catchment Management Authority, Draft NSW Music Modelling Guidelines (August 2010)

Sydney Catchment Authority, Draft a Guide to the Use of MUSIC in Sydney's Drinking Water Catchments

APPENDIX A DRAWINGS

NOTE:
REFER TO DRAWING No.3 FOR EXTERNAL CATCHMENT EXTENT
N
FUTURE SOUTHERN LINK ROAD
EXISTING SWALE
EXISTING DRAINAGE LINE
OUTLET No.2
EXISTING OUTLET No.03 DRAINING TO READY CREEK
OUTLET No.3
EXISTING DAM
ROAD No.2
ROAD No.3
ROAD No.1
LOT 11 R.L. 70.50
LOT 12 R.L. 70.50
LOT 13 R.L. 71.0
LOT 14 R.L. 71.0
LOT 1 R.L. 67.0
LOT 2 R.L. 67.0
LOT 10 R.L. 64.0
LOT 9 R.L. 71.0
LOT 8 R.L. 72.0
LOT 7 R.L. 73.0
LOT 6 R.L. 75.0
LOT 5 R.L. 74.0
LOT 4 R.L. 71.0
LOT 3A R.L. 67.0
EX. 3.2 5.28 ha
EX. 3.3 4.99 ha
EX. 3.4 3.04 ha
EX. 3.1 5.7 ha
EX. 4 5.04 ha
EX. 2.1 1.48 ha
EX. 2.2 4.6 ha
EX. 2.3 3.22 ha
EX. 1.3 3.4 ha
EX. 1.3 4.43 ha
EX. 1.1 4.97 ha
EX. 1.4 0.97 ha
CATCHMENT No.3 26.0 ha
CATCHMENT No.2 13.0 ha
CATCHMENT No.1 14.12 ha
EXISTING DAM
M7 WALLGROVE ROAD MOTORWAY
EXISTING CULVERT UNDER WALLGROVE ROAD
OUTLET No.1
OUTLET No.3a
EXISTING DRAINAGE LINE DISCHARGING TO READY CREEK
D.P.13905
D.P.1090132
D.P.1021715
D.P.523725
D.P.393990
D.P.24094
EXT. SW 5.61 ha
EXT. SE 74.71 ha
LEGEND
EXISTING PRINCIPLE CATCHMENT EXTENT
EXISTING SUB CATCHMENT EXTENT
EXISTING EXTERNAL SW CATCHMENT EXTENT
EXISTING EXTERNAL SE CATCHMENT EXTENT
PROPOSED LAYOUT
OUTLET No.3
OUTLET LOCATION OF EXISTING SITE
DRAINAGE LOCATION SUBJECT TO EXISTING SITE
EX. 0.000 ha
EXISTING CATCHMENT LABEL
EXISTING CONTOUR

STORMWATER CONCEPT PLAN

First Issue	VC Drawn	RB Design	PB Check	Appd.	2/08/2013 Date	Revision Details

0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

Client: GAZCORP PTY. LTD.

Project: GAZCORP INDUSTRIAL ESTATE
WALLGROVE ROAD, HORSLEY PARK

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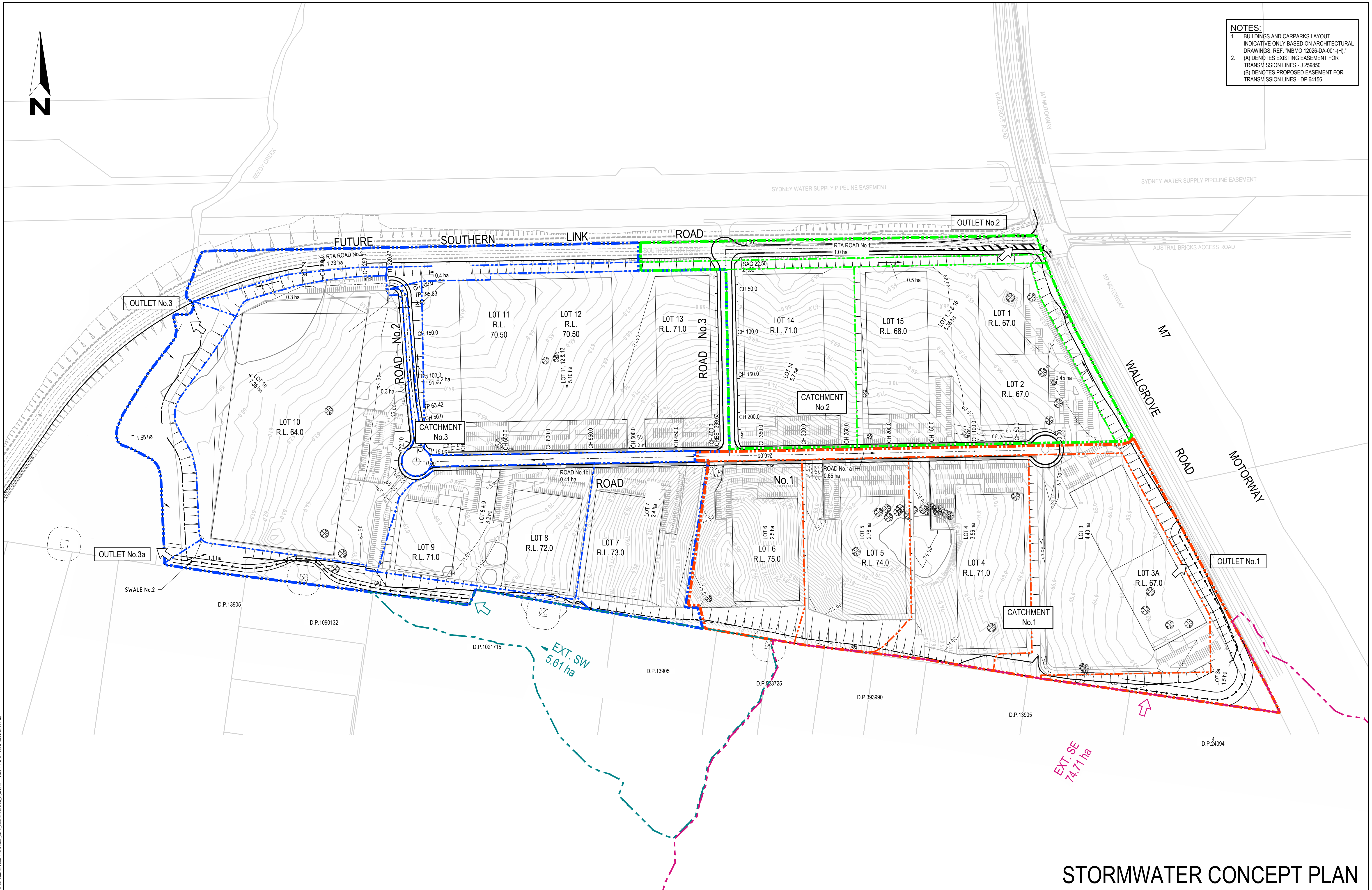
Drawing Title: EXISTING CATCHMENT PLAN

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	01	_

STORMWATER CONCEPT PLAN



NOTES:
1. BUILDINGS AND CARPARKS LAYOUT INDICATIVE ONLY BASED ON ARCHITECTURAL DRAWINGS, REF: "MBMO 12026-DA-001-(H)."
2. (A) DENOTES EXISTING EASEMENT FOR TRANSMISSION LINES - J 259850
(B) DENOTES PROPOSED EASEMENT FOR TRANSMISSION LINES - DP 64156

Revisions					
First Issue	RB	RB	PB	2/08/2013	
Issue	Drawn	Design	Check	Appd.	Date	Revision Details

SCALE 1:2000 (A1) — SCALE 1:4000 (A3)

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STUART GREEN
FIEAust. CPEng,
Manager - Urban Development

Client: GAZCORP PTY. LTD.

Project: GAZCORP INDUSTRIAL ESTATE WALLGROVE ROAD, HORSLEY PARK EARTHWORKS & ROAD DESIGN

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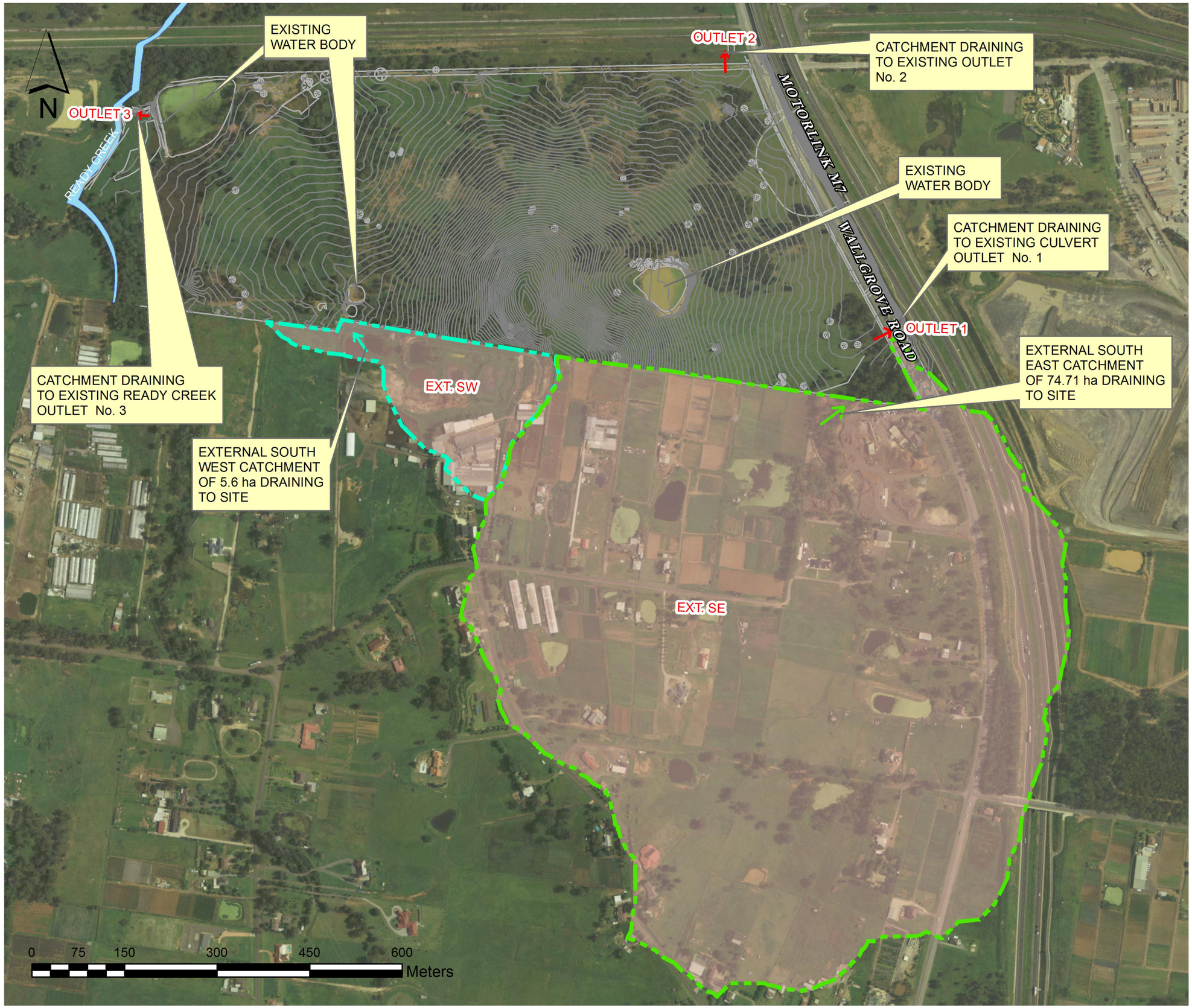
Drawing Title: PROPOSED CATCHMENT PLAN

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	01	



BROWN
Smart Water

Legend

- EX. EXTERNAL SW CATCHMENT
- EX. EXTERNAL SE CATCHMENT
- READY CREEK
- EXISTING CONT. 1m INC.

Details

Issue	Amendment	Date

Project

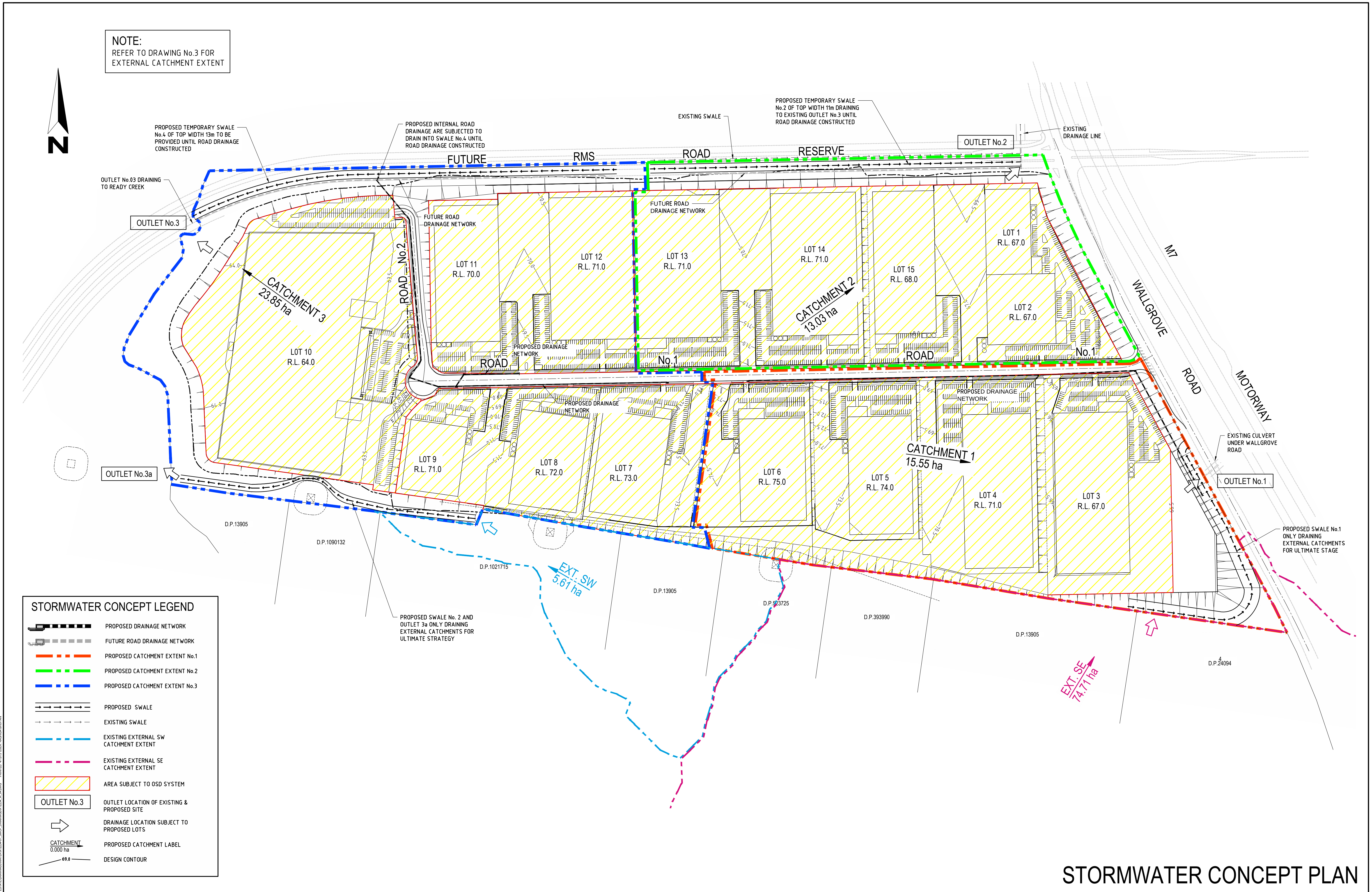
WALLGROVE ROAD INDUSTRIAL ESTATE

Drawing Title

EXTERNAL CATCHMENT PLAN FOR EXISTING AND PROPOSED CONDITION

Scale	1:6,000 @ A3
Drawn	RB
Checked	PB
Job No.	X12254
Drawing No.	03

Issue –


NOTE:
REFER TO DRAWING No.3 FOR EXTERNAL CATCHMENT EXTENT
N
PROPOSED TEMPORARY SWALE No.4 OF TOP WIDTH 13m TO BE PROVIDED UNTIL ROAD DRAINAGE CONSTRUCTED
PROPOSED INTERNAL ROAD DRAINAGE ARE SUBJECTED TO DRAIN INTO SWALE No.4 UNTIL ROAD DRAINAGE CONSTRUCTED
EXISTING SWALE
PROPOSED TEMPORARY SWALE No.2 OF TOP WIDTH 11m DRAINING TO EXISTING OUTLET No.3 UNTIL ROAD DRAINAGE CONSTRUCTED
OUTLET No.2
EXISTING DRAINAGE LINE
OUTLET No.03 DRAINING TO READY CREEK
OUTLET No.3
FUTURE RMS ROAD RESERVE
FUTURE ROAD DRAINAGE NETWORK
ROAD No.2
CATCHMENT 3
23.85 ha
LOT 10
R.L. 64.0
LOT 11
R.L. 70.0
LOT 12
R.L. 71.0
LOT 13
R.L. 71.0
LOT 14
R.L. 71.0
LOT 15
R.L. 68.0
LOT 1
R.L. 67.0
LOT 2
R.L. 67.0
CATCHMENT 2
13.03 ha
PROPOSED DRAINAGE NETWORK
ROAD No.1
M7 MOTORWAY
WALLGROVE ROAD
LOT 9
R.L. 71.0
LOT 8
R.L. 72.0
LOT 7
R.L. 73.0
LOT 6
R.L. 75.0
LOT 5
R.L. 74.0
LOT 4
R.L. 71.0
LOT 3
R.L. 67.0
CATCHMENT 1
15.55 ha
EXISTING CULVERT UNDER WALLGROVE ROAD
OUTLET No.1
OUTLET No.3a
PROPOSED SWALE No.1 ONLY DRAINING EXTERNAL CATCHMENTS FOR ULTIMATE STAGE
D.P.13905
D.P.1090132
D.P.1021715
EXT. SW
5.61 ha
D.P.13905
D.P.523725
D.P.393990
D.P.13905
D.P.24094
EXT. SE
74.71 ha
PROPOSED SWALE No. 2 AND OUTLET 3a ONLY DRAINING EXTERNAL CATCHMENTS FOR ULTIMATE STRATEGY
STORMWATER CONCEPT LEGEND
PROPOSED DRAINAGE NETWORK
FUTURE ROAD DRAINAGE NETWORK
PROPOSED CATCHMENT EXTENT No.1
PROPOSED CATCHMENT EXTENT No.2
PROPOSED CATCHMENT EXTENT No.3
PROPOSED SWALE
EXISTING SWALE
EXISTING EXTERNAL SW CATCHMENT EXTENT
EXISTING EXTERNAL SE CATCHMENT EXTENT
AREA SUBJECT TO OSD SYSTEM
OUTLET No.3
OUTLET LOCATION OF EXISTING & PROPOSED SITE
DRAINAGE LOCATION SUBJECT TO PROPOSED LOTS
CATCHMENT
0.000 ha
PROPOSED CATCHMENT LABEL
69.0
DESIGN CONTOUR

STORMWATER CONCEPT PLAN

First Issue	VC	RB	PB		2/08/2013	Revision Details
Issue	Drawn	Design	Check	Appd.	Date	

0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

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CONSULT AUSTRALIA Member Firm — Quality System Quality Endorsed Company

Client: GAZCORP PTY. LTD.

Project: GAZCORP INDUSTRIAL ESTATE
WALLGROVE ROAD, HORSLEY PARK

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Drawing Title: STORMWATER CONCEPT PLAN

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	04	_


NOTE:
REFER TO DRAWING No.3 FOR EXTERNAL CATCHMENT EXTENT
N
PROPOSED SWALE No. 4
FUTURE SOUTHERN LINK ROAD
SYDNEY WATER SUPPLY PIPELINE EASEMENT
EXISTING SWALE
OUTLET No.2
EXISTING DRAINAGE LINE
AUSTRAL BRICKS ACCESS ROAD
EXISTING OUTLET No.03 DRAINING TO READY CREEK
OUTLET No.3
ROAD No.2
ROAD No.3
ROAD No.1
EX. 3.2
4.80 ha
EX. 2.1
3.20 ha
EX. 2.2
4.6 ha
CATCHMENT No.2
12.70 ha
EX. 2.3
3.2 ha
M7 WALLGROVE ROAD MOTORWAY
LOT 10
R.L. 64.0
EX. 3.4
1.72ha
D 1.2
7.35 ha
EX. 3.1b
2.20 ha
D 1.1
1.93 ha
CATCHMENT No.3
26.23 ha
EX. 3.1a
2.50 ha
EX. 1.3
3.40 ha
EXISTING OUTLET No.03a DRAINING TO READY CREEK
OUTLET No.3a
PROPOSED TEMPORARY 600mm Φ PIPE WITH HEADWALL PROVIDED TO DIVERT NATURAL FLOW.
CATCHMENT No.1
13.70 ha
EXISTING DAM
EX. 1.2
4.4 ha
EXISTING CULVERT UNDER WALLGROVE ROAD
OUTLET No.1
EX. 4
4.36 ha
EXISTING DAM
D.P.13905
D.P.1090132
D.P.1021715
EXT. SW
5.61 ha
D.P.13905
D.P.523725
EX. 1.1
4.88 ha
PROPOSED SWALE No.1 ONLY DRAINING EXTERNAL CATCHMENTS FLOW
EX. 1.4
1.13 ha
D.P.393990
D.P.13905
D.P.24094
PROPOSED SWALE No. 2 TO BE CONSTRUCTED AS PART OF STAGE 1 WORKS
EXT. SE
74.71 ha
LEGEND
PRINCIPLE CATCHMENT EXTENT FOR STAGE 1
SUB CATCHMENT EXTENT FOR STAGE 1
PROPOSED CATCHMENTS FOR INTERIM STAGE 1
EXISTING EXTERNAL SW CATCHMENT EXTENT
EXISTING EXTERNAL SE CATCHMENT EXTENT
PROPOSED SWALE
EXISTING SWALE
OUTLET No.3
OUTLET LOCATION OF EXISTING SITE
DRAINAGE LOCATION SUBJECT TO EXISTING SITE
EX.
0.000 ha
CATCHMENT LABEL FOR NATURAL SURFACE
EXISTING CONTOUR
D 1.1
0.000 ha
PROPOSED CATCHMENT LABEL FOR STAGE - 1
DESIGN CONTOUR
ROCK RETAINING WALL

STORMWATER CONCEPT PLAN

Revisions						
01	RB	RB	PG		18/03/2015	----
First	VC	RB	PB		2/08/2013	
Issue	Drawn	Design	Check	Appd.	Date	Revision Details

0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

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CONSULT AUSTRALIA Member Firm
Quality System Quality Endorsed Company

Client:
GAZCORP PTY. LTD.

Project:
GAZCORP INDUSTRIAL ESTATE
WALLGROVE ROAD, HORSLEY PARK

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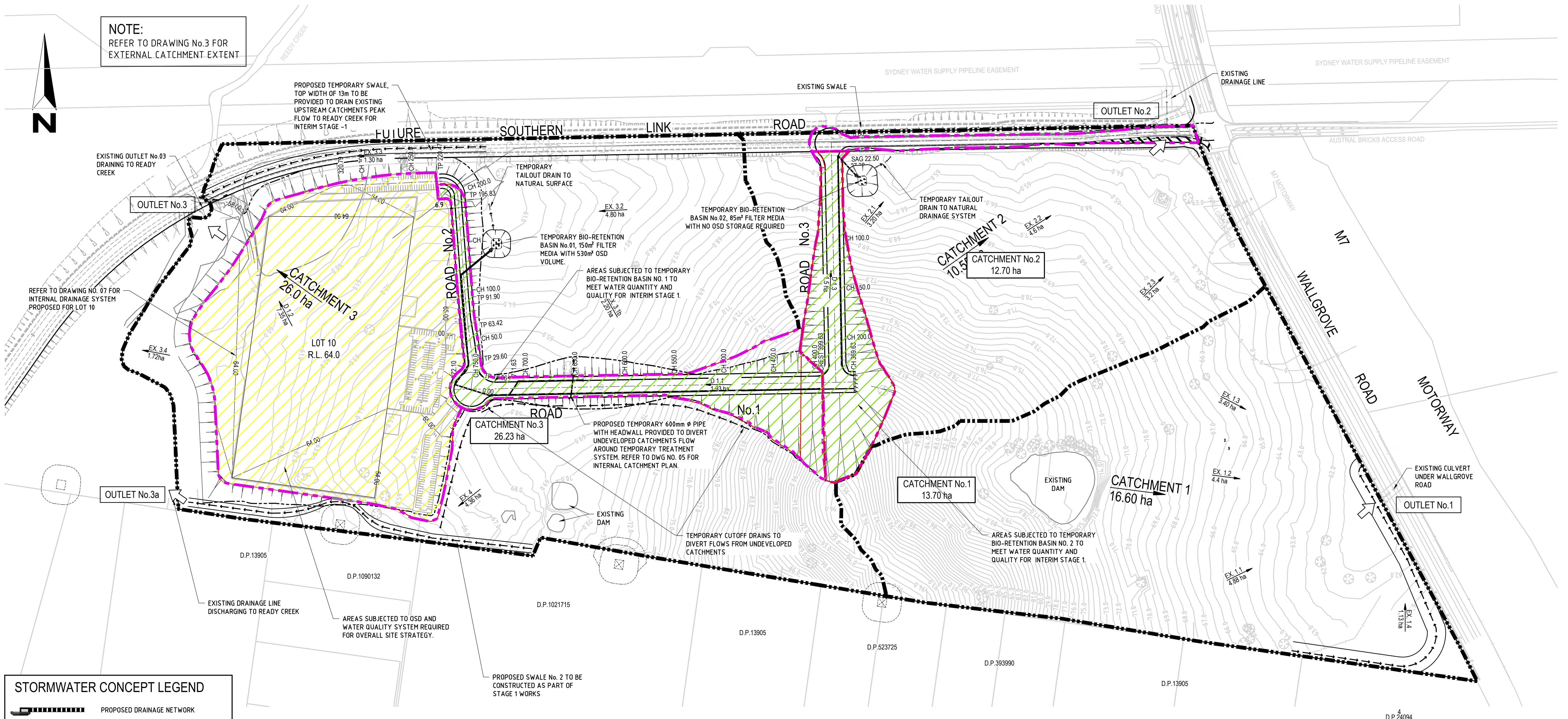
Drawing Title:
CATCHMENT PLAN FOR INTERIM STAGE 1

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	05	01


NOTE:
REFER TO DRAWING No.3 FOR EXTERNAL CATCHMENT EXTENT
N
PROPOSED TEMPORARY SWALE, TOP WIDTH OF 13m TO BE PROVIDED TO DRAIN EXISTING UPSTREAM CATCHMENTS PEAK FLOW TO READY CREEK FOR INTERIM STAGE -1
EXISTING SWALE
FUTURE SOUTHERN LINK ROAD
OUTLET No.2
EXISTING DRAINAGE LINE
SYDNEY WATER SUPPLY PIPELINE EASEMENT
AUSTRAL BRICKS ACCESS ROAD
EXISTING OUTLET No.03 DRAINING TO READY CREEK
OUTLET No.3
TEMPORARY TAILOUT DRAIN TO NATURAL SURFACE
TEMPORARY BIO-RETENTION BASIN No.01, 150m² FILTER MEDIA WITH 530m³ OSD VOLUME.
TEMPORARY BIO-RETENTION BASIN No.02, 85m² FILTER MEDIA WITH NO OSD STORAGE REQUIRED
TEMPORARY TAILOUT DRAIN TO NATURAL DRAINAGE SYSTEM
AREAS SUBJECTED TO TEMPORARY BIO-RETENTION BASIN NO. 1 TO MEET WATER QUANTITY AND QUALITY FOR INTERIM STAGE 1.
CATCHMENT 2
CATCHMENT No.2
12.70 ha
CATCHMENT 3
26.0 ha
LOT 10
R.L. 64.0
ROAD No.2
ROAD No.3
ROAD No.1
REFER TO DRAWING NO. 07 FOR INTERNAL DRAINAGE SYSTEM PROPOSED FOR LOT 10
CATCHMENT No.3
26.23 ha
PROPOSED TEMPORARY 600mm ø PIPE WITH HEADWALL PROVIDED TO DIVERT UNDEVELOPED CATCHMENTS FLOW AROUND TEMPORARY TREATMENT SYSTEM. REFER TO DWG NO. 05 FOR INTERNAL CATCHMENT PLAN.
EXISTING DAM
TEMPORARY CUTOFF DRAINS TO DIVERT FLOWS FROM UNDEVELOPED CATCHMENTS
CATCHMENT No.1
13.70 ha
CATCHMENT 1
16.60 ha
AREAS SUBJECTED TO TEMPORARY BIO-RETENTION BASIN NO. 2 TO MEET WATER QUANTITY AND QUALITY FOR INTERIM STAGE 1.
M7
WALLGROVE ROAD
MOTORWAY
EXISTING CULVERT UNDER WALLGROVE ROAD
OUTLET No.1
OUTLET No.3a
EXISTING DRAINAGE LINE DISCHARGING TO READY CREEK
AREAS SUBJECTED TO OSD AND WATER QUALITY SYSTEM REQUIRED FOR OVERALL SITE STRATEGY.
PROPOSED SWALE No. 2 TO BE CONSTRUCTED AS PART OF STAGE 1 WORKS
D.P.13905
D.P.1090132
D.P.1021715
D.P.523725
D.P.393990
D.P.24094

STORMWATER CONCEPT LEGEND

- PROPOSED DRAINAGE NETWORK
- PRINCIPLE CATCHMENT EXTENTS
- PROPOSED TEMPORARY SWALE
- EXISTING SWALE
- EXISTING EXTERNAL SW CATCHMENT EXTENT
- EXISTING EXTERNAL SE CATCHMENT EXTENT
- AREA SUBJECT TO OSD & WATER QUALITY SYSTEM
- AREA SUBJECT TO TEMPORARY OSD & WATER QUALITY SYSTEM REQUIRED FOR STAGE -1
- OUTLET No.3 — OUTLET LOCATION OF EXISTING & PROPOSED SITE
- DRAINAGE LOCATION SUBJECT TO PROPOSED LOTS
- CATCHMENT 0.000 ha — CATCHMENT LABEL FOR STAGE - 1
- EXISTING CONTOUR
- DESIGN CONTOUR
- TEMPORARY TAILOUT DRAIN
- ROCK RETAINING WALL

STORMWATER CONCEPT PLAN

Revisions						
01	RB	RB	PG		18/03/2015	----
First	VC	RB	PB		2/08/2013	
Issue	Drawn	Design	Check	Appd.	Date	Revision Details

SCALE 1:2000 (A1) — SCALE 1:4000 (A3)

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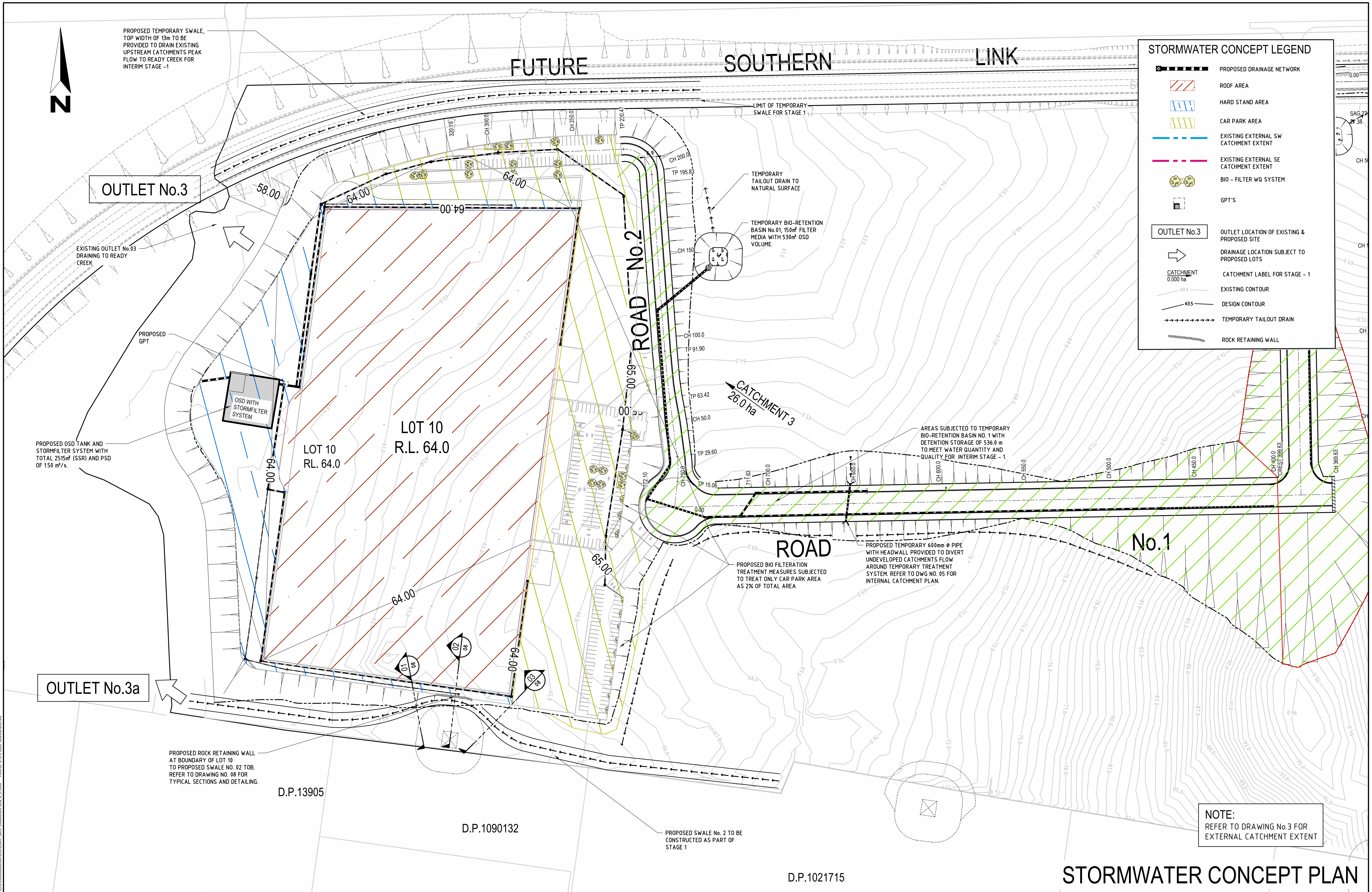
Client: GAZCORP PTY. LTD.

Project: GAZCORP INDUSTRIAL ESTATE
WALLGROVE ROAD, HORSLEY PARK

BROWN Smart Consulting
 www.brownconsulting.com.au

Drawing Title: STORMWATER CONCEPT PLAN FOR INTERIM STAGE 1

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	06	03



PROPOSED TEMPORARY SWALE, TOP WIDTH OF 13m TO BE PROVIDED TO DRAIN EXISTING UPSTREAM CATCHMENTS PEAK FLOW TO READY CREEK FOR INTERIM STAGE -1
FUTURE SOUTHERN LINK
LIMIT OF TEMPORARY SWALE FOR STAGE 1
OUTLET No.3
EXISTING OUTLET No.03 DRAINING TO READY CREEK
TEMPORARY TAILOUT DRAIN TO NATURAL SURFACE
TEMPORARY BIO-RETENTION BASIN No.01, 150m² FILTER MEDIA WITH 530m³ OSD VOLUME.
ROAD No.2
CATCHMENT 3 26.0 ha
PROPOSED GPT
OSD WITH STORMFILTER SYSTEM
PROPOSED OSD TANK AND STORMFILTER SYSTEM WITH TOTAL 2515m³ (SSR) AND PSD OF 1.50 m³/s.
LOT 10 R.L. 64.0
LOT 10 RL. 64.0
AREAS SUBJECTED TO TEMPORARY BIO-RETENTION BASIN NO. 1 WITH DETENTION STORAGE OF 536.0 m TO MEET WATER QUANTITY AND QUALITY FOR INTERIM STAGE - 1.
ROAD No.1
PROPOSED BIO FILTERATION TREATMENT MEASURES SUBJECTED TO TREAT ONLY CAR PARK AREA AS 2% OF TOTAL AREA
PROPOSED TEMPORARY 600mm ϕ PIPE WITH HEADWALL PROVIDED TO DIVERT UNDEVELOPED CATCHMENTS FLOW AROUND TEMPORARY TREATMENT SYSTEM. REFER TO DWG NO. 05 FOR INTERNAL CATCHMENT PLAN.
OUTLET No.3a
PROPOSED ROCK RETAINING WALL AT BOUNDARY OF LOT 10 TO PROPOSED SWALE NO. 02 TOB. REFER TO DRAWING NO. 08 FOR TYPICAL SECTIONS AND DETAILING.
D.P.13905
D.P.1090132
PROPOSED SWALE No. 2 TO BE CONSTRUCTED AS PART OF STAGE 1
D.P.1021715
STORMWATER CONCEPT LEGEND
PROPOSED DRAINAGE NETWORK
ROOF AREA
HARD STAND AREA
CAR PARK AREA
EXISTING EXTERNAL SW CATCHMENT EXTENT
EXISTING EXTERNAL SE CATCHMENT EXTENT
BIO - FILTER WQ SYSTEM
GPT'S
OUTLET LOCATION OF EXISTING & PROPOSED SITE
DRAINAGE LOCATION SUBJECT TO PROPOSED LOTS
CATCHMENT LABEL FOR STAGE - 1
EXISTING CONTOUR
DESIGN CONTOUR
TEMPORARY TAILOUT DRAIN
ROCK RETAINING WALL
NOTE: REFER TO DRAWING No.3 FOR EXTERNAL CATCHMENT EXTENT

STORMWATER CONCEPT PLAN

Revisions					
First Issue	RB	RB	PB		2/08/2013
Issue	Drawn	Design	Check	Appd.	Date

Revision Details

SCALE 1:1000 (A1) SCALE 1:2000 (A3)

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Client: GAZCORP PTY. LTD.

Project: GAZCORP INDUSTRIAL ESTATE WALLGROVE ROAD, HORSLEY PARK

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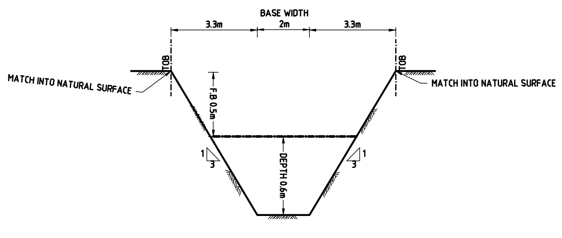
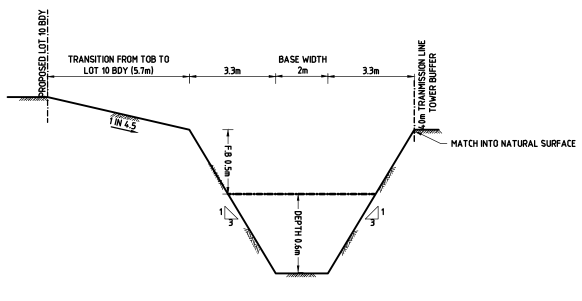
Drawing Title: STORMWATER CONCEPT PLAN FOR LOT 10 (INTERIM STAGE 1)

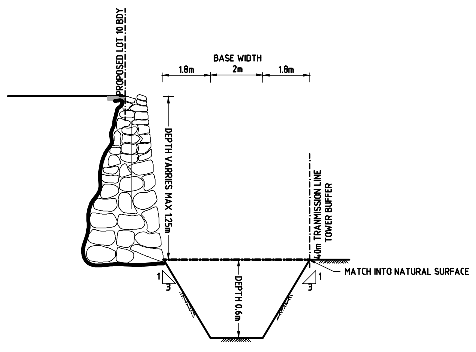
Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	07	_



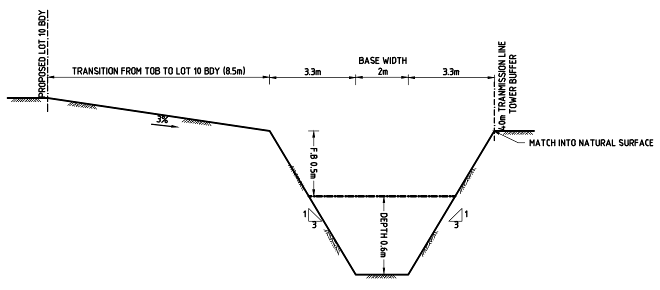
TYPICAL SECTION - SWALE NO. 02
SCALE: 1:50 (H)
SCALE: 1:10 (V)



TYPICAL SECTION - 01 (01/07)
SCALE: 1:50 (H)
SCALE: 1:10 (V)



TYPICAL SECTION - 02 (02/07)
SCALE: 1:50 (H)
SCALE: 1:10 (V)



TYPICAL SECTION - 03 (03/07)
SCALE: 1:50 (H)
SCALE: 1:10 (V)

NOTES:

1. BACKFILL IS TO BE GRANULAR, FREE DRAINING AND COMPACTED.

2. FOUNDATION TO BE APPROVED FOR A SAFE BEARING CAPACITY OF 150KPa PRIOR TO CONSTRUCTION.

3. WHERE THE SURFACE SLOPE OF RETAINED MATERIAL IS BETWEEN 10:1 AND 4:1 THE WALL BASE DIMENSION IS TO BE INCREASED BY 0.5 METRES.

4. ROCK IS TO BE SOUND DURABLE SANDSTONE OR OTHER APPROVED MATERIAL AND AT LEAST 0.5 SQUARE METRES PLAIN AREA.

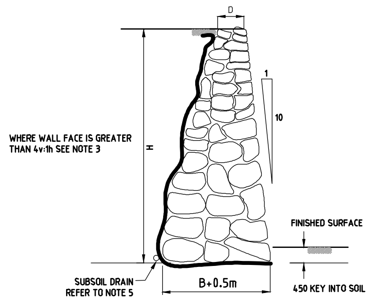
5. A CONTINUOUS 100mm DIA. SUBSOIL DRAIN IS TO BE INSTALLED AT THE REAR OF THE WALL WHERE THE WALL HEIGHT EXCEEDS 3m OR WHERE THE WALL FOUNDATION CONSISTS OF OTHER THAN ROCK.

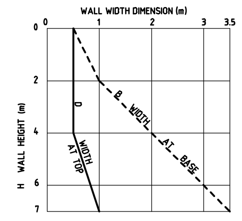
6. ROCKS SHALL BE PLACED IN SUCH A MANNER THAT THEY ARE STABLE AND INTERLOCKING & BEDDED ON THEIR BROADEST BASE.

ROCK SPECIFICATION NOTES:

BREADTH (B) - 0.4 TO 0.6m
WIDTH (W) -0.4 TO 0.6m
LENGTH (L) - 2x(B OR W) <L< 3x(B OR W)
>2200 kg/cum

EACH ROCK SHALL BE:
1. ELONGATED TO ALLOW STACKING ON THE LONGEST AXIS
2. ANGULAR IN SHAPE (PROMOTES INTERLOCKING)
3. FREE FROM OVERBURDEN, SPOIL, SHALE & ORGANIC MATERIAL





ROCK RETAINING WALL DETAIL

Revisions						
First Issue	RB	RB	PB		2/08/2013	
Issue	Drawn	Design	Check	Appd.	Date	Revision Details

0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
SCALE 1:50 (A1) SCALE 1:100 (A3)

Client: GAZCORP PTY. LTD.

Project: GAZCORP INDUSTRIAL ESTATE
WALLGROVE ROAD, HORSLEY PARK

BROWN Smart Consulting

Drawing Title: TYPICAL SECTIONS FOR SWALE NO. 02

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
X12254.W		SCP	08	_

APPENDIX B - RAFTS RESULTS

```
################################################################################################
Wallgrove Road
Results for period from  0: 0.0  1/ 1/2000
                to  3: 0.0  1/ 1/2000
################################################################################################
                        ROUTING INCREMENT (MINS) =       1.00
                        STORM DURATION (MINS)    =       90.
                        RETURN PERIOD (YRS)      =      100.
                        BX                       =     1.0000
                        TOTAL OF FIRST SUB-AREAS  (ha) =     52.62
                        TOTAL OF SECOND SUB-AREAS (ha) =      0.00
                        TOTAL OF ALL SUB-AREAS (ha)    =     52.62

SUMMARY OF CATCHMENT AND RAINFALL DATA
 Link      Catch. Area      Slope    % Impervious     Pern        B       Link
 Label      #1     #2     #1    #2     #1   #2     #1    #2    #1   #2     No.
          (ha)            (%)          (%)
Catch 1   12.440  0.000  2.000 0.000  90.00 0.000  .020 0.00  .0067 0.000  1.000
B1        .00001  0.000  .0010 0.000  0.000 0.000  .025 0.00  .0021 0.000  1.001
Bp1        3.000  0.000  2.000 0.000  90.00 0.000  .020 0.00  .0032 0.000  2.000
D1        .00001  0.000  2.200 0.000  100.0 0.000  .012 0.00  0.000 0.000  1.002
Out 1     .00001  0.000  .0010 0.000  0.000 0.000  .025 0.00  .0021 0.000  1.003
BP3        5.000  0.000  2.000 0.000  90.00 0.000  .020 0.00  .0042 0.000  3.000
Catch 3   18.650  0.000  2.000 0.000  90.00 0.000  .020 0.00  .0083 0.000  4.000
B3        .00001  0.000  .0010 0.000  0.000 0.000  .025 0.00  .0021 0.000  4.001
D3        .00001  0.000  .0010 0.000  0.000 0.000  .025 0.00  .0021 0.000  3.001
out 3     .00001  0.000  .1000 0.000  5.000 0.000  .025 0.00  .0002 0.000  3.002
Catch 2   10.400  0.000  2.500 0.000  90.00 0.000  .020 0.00  .0055 0.000  5.000
B2        .00001  0.000  .0010 0.000  0.000 0.000  .025 0.00  .0021 0.000  5.001
Bp2        2.430  0.000  2.000 0.000  90.00 0.000  .020 0.00  .0029 0.000  6.000
D2        0.7000  0.000  2.000 0.000  0.000 0.000  .040 0.00  .0214 0.000  5.002
Out 2     .00001  0.000  .1000 0.000  5.000 0.000  .025 0.00  .0002 0.000  5.003
outlet    .00001  0.000  .0100 0.000  5.000 0.000  .025 0.00  .0005 0.000  1.004

 Link    Average  Init. Loss  Cont. Loss    Excess Rain   Peak    Time   Link
 Label  Intensity  #1    #2    #1    #2      #1    #2    Inflow   to     Lag
          (mm/h)    ( mm )      (mm/h)        ( mm )     (m^3/s)  Peak  mins
Catch 1   53.019 1.000 0.000  0.000 0.000  78.528  0.000   6.498  29.00 0.000
B1        53.019 1.000 0.000  0.000 0.000  78.528  0.000   6.498  29.00 0.000
Bp1       53.019 1.000 0.000  0.000 0.000  78.528  0.000   1.581  28.00 0.000
D1        53.019 1.000 0.000  0.000 0.000  78.528  0.000   4.325  30.00 0.000
Out 1     53.019 10.00 0.000  2.500 0.000  66.237  0.000   4.325  30.00 0.000
BP3       53.019 1.000 0.000  0.000 0.000  78.528  0.000   2.619  29.00 0.000
Catch 3   53.019 1.000 0.000  0.000 0.000  78.528  0.000   9.678  30.00 0.000
B3        53.019 1.000 0.000  0.000 0.000  78.528  0.000   9.678  30.00 0.000
D3        53.019 1.000 0.000  0.000 0.000  78.528  0.000   6.744  30.00 0.000
out 3     53.019 10.00 0.000  2.500 0.000  66.237  0.000   6.744  30.00 0.000
Catch 2   53.019 1.000 0.000  0.000 0.000  78.528  0.000   5.452  29.00 0.000
B2        53.019 1.000 0.000  0.000 0.000  78.528  0.000   5.452  29.00 0.000
```

Bp2 53.019 1.000 0.000 0.000 0.000 78.528 0.000 1.279 28.00 0.000
D2 53.019 10.00 0.000 2.500 0.000 66.237 0.000 3.773 30.00 0.000
Out 2 53.019 10.00 0.000 2.500 0.000 66.237 0.000 3.773 30.00 0.000
outlet 53.019 10.00 0.000 2.500 0.000 66.237 0.000 14.842 30.00 0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Inflow (m^3/s)	Time to Peak	Outflow (m^3/s)	Total Inflow (m^3)	Vol. Avail	Vol. Used	Stage Used
B1	29.00	6.498	33.00	2.895	9762.8	0.0000	3963.7	1.5222
B3	30.00	9.678	33.00	4.345	14637.5	0.0000	5925.7	1.5091
B2	29.00	5.451	32.00	2.432	8161.6	0.0000	3334.5	1.5268

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
B1	1.0	1.000	0.000	20.000		0.2000
B3	1.0	1.000	0.000	20.000		0.2000
B2	1.0	1.000	0.000	20.000		0.2000

Results for Developed Catchment Condition with Detention for Interim stage 1

##
Wallgrove Road
Results for period from 0: 0.0 1/ 1/2000
to 4: 0.0 1/ 1/2000
##

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 120.
RETURN PERIOD (YRS) = 5.
BX = 1.0000
TOTAL OF FIRST SUB-AREAS (ha) = 48.39
TOTAL OF SECOND SUB-AREAS (ha) = 4.35
TOTAL OF ALL SUB-AREAS (ha) = 52.74

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha) #1	#2	Slope (%) #1	#2	% Impervious #1	#2	Pern #1	#2	B #1	#2	Link No.
Ex 2.1	3.660	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0296	0.000	1.000
D3	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0016	0.000	1.001
Ex 2.3	3.200	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0276	0.000	2.000
D1	.00001	0.000	.0100	0.000	5.000	0.000	.025	0.00	.0005	0.000	2.001
Ex 2.2	3.300	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0280	0.000	3.000
D2	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0016	0.000	3.001
Out 2	.00001	0.000	.1000	0.000	5.000	0.000	.025	0.00	.0002	0.000	1.002
Ex 1.3	1.900	0.000	2.480	0.000	5.000	0.000	.035	0.00	.0235	0.000	4.000

Ex 1.2	4.400	0.000	4.470	0.000	5.000	0.000	.035	0.00	.0271	0.000	5.000
Ex 1.1	4.880	0.000	3.940	0.000	5.000	0.000	.035	0.00	.0305	0.000	6.000
D 1.3	0.6500	3.650	2.000	2.000	90.00	5.000	.020	.035	.0014	.0367	7.000
B2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	7.001
D9	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	7.002
out1	1.130	0.000	1.690	0.000	5.000	0.000	.035	0.00	.0217	0.000	4.001
Ex 3.1b	2.200	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0227	0.000	8.000
Ex 3.1a	2.500	0.000	2.000	0.000	5.000	0.000	.035	0.00	.0302	0.000	9.000
D5	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	8.001
D 1.1	1.000	0.7000	2.000	2.000	90.00	5.000	.020	.035	.0018	.0156	10.00
B1	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	10.00
Ex 3.2	4.840	0.000	3.270	0.000	5.000	0.000	.035	0.00	.0333	0.000	8.002
Ex 3.3	1.300	0.000	.5000	0.000	5.000	0.000	.035	0.00	.0429	0.000	11.00
D7	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0016	0.000	8.003
D1.2	7.350	0.000	2.000	0.000	90.00	0.000	.020	0.00	.0051	0.000	12.00
B10	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	12.00
D6	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	12.00
EX 3.4	1.720	0.000	1.000	0.000	5.000	0.000	.035	0.00	.0351	0.000	13.00
Ex 4.0	4.360	0.000	2.930	0.000	5.000	0.000	.035	0.00	.0333	0.000	14.00
out 3a	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	14.00
out 3	.00001	0.000	.1000	0.000	5.000	0.000	.025	0.00	.0002	0.000	8.004
Site Out	.00001	0.000	.0100	0.000	5.000	0.000	.025	0.00	.0005	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2	Cont. Loss #1 (mm/h)	Cont. Loss #2	Excess Rain #1 (mm)	Excess Rain #2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
Ex 2.1	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.6126	43.00	0.000
D3	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.6126	43.00	1.330
Ex 2.3	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.5524	42.00	0.000
D1	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.5524	42.00	.5000
Ex 2.2	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.5668	42.00	0.000
D2	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.5668	42.00	.8000
Out 2	26.932	10.00	0.000	2.500	0.000	39.738	0.000	1.730	43.00	0.000
Ex 1.3	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.3157	43.00	0.000
Ex 1.2	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.8199	41.00	0.000
Ex 1.1	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.8430	42.00	0.000
D 1.3	26.932	1.000	10.00	0.000	2.500	52.863	39.738	0.5783	41.00	0.000
B2	26.932	1.000	0.000	0.000	0.000	52.863	0.000	0.5783	41.00	0.000
D9	26.932	1.000	0.000	0.000	0.000	52.863	0.000	0.3697	65.00	0.000
out1	26.932	10.00	0.000	2.500	0.000	39.738	0.000	2.343	43.00	4.400
Ex 3.1b	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.4002	41.00	0.000
Ex 3.1a	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.3598	45.00	1.000
D5	26.932	1.000	0.000	0.000	0.000	52.863	0.000	0.7323	44.00	1.000
D 1.1	26.932	1.000	10.00	0.000	2.500	52.863	39.738	0.3947	35.00	0.000
B1	26.932	1.000	0.000	0.000	0.000	52.863	0.000	0.3947	35.00	0.000
Ex 3.2	26.932	10.00	0.000	2.500	0.000	39.738	0.000	1.647	45.00	1.500
Ex 3.3	26.932	10.00	0.000	2.500	0.000	39.738	0.000	0.1117	57.00	0.000
D7	26.932	10.00	0.000	2.500	0.000	39.738	0.000	1.754	47.00	1.000
D1.2	26.932	1.000	0.000	0.000	0.000	52.863	0.000	2.398	34.00	0.000
B10	26.932	1.000	0.000	0.000	0.000	52.863	0.000	2.398	34.00	0.000

D6 26.932 10.00 0.000 2.500 0.000 39.738 0.000 0.7772 44.00 0.000
EX 3.4 26.932 10.00 0.000 2.500 0.000 39.738 0.000 0.1935 50.00 0.000
Ex 4.0 26.932 10.00 0.000 2.500 0.000 39.738 0.000 0.6865 44.00 0.000
out 3a 26.932 1.000 0.000 0.000 0.000 52.863 0.000 0.6865 44.00 0.000
out 3 26.932 10.00 0.000 2.500 0.000 39.738 0.000 3.383 46.00 0.000
Site Out 26.932 10.00 0.000 2.500 0.000 39.738 0.000 7.395 46.00 0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	--- Basin --- Vol. Avail	Vol. Used	Stage Used
B2	41.00	.5783	65.00	.3697	1792.3	0.0000	522.84	0.9593
B1	35.00	.3947	48.00	.1448	806.47	0.0000	306.97	0.8599
B10	34.00	2.397	44.00	.7772	3883.2	0.0000	1615.2	1.0461

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
B2	1.0	1.000	0.000	20.000		0.2000
B1	1.0	1.000	0.000	20.000		0.2000
B10	1.0	1.000	0.000	20.000		0.2000

##
Wallgrove Road
Results for period from 0: 0.0 1/ 1/2000
to 4: 0.0 1/ 1/2000
##

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 120.
RETURN PERIOD (YRS) = 100.
BX = 1.0000
TOTAL OF FIRST SUB-AREAS (ha) = 48.39
TOTAL OF SECOND SUB-AREAS (ha) = 4.35
TOTAL OF ALL SUB-AREAS (ha) = 52.74

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha) #1	#2	Slope (%) #1	#2	% Impervious #1	#2	Pern #1	#2	B #1	#2	Link No.
Ex 2.1	3.660	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0296	0.000	1.000
D3	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0016	0.000	1.001
Ex 2.3	3.200	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0276	0.000	2.000
D1	.00001	0.000	.0100	0.000	5.000	0.000	.025	0.00	.0005	0.000	2.001
Ex 2.2	3.300	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0280	0.000	3.000
D2	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0016	0.000	3.001
Out 2	.00001	0.000	.1000	0.000	5.000	0.000	.025	0.00	.0002	0.000	1.002
Ex 1.3	1.900	0.000	2.480	0.000	5.000	0.000	.035	0.00	.0235	0.000	4.000

Ex 1.2	4.400	0.000	4.470	0.000	5.000	0.000	.035	0.00	.0271	0.000	5.000
Ex 1.1	4.880	0.000	3.940	0.000	5.000	0.000	.035	0.00	.0305	0.000	6.000
D 1.3	0.6500	3.650	2.000	2.000	90.00	5.000	.020	.035	.0014	.0367	7.000
B2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	7.001
D9	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	7.002
out1	1.130	0.000	1.690	0.000	5.000	0.000	.035	0.00	.0217	0.000	4.001
Ex 3.1b	2.200	0.000	3.100	0.000	5.000	0.000	.035	0.00	.0227	0.000	8.000
Ex 3.1a	2.500	0.000	2.000	0.000	5.000	0.000	.035	0.00	.0302	0.000	9.000
D5	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	8.001
D 1.1	1.000	0.7000	2.000	2.000	90.00	5.000	.020	.035	.0018	.0156	10.00
B1	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	10.00
Ex 3.2	4.840	0.000	3.270	0.000	5.000	0.000	.035	0.00	.0333	0.000	8.002
Ex 3.3	1.300	0.000	.5000	0.000	5.000	0.000	.035	0.00	.0429	0.000	11.00
D7	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0016	0.000	8.003
D1.2	7.350	0.000	2.000	0.000	90.00	0.000	.020	0.00	.0051	0.000	12.00
B10	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	12.00
D6	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	12.00
EX 3.4	1.720	0.000	1.000	0.000	5.000	0.000	.035	0.00	.0351	0.000	13.00
Ex 4.0	4.360	0.000	2.930	0.000	5.000	0.000	.035	0.00	.0333	0.000	14.00
out 3a	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	14.00
out 3	.00001	0.000	.1000	0.000	5.000	0.000	.025	0.00	.0002	0.000	8.004
Site Out	.00001	0.000	.0100	0.000	5.000	0.000	.025	0.00	.0005	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm/h)	Cont. Loss #1 (mm)	Cont. Loss #2	Excess Rain #1	Excess Rain #2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
Ex 2.1	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.182	41.00	0.000
D3	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.182	41.00	1.330
Ex 2.3	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.049	41.00	0.000
D1	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.049	41.00	.5000
Ex 2.2	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.079	41.00	0.000
D2	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.079	41.00	.8000
Out 2	44.668	10.00	0.000	2.500	0.000	74.962	0.000	3.310	42.00	0.000
Ex 1.3	44.668	10.00	0.000	2.500	0.000	74.962	0.000	0.6201	41.00	0.000
Ex 1.2	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.513	40.00	0.000
Ex 1.1	44.668	10.00	0.000	2.500	0.000	74.962	0.000	1.612	40.00	0.000
D 1.3	44.668	1.000	10.00	0.000	2.500	88.337	74.962	1.236	40.00	0.000
B2	44.668	1.000	0.000	0.000	0.000	88.337	0.000	1.236	40.00	0.000
D9	44.668	1.000	0.000	0.000	0.000	88.337	0.000	0.8542	51.00	0.000
out1	44.668	10.00	0.000	2.500	0.000	74.962	0.000	4.640	41.00	4.400
Ex 3.1b	44.668	10.00	0.000	2.500	0.000	74.962	0.000	0.7451	40.00	0.000
Ex 3.1a	44.668	10.00	0.000	2.500	0.000	74.962	0.000	0.7403	41.00	1.000
D5	44.668	1.000	0.000	0.000	0.000	88.337	0.000	1.469	41.00	1.000
D 1.1	44.668	1.000	10.00	0.000	2.500	88.337	74.962	0.6878	35.00	0.000
B1	44.668	1.000	0.000	0.000	0.000	88.337	0.000	0.6878	35.00	0.000
Ex 3.2	44.668	10.00	0.000	2.500	0.000	74.962	0.000	3.208	42.00	1.500
Ex 3.3	44.668	10.00	0.000	2.500	0.000	74.962	0.000	0.2359	53.00	0.000
D7	44.668	10.00	0.000	2.500	0.000	74.962	0.000	3.426	44.00	1.000
D1.2	44.668	1.000	0.000	0.000	0.000	88.337	0.000	3.707	34.00	0.000
B10	44.668	1.000	0.000	0.000	0.000	88.337	0.000	3.707	34.00	0.000

D6 44.668 10.00 0.000 2.500 0.000 74.962 0.000 1.731 42.00 0.000
EX 3.4 44.668 10.00 0.000 2.500 0.000 74.962 0.000 0.4053 45.00 0.000
Ex 4.0 44.668 10.00 0.000 2.500 0.000 74.962 0.000 1.354 41.00 0.000
out 3a 44.668 1.000 0.000 0.000 0.000 88.337 0.000 1.354 41.00 0.000
out 3 44.668 10.00 0.000 2.500 0.000 74.962 0.000 6.803 44.00 0.000
Site Out 44.668 10.00 0.000 2.500 0.000 74.962 0.000 14.505 44.00 0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Inflow (m^3/s)	Time to Peak	Outflow (m^3/s)	Peak Inflow (m^3)	Total Vol. Avail	--------- Basin --------- Vol. Used	Stage Used
B2	40.00	1.235	51.00	.8542	3310.7	0.0000	809.18	1.4856
B1	35.00	.6878	48.00	.2577	1408.8	0.0000	531.82	1.4883
B10	34.00	3.706	42.00	1.730	6489.1	0.0000	2339.8	1.5154

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
B2	1.0	1.000	0.000	20.000		0.2000
B1	1.0	1.000	0.000	20.000		0.2000
B10	1.0	1.000	0.000	20.000		0.2000

APPENDIX C - -MUSIC MODELLING RESULTS

Table C.1: Adopted MUSIC modelling parameters for Rainfall Runoff Parameters

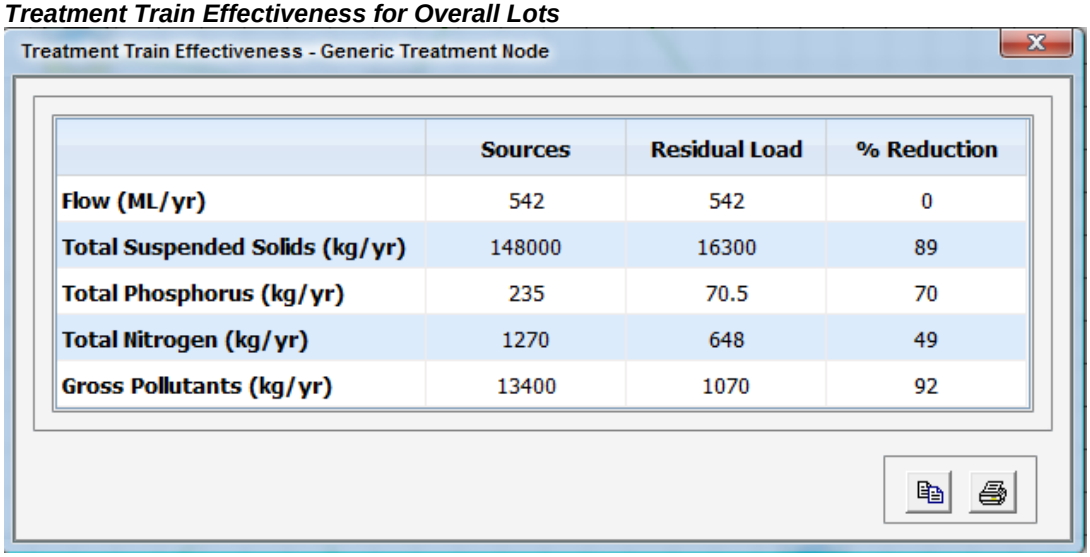
PARAMETER	***INDUSTRIAL***	
	Roof, Car Park and Road Areas	***External Landscape Areas***
Friction Impervious (%)	90	5
Impervious Area properties		
Rainfall Threshold (mm/day)	1.0	1.0
Pervious Area Properties		
Soil Storage Capacity (mm)	120	120
Soil Initial Storage (% of capacity)	25	25
Field Capacity (mm)	80	80
Infiltration Capacity Coefficient - a	200	200
Infiltration Capacity Exponent - b	1	1
Groundwater Properties		
Initial Depth (mm)	10	10
Daily Recharge rate (%)	25	25
Daily Baseflow rate (%)	5	5
Daily Deep Seepage rate (%)	0.0	0.0

Table C.2: Adopted MUSIC modelling parameters for Pollutant Load Generation

PARAMETER	*INDUSTRIAL AREA*	
	Roof, and External Landscape Areas	***Car Park and Road Areas***
Baseflow TSS Mean (log mg/L)	1.20	1.20
Baseflow TSS Stand Dev (log mg/L)	0.17	0.17
Stormflow TSS Mean (log mg/L)	2.15	2.43
Stormflow TSS Stand Dev (log mg/L)	0.32	0.32
Baseflow TP Mean (log mg/L)	-0.85	-0.85
Baseflow TP Stand Dev (log mg/L)	0.19	0.19
Stormflow TP Mean (log mg/L)	-0.60	-0.30
Stormflow TP Stand Dev (log mg/L)	0.25	0.25
Baseflow TN Mean (log mg/L)	0.11	0.11
Baseflow TN Stand Dev (log mg/L)	0.12	0.12
Stormflow TN Mean (log mg/L)	0.30	0.34
Stormflow TN Stand Dev (log mg/L)	0.19	0.19

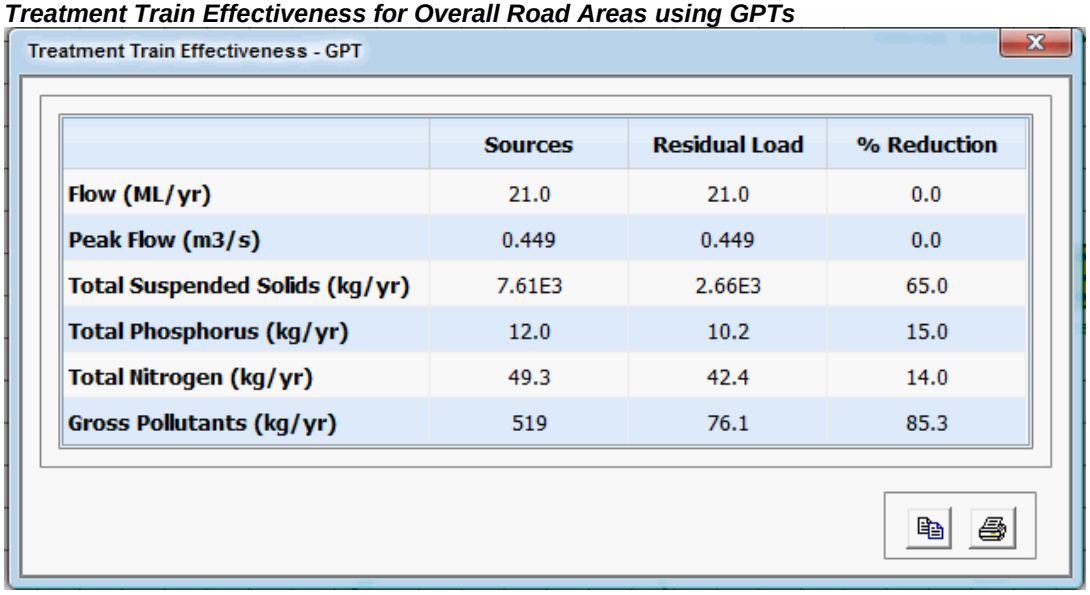
Results for Stormwater Treatment Strategy for Overall site

Treatment Train Effectiveness for Overall Lots



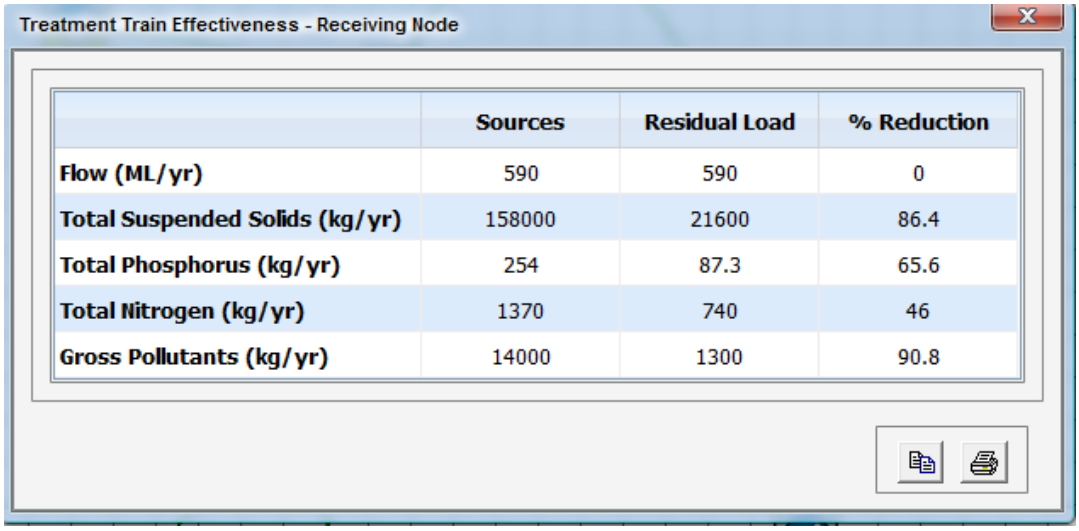
	Sources	Residual Load	% Reduction
Flow (ML/yr)	542	542	0
Total Suspended Solids (kg/yr)	148000	16300	89
Total Phosphorus (kg/yr)	235	70.5	70
Total Nitrogen (kg/yr)	1270	648	49
Gross Pollutants (kg/yr)	13400	1070	92

Treatment Train Effectiveness for Overall Road Areas using GPTs



	Sources	Residual Load	% Reduction
Flow (ML/yr)	21.0	21.0	0.0
Peak Flow (m3/s)	0.449	0.449	0.0
Total Suspended Solids (kg/yr)	7.61E3	2.66E3	65.0
Total Phosphorus (kg/yr)	12.0	10.2	15.0
Total Nitrogen (kg/yr)	49.3	42.4	14.0
Gross Pollutants (kg/yr)	519	76.1	85.3

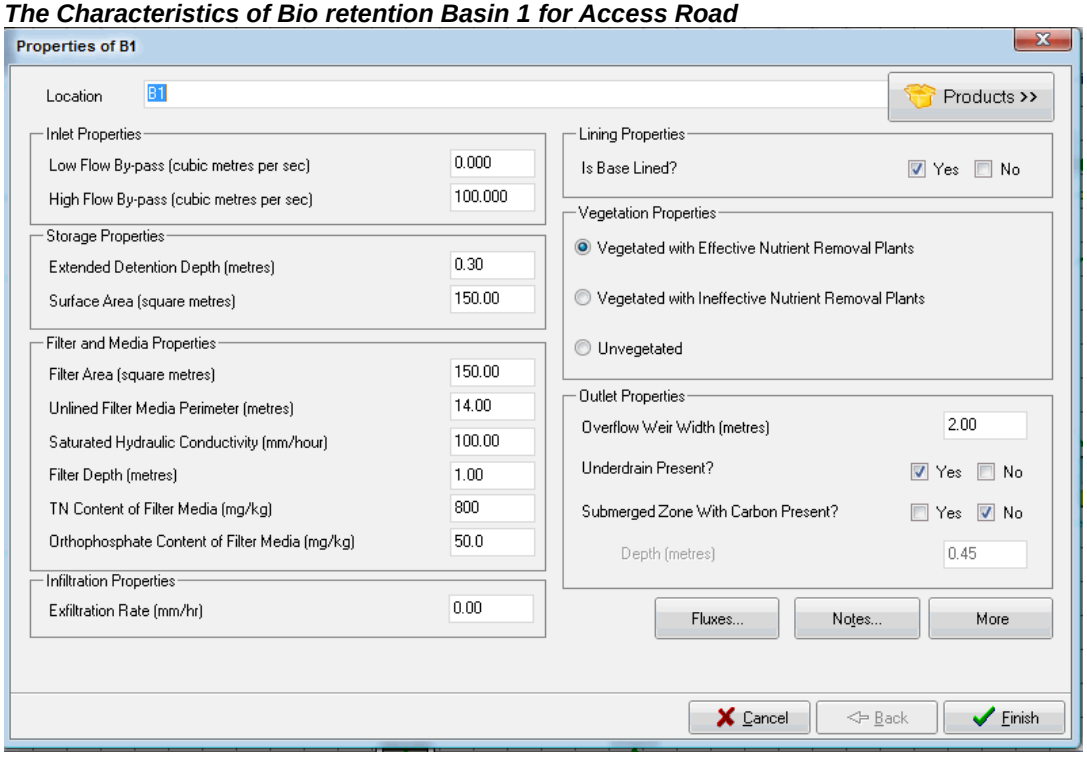
Treatment Train Effectiveness for Overall Site



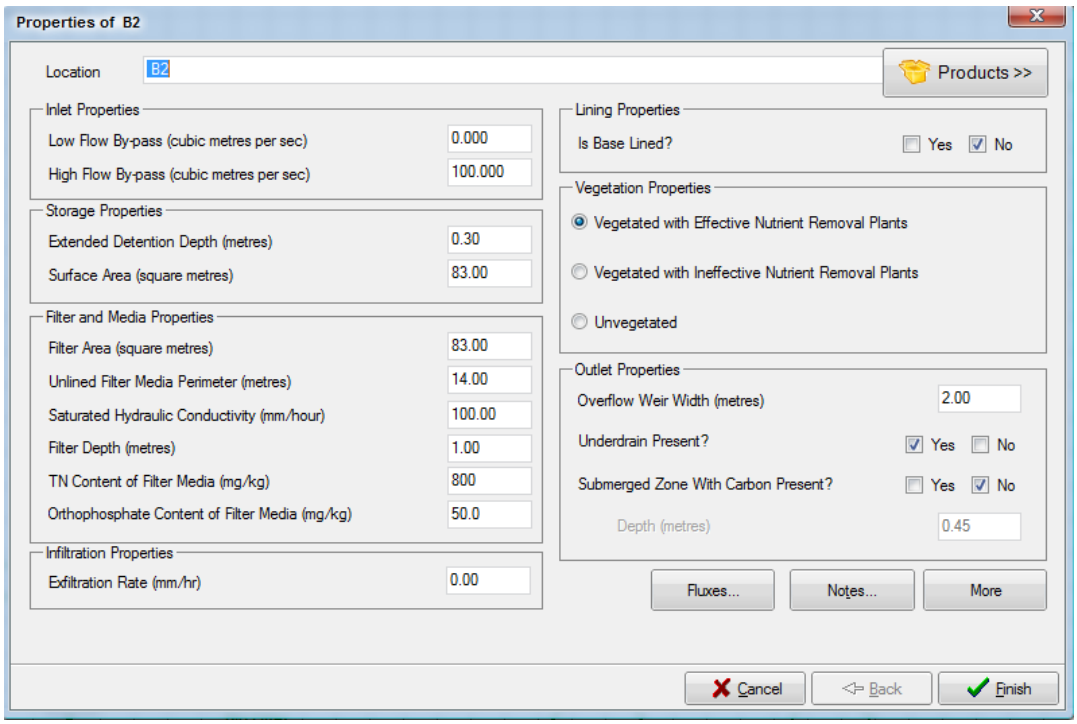
	Sources	Residual Load	% Reduction
Flow (ML/yr)	590	590	0
Total Suspended Solids (kg/yr)	158000	21600	86.4
Total Phosphorus (kg/yr)	254	87.3	65.6
Total Nitrogen (kg/yr)	1370	740	46
Gross Pollutants (kg/yr)	14000	1300	90.8

Music Modelling Parameters used for Treatment Strategy for Stage - 1

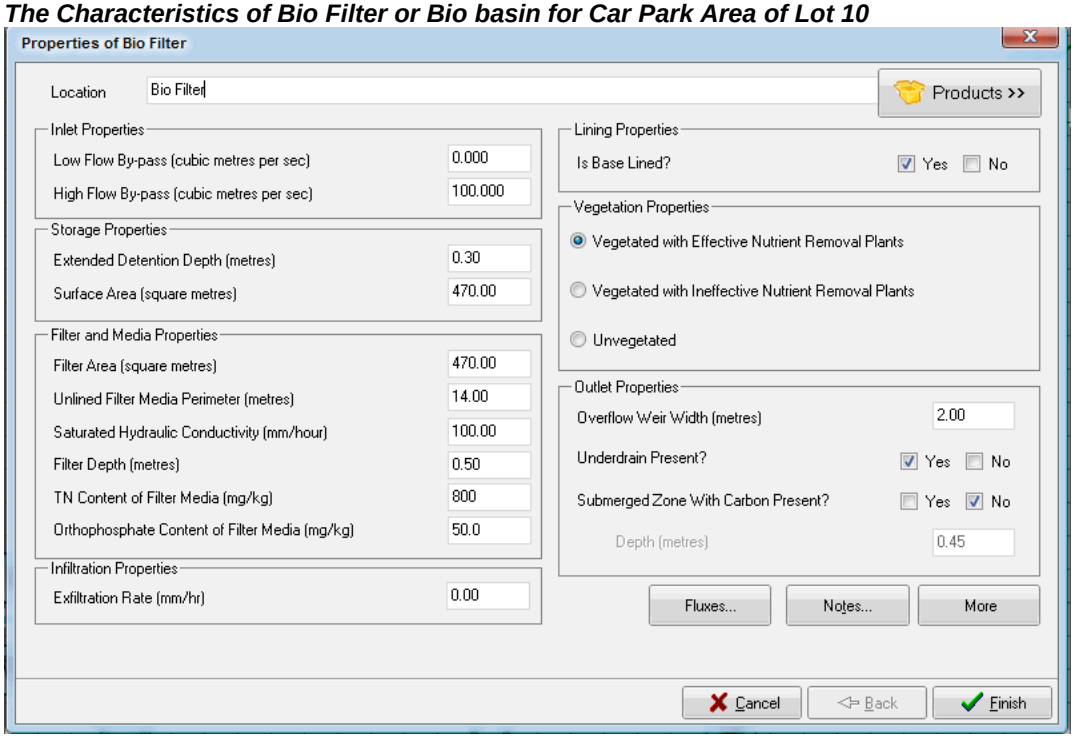
The Characteristics of Bio retention Basin 1 for Access Road



The Characteristics of Bio retention Basin 2 for Access Road

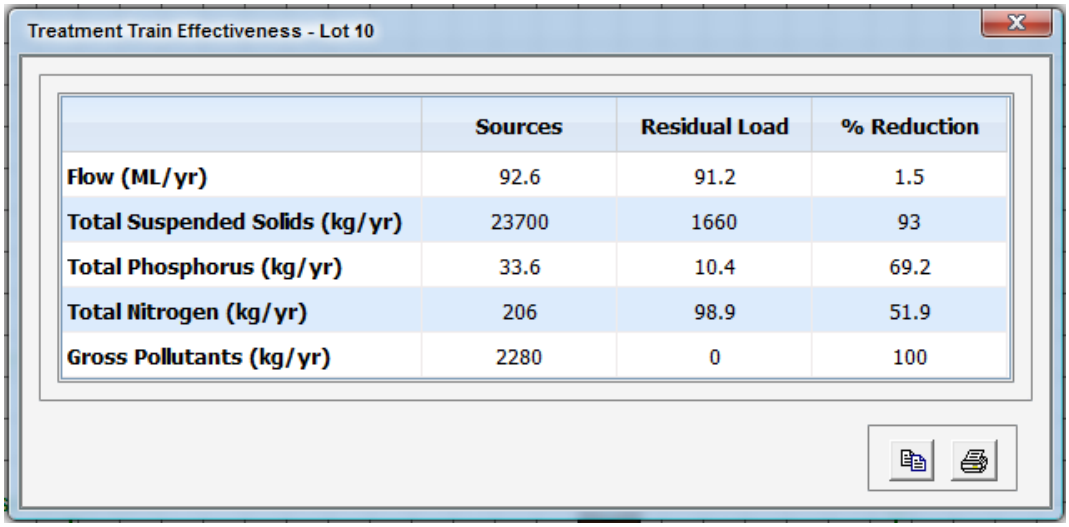


The Characteristics of Bio Filter or Bio basin for Car Park Area of Lot 10



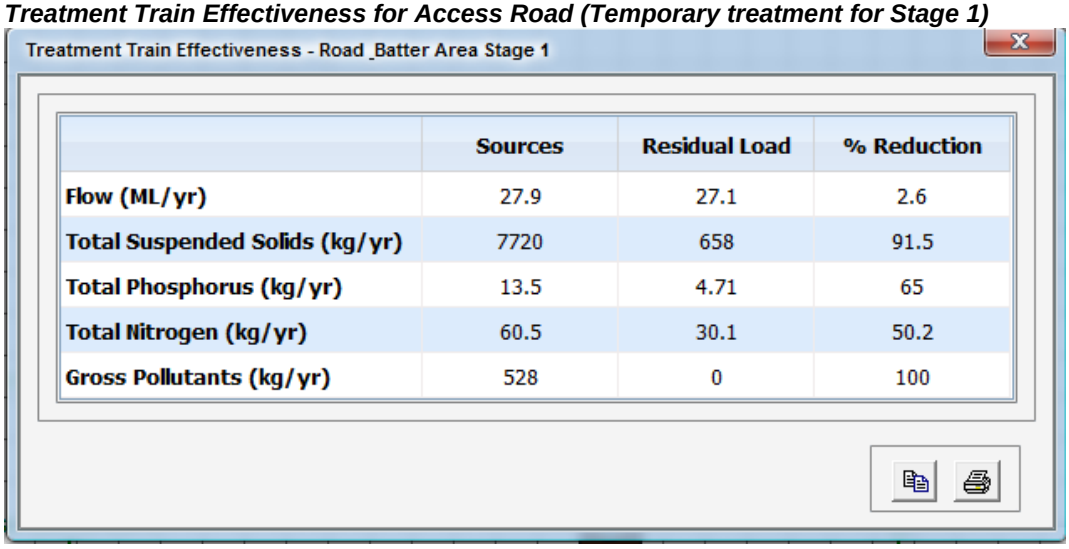
Results for Stormwater Treatment Strategy for Stage 1

Treatment Train Effectiveness for Lot 10



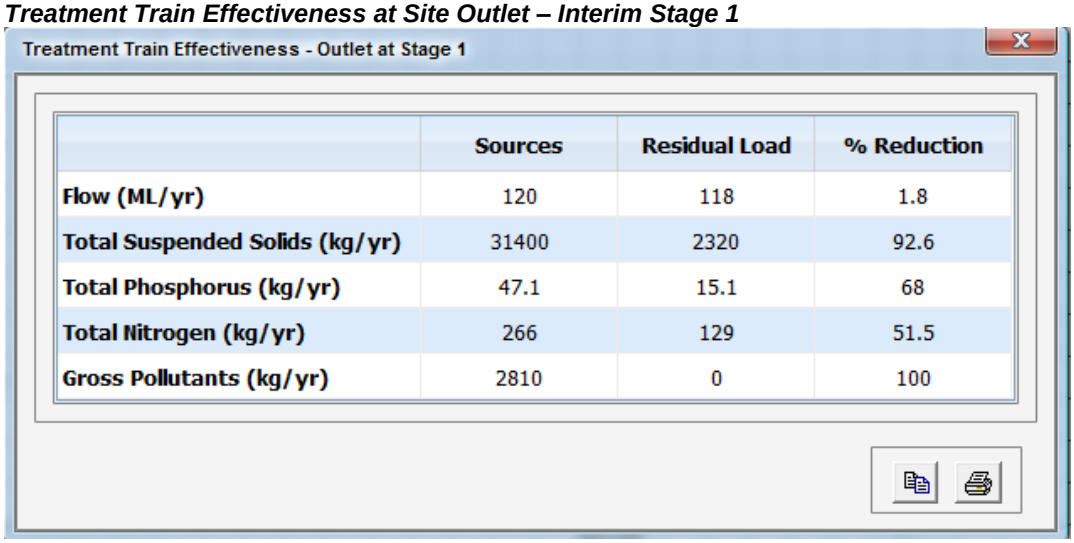
	Sources	Residual Load	% Reduction
Flow (ML/yr)	92.6	91.2	1.5
Total Suspended Solids (kg/yr)	23700	1660	93
Total Phosphorus (kg/yr)	33.6	10.4	69.2
Total Nitrogen (kg/yr)	206	98.9	51.9
Gross Pollutants (kg/yr)	2280	0	100

Treatment Train Effectiveness for Access Road (Temporary treatment for Stage 1)



	Sources	Residual Load	% Reduction
Flow (ML/yr)	27.9	27.1	2.6
Total Suspended Solids (kg/yr)	7720	658	91.5
Total Phosphorus (kg/yr)	13.5	4.71	65
Total Nitrogen (kg/yr)	60.5	30.1	50.2
Gross Pollutants (kg/yr)	528	0	100

Treatment Train Effectiveness at Site Outlet – Interim Stage 1



	Sources	Residual Load	% Reduction
Flow (ML/yr)	120	118	1.8
Total Suspended Solids (kg/yr)	31400	2320	92.6
Total Phosphorus (kg/yr)	47.1	15.1	68
Total Nitrogen (kg/yr)	266	129	51.5
Gross Pollutants (kg/yr)	2810	0	100