

STORMWATER MANAGEMENT PLAN

1.0 Introduction

This plan has been prepared by Richmond + Ross Pty Ltd at the request of Stockland Trust Group. This plan forms part of the Environmental Management Plan required for Yennora Distribution Park (YDP) under the requirements of the Section 80 DA approval (DA 264-09-01).

The purpose of this plan is to provide the details regarding the proposed stormwater management for the life of the site and to enable Planning NSW to assess the merits of the proposed Environmental Management Plan (EMP) with respect to stormwater management issues. Detailed plans relating to the proposed stormwater works within the development area have been prepared.

This management plan is based on:

- Masterplan documentation for Yennora Distribution Park (YDP) submitted with the application for Section 80 DA (DA 264-09-01).
- The proposed building and drainage works as noted on plans provided by MNIA, Architects for the Stage1 and 1B.
- Detailed hydraulic and hydrological calculations
- Site inspection and field investigations
- Site level survey
- Discussions with Holroyd Council and the Department of Land & Water Conservation (DLWC)

2.0 Site Location

The site for the stormwater management plan is bounded by Dennistoun Ave to the North, Byron Road to the East, Loftus Road to the South, and the existing creek system to the West. Refer to the main body of the EMP document for real property descriptions of the area to be developed.

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3.0 Existing Drainage and Catchments

The stormwater catchments for runoff draining toward the site are defined in the catchment plan, Appendix A, Figure-1. Five major catchments external to the site contribute stormwater runoff which may affect YDP due to the topography of the upstream catchments.

3.1 External Catchment (A)

This catchment, of approximately 12.5 Ha, contributes to one of the overland flow paths across the YDP site. Topographic maps and visual inspection indicate a distinct gully across and into the one of the proposed development areas.

Calculation indicates an external catchment flow of the order of $4.8\text{m}^3/\text{sec}$, in a 1 in 100yr event. This water flows into a low laying area which discharges via the existing internal underground drainage system. The current system does not have the capacity to carry the full external and internal stormwater flows; hence ponding occurs, with a controlled discharge to the internal drainage system. This functions as a de facto detention system. The ultimate end outfall of the internal system is into dual 1800 dia pipes in Loftus Road.

3.2 External Catchment (B)

The external catchment which flows around Buildings 1 & 2 to the Western Precinct is approximately 45ha in area, with a flow of some $16\text{m}^3/\text{sec}$ in a 1 in 100yr Rainfall event. Surface runoff flows down Dennistoun and Renfrew to the low point in Dennistoun Ave at the end of Renfrew Street. Calculation indicates the overflow into YDP is the order of $7.5\text{m}^3/\text{sec}$ in a 1 in 100yr Rainfall event. This surface water would flow generally to the West and South of the site as sheet flow in the internal roadways and across currently vacant land, before joining into the creek on the Western side of YDP

3.3 External Catchments (C, D & E)

These external catchments flow into the series of three creeks on the Western side of YDP with a total catchment area of some 65ha and a total flow of some $24\text{m}^3/\text{sec}$ in a 1 in 100yr Rainfall event. Surface runoff flows down Dennistoun and Lomond Road to three low points in Dennistoun Ave. Calculation indicates that the creek system does not overflow into YDP in a 1 in 100yr Rainfall event.

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3.4 Roof & Site Drainage

The current drainage of YDP is by a combination of pits, drains and overland surface flows ultimately draining into the existing underground pipe system in Loftus Road. Currently no roof or pavement area is directly connected to the creeks on the Western side of YDP, however surface flows from unpaved areas and flows from external catchments do flow into that creek system

3.5 Overland Flow Paths

Overland flow paths within the site have been defined for the pre and post development of the site, these paths are of an approximate nature due to the low gradients on the site. These paths are shown on the plan Figures 2 & 3, Appendix A. The site also contains various existing "local" drainage systems however these are not noted on that plan. The post development flows are based on the full development of the site in general accordance with the Master Plan for site development.

4.0 Proposed Drainage Works

4.1 External Catchment (A)

The proposed development in the Eastern Precinct is located in the path of overland flows & runoff from upstream and internal catchments. It is proposed to provide new drainage to direct all upstream flows around the proposed development and into a new wetland/ detention basin system.

The overview details of the proposed system are shown on the Stormwater Management Plan (SMP) drawings SMP01-SMP08 inc and in the calculations. The intent of the wetland/ detention system is two fold;

- (i) To limit the post development out flow from the external catchments and proposed internal development to less than that which would occur pre development.
- (ii) To provide an area of riparian vegetation and a creek like topographic surface, to meet the requirements of DLWC. This provides water quality improvements and native habitat for fauna & flora, refer to BIOSIS report for further details of vegetation

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4.2 External Catchment (B)

It is proposed to formalise the overland flows from Catchment (B) via the provision of a landscape swale and improved capture facilities at the low point of Dennistoun Ave and direct those waters past the Western Precinct works into the Creek on the Western side of YDP. Refer to drawings SMP01-08 inc.

4.3 External Catchment (C,D&E)

In conjunction with DLWC it is proposed to improve the overland and creek flows from Catchments (C,D & E) across the Native vegetation area, which is to remain, via the provision of creek rehabilitation works, such as batter stabilisation and improved capture facilities at the low points of Dennistoun Ave. The rehabilitation works are defined in the Landscape Management Plan and the capture facilities are noted on our drawings SMP01-08 inc.

4.4 Roof & Site Drainage

The proposed extent of the buildings and paving over the existing situation would result in an increase in impervious area. As such Holroyd Council require On Site Detention (OSD) for all new impervious areas. It is proposed to combine the OSD with the wetland/ detention system in some areas. Calculation of the proposed works indicates a reduction in peak runoff at the outfall into the Loftus Road drainage system.

The drainage of the proposed development will require the provision of a new drains and pits within the site. The general size, depth and location of these drains and pits are provided on our drawings SMP 01 to 08 inc and our calculations. Pollution control devices will be provided for on site runoff prior to discharge into wetland/ basin system.

4.4 Groundwater Considerations

No obvious seams or seepage were noted on the YDP site. The site topography is such that groundwater flows would not concentrate in the area of the proposed development. However ground water flows may follow the existing gullies, interception of these flows would occur at the capture point for the surface flows.

The ponding of water and subsequent infiltration in the low laying areas to the East of the site would be eliminated by the proposed development. Examination of historical records (survey) indicated that the current low laying areas drained to a "swamp" in the approximate location of the proposed wetland/ basin. Given this fact the relocation of infiltration from the current location should not have an adverse effect on ground water quality or levels.

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The proposed development will be provided with subsoil drains at the foot of all retaining walls and at the base of all excavations. This drainage will direct any sub surface flows around the proposed development.

5.0 Stormwater Standards and Performance Criteria

The standards adopted for stormwater management, on this development, will comply with the requirements of the relevant Australian Standards, in particular AS 3500, Prospect Creek Stormwater management plan and the Holroyd Council stormwater requirements.

During construction a 1 in 2 yr standard of flow capacity will be provided for drainage of all new works under construction, both roof and in ground. Protection of existing and proposed floors from flooding will use a minimum of 100mm freeboard above the calculated 1 in 2 yr flood levels for the construction period.

A 1 in 100 yr standard of flow capacity will be provided for all new drainage works, both roof and in ground. Protection of existing and proposed floors from flooding will use a minimum of 300mm freeboard above the calculated 1 in 100 yr flood levels.

The overall out flow, from the works, into the broader stormwater system as a whole will be limited to pre development flows, as a maximum, by a combination of On site detention (OSD) and redirection of external flow paths within the site.

Given the nature of the site and the significant quantities and variable quality of the external flows it is proposed to undertake baseline monitoring for water quality of the external catchment flows. The performance of the system, for water quality issues, will be measured against the baseline values determined.

Pollution control measures will be applied to all ground surface runoff only, roof runoff will generally not be treated. Performance criteria for pollutant control adopted are based on Table 5.2 of the Prospect Creek Stormwater Management Plan.

Performance and assessment criteria are to be as noted in Table 1 as is an overview of the contingency actions required for non-compliance.

Locations of testing points for baseline measurements and site generated pollutants are denoted on the drawings SMP01-08 inc.

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Pollutant	Objective		Frequency of review	Contingency Actions
Suspended Solids	Ob-1	80% Retention/capture over a 12 month period of suspended solids greater than the baseline values measured.	Testing to occur at nominated locations during major rainfall events, and for three random minor events in a 12 month period.	Check filters/ control pit for blockage and clean out as reqd. Add flocculent to basin
Total Phosphorus	Ob-2	45% Retention/capture over a 12 month period of Total Phosphorus greater than the baseline values measured.	Testing to occur at nominated locations during major rainfall events, and for three random minor events in a 12 month period.	Review source
Total Nitrogen	Ob-3	45% Retention/capture over a 12 month period of Total Nitrogen greater than the baseline values measured.	Testing to occur at nominated locations during major rainfall events, and for three random minor events in a 12 month period.	Review source
Litter	Ob-4	Retention of litter greater than 50mm for flows up to 25% of 1in1 year peak flows	Weekly, Visual inspection of control devices and pits.	Check filters/ all grates correctly fitted, educate tenants
Oils and grease	Ob-5	No visible discharge and 90% retention/capture of any discharges greater than the baseline values measured.	Weekly, Visual inspection of control devices and pits. Testing to occur at nominated locations during major rainfall events, and for three random minor events in a 12 month period.	Check filters/ control pit for blockage and clean out as reqd, review source and educate tenants on legal disposal
Coarse Sediments	Ob-6	Retention of sediment bigger than 0.125mm for flows up to 25% of 1in1 year peak flows	Weekly, Visual inspection of control devices and pits.	Check filters/control pit for blockage and clean out as reqd.

Table 1

STORMWATER MANAGEMENT PLAN

6.0 Stormwater & Pollution Control Measures

The control of site generated pollution requires the implementation of control measures before water enters the main drainage system.

6.1 Roof & Site Drainage Details

The current drainage of the site is by a combination of pits, drains and overland surface flows ultimately draining into the existing underground pipe system.

The proposed ultimate extent of the buildings and paving over the existing situation would result in an increase in roof area and an increase in the impervious ground surface area. As such OSD will be provided at discrete locations to limit the discharge to pre development flow levels. In some areas of the proposed development the net impervious area drained is comparable with the current area, in those areas it is intended to utilise the existing main drainage system.

The drainage of the proposed works will require the provision of a new drains and pits within the site. The exact size, depth and location of any such drains and pits are based on detailed design and calculation.

The details of works to be undertaken are noted on drawings SMP01-08 inc along with pollution control device details to be provided for on site runoff prior to discharge into the existing main drainage system.

6.2 Implementation

The Site Owner / Operator (SO) shall be responsible for constructing and maintaining the stormwater drains and pollution control measures for the whole site for the life of the development, as per the requirements of the DA. The SO will monitor the performance of the pollution control measures, keep records and prepare reports in accordance with the EMP requirements.

During construction, of any given portion of the site, the Contractor, when they take control of the works site, shall be responsible for constructing and maintaining the stormwater drains and pollution control measures at all times, until hand over back to the owners of the completed works. The SO will audit the performance of the pollution control measures, the Contractor shall monitor and keep records.

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6.3 Detailed Actions to meet Pollution control Objectives

Objectives 1,4,5 & 6 of Table 1 can be met by the provision of mechanical interception techniques in the drainage system. In some areas a common interception device is appropriate, in other areas treatment at each pit location is more practical.

All these devices require regular maintenance to be effective, inspection and maintenance would be undertaken as per the maintenance schedules in Appendix B.

The objectives, 2 & 3 of reducing Total Phosphorus and Nitrogen are met by providing suitable landscape management practices which limit fertilisers running off into the stormwater system.

7.0 Staging

Given the size of this development and its nature, it is likely the development of the site will occur over a period of years in discrete stages. Based on the best information currently available we have designed the stormwater management system to be able to be constructed in such a manner that the construction sequence for different areas of the site is catered for by the system. We have allowed for each building to be developed independently and have details of the *essential stormwater management works* for each building proposed as denoted on our drawings SMP01-08 inc .

8.0 Monitoring/ Compliance

The stormwater management issues relevant to this site are outlined previously, they are common issues for most industrial sites and are not considered unique to this site.

8.1 Flooding

The compliance with the physical performance standards adopted for the drainage system, will occur at the design stage, by the certifying authority for each stage of the works. Monitoring of flow capacity and flood levels is not required. This is because flood level and flow modelling have well accepted design procedures and the outcomes are readily checked by calculation.

8.2 Pollution

The monitoring of the performance of the pollution control measures shall be undertaken by the Property Supervisor (PS) on a regular basis as per Table 1. During nominated periods of rainfall or runoff the PS shall monitor the water discharging from the drainage system at the testing locations and take a representative sample for laboratory analysis. Non compliance with the performance criteria will

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trigger the Contingency Actions noted in Table 1 and activate the non conformance procedures in the body of the EMP. The control and testing processes are as documented in Appendix C.

The results of the monitoring will be recorded and forwarded to the PS on a regular basis along with records of any non compliance / need to undertake contingency actions. Written records of observations are to be kept on site in a log which shall be updated when testing is undertaken. The log will be made available for review by request for any Authorised Person from any Relevant Authority and the owners of the site.

The total stormwater system will be inspected on an annual basis and a condition report prepared outlining the maintenance undertaken as per the requirements of inspection and maintenance schedules in Appendix B.

9.0 Maintenance of Stormwater & Pollution Control Measures

The maintenance of the total stormwater system and the adopted controls is solely the responsibility of the SO. As such a programmed series of inspection and maintenance actions will be undertaken in accordance with the inspection and maintenance schedules in Appendix B.

10.0 Summary

In summary all stormwater management issues during construction relating to the redevelopment of YDP have technical solutions which can be achieved without compromise to the amenity or functionality of the area as a whole. Refer to our drawings and management checklists for specific details. It is our opinion that given the correct implantation and monitoring of the stormwater works then no adverse effects would then occur on the adjoining streams, properties or site as a result of the proposed development.

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Appendix A-

Catchment Plans and 1 in 100 Year Flow Paths

Yennora Distribution Park
Environmental Management Plans

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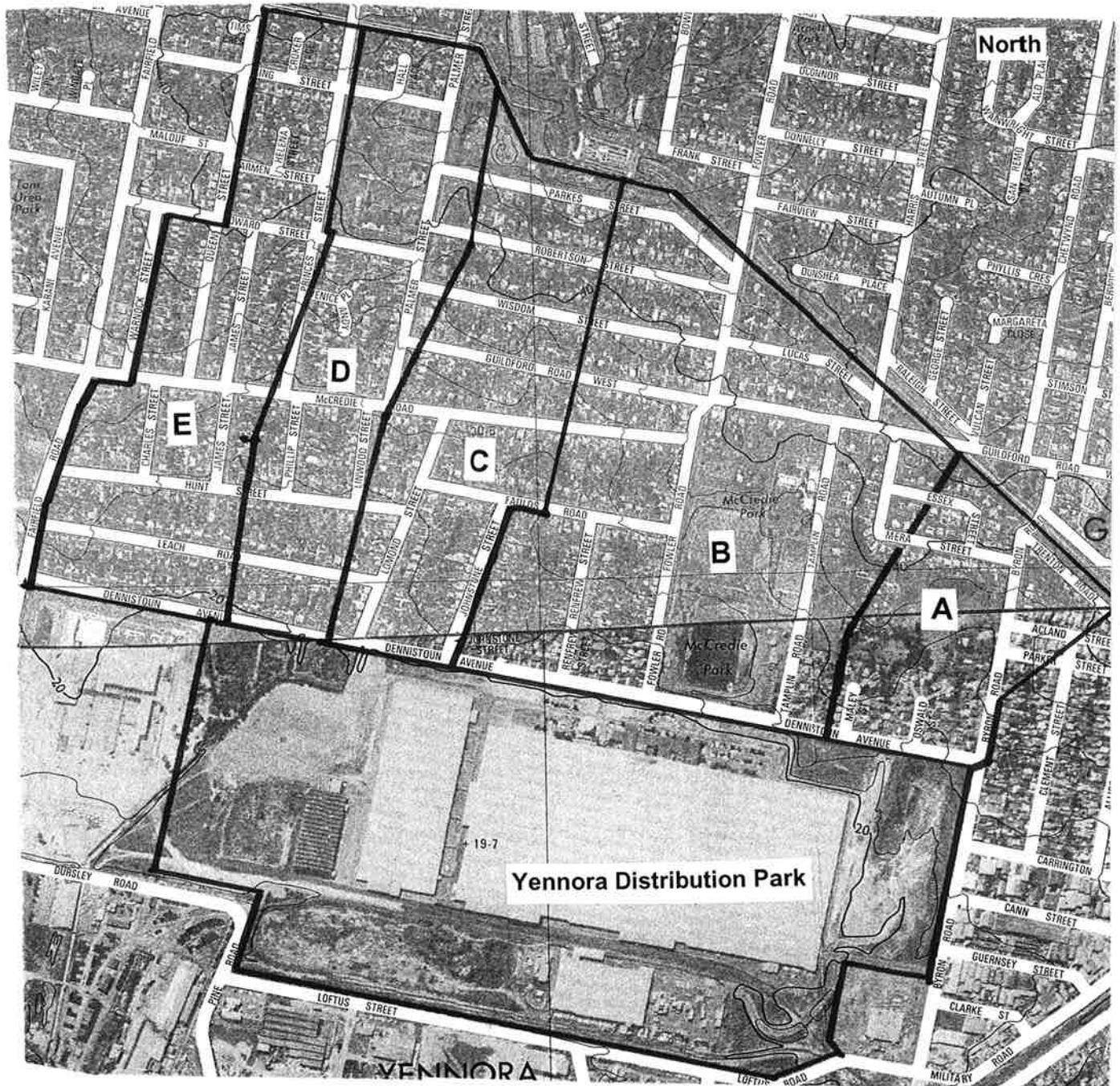


Figure No. 1
Site & Catchment Plan
approximate scale 1:10,000

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Figure No. 2
1 in 100 Year Pre Development Flows
approximate scale 1:4,000

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Appendix B-

Inspection and Maintenance Checklists

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ANNUAL INSPECTION OF SURFACE STORMWATER SYSTEM

(Physical/Visual inspection)

Conducted/...../.....

By:.....

Pits, Pollution Control Devices & Junction Boxes (each item to be inspected)

- ☐ Do grated covers /concrete lids fit properly on frame: Y/N
- ☐ Are grates in sound condition : Y/N concrete surround to lid cracked/broken: Y/N
- ☐ Are there any significant cracks in the pit walls: Y/N
- ☐ Is there any trapped debris/rubbish inside the pit: Y/N
- ☐ Is there silt / sediment trapped at the bottom of the pit: Y/N
- ☐ Is there water trapped at the bottom of the pit: Y/N are pipes free draining: Y/N
- ☐ Are pipe inlet and outlet into the pit sound: Y/N rendering around pipe req'd: Y/N
- ☐ Are the baffle walls/ trash rack/screens in functioning condition: Y/N

Pipes & Culverts (each length of pipe/culvert to be inspected from inside pits)

- ☐ Is there silt / sediment deposited at the bottom of the pipe/ culvert: Y/N
- ☐ Are there cracks or deformation of joints: Y/N
- ☐ Is there any unevenness in alignment or grade of the pipe /culvert: Y/N

Open Channels (each length of channel to be inspected)

- ☐ Scour present: Y/N
- ☐ vegetation cover adequate: Y/N
- ☐ Is there silt / sediment/ rubbish trapped at the bottom of the channel: Y/N

Headwalls & Basins/Wetlands (each headwall / basin to be inspected)

- ☐ Scour present: Y/N
- ☐ vegetation cover adequate: Y/N
- ☐ Is there silt / sediment/ rubbish trapped at the bottom of the basin: Y/N

Note: if Yes to any item, place on list to rectify.

Check /delete as applicable

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**ANNUAL INSPECTION OF
ROOF STORMWATER SYSTEM**

(Physical/Visual inspection)

Conducted/...../.....

By:.....

Roof Gutters, Sumps & Down Pipes (each gutter, sump & DP to be inspected)

- ☐ Is there water trapped at the bottom of the gutter: Y/N
- ☐ Are down pipes free draining: Y/N
- ☐ Is there silt / sediment/ rubbish trapped at the bottom of the gutter: Y/N
- ☐ Is there silt / sediment/ rubbish trapped at the bottom of the sump: Y/N
- ☐ Are down pipes cracked: Y/N are any signs of leaking present: Y/N
- ☐ Are joints sound and tight: Y/N
- ☐ Are the box gutter expansion joints sound and watertight: Y/N

Note: if Yes to any item, place on list to rectify.

Check /delete as applicable

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Appendix C-

Control Process and Testing Checklists

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POLLUTION TESTING PROCESS:

During three random rainfall events in a 12 month period and during periods of *high rainfall*, defined as the outfall pipe flowing at 1/2 full (equivalent to a 1 in 1 to 1 in 5 yr rainfall event) the following testing procedure shall be undertaken:

A. Conduct Baseline sampling at locations

The samples shall be taken from the middle of the flow stream in a clean sample container and clearly marked with location, time and date of sample. These samples shall be sealed and stored so as to prevent contamination.

B. Conduct Sampling at outfall testing points

The samples shall be taken from the middle of the flow stream in a clean sample container and clearly marked with location time and date of sample. These samples shall be sealed and stored so as to prevent contamination.

C. Undertake testing

C.1 Initial Testing

A visual comparison of the baseline samples and the outfall samples shall be undertaken at the time of sampling. Any obvious contamination/ pollution (eg litter, oils, sediments) greater than in the baseline samples shall be recorded and its source investigated, preferably during the rain fall event. Any obvious problems found shall evoke the contingency actions for that pollutant noted in Table 1 of the SMP.

C.2 Laboratory Testing

The samples shall be sent to a NATA registered laboratory for testing within 24 hours of collection. The samples shall be tested for:

- Suspended Solids
- Total Nitrogen
- Total Phosphors
- Hydrocarbons

and the results of the required tests are to be documented and reported back to the SO.

D. Review results.

The result of the laboratory testing for the baseline and outfall samples shall be compared and recorded. The evaluation of the test results shall be undertaken

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using the work sheets for each of the test locations provided following. Any calculated pollutant levels greater than the allowable values determined by the work sheet, shall evoke the contingency actions for that pollutant given in Table 1 of the SMP.

E. Prepare reports.

The results of all testing, calculation and contingency actions undertaken shall be recorded in a site log. The recorded values and actions shall be reported in accordance with the EMP reporting process.

F. Contingency actions

The contingency actions shall be undertaken as result of non compliance with objectives given in Table 1 of the SMP. These actions are a first step, should the contingency actions fail to remedy the non compliance then specialist assistance shall be sought by the SO within 48 hours of the evidence of failure of the contingency action.

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POLLUTION CONTROL TESTING

Form to be completed for each testing location

Conducted:/...../.....

Time of Day:am/pm

at Test Location No:

By:.....

Rainfall:mm in hours

☐ **Baseline Flows** (*Physical/Visual inspection*)

☐ Depth of flow in pit/pipe at test location; low: med: high

☐ State of flow in pit/pipe; turbulent: smooth

☐ Debris: amount of rubbish in flow; none: small quantity: large quantity

☐ Trapped debris/rubbish at test location: none: small quantity: large quantity

☐ Silt/sediment trapped at test location: none: small quantity: large quantity

☐ Colour of flow:

☐ Oils/ "slicking" in flow; none: small quantity: large quantity

☐ **Outfall Flows** (*Physical/Visual inspection*)

☐ Depth of flow in pit/pipe at test location; low: med: high

☐ State of flow in pit/pipe; turbulent: smooth

☐ Debris: amount of rubbish in flow; none: small quantity: large quantity

☐ Trapped debris/rubbish at test location: none: small quantity: large quantity

☐ Silt/sediment trapped at test location: none: small quantity: large quantity

☐ Colour of flow:

☐ Oils/ "slicking" in flow; none: small quantity: large quantity

Check / delete each item as applicable

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STORMWATER MANAGEMENT PLAN

CONTINGENCY ACTION CHECKLIST

Form to be completed for each action taken

Conducted:/...../.....

Time of Day:am/pm

Non compliance noted

at Test Location No:

By:.....

Rainfall:mm in hours

Follow up by:.....

ACTION UNDERTAKEN:

Weather Conditions (at time of undertaking action)

☐ Rain; none: light: moderate: heavy

☐ Hail; none: light: moderate: heavy

☐ Shine; sunny: overcast: cloud

☐ Wind; none: light: moderate: gusty

Pits (Physical/Visual inspection)

☐ Pit no/location with problem :.....

☐ Pit cleaned out/ function of grates/ filters checked

Open Channels(Physical/Visual inspection)

☐ Channel location with problem :.....

☐ Scour present

☐ Vegetation cover adequate

Headwalls & Basins/Wetlands(Physical/Visual inspection)

☐ Basin location with problem :.....

☐ Scour present

☐ Vegetation cover adequate

Check / delete each item as applicable

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STORMWATER MANAGEMENT PLAN

POLLUTANT LEVEL WORKSHEET

Test Conducted:/...../.....

Form to be completed for each test location

Time of Day:am/pm

Test Location No:

By:.....

T_{In} = Averaged baseflow test result (see table following)

T_{Out} = Actual outflow test result

Pollutant	T_{In}	T_{Out}	SF, Site Factor	$T_{allow} = T_{In} \times SF$	T_{Out}	Is $T_{Out} > T_{allow}$
Suspended Solids						Yes/No
Total Phosphorus						Yes/No
Total Nitrogen						Yes/No
Hydrocarbons						Yes/No

SF, Site Factor for each pollutant and out fall location

T_{Out}	OF1	OF2	OF3	OF4
T_{In}	BF2	$\frac{(BF1+BF4)}{2}$	BF4	$\frac{(BF1+BF4)}{2}$
Suspended Solids	0.51	0.20	0.61	0.20
Total Phosphorus	0.72	0.55	0.78	0.55
Total Nitrogen	0.72	0.55	0.78	0.55
Hydrocarbons	0.45	0.10	0.56	0.10

IF YES TO ANY ABOVE

ACTION UNDERTAKEN:

.....

.....

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Figure No. 3
1 in 100 Year Post Development Flows
approximate scale 1:4,000

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Hydraulic and Hydrological

Calculations

For the Proposed Swale Drain

Yennora Distribution Park

Dennistoun Avenue, Yennora

Job No. 02/0083

April 2002

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