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ENGINEERING REPORT INCORPORATING STORMWATER MANAGEMENT PLAN SSD 8606

MARSDEN INDUSTRIAL ESTATE: LOTS 23 AND 24 IN DP 262886 HOLLINSWORTH ROAD MARSDEN PARK NSW

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1 INTRODUCTION

1.1 Introduction

Logos Property proposes to construct an industrial warehouse estate comprising 7 warehouses on an un-developed parcel of land, Lots 23 & 24 in DP262886, at Hollinsworth Road, Marsden Park, NSW. The land comprises an area of approximately 21.5 Ha and is located on the western extent of the Sydney Business Park industrial area. The existing site is currently utilised as rural use.

Previous applications for subdivision and infrastructure works have been granted over the land by Blacktown City Council under DA 15-275 dated 9 September 2015. This approval included subdivision of the land, earthworks and half road construction of the extension of Hollinsworth Road. A subsequent S96 and amending development approval application over the land has been lodged by Logos Property. This SSD Application relates to the construction of seven warehouse buildings and associated estate infrastructure works.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by Logos Property to prepare this Engineering Report in support of the proposed Estate Masterplan Application to the Department of Planning and Infrastructure under SSD_8606.

This report provides a summary of the design principles and planning objectives for the following civil engineering components of the project:

- Site Works
- Management of Stormwater Quality;
- Management of Stormwater Quantity: and
- Erosion Control.

The engineering objectives for the development are to create a site which responds to the existing site topography and site constraints, and to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design and is consistent with the requirements of council's water quality objectives and takes into consideration previously approved engineering strategies over the land.

A set of drawings have been prepared to show the proposed infrastructure works including bulk earthworks, stormwater drainage diversions and sediment and erosion controls. The sediment and control measures detailed are also based on the proposed bulk earthwork levels with minimal fall to control drainage and minimise future bulk earthworks on the sites.

1.3 Authority Jurisdiction

The consent authority is the NSW Department of Planning and Environment. As the site is located within the Blacktown City Council local government area, the requirements of the Blacktown City Council *Engineering Guide for Development* and *Part J* of the *Development Control Plan 2015* are to be considered for the development.

The site is also located within the Marsden Park Industrial Precinct and the requirements of Schedule 3 Marsden Park Industrial Precinct document from Blacktown City Council.

2 DEVELOPMENT SITE

2.1 Site Description

The site, Lots 23 & 24 in DP262886, is approximately 21.1Ha in area, generally rectangular in shape and located within Blacktown City Council Local Government Area. The site is also within the Sydney Business Park Precinct and requires consideration to the approved precinct wide policies.

The property is located on the southern side of Hollinsworth Road in the suburb of Marsden Park as shown in **Figure 2.1**.

Figure 2.1 Locality Plan (Source: SIX Maps 2016)

The site is bounded on the north by a residential caravan park/ removable home development (Ingenia Property), to the east by the Busway Land (proposed future industrial), undeveloped future road corridor land to the south and undeveloped Sydney Business Park land to the west.

Access to the site is via Hollinsworth Road at the north-east corner of the site. The ground level at the termination point of Hollinsworth Road, being a partially formed cul-de-sac head, is approximately RL 54.5m AHD.

The site is split into three catchments via a saddle crest in the eastern portion of the site. Approximately 14.5 Ha drains to the north-west corner (Discharge Point 1) of the site, and 6.5 Ha drains to the south-east (Discharge Point 2). Further discussion relating to catchments is made in the Stormwater Management section of the report following.

The highest level on the site is RL 61.2m AHD (at the peak of the saddle crest) and the lowest is RL 45.8m (south-east corner, Discharge Point 2), giving a maximum level difference of approximately 15.4m.

The ground level at Discharge Point 1 is RL 47.3m AHD.

2.2 Proposed Development

The proposed development is for construction of seven (7) industrial warehouse buildings over the 21.4 Ha property. The typical use for the warehouse buildings will be for distribution and logistics type use as defined in the Urbis Statement of Environmental Effects report.

Typically each of the buildings will comprise a single level steel framed warehouse, ancillary office space, car parking areas, truck circulation and loading zones, fire brigade perimeter access and landscaping. Buildings vary in size from circa 3250m^2 to 37,000m^2. The proposed development layout is shown on Estate Masterplan drawings by Watch This Space Design as shown in **Figure 2.2**.

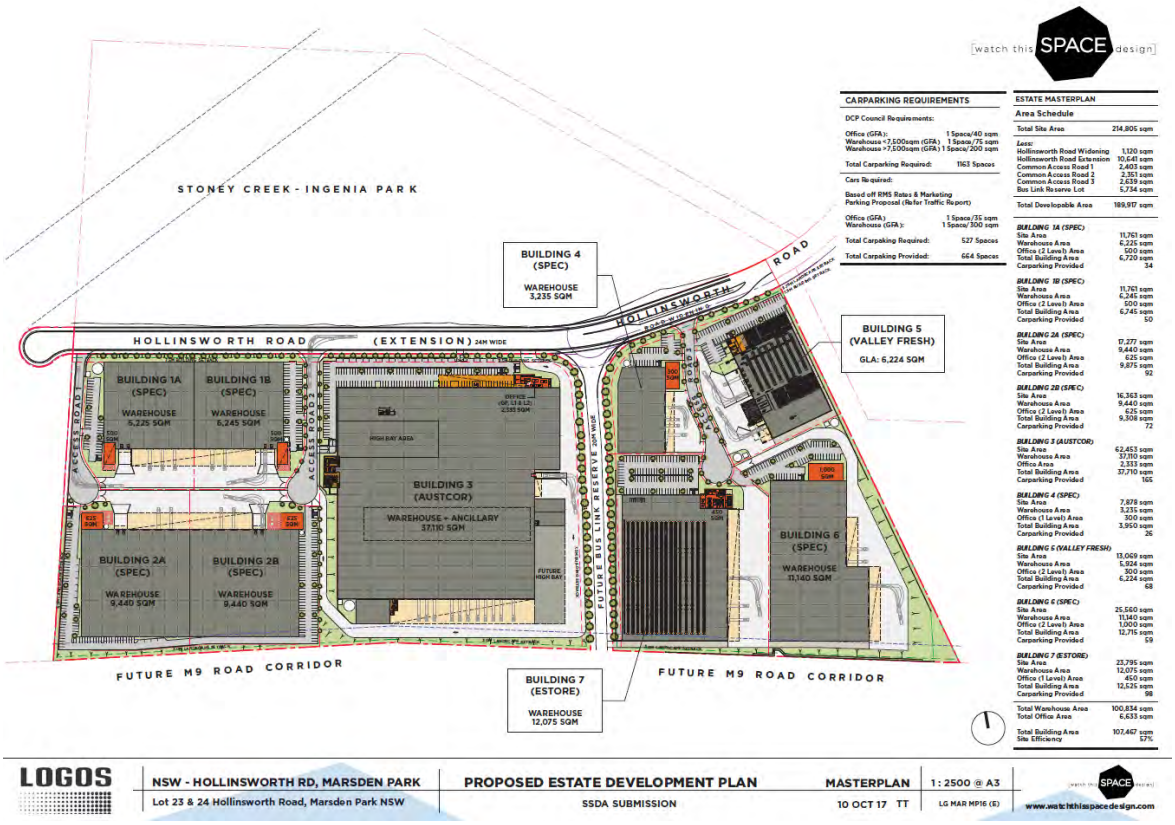

Figure 2.2 Proposed Development Layout

As noted in **Section 1.1** of this report, previous applications for subdivision and infrastructure works have been granted over the land by Blacktown City Council under DA 15-275 dated 9 September 2015. A subsequent S96(2) application over the land has been lodged by Logos Property. The amendment to the approved Development Application DA15-275 is for a modification to the subdivision layout to suit Logos Properties preferred lot configuration and is currently under assessment for approval by Blacktown City Council.

The proposed infrastructure works applications include the infrastructure works required for the subdivision and servicing of the property as an industrial estate. The infrastructure and site servicing works incorporates the following elements:

- Earthworks and retaining walls to facilitate flat building pads
- The upgrade of Hollinsworth Road to the east of the proposed Bus Link corridor;
- The extension of Hollinsworth Road to the west of the proposed Bus Link Corridor;
- Infrastructure works associated with new and upgraded roadways including stormwater, energy, telecommunications and sewer;
- Formalised drainage discharge points including easements though Busway Land to the south-east, and box culvert system through Ingenia land to the north-west;
- Detention systems associated with future building developments;
- Provision of drainage connections and servicing of individual development lots.

The civil design and stormwater management prepared in this report for the Masterplan Application submission SSD_8606 takes into account the proposed works and engineering design included under the Section 96(2) approval application and does not include any of the elements relating to the infrastructure design. For reference we have included the submitted infrastructure engineering design as **Appendix B** and provide a general description of the proposed roads and site work in Section 3 of this report.

3 INFRASTRUCTURE WORKS

3.1 General

As discussed in **Section 1.1** and **2.2** of this report, the infrastructure and servicing works (including the Hollinsworth Road Widening and extension, earthworks, sediment controls, retaining walls and trunk stormwater drainage and drainage connections) form part of separate development approvals with Blacktown City Council. Although these items form part of separate applications we provide the following summary of design parameters and allowances made in relation to roads and transportation, and site works which service the development. Further reference to **Appendix B** should be made for Engineering Design drawings associated with the separate approval with Blacktown City Council.

3.2 Roads and Transportation

3.2.1 General

The proposed Hollinsworth Road widening and extension has been designed with the following allowances:

- Geometric design completed in accordance with Austroads Guide to Road Design 2010, Austroads – Pavement Design, A guide to Structural Design of Road Pavements and Blacktown City Council Engineering Guide for Development, 2005;
- Design Vehicle – Estate Road, B-Double;
- Design Speed – 60kM/hr (50kM/hr posted);
- Estate Road Type – Industrial & collector; and
- Traffic Loading – $1x10^7$ Equivalent Standard Axles.

3.2.2 Road Widths

The proposed Hollinsworth upgrade and extension are required of Blacktown Council to be designed as an industrial collector road. The cross section for this road type is defined in *Figure 5.3 of Schedule 3* of the *Marsden Park Industrial Precinct Plan* as follows:

Road Type & Traffic Volume	**Carriageway**	**Verge (Pedestrian & Cycleway)**	**Total Road Reserve**	**Number of lanes**
Hollinsworth Road Extension (West of Bus Link)	15.5m (2 x 7.75m)	4.25m	24.00m	2 travel/ 2 parking lane
Hollinsworth Road Upgrade (East of Bus Link)	Dual 7m & 4.5m central median	4.25m	27.0	4 travel

Table 3.1. Proposed Road Cross Sections

The roads will have concrete kerb and gutter and a carriageway surface finished with asphaltic concrete as per the requirements of Blacktown City Council and remain consistent with the adjoining Sydney Business Park roadways.

The upgrade and extension of Hollinsworth Road will be full width construction fronting the property boundary with transition to the existing alignment of Hollinsworth Road being made at the eastern property boundary.

The dimensions of the adopted design cross section are shown on Drawing No. **Co12829.06-DA491** in **Appendix B**.

3.2.3 Road Alignments

The proposed road alignments have been designed to meet Council and Austroads requirements, and with consideration to the overall precinct masterplan and zoning arrangements. The alignment of the Hollinsworth Road extension has been adjusted from the DA15-275 approval and currently zoned land to enable the whole of the road reserve to be positioned within the Logos property. This will mean the whole of the road has be removed from the Ingenia property and enable the full width road to be constructed as part of the infrastructure works proposed by Logos, and will not affect existing residences within the Ingenia land. This alignment has been agreed between all key stakeholders including Blacktown City Council, Logos, Sydney Business Park and Ingenia.

The proposed road layout incorporates best practice for both horizontal and vertical alignments with empathy to the landform. Priority has been given in the design for the safety of vehicles and pedestrians.

The horizontal alignments generally meet Council standards. Minimum horizontal radii in accordance with *Section 3.11 of Council's Engineering Guide for Development, 2005*, have been provided.

In accordance with the Council standards, a minimum longitudinal grade of 1% and a maximum of 7.5% have been designed. The maximum grade of the industrial access road is slightly higher than councils desirable grade limit (Table 3.6 of *Blacktown Council Engineering Guide for Development 2005*) of 6% however less than the absolute maximum of 10%. The steeper than desirable grade is required to facilitate access to the development lots and given the short extent of travel within the cul-de-sac the 7.5% grade is considered acceptable.

Where a change of grade is in excess of 0.6%, a vertical curve in accordance with the RTA Road Design Guide for a design speed of 60 km/h has been provided.

Allowance for access to existing properties has been made in the design. The final arrangement of these items will need to be reviewed as part of detail design and final road and intersection arrangements. The application includes for the construction of a right turn bay and intersection treatment into the existing driveway to the Ingenia land. This location is consistent with the location of the future bus link and expected roundabout construction.

Allowance for a future round-about construction at the intersection of Hollinsworth Road and the future bus-link has been made in the design. The proposed Logos boundaries allow for future kerb returns which would be required for a roundabout. The boundary

arrangement is based on with concept designs and precinct masterplan prepared by Sydney Business Park and has been shown in the background of the design drawings. Future road resumption of a small portion Ingenia land on the northern side of the future roundabout will be required to accommodate the construction.

3.2.4 Pedestrian Facilities

Pedestrian paths have been located on both sides of the Hollinsworth Road upgrade and extension in accordance with the adopted precinct plan arrangements. Provision for a bus stop has been made on Hollinsworth Road in proximity to the existing bus stop near the Ingenia property entry.

3.3 Site Works

3.3.1 Bulk Earthworks

The proposed developments will be sympathetic to the site topography and the environment with building pads being sited to the contours of the land. As the proposed development is for industrial use, and the level differences over the existing site are reasonably large, it is inevitable that some areas will be in substantial cut, and others in fill. This will be required in order to provide large flat pads for the future buildings.

It is noted again that the main component of earthworks will be completed under separate approvals to Blacktown City Council. The existing surface levels and proposed pad levels defined in these separate applications are shown on Drawings **Co12829.06-DA311, DA312, DA318 & DA319** in **Appendix B.** Minor earthworks over development lots, following the main earthworks components, will be required to suit site layouts as described in the following paragraphs.

The Bulk Earthwork Levels (B.E.L) shown on above plans is based on creating a balance of the earthwork cut and fill volumes. This will require neither importation nor exportation of material other than stripped topsoil and any other vegetation or deleterious material.

The Bulk Earthwork Levels have been selected based on the proposed estate lot layout while attempting to follow the surrounding levels, to allow for access, to drain the site by gravity and minimise retaining walls. The proposed bulk earthworks layout comprises a number of level pads with falls away from nominal building pad locations to the new estate road and proposed boundaries.

Final trimming and grading over each lot will be required to suit development footprints, localised falls, docks, pavement thicknesses and the like. We note that bulk levels nominated on the infrastructure concept design drawings are within plus or minus 500mm of the final levels subject to the final geotechnical requirements, site layouts, service excavation volumes and final volumes on site.

Soil Erosion and Sediment Control measures including sedimentation basins are to be placed in accordance with submitted drawings and the Soil and Water Management Plan in **Section 8** of this report.

3.3.2 Embankment Stability

To assist in maintaining embankment stability permanent batters slopes will be no steeper than 3 horizontal to 1 vertical, while temporary batters will be no steeper than 2 horizontal to 1 vertical.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the Soil and Water Management Plan.

3.3.3 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

3.3.4 Retaining Walls

Due to the existing topography and the nature of the proposed development, retaining walls will be required over the site. The proposed layout and configuration of the infrastructure retaining walls is shown on drawing **Co12829.06-DA610**. Typical retaining wall details are shown on drawings **DA650**.

The final configuration of walls will be subject to detail design and local level differences in and around the building footprints, however typical items required of Blacktown City Council will form part of the design considerations. Such items would include tiering (refer below), masonry construction and design being completed by an engineer on the national engineering register.

Walls greater than 3m in height, where aligned along public roads, will be terraced in accordance with BCC requirements. Where walls are located outside of public view (i.e. behind buildings or future development sites on adjoining properties) then terraces will not be included in the design.

4 STORMWATER DRAINAGE

4.1 Site Drainage

4.1.1 Existing Site Drainage

The property is currently undeveloped with little to no formal drainage located on site.

The existing site comprises undulating rural land with three drainage catchments defined by a peak and spur which traverses the site diagonally from the centre of the site toward the south-eastern boundary.

A catchment, with an area of 12.89 Ha, drains to Hollinsworth Road on the northern side of the property and ultimately to Sydney Business Park Basin E. The second catchment, with an area of 2.35 Ha, drains from the site through private property at the north-east corner of the development site and ultimately to the proposed Sydney Business Park Basin E as well. A third catchment drains with an area of 1.45 Ha to the east of the site, to an existing basin and ultimately to an existing overland flow path, where it ultimately joins with the remaining 5.29 Ha catchment. These two catchments drain to the south-east, through an existing flow path within the future RMS road corridor, toward an existing SP2 zoned drainage corridor which ultimately drains to Sydney Business Park Basin G, via an open channel and creek within the Ahmadiyya Muslim Association Australia land.

As part of the Sydney Business Park development, a series of regional detention basins have been either designed and constructed, or designed and approved for future construction. As we understand the Sydney Business Park Precinct catchment breakdown allows for the development site to drain to Basins E and G. These regional basins allow for attenuation of the site, and for water quality of Section 94 roads. At the time of writing, the construction of Basin E and Basin G are only partially completed.

4.1.2 Proposed Infrastructure Drainage

As per general engineering practice and the guidelines of BCC, the proposed stormwater drainage system for the development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. The major system through new paved areas has been designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system employs the use of defined overland flow paths to safely convey excess run-off from the site to the two discharge points.

The catchment configuration for the estate is as follows:

- The existing 5.29 Ha RMS land catchment, located along the southern boundary of lots 1 & 2, will be diverted around the site via a series of pits and pipes in a 3.5m wide easement and ultimately to Basin G. This drainage system is subject to approval under the existing subdivision and infrastructure development application approval DA 15-275.

- The proposed extension of Hollinsworth Road, which has a total catchment area of 1.48Ha, drains to the west via pits and pipes within the road, and ultimately discharges to Basin G. This drainage system is subject to approval under the existing subdivision and infrastructure development application approval DA 15-275.
- The proposed Buslink road (Daniel's Road), which has a total catchment area of 0.52Ha, drains to either the north or the south, generally consistent with the existing site topography. No formal drainage is proposed under this approval or the separate DA approval for infrastructure works. Runoff from this area shall be captured in temporary swales as noted in the Costin Roe Amending Development Application documents in Appendix B.
- Lot 1 shall have 5.75Ha collected by on-site drainage per the proposed masterplan layout. Lot 2 shall have 6.13Ha collected by on-site drainage per the proposed masterplan layout. Flows from these lots will be attenuated with on-site detention (OSD) and discharge to Hollinsworth road per the above approval. The remainder of Lot 1 & 2 (~0.56Ha) shall bypass formalised drainage – the flows from this bypass shall be accounted for in the OSD.
- Lot 3 shall have 6.69 Ha collected by on-site drainage per the proposed masterplan layout. Flows from this area shall be attenuated by OSD and shall ultimately discharge to the existing low-point in the RMS corridor. The remainder of Lot 3 (~0.6Ha) shall bypass formalised drainage – the flows from this bypass shall be accounted for in the OSD.

4.1.3 Proposed Building/ Lot Drainage

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, the standards of BCC and accepted engineering practice and as defined in the Sydney Business Park Stormwater Management Strategy. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1988 Edition), Volumes 1 and 2 (AR&R).

Water quality and re-use are to be considered in the design to ensure that any increase in the detrimental effects of pollution is mitigated, BCC Water Quality Objectives are met and that the demand on potable water resources is reduced. This document confirms the requirements for future development lots based on a whole of catchment approach, allowing for treatment the proposed Hollinsworth Road extension to be completed within regional basins and treatment of buildings being performed on lot.

Water quantity (stormwater detention) is not required for development sites which drain to the Sydney Business Park Regional Basins when constructed. The regional basins are however, at the time of writing, not fully constructed and timing of the final construction of these basins is subject to a number of factors which are not in the control of Logos. Until such time that the regional basins have been constructed and will provide sufficient capacity to attenuate the subject site drainage runoff, temporary detention systems will be required within the subject site for building developments.
Assessment for the need of temporary detention, and necessary storage volumes, has been

provided in this report for buildings on each lot. It is noted that if the regional basins are constructed with sufficient capacity to attenuate stormwater runoff from the Logos property prior to construction of buildings on the site then the nominated detention systems in this report will not be required to be constructed.

The provided concept stormwater management for each lot will comprise the following elements, which are further described and quantified in following sections:

- Minor drainage system consisting of a piped drainage system designed to accommodate the 1 in 20-year ARI storm event (Q20).
- Major drainage system through new paved areas has been designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100);
- Stormwater Quantity Management System comprising underground tank to attenuate post development stormwater runoff to pre-developed. As noted if the regional basins are constructed with sufficient capacity to attenuate stormwater runoff from the Logos property prior to construction of the building then the nominated detention systems in this report will not be required to be constructed;
- Stormwater quality system which meets the load based pollution reduction requirements of Blacktown City Council Part J DCP2015; and
- Rainwater reuse which reduces demand on non-potable water use by 80% as per Blacktown City Council Part J DCP2015.

4.2 Hydrologic Modelling and Analysis

4.2.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Blacktown City Council and accepted engineering practice.

Specifically, the design will be based on:

- Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage;
- Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1987 Edition), Volumes 1 and 2 (AR&R) – It is noted that a design principle is not yet in place for on-site detention systems using AR&R 2016 data;
- Blacktown City Council's *Engineering Guidelines for Development 2005;*
- Storm events for the 2 to 100 Year ARI event have been assessed.

4.2.2 Minor/ Major System Design

The piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

4.2.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for ILSAX and RAFTS modelling for the 2 to 100 Year ARI events, was taken from Blacktown City Council's *Engineering Guidelines for Development 2005*.

4.2.4 Runoff Models

In accordance with the recommendations and standards of Blacktown City Council, the calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS. The ILSAX hydrological model component will be utilised for the post-development site and the RAFTS model component for broad scale catchments. This will be in accordance with previous studies and approvals for land in the area.

The design parameters for the ILSAX model are to be based on the recommendations as defined by BCC and parameters for the area and are as follows:

Model	**Model for Design and analysis run**	**Rational method**	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage (Post Development)	5	mm
	Grassed (Pervious) Area Depression Storage (Pre-Development)	15	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

Table 4.1. DRAINS ILSAX Parameters

4.3 Hydraulics

4.3.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.3.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground level, for the peak runoff from the Minor System runoff. Where the pipes and junctions are sealed, this freeboard would not be required.

Freeboard of 300mm has been achieved to building levels during the Major Storm Event.

4.3.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.3.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.3.5 Overland Flow

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the estate road system.

4.4 External Catchments and Flooding

Lot 23 is affected by flow from an upstream catchment. Overland flow is currently conveyed through the western side of Lot 23 along an existing gully and through an existing dam prior to discharge from the property to the north. The upstream catchment (approximately 5.3 Ha) will need to be conveyed through the site within a pipe and dedicated easement. This is currently under being processed under a separate approval with Blacktown City Council, DA 15-275.

This flow from the upstream catchment is to be design to bypass all future site detention (OSD) measures and water quality devices.

The site is not affected by flooding, other than the overland flow from the catchment discussed above. Refer to Costin Roe Amending Development Application **Co12829.06-DA** series drawings in **Appendix B** for details.

4.5 Stormwater Management

The proposed stormwater management for future development lots will be required to be consistent with Blacktown City Councils DCP2015 Part J and generally in accordance with the approved arrangement.

Sections 5 & 6 of this report describe the general arrangement for the Stormwater Management and objectives which will be required for development lots.

5 STORMWATER QUANTITY MANAGEMENT

5.1 Introduction

Blacktown City Council requires water quantity to be managed to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated from the early works carried out. Water quantity management is sometimes referred to as stormwater detention, or on-site detention (OSD).

With the sites ultimately discharging to the Sydney Business Park Regional Basins, water quantity management (stormwater detention) is not required for the development site. The regional basins are however, at the time of writing, not fully constructed and the timing of the final construction of these basins is subject to a number of factors which are no in control of Logos. Until such time that the regional basins have been constructed and will provide sufficient capacity to attenuate the subject site drainage runoff, temporary detention systems will be required within the subject site to accommodate runoff resulting from the early works and our assessment is based on this scenario.

An assessment of the required drainage attenuation storage requirements has been made based on the total storage requirements for each lot being defined. The final volumes of individual building systems shall be confirmed during the detailed design phase for each of the buildings ensuring that site discharge rates remain consistent with the requirements of BCC and attenuating post developed flows to pre-developed flow as set out in this report. It is expected that an underground detention tank shall be provided per warehouse and a concept layout of the tank configurations, based on proportioning the lot storage requirements for each building area, are shown on drawings **Co12829.06-SSDA41-43**.

The methodology employed to determine the attenuation requirements are based on assessing storms for the 1 in 2 year ARI to the 1 in 100 year ARI for the pre and post development phases. Given the pre and post development surfaces are both considered pervious, the pre-developed flows have been assessed based on a 15mm depression depth and the post development based on a fully impervious industrial lot. This is generally in line with Blacktown Councils recent requirements for the modelling of detention systems and is considered appropriate for the currently modelled situation for a temporary detention system.

Runoff resulting from the proposed batters around the development site has been considered to bypass the OSD basins. It is believed that this bypass doesn't increase the site discharge from pre-development flow.

In relation to the future building developments, regional basins, interim basins and meeting pre and post development runoff for building sites, these considerations would all form part of either a second Construction Certificate, or amended development approval. For reference is it noted that Discharge Point 1 drains to Regional Basin E and Discharge Point 2 drains to Regional Basin G. We understand that SBP Basin E has been or is near to being completed however Basin G is still under construction. The timing and program of the SBP basins will need to be discussed and confirmed with SBP in relation to the proposed development of Lots 23 and 24. It is expected that Basin G would be complete during 2017-2018 subject to the amount of development complete within the business park.

In the scenario that the SBP basins have been constructed, no on-site detention systems are required. Given however the SBP basins are not complete, interim/ temporary basins are required to be constructed on site – this has been reflected in JWP design and also in the *Blacktown City Council Approval Condition 4.11.5.1*. It is noted that the construction of any temporary or interim tanks should be required until such time that construction of the regional basins is complete.

5.2 Existing & Post Development Peak Flows

Intensity/Frequency/Duration (IFD) data was adopted from councils Development Guidelines used in conjunction with rational method calculations to estimate peak flows for the site and surrounding catchments.

Two OSD tanks are proposed to attenuate the 5.75Ha Lot 1 catchment, one OSD tank is proposed to attenuate the 6.13Ha Lot 2 catchment, and four OSD tanks are proposed to attenuate the 6.69Ha eastern catchment. It is proposed that one OSD tank be provided per warehouse.

The attenuation volume for the interim detention has been assessed based on attenuating the post development flow to pre-development flow for storms ranging from 1 in 2 year ARI to 1 in 100 year ARI. The total attenuation volumes per lot have been provided.

ARI	Design Storm Duration	Peak Flow (m3/s)				
		Undeveloped	Lot 1	Lot 2	Bypass	Total Outflow
		Western Catchment	Site (No Attenuation)	Site (No Attenuation)	Total Bypassing OSD	Site (With Attenuation)
2	1 Hr	0.353	1.340	1.430	0.017	0.308
	2 Hr	0.487	1.370	1.460	0.023	0.330
	3 Hr	0.478	0.746	0.795	0.022	0.327
	6 Hr	0.583	0.484	0.516	0.027	0.332
	12Hr	0.624	0.430	0.458	0.029	0.312
	24Hr	0.459	0.275	0.293	0.021	0.302
	48Hr	0.358	0.212	0.226	0.016	0.293
20	20 min	0.426	2.530	2.700	0.020	0.342
	30 min	0.691	2.360	2.520	0.033	0.642
	1 Hr	1.130	2.250	2.400	0.053	0.876
	2 Hr	1.300	2.300	2.450	0.059	0.927
	3 Hr	1.170	1.250	1.330	0.054	0.889
	6 Hr	1.230	0.810	0.863	0.056	0.931
	12Hr	1.200	0.724	0.771	0.055	0.938
	24 Hr	0.901	0.481	0.512	0.041	0.820
100	20 min	0.844	3.090	3.300	0.040	0.825
	30 min	1.250	2.810	2.990	0.059	0.970
	1 hr	1.790	2.750	2.930	0.083	1.270
	2 hr	1.870	2.790	2.970	0.086	1.430
	3 hr	1.600	1.520	1.620	0.073	1.170
	6 Hr	1.600	0.979	1.040	0.073	1.300
	12Hr	1.520	0.879	0.936	0.070	1.460
	24 Hr	1.140	0.594	0.633	0.052	1.020

Table 5.1. Lot 1 & Lot 2 Pre Development Flows

Post development site discharge volumes, as well as the provided detention volumes and depths for Lot 1 are provided in **Table 5.2** & Lot 2 are provided in **Table 5.3** below.

ARI	Duration (mins)	Peak Flow (m^3/s)						Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation						
			Orifice 1	Orifice 2	High Weir	Emergency	Total		
2	3 Hr	0.746	0.154	0	0	0	0.154	1.47	1450
20	12Hr	0.724	0.185	0.253	0	0	0.438	2.18	2140
100	2 Hr	2.79	0.204	0.331	0.126	0	0.661	2.66	2615

Table 5.2. Detention System Flow and Volume Requirements – Lot 1

ARI	Duration (mins)	Peak Flow (m^3/s)						Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation						
			Orifice 1	Orifice 2	High Weir	Emergency	Total		
2	3 Hr	0.795	0.156	0	0	0	0.156	1.51	1580
20	12 Hr	0.771	0.189	0.259	0	0	0.447	2.26	2380
100	12 Hrs	0.936	0.207	0.335	0.190	0	0.734	2.75	2890

Table 5.3. Detention System Flow and Volume Requirements – Lot 2

As shown in **Table 5.2** and **Table 5.3** above, an active detention storage of 2,615m^3 and 2,890m^3 is required in Basins P1 and P2, respectively, to attenuate the post development flows to pre-development flows for the 12.44Ha western catchment, which will discharge into the existing drainage infrastructure.

The pre-development site discharge volumes for Lot 3 is provided in **Table 5.4** below.

ARI	Design Storm Duration	Peak Flow (m3/s)			
		Undeveloped	Basin P3	Bypass	Total Outflow
		Eastern Catchment	Site (No Attenuation)		
2	1 hr	0.312	1.56	0.036	0.229
	2 hr	0.345	1.6	0.039	0.235
	3 hr	0.276	0.868	0.033	0.229
	6 Hr	0.353	0.563	0.041	0.23
	12Hr	0.347	0.500	0.041	0.221
	24Hr	0.216	0.320	0.026	0.198
20	20 min	0.516	2.95	0.056	0.27
	30 min	0.686	2.75	0.076	0.304
	1 hr	0.928	2.62	0.104	0.434
	2 hr	1.050	2.67	0.117	0.455
	3 hr	0.805	1.45	0.09	0.447
	6 Hr	0.699	0.943	0.081	0.46
	12Hr	0.621	0.842	0.072	0.433
	24 Hr	0.403	0.559	0.047	0.392
100	20 min	0.986	3.6	0.108	0.38
	30 min	1.100	3.27	0.123	0.515
	1 hr	1.340	3.2	0.15	0.595
	2 hr	1.520	3.24	0.168	0.769
	3 hr	1.170	1.76	0.131	0.612
	6 Hr	0.856	1.140	0.099	0.704
	12Hr	0.765	1.020	0.088	0.679

Table 5.4. Lot 3 Pre Development Flows

Post development site discharge volumes, as well as the provided detention volumes and depths for Basin P3 are provided in **Table 5.5** below.

ARI	Duration (mins)	Peak Flow (m^3/s)						Depth (mm)	Storage (m^3)
		No Attenuation	With Attenuation						
			Orifice 1	Orifice 2	High Weir	Emergency	Total		
2	2 Hr	1.6	0.204	0	0	0	0.204	1.36	1570
20	6 Hr	0.943	0.263	0.148	0	0	0.411	2.36	2720
100	2 Hr	3.24	0.290	0.217	0.195	0	0.7	2.89	3330

Table 5.5. Detention System Flow and Volume Requirements – Lot 3

As shown in **Table 5.5** above, an active detention storage of 3,330m^3 is required in Basins P3 to attenuate the post development flows to pre-development flows for the 5.29Ha eastern catchment, which will discharge into the existing drainage low point, and subsequently into the existing drainage channel.

6 STORMWATER QUALITY CONTROLS

6.1 Stormwater Management Objectives

There is a need to provide design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by the Blacktown City Council.

Stormwater quality will comprise a treatment train which meets the percentage based pollution reduction objectives of Blacktown Council Policy DCP2015 Part J.

The water quality objectives for the entire development are presented in terms of annual percentage pollutant reductions on a developed catchment:

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%
Total Hydrocarbons	90%

Water quality for development lots will be completed as part of individual future development applications for building development. Water quality measures will need to be provided for each lot in accordance with Blacktown City Council DCP2015 Part J reductions quoted above and proven by MUSIC modelling.

It is noted that provision for water quality treatment of the catchments associated with the Bus Link Corridor and the Hollinsworth Road extension have been accounted for in the overall precinct Stormwater Management Strategy and S94 Contribution plan. Allowance for treatment of these catchments has been made in water quality measures provided in the *Sydney Business Park Regional Basins E and G*. As such no allowance for water quality treatment associated with these road corridors is required in the current SSD Application.

6.2 Proposed Stormwater Treatment System

Roof, hardstand, car parking, roads, other paved areas and landscaping areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development, except the S94 roads. The STM's for the development shall be based on a treatment train approach to ensure that all of the objectives above are met. A concept for the treatment of each building has been presented which would need to be confirmed at detail design stage to meet the load based objectives noted above.

Components of the treatment train for the each building are expected to comprise the following elements:

- Primary treatment to parking and hardstand areas is to be performed Stormwater 360 Enviropod Pit Inserts;

- Tertiary treatment is to be made via a Stormwater360 Stormfilter System. these may be housed within detention system or their own underground housing tank;
- A portion of the roof will also be treated via rainwater reuse and settlement within the rainwater tank.

The proposed stormwater treatment system will need to allow for the 6month ARI flow to be conveyed through the Stormfilter treatment chamber, allowing for an oil baffle which has been sized to limit flow velocity past the baffle to 0.4 m/s.

In order to estimate the number of Stormfilters and Enviropods required to meet the requirements of councils load based pollution reduction objectives, a MUSIC model has been prepared based on a nominal 1Ha catchment site. The 1Ha site allows for breakdown of different surfaces per the Estate Masterplan Layout and will enable a per-hectare rate to be defined which can be applied to the different building catchments. Additionally this allows for an estimate of rainwater reuse to be defined over the development.

6.3 Stormwater Quality Modelling

6.3.1 Introduction

The MUSIC model was chosen to model water quality. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km^2 and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria set out in Part J of BCC's DCP2015 and nominated in Section 6.1 of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model "*12829.06- Rev1.sqz*" was set up to examine the effectiveness of the water quality treatment train and to predict if BCC requirements have been achieved. The model was set up using the latest Blacktown City Council *MUSICLINK* parameters and the layout of the MUSIC model is presented in **Appendix C**.

6.3.2 Rainfall Data

Six minute pluviographic data was provided by BCC which has been sourced from the Bureau of Meteorology (BOM) as nominated below. Evapo-transpiration data for the period was sourced from the Sydney Monthly Areal PET data set supplied with the MUSIC software.

Input	**Data Used**
Rainfall Station	67035 Liverpool (Whitlam)
Rainfall Period	1 January 1967 – 31 December 1976 (10 years)
Mean Annual Rainfall (mm)	857
Evapotanspiration	Sydney Monthly Areal PET
Model Timestep	6 minutes

6.3.3 Rainfall Runoff Parameters

Parameter	**Value**
Rainfall Threshold	1.40
Soil Storage Capacity (mm)	170
Initial Storage (% capacity)	30
Field Capacity (mm)	70
Infiltration Capacity Coefficient a	210
Infiltration Capacity exponent b	4.7
Initial Depth (mm)	10
Daily Recharge Rate (%)	50
Daily Baseflow Rate (%)	4
Daily Seepage Rate (%)	0

6.3.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are based on BCC land use parameters as per the **Table 6.1**.:

Flow Type	Surface Type	TSS (log_{10} values)		TP (log_{10} values)		TN (log_{10} values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	1.20	0.17	-0.85	0.19	0.11	0.12
	Roads	1.20	0.17	-0.85	0.19	0.11	0.12
	Landscaping	1.2	0.17	-0.85	0.19	0.11	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19
	Landscaping	2.15	0.32	-0.6	0.25	0.30	0.19

Table 6.1. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 6.1** above and the catchments shown in **Table 6.2**.

The relevant stormwater catchment sizes are listed below in **Table 6.2** and shown in **Appendix C**.

Catchment	Area (Ha)	Source Node	% Impervious	Stormwater Treatment
Roof to Ground	0.428	Roof	100%	Enviropod EP200 Pit Inserts SW360 Stormfilter Cartridge Tank
Roof to RWT	0.142	Roof	100%	Rainwater Tank SW360 Stormfilter Cartridge Tank
Hardstand/Carpark	0.330	Hardstand	95%	Enviropod EP200 Pit Inserts SW360 Stormfilter Cartridge Tank
Landscaping	0.05	Landscape	0%	Enviropod EP200 Pit Inserts SW360 Stormfilter Cartridge Tank
Landscape Bypass	0.05	Landscape	0%	-
Total	1.000			

Table 6.2. Music Model Source Nodes

6.3.5 Treatment Nodes

Rainwater tank, Stormwater 360 Enviropod and Stormwater360 Stormfilter nodes have been used in the modelling of the development.

6.3.6 Results

Table 6.3 shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment over the modelled 1 Ha catchment.

	Source	Residual Load	% Reduction	Target Met
Flow (ML/yr)	6.7	6.22	7.2	NA
Total Suspended Solids (kg/yr)	938	115	87.7	Y
Total Phosphorus (kg/yr)	2.04	0.68	66.6	Y
Total Nitrogen (kg/yr)	15.1	8.08	46.5	Y
Gross Pollutants (kg/yr)	170	0	100	Y

Table 6.3. MUSIC analysis results

The model results indicate that, through the use of the STM's in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the requirements of Part J of BCC's DCP 2015 over the 1Ha catchment. This rate has then been applied over the overall catchment and shown on drawings Co12829.06-SSDA41, SSDA42 and SSDA43.

6.3.7 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements of Part J of BCC's DCP2015 have been met.

The MUSIC modelling has shown that the proposed treatment train of SQID's will provide stormwater treatment which will meet BCC requirements in an effective and economical manner.

Hydrocarbon removal cannot be modelled with MUSIC software. The proposed distribution/ storage facility would be expected to produce low source loadings of hydrocarbons. Potential sources of hydrocarbons would be limited to leaking engine sumps or for accidental fuel spills/leaks and leaching of bituminous pavements (carparking only). The potential for hydrocarbon pollution is low and published data from the CSIRO indicates that average concentrations from Industrial sites are in the order of 10mg/L and we would expect source loading from this site to be near to or below this concentration.

Given the expected low source loadings of hydrocarbons and removal efficiencies of the treatment devices we consider that the requirements of the Blacktown Council have been met.

6.4 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas, or stormwater where the flow is from all areas of the development.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for this development with re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the water demand for the development by a minimum of 80% and to satisfy the requirements of Blacktown City Council DCP2015 Part J.

In general terms the rainwater harvesting system will be an in-line tank for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system.

Rainwater tanks have been designed, using MUSIC software to balance the supply and demand, based on the below base water demands and the requirement of Blacktown Council DCP2015 Part J to provide 80% reduction in non-potable water demand.

6.4.1 Internal Base Water Demand

Indoor water demand has been based on Section 7.11 of Blacktown Council DRAFT MUSIC Modelling Guideline 2013 for an industrial/ commercial development. Section 7.11 requires an allowance of 0.1kL/day/ toilet or urinal. No allowance is required for disable toilets.

The above rates result in the following internal non-potable demand:

Per Hectare	7 Toilets	0.7 kL/day

Note, the final number of toilets & subsequent re-use shall be confirmed during detailed design.

6.4.2 External Base Water Demand

The external base water demand has also been based on Section 7.11 of Blacktown Council DRAFT MUSIC Modelling Guideline 2013 and recent agreed rates with Mr Tony Merrillees from Blacktown Council for an industrial/ commercial development. Section 7.11 requires an allowance of 0.3kL/year/m^2 as PET-Rain for subsurface irrigation.

The above regime for the landscaped area for the site gives the following yearly outdoor water demand:

Irrigated Area (0.3kL/year/m^2)	1000m^2	330 kL/year
TOTAL		**330 kL/year**

6.4.3 Rainwater Tank Sizing

The use of rainwater reduces the mains water demand and the amount of stormwater runoff. By collecting the rainwater run-off from roof areas, rainwater tanks provide a valuable water source suitable for flushing toilets and landscape irrigation.

Rainwater tanks have been designed, using MUSIC software to balance the supply and demand, based on the calculated base water demands and proposed roof catchment areas. Allowances in the MUSIC model have been made for high flow bypass which will be managed by a dual high flow (225mm downpipe) and low flow (100mm downpipe) roofwater collection configuration along a portion of the southern elevation of the warehouse. The final configuration, including the arrangement of downpipes shall be confirmed during the detailed design of individual warehouses.

Roof Catchment (m^2)	Highflow Bypass (l/s)	Tank Size in MUSIC (kL)	Predicted Demand Reduction (%)	Provided Tank (kL)
1420	100	48	82.81	60

Table 6.4. Rainwater Reuse Requirements

The MUSIC model, results summarised in **Table 6.4**, predicts that the requirements of Blacktown Council DCP2015 Part J (80% reduction in non-potable water demand) will be met for the development with the provision of a minimum 120 kL rainwater tank.

We note that the final configuration and sizing of the rainwater tanks is subject to detail design considerations and optimum site utilisation.

6.5 Stream Erosion Index

Consideration to waterway stability and the Stream Erosion Index (SEI) assessment has been made in accordance with *Section 4.4* of Blacktown City Councils DCP2015 Part J for the stormwater runoff from the development. As noted in the DCP, *Development sites which are exempt from providing on-site detention are deemed to satisfy the SEI control*.

All parts of this development drain to the regional detention systems within the SBP and are exempt from providing on-site detention. As such no SEI calculation has been completed or is required to be completed for the development.

6.6 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 6.6** below).

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the maintenance requirements below it is also recommended that inspections are made following heavy rainfall or major storm events. Event heavy rain inspections should be carried out as soon as practicable following an intense period of rainfall, (i.e. greater than 100mm over 48 hours), as measured at the Horsley Park or Prospect Reservoir weather stations.

Table 6.6. Indicative Maintenance Schedule

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES/ LANDSCAPED AREAS			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
RAINWATER TANK			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet - leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
			depth as specified by the hydraulic consultant
INLET & JUNCTION PITS			
Inside Pit	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of Pit	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.
OSD SYSTEM			
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen and clean	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen if required to clean it.
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve is clear.
Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates.	Six Monthly	Maintenance Contractor/ Owner	Remove debris and floatable materials.
Check attachment of orifice plate and screen to wall of pit	Annually	Maintenance Contractor	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required.