2 Figtree Drive,
Sydney Olympic Park
(Site 53)

Stormwater Management Strategy

FOR / Civil Engineering Services

CLIENT / Mirvac Project Pty Ltd

DOCUMENT NO / S14184-RPT-C-0001 REV / D DATE / 06/08/15

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CONTENTS

Document *Control*

Revision	Date	Description	Prepared	Reviewed	Approved
A	15/06/2015	Issued for Internal Review	TW	BS	
B	17/06/2015	Issued for Comment	TW	AB	
C	05/08/2015	Issued for Information	TW	AB	
D	06/08/2015	Issued for Development Application	TW	AB	

1 INTRODUCTION

1.1 Background

The proposed site is located at 2 Figtree Drive, Sydney Olympic Park (Site 53). The development site is located within the Auburn City Council Local Government Area (LGA), however the Sydney Olympic Park Authority (SOPA) will be the approving authority for the stormwater drainage design. The site is located within the SOPA Masterplan 2030 Town Centre Central Precinct. The site is bounded by Figtree Drive to the north, Australia Avenue to the east, the Olympic Sprint Lidcombe Shuffle railway corridor to the south and a Fujitsu Data Centre to the west at 4 Figtree Drive. There is an existing building and carpark on the site that are to be demolished to make way for 422 residential units, approximately 1500sq.m of retail, and a new road for access from Figtree Drive. The Landscape Architect's overall layout plan is attached as Appendix A.

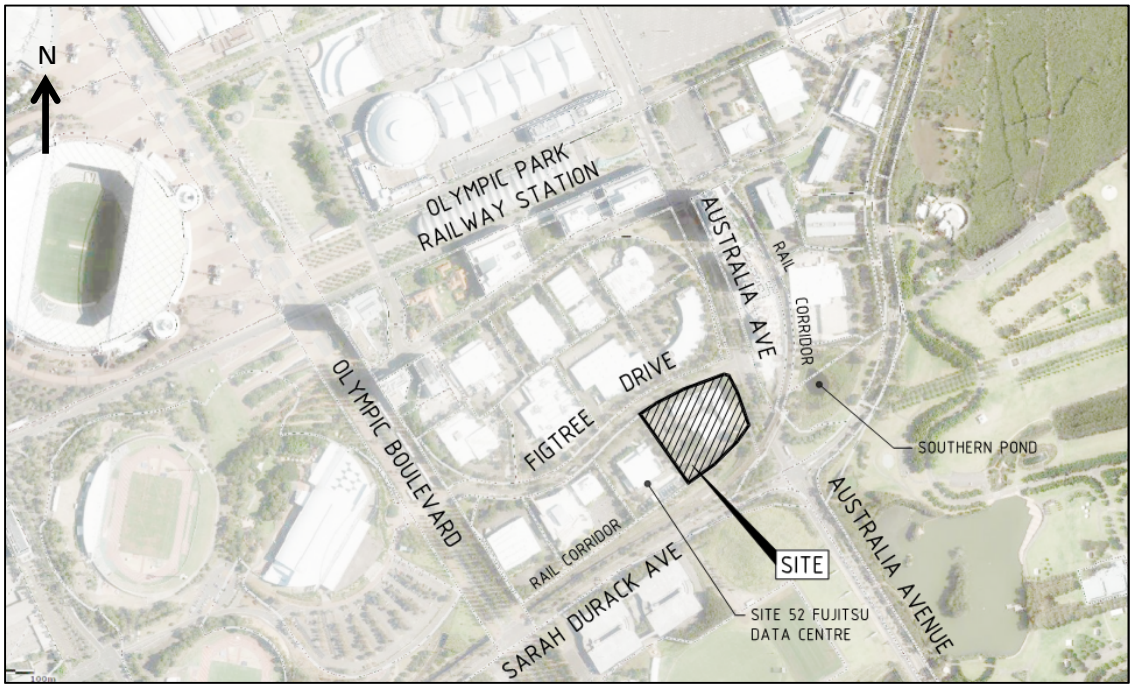

Figure 1 - Locality Plan (Aerial mapping source – SIX Maps)

1.2 Scope and Objectives

This Stormwater Management Strategy aims to provide an overall philosophy for the collection, treatment, and disposal of stormwater from the development site. All stormwater drainage designs will endeavour to satisfy the requirements of both Auburn City Council and SOPA's Stormwater Policy *"Stormwater Management and Water Sensitive Urban Design Policy"*, (The Stormwater Policy), Version 1, Policy Number POL13/04, dated October 2013 (SOPA Environment and Ecology review undertaken January 2014 and January 2015).

2 EXISTING DRAINAGE

Map 1 attached to The Stormwater Policy indicates that the site is situated within a 20.5 hectare (approximate) catchment that drains to the Southern Pond located on Site 68 to the east of Australia Avenue (attached as Appendix B).

The site covers an area of 1.23 hectares. There is an existing building and carpark currently located on the site. The site falls generally from Figtree Drive towards the railway corridor in the south. A topographical survey of the site is attached as Appendix C.

SOPA have supplied a plan of existing services within the site showing the existing drainage infrastructure, attached as Appendix D. The site drainage is collected by the network shown on the attached services plan and discharges to a trunk drainage line in the south eastern corner of the site of varying diameter and size. The plan of existing services supplied by SOPA shows this pipe to be a 600mm dia pipe, however the topographical survey attached as Appendix C indicates a combination of various pipe diameters and culverts, with pipe diameters ranging from 375mm dia in the south-western corner of the site to 1200mm dia pipe in the south-eastern corner of the site. The trunk line conveys flows under Australia Avenue to where it discharges into the Sothern Pond to the east of Australia Avenue.

It is understood that there is currently no On Site Detention (OSD) or water quality treatment measures on site.

The design intent is to ensure that the downstream system is not adversely impacted by the development. The proposed stormwater system will be designed to ensure that overland flow leaving the site will be limited to the existing predicted overland flows, hence either matching the current situation, or reducing the overland flow, thus improving the effect on the downstream system. The existing overland flow path is attached as Appendix E.

3 PROPOSED DRAINAGE

3.1 SOPA's Stormwater Policy Requirements

The civil drainage scope includes all site drainage outside of the proposed building footprint.

The proposed drainage system comprises of road drainage for the New Street, OSD, and Water Sensitive Urban Design (WSUD) measures in accordance with The Stormwater Policy. These are discussed in the following sections.

3.2 Drainage Strategy

A concept layout of the proposed drainage scheme is attached as Appendix F.

The road reserve is partially located on the neighbouring Fujitsu site. An interim road section is proposed to be constructed as part of these works which is contained within the site boundary. The road and associated turning head will be graded to ensure that the drainage strategy for the development site will only allow for half of the road that is located within the site boundary. It is assumed that drainage associated with the future half-road construction to be built on the Fujitsu site by others will be drained by a separate drainage scheme.

Upon the completion of the Fujitsu development at 4 Figtree Drive, the New Street will have been transformed into its ultimate width comprising of two traffic lanes and two parking lanes in accordance with SOPA's UDEM. Once complete, this road will be dedicated to Council.

Therefore it has been agreed that the stormwater runoff generated from the New Street will drain directly to the trunk drainage line located to the south of the site via a GPT. This catchment has not been included in either the water quantity or the water quality calculations.

Stormwater run-off generated by the New Street will be collected by kerb inlet pits and piped to the discharge point which connects to the existing trunk drainage line.

3.3 Discharge Location

The existing drainage network discharges to the pit shown in Figure 2 below.

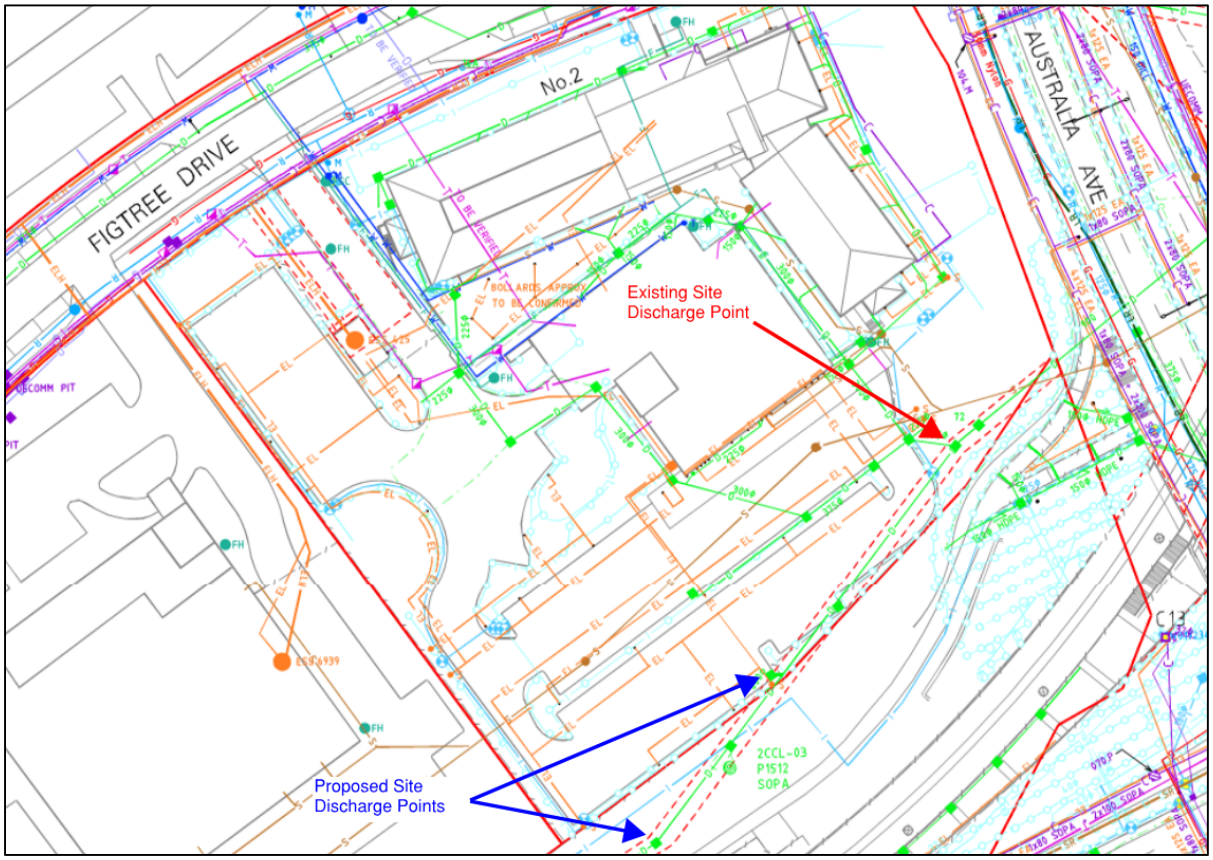

Figure 2 – Proposed and Existing Site Discharge Points

Due to space limitations, it will be necessary to create a new discharge location in the existing pit located upstream of the current pit, as shown in Figure 2. As discussed above, the New Street catchment has not been included in either the water quality or water quantity calculations. This has created the need for two separate drainage lines. It is proposed to connect the New Street drainage directly to the trunk drainage line to the western pit shown in Figure 2 via a proposed GPT, and the outlet from the water quality treatment train to the eastern pit shown in Figure 2. Two discharge locations have been proposed in order to avoid the tree root plate of the relocated fig tree location. Refer to the stormwater layout plan attached as Appendix F.

The fig tree that is currently located on the boundary between Site 52 and Site 53 is to be relocated to the south western corner of the site (refer to the Arborist's report for further detail). The fig tree will sit on a 10m x 10m root plate. Therefore the proposed discharge pipe from the proposed network will need to be located as far as practicable from the root plate. This leaves a narrow corridor between the carpark basement and the root plate where the pipe can be located. The pipe will be located within the Tree Protection Zone (TPZ).

Stormwater flows that are currently contained within Figtree Drive and then onto the Australia Avenue will not be altered by the current proposal. The New Street will be graded to ensure that Site 53 will not receive flows from the upstream external catchment from Figtree Drive.

3.4 Drainage Network Modelling Software

The computer software DRAINS has been used for the design of the drainage network and modelling of the OSD. The software MUSIC has been used for the water quality modelling. The rainfall data has been sourced from Auburn City Council's rainfall intensities (Attached as Appendix G).

3.5 Water Quantity Measures (OSD)

The Stormwater Policy requires that *"development within a Sydney Olympic Park non-stormwater harvesting catchment must maintain a 1 in 5 year ARI (Average Recurrence Interval) peak discharge to pre-development (non-urbanised) magnitude."* Due to space limitations, it has considered unfeasible to provide this detention above ground. Therefore, in order to satisfy this requirement, it is proposed to limit the peak discharge from the site by means of an OSD tank. The plans attached as Appendix F shows the conceptual layout of this tank located in the basement.

The system has been modelled using DRAINS. Two pre-development scenarios have been modelled. The first model is a greenfields pre-development model, as required by The Stormwater Policy. The second models the site in its current state. The results are tabulated below in Table 1:

	Greenfield	Current conditions
5 yr ARI Peak (l/s)	238	388

Table 1 – Greenfields and Pre-Development Peak discharge

As can be seen in Table 1, the adopted 5 year ARI Permissible Site Discharge (PSD) is 238l/s. Figure 3 shows the preliminary DRAINS OSD model.

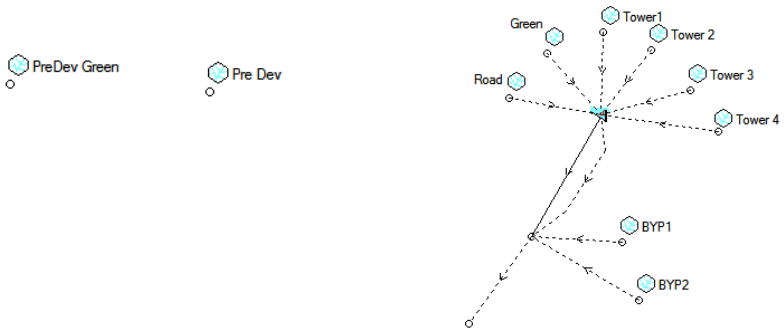

Figure 3 – Preliminary DRAINS OSD Model

The OSD tank within the allocated space within the basement has been sized to satisfy the requirements of The Stormwater Policy. Further co-ordination with the hydraulics engineer and landscape architect is required to develop the catchments draining to the tank.

It should be noted that as discussed in Section 3.2, it has been agreed to allow the New Street catchment to drain directly to the trunk drainage line. For this reason, this catchment has not been included in the OSD calculations.

In order to limit the 5 year ARI peak flows leaving the proposed development to the 5 year ARI peak discharge for a greenfields site, approximately 51cu.m of storage will be required. Access to the tank is proposed via manholes at podium level. Emergency overflow from tank will be via two pits at also at podium level, which will then flow into the New Street, where it will be collected by the proposed drainage in the New Street. It is proposed to control the outflow from the tank via a 290mm dia (approximate) orifice.

As required by The Stormwater Policy, a rainwater tank has been proposed. It is proposed to supply a 100cu.m rainwater harvesting tank meet the water supply demand for the site. Refer the Hydraulics Engineers Report for further detail. The Stormwater Policy does not contain any guidance for offsetting the rainwater volume against the OSD volume. It is common practice within the industry to reduce the amount of OSD volume if a rainwater tank is installed. Many Councils across Sydney allow rainwater tank volumes to offset OSD volumes. Auburn City Council's Stormwater Policy contains such guidance. Therefore it is proposed to adopt Auburn City Council's guidelines with respect to offsetting the OSD volume with the aim to reduce the volume required. Clause 7.1 D4 states that:

> *"One third of the volume of the rainwater storage shall be used to offset the OSD volume requirements, provided a reticulation system to supply a reasonable quantity of on-site non-potable uses is installed.*
>
> ***Note**: Minimum 50% of detention volume shall be provided as detention storage."*

Therefore, if this guideline is adopted, it is appropriate to reduce the OSD volume by one third of the rainwater tank volume, provided that at least 50% of the calculated OSD detention volume is provided. Considering a 100cu.m rainwater tank is proposed this would result in a 33cu.m reduction in the OSD volume, reducing OSD volume from 51cu.m down to 18cu.m. However, the overriding criteria then becomes the minimum 50% of the detention volume which equates to 25.5cu.m. Therefore the adopted storage volume required is 26cu.m. It should be noted however that the final total volume of the tank may be slightly larger than this at detail design depending on factors such as freeboard and spatial requirements, though the OSD storage requirement is 26 approximately 26cu.m

Below is a summary of the predicted flows:

	Greenfield	Current Conditions	Proposed Detention
5 yr ARI Peak (l/s)	238	388	236

Table 2 – Summary of 5yr ARI Peak Flows

Table 2 demonstrates that the requirements of The Stormwater Policy will be met.

3.6 Water Quality Measures (WSUD)

3.6.1 Water Quality Targets

The Stormwater Policy requires that the following water quality targets are met, depending on which SOPA defined catchment the development site is located within:

"All development must as a minimum meet the following baseline water quality targets (referred to as baseline targets)*:*

- *45% reduction in the mean annual load of Total Nitrogen*
- *65% reduction in the mean annual load of Total Phosphorus*
- *85% reduction in the mean annual load of Total Suspended Solids*
- *90% reduction in the mean annual load of hydrocarbons*
- *90% reduction in the mean annual load of gross pollutants*

Development within a Sydney Olympic Park non-stormwater harvesting catchment must strive to the maximum extent practicable, to meet the following water quality targets (referred to as enhanced targets):

- *65% reduction in the mean annual load of Total Nitrogen*
- *85% reduction in the mean annual load of Total Phosphorus*
- *90% reduction in the mean annual load of Total Suspended Solids*
- *90% reduction in the mean annual load of hydrocarbons*
- *95% reduction in the mean annual load of gross pollutants"*

The development site is located within a Sydney Olympic Park non-stormwater harvesting catchment. Therefore the water quality treatment train will aim to exceed the *baseline* targets outlined above, with the objective of attaining the *enhanced* water quality targets required for a development within a non-stormwater harvesting catchment as far as practicably possible.

3.6.2 WSUD Design Intent

As the proposed basement footprint occupies a considerable area of the total site, there is little space available to consider the use of above-ground WSUD treatment measures, such as rain gardens, basins or swales. The option to supply a swale in the verge of the New Street has been investigated; however it was discounted due to the proposed gradient of the New Street. The proposed New Street closely follows the gradient of the existing surface, which falls at approximately 7.5%. Bio-swales work effectively up to a maximum longitudinal gradient of 3%. In order to achieve the Stormwater Policy's *enhanced* targets as far as practicably possible, it is proposed to supply underground propriety products including Enviropod GPTs and Stormfilter systems.

A number of various scenarios have been modelled using MUSIC software. A system that incorporates a 55 cartridge (690mm) Psorb StormFilter system located within an 80sq.m insitu chamber has been deployed. Stormwater layout plans attached as Appendix F show the proposed water quality treatment train. Upstream of the filter cartridge system is a pre-treatment unit utilising a 6 Enviropod 200 GPT.

Detailed design of building hydraulics pipework has not been documented at the time of preparing this report. In lieu of detailed pipe connectivity from the building structures and the podium slab to the OSD tank, catchments that drain to each of the elements of the treatment train have been assumed. Refer to Appendix H for assumed WSUD catchments. Further co-ordination with the hydraulics engineer and landscape architect is required to further develop the model at detailed design stage.

3.6.3 MUSIC Modelling

The section below discusses the modelled scenarios. Refer to Appendix H for a definition of the catchment areas quoted below.

Scenario 1 – Only "Bypass 1" bypasses the treatment train.

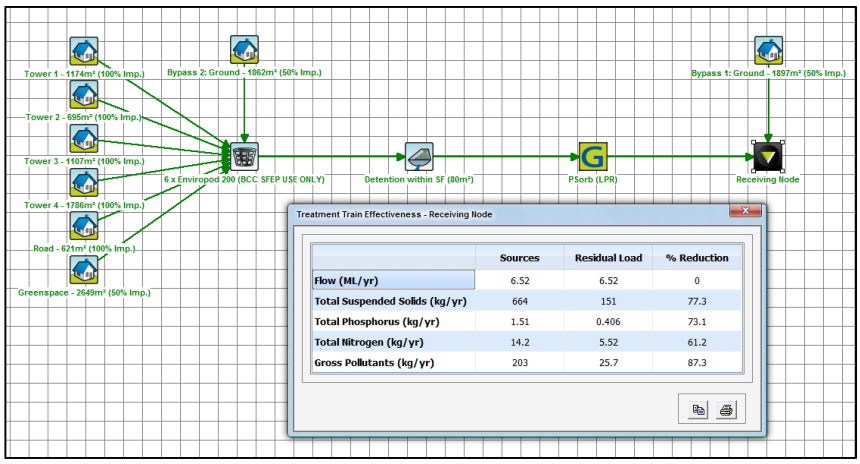

Figure 3 – MUSIC Model Scenario 1

Scenario 2 – "Bypass 1" is halved so that 50% drains to the filter chamber and 50% bypasses the treatment train.

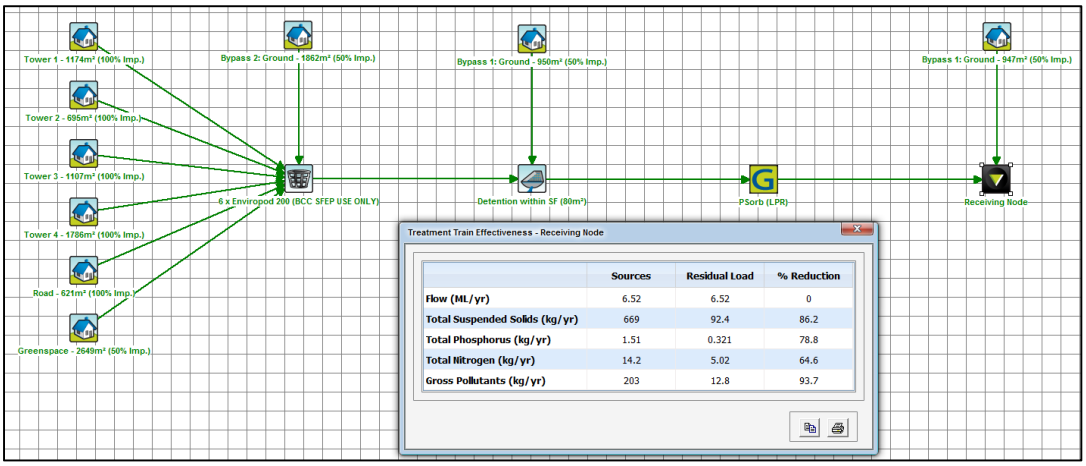

Figure 4 – MUSIC Model Scenario 2

Scenario 3 – 100% of "Bypass 1" can be connected to the Filter chamber.

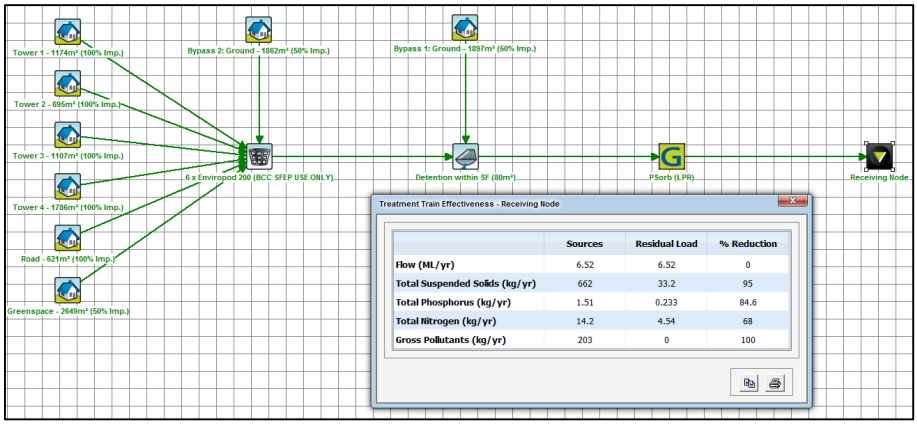

Figure 5 – MUSIC Model Scenario 3

Scenario 4 – 100% of the site is treated through the GPT then the Filter system.

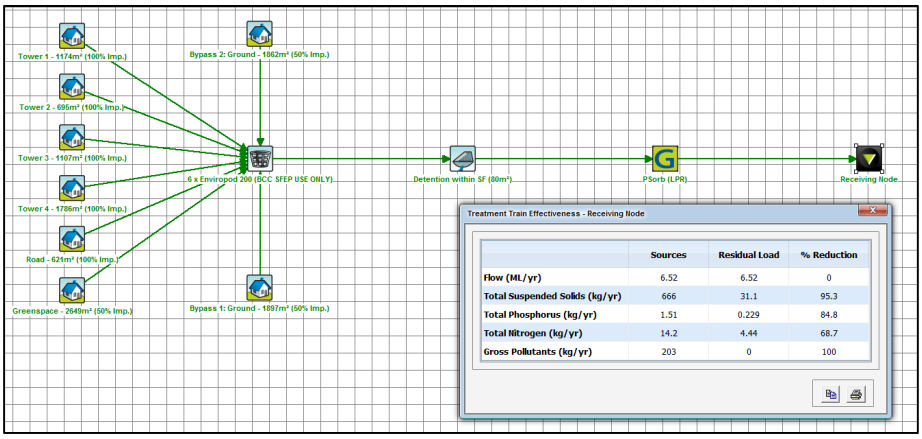

Figure 6 – MUSIC Model Scenario 4

3.6.4 Water Quality Modelling Results

A summary of the results is contained in Table 3.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Baseline Targets	Enhanced Targets
	% reduction					
Total Suspended Solids	77.3	86.2	95	95.3	85	90
Phosphorus	73.1	78.8	84.6	84.8	65	85
Nitrogen	61.2	64.6	68	68.7	45	65
Gross Pollutants	87.3	93.7	100	100	90	95

Table 3 – MUSIC Modelling Summary

It can be determined from the four modelled scenarios that as a minimum, the *baseline* targets required by The Stormwater Policy *will* be achieved. Subject to further design development and final agreement

between Mirvac and SOPA regarding future subdivision boundaries, the design intent is to strive for the *enhanced* water quality targets as far as practicably possible.

3.6.5 Water Quality Conclusion

It can be concluded that as a minimum, the baseline targets will be achieved by the proposed treatment train. It is intended to treat as much of the site as practicably possible at detail design, which will ensure that the treatment targets are close as possible to the enhanced targets, satisfying the requirements of The Stormwater Policy.

3.7 Rainwater harvesting and Re-use

The Stormwater Policy requires that the development maximises the harvest and re-use of roof-water. It requires that "*locally harvested rainwater shall be the primary source of non-potable water for developments located within a non-stormwater harvesting catchment. Where practicable, at least 90% of non-potable demand shall be met from this source."* Rainwater harvesting is designed by the hydraulics engineers.

3.8 Overland Flow

Should the stormwater system become blocked or the capacity of the system is exceeded, a safe overland flow route will be determined. The turning circle at the end of the New Street and the levels of the basement entry will be determined to ensure that the basement will be flood free for the 1 in 100 year Average Recurrence Interval (ARI) event. The proposed overland flow route is attached as Appendix E. Flows that exceed the capacity of the system will top the kerb in the turning circle at the end of the New Street, where it will make its way down the hill to the footpath to the south of the site. It will follow the footpath until it ultimately discharges into Australia Avenue.

4 CONCLUSION

This Stormwater Management Strategy has provided an overall philosophy for the collection, treatment and disposal of stormwater from the development site. The site will incorporate a stormwater collection and disposal system that meets the requirements of The Stormwater Policy. Exact layouts and sizing for the stormwater system will be confirmed during detailed design.

APPENDIX A

Landscape Architect Plan