APPENDIX 14

Combined Infrastructure Services Report

Barangaroo Headland Park
Infrastructure and Services Report

20/10/2010
SBE1004200

Client

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Authorised for Issue	GJW	20/10/2010
	Project Leader	Date

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climate friendly business

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1 Introduction

This report outlines the infrastructure and Services provisions for the Barangaroo Headland Park development. A description of work for each discipline has been submitted in the following reports:

- Integrated Water Management Plan for Headland Park Barangaroo by Warren Smith and Partners (Detailed in Appendix A)
- Barangaroo Headland Park Main Works Application Infrastructure Report – Lighting, Electrical and Telecommunications by WEBB (Detailed in Appendix B)
- Infrastructure and Services Provisions – Civil Works by Robert Bird Group (Detailed in Appendix C)

Please note that the purpose of this report is to summarise and outline the services and infrastructure works. Full Details on services and infrastructure provisions is detailed in the relevant reports attached as appendices.

2 Existing Services and Infrastrucure

Existing services and infrastructure occur throughout the Headland Park site. These include:

2.1 Stormwater and Sewage:

- Existing Sydney Water Sewerage Pumping Station SPS0014
- The existing water supply to BHP is supplied adjacent to Gate 3 with a water service extending to the SPS0014.
- Existing Gravity Reticulation and Overflow Sewers including:
    - 300mm diameter sewer draining east to west across the site to the SPS0014 from Dalgety Road and Towns Place
    - 300mm diameter sewer draining onto the site from the Hungry Mile where it collects sewer flows along the Hungry Mile and the higher catchment within the High Street catchment
    - Two 300m sewer overflows drain off this sewer line directly into Darling Harbour.
    - Other existing systems that indirectly affect the site, which are those serving the high level residential precinct within Bettington Street.
    - The existing Sydney Ports Control Tower, which is under current operation and is presently served by a DN150 existing house sewer drainage line
- Seven (7) stormwater drainage lines that discharge into Sydney water
    - One stormwater drainage line is located at the southern section of BHP and will remain unchanged.
    - Two stormwater drainage lines cut across, and are interfered with by, the proposed Carpark works. These two lines serve the existing high level Residential Precinct in Merriman Street and Bettington Street.
    - Four lines runs south to north in the vicinity of Gate 3. This existing stormwater system has been verified to exist at high level in Clyne Reserve, with a vertical pipe dropper fixed to the sandstone rock wall.

2.2 Electrical

- The maritime control tower has 2 electrical supplies: mains supply is from Merriman Street which runs down the face of the rock face behind the tower; the secondary supply is from Towns Place reticulating along the base of the sandstone rock-face to the base of the tower.

- The Sewer pump station SPS14 receives electrical supply from Towns Place and is reticulated via the existing underground conduit and pit system. Existing underground route to be coordinated with water and sewerage works to ensure it is protected.

- Navigation lights and existing public amenities demountable to have replacement underground supply provided by Lend Lease.

- The 5 existing light towers in the Headland Park zone are to be demolished and electrical supplies disconnected.

3 Proposed Infrastructure and Services

3.1 Stormwater

The overall philosophy for drainage of the Barangaroo Headland Park stormwater is as follows:

- Provision of a network of bio-retention swales of an overall nominal width of 3.6metres inclusive of the banks at high level to contain high flows up to the 1 in 100 Year ARI event from the Upper Bluff;
- Provision of a network of half round 300mm wide dish drains and 150mm subsoil drainage with interconnecting pits and pipes as shown on Drawing MW-WSP-H-1039 to adequately drain low flow and moderate flows up to the 20 Year event within the terraced lower slopes of the park;
- Provision of a network of bio-retention swales of an overall nominal width of 3.6metres inclusive of the banks at the toe of the grass zone of the park where it meets the two level bicycle and walking paths.

The stormwater drainage inlet pits are located at approximately 20 to 30 metre centres and are finished flush with the grassed surface. The swale will be fitted out with surface planting consisting of sedges of 0.8m in approximate height and specific backfill capable of providing filtration and stormwater treatment. The cross section of the swale will typically have a 1.2m base width and a maximum water depth of 300m with batters of slope not exceeding 1:3 vertical to horizontal. The surface runoff will be collected within the swale up to the 1 in 100 Year event and will filter through the backfill medium and be collected within a two cell wide Atlantis Flo-Channel box drain.

Stormwater drained on site will be treated in accordance with National Best Practice standards. Stormwater will be captured in a 1250kL tank and re-used on site for non-potable water uses including, and predominantly for irrigation. Further details of the water balance are provided in the Integrated Water Management Report.

3.2 Sewage Infrastructure Services

Sewage works include the decommissioning and re-use of existing services as well as the construction of new services. The preferred option includes the following items of work:

- Decommissioning of the existing SPS0014 super structure and relocation of this structure elsewhere within the Barangaroo site;
- Exposure of the existing concrete wet well and dry well within SPS0014 and recording the detail of this station for Heritage purposes;
- Possible reuse of SPS0014 substructure as a water tank or backfilling of this SPS0014 substructure
- Decommissioning of the existing Sydney Water 300mm diameter gravity reticulation sewers traversing the site from the Hungry Mile and Towns Place;
- Decommissioning of the existing Sydney Water 400mm diameter overflow sewer discharging to Darling Harbour;
- Diversion of the existing 150mm diameter Bettington Street sewer onto the Hungry Mile and connection into the new gravity system within the Hungry Mile;
- Construction of approximately 760 meters of new gravity reticulation sewer by traditional construction or micro-tunnelling from Towns Place (intersection Dalgety Road) in a south east and southerly direction along the Hungry Mile and connection to SPS1129;
- Construction of approximately 100m3 of additional overflow storage to increase the detention time within SPS1129 and satisfy Sydney Water requirements;

- Review by Sydney Water of the pumping machinery capacity and possible upgrade of the flow capacity by an impeller upgrade, installation of an additional pump or complete upgrade of the existing pumping machinery;

- Possible upgrade of the existing electrical equipment and communication equipment, i.e. SCADA.

3.3 Electrical and Lighting

The proposed electrical works include:

- Establishment of the Underground Carpark and the future Cultural Centre shell-only, including establishment of chamber substation for permanent supply.

- Establishment of new sewer pump station.

- Establishment of on-site renewable energy generation in the form of photovoltaics where possible.

- Foreshore Promenade and Cafe.

- Parkland and Upper Bluff interconnections to Merriman Street.

- Re-configuration of electrical supply to the Maritime Control Tower.

To minimise energy consumption of the site the following infrastructure services will be provided:

- A minimum of 20% of car space will be electric vehicle parking stations

- Efficient lighting systems

- BMS control of services and sub metering

- Low energy ventilation and air-conditioning systems.

- CO monitoring and variable speed drives on fans on each level of the carpark will be used to adjust the level of ventilation required to maintain safe conditions. Patrons will be encouraged to use the upper floors of the carpark when not at capacity which will allow the lower level carpark ventilation to be minimized.

- The light fittings will be fitted with dimmable ballasts which will be controlled by photocells to maintain required light level over life of lamp, saving energy and extending the life of the lamps. Light levels will be adjusted to provide comfortable conditions down to a minimum of 40 Lux as required by the standard.

- Carpark lighting will be controlled by time clock and occupancy sensors allowing separate control of each carpark level. Patrons will be encouraged to use the upper floors of the carpark when not at capacity which will allow L2 carpark lighting to be minimized.

- Harbour heat rejection

3.4 Communications

The proposed communications infrastructure works includes security and ICT infrastructure. A system shall be provided for the public domain/carpark which will include CCTV monitoring, access control, communications links (with external monitoring) and a building distributor room to accommodate the main distribution frames (MDF) and provider head end equipment.

External lighting in the Public Domain will be adjusted to meet the minimum level required for effective CCTV operation. External passive security will be provided, by bounding perimeter landscape features and lighting.

The Communications infrastructure to be provided in the Barangaroo Precinct shall support the goals of the City of Sydney Sustainable Sydney 2030 policy initiatives.

The ICT infrastructure shall include site wide pit and pipe system with optical fibre, a Management Control System complete with interfaces to sustainable and energy infrastructure and localised displays for the monitoring and reporting of sustainable initiatives impacts.

3.5 Civil Works

The civil infrastructure works include the provision of fill batter slopes set up at a ratio of 1:1.5 where tensile reinforcement is proposed. Temporary erosion and sediment control measures will be implemented for the earthworks construction phase. Temporary measures are likely to include:

- Construction access controls
- Temporary basins
- Silt control fencing
- Control drainage measures

APPENDIX A – INTEGRATED WATER MANAGEMENT PLAN FOR HEADLAND PARK BARANGAROO

INTEGRATED WATER MANAGEMENT PLAN FOR HEADLAND PARK, BARANGAROO

for

BARANGAROO DELIVERY AUTHORITY

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Issue	Reason	Date	Prepared By	Reviewed By	Status
A	Integrated Water Management Plan	7.10.10	L Panagopoulos	W Smith	Superseded
B	Integrated Water Management Plan	13.10.10	L Panagopoulos	W Smith	Superseded
C	Integrated Water Management Plan	20.10.10	L Panagopoulos	W Smith	Current

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ATTACHMENT A AG ENVIRO SOLUTIONS REPORT OF 29TH SEPTEMBER 2010

ATTACHMENT B FLOOD STUDY – MODEL DATA AND RESULTS

1. CATCHMENT ANALYSIS USING 'DRAINS' PROGRAM – EXISTING CONDITION
'Free to Atmosphere' at the outlet

- DRAINS Model Node Diagram
- DRAINS Model Data Sheet
- DRAINS Model 1 Year ARI Results
- DRAINS Model 20 Year ARI Results
- DRAINS Model 100 Year ARI Results

2. CATCHMENT ANALYSIS USING 'DRAINS' PROGRAM – EXISTING CONDITION
'Mean High Water Spring' tide at the outlet, RL 0.625m AHD

- DRAINS Model Node Diagram
- DRAINS Model Data Sheet
- DRAINS Model 1 Year ARI Results
- DRAINS Model 20 Year ARI Results
- DRAINS Model 100 Year ARI Results

ATTACHMENT C CITY OF SYDNEY COUNCIL STORMWATER INFRASTRUCTURE DRAWINGS

ATTACHMENT D HUMES WATER SOLUTIONS GROSS POLLUTANT TRAP DETAILS

FIGURES:

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MW-WSP-H-1032	LEGEND AND ABBREVIATIONS
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MW-WSP-H-1037	STORMWATER CATCHMENT PROPOSED PARK
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MW-WSP-H-1040	IRRIGATION LAYOUT PLAN
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MW-WSP-H-1042	CIVIL DETAILS
MW-WSP-H-1043	SYDNEY WATER CORPORATION GRAVITY SEWER DEVIATION TO SPS1129 AND DECOMMISSIONING OF SPS0014

REFERENCES:

[1] Minister For Planning – Modification Of Major Project Approval of 11th November 2009;

[2] MG Planning Report titled Preliminary Assessment and Request for Director General's Requirements for Early Works and Main Works Project Applications of March 2010;

[2a] Built Ecology Report titled SBE1004200 Integrated Water Management Plan dated 11th October 2010;

[3] Sydney Water letter of 23rd April 2010 regarding details of key issues and assessment requirements, Headland Park and Northern Cove, Barangaroo, East Darling Harbour, Sydney

[4] NSW Planning letter of 6th May 2010 and enclosing Director General's Requirements for Early Works and Main Works, Barangaroo Headland Park and Northern Cove, Reference Application No. MP10_0047 and 48;

[5] Preliminary Water Management Plan – Early Works by Barangaroo Delivery Authority dated 28th May 2010;

[6] Built Ecology Report titled SBE1004200 Headland Park Early Works Package ESD Report of 3rd June 2010;

[7] WSP Lincolne Scott Report titled Services Feasibility Report, Revision B of 18th June 2010;

[8] Survey by Rygate and Company Pty Limited Plan showing Detail, Levels and Services Lots 4 and 5, DP 876514;

[9] MG Planning Submission of Environmental Assessment for Barangaroo Part 3A Project Application, Headland Park and Northern Cove Early Works of 23rd June 2010;

[10] JBS Environmental Letter regarding Irrigation / Water Seepage Water Quality of 30th August 2010;

[11] WSP Environment and Energy Report titled Soil and Water Report to support the Environmental Assessment for Headland Park, Barangaroo of September 2010;

[12] Robert Bird Group Report titled Stage 3 Preliminary Design Report – Civil Engineering Works For Main Project Application, Revision A of 2nd September 2010;

[13] Webb Australia Report titled Barangaroo Headland Park Infrastructure and Services Provisions , Revision B of 6th September 2010;

[14] Sydney Environmental and Soil Laboratory Pty Ltd (SESL) – Soil Volumes of 22nd September 2010;

[15] PWP Landscape Architecture Main Works Application Drawings Ref: MW-PWP-L-SO 1001, 1002, 2001, 2003, 2004 and 2005;

[16] Department of Environment and Conservation Report titled Managing Urban Stormwater Harvesting and Reuse, April 2006;

[17] Landcom Report titled Water Sensitive Urban Design, Book 1, Policy, May 2009;

[18] Sydney Water Corporation Notice of Requirements of 6th September 2010;

[19] Department of Environment, Climate Change and Water Early Works Assessment letter of 24th August 2010;

ABBREVIATIONS

Ha	Hectare
Q	Discharge rate in m^3/sec
m^3/sec	Cubic metres per second
L/s	Litres per second
ARI	Average Recurrence Interval
RL	Reduced Level
M	Height in metres to Australian Height Datum
IL	Invert Level
DN	Nominal Diameter
RBC	Rectangular Box Culvert
FFL	Finished Floor Level
FGL	Finished Ground Level
Ch	Chainage
RCP	Reinforced Concrete Pipeline
PE	Polyethylene (pipeline)
RC	Reinforced Concrete
OD	Outside Diameter
OSD	On Site Stormwater Detention
DRAINS	Two Dimensional Numerical Drainage Modelling Programme
BCA	Building Code of Australia
OHS	Occupational Health and Safety
DA	Development Application
IWMP	Integrated Water Management Plan
IMP	Infrastructure Management Plan
PMF	Probable Maximum Flood
EP&A Act	Environmental Planning and Assessment Act
SEPP	State Environmental Planning Policy
WSUD	Water Sensitive Urban Design
BDA	Barangaroo Delivery Authority
BHP	Barangaroo Headland Park
PWP	Peter Walker Partnership Landscape Architecture
JPW	Johnson Pilton Walker
WSP	Warren Smith and Partners Pty Limited
AES	AgEnviro Solutions
MGP	MG Planning
BE	Built Ecology

WSPLS	WSP Lincoln Scott
JBS	JBS Environmental
RBG	Robert Bird Group
WA	Webb Australia
DOP	NSW Department of Planning
DGR	Director General's Requirements
COS	City of Sydney Council
SWC	Sydney Water Corporation
RTA	Roads &Traffic Authority
DECC	NSW Department Environment, Climate Change and Water
SPS	Sewerage Pumping Station

1. INTRODUCTION

Background

Barangaroo (formerly East Darling Harbour) is a 22 hectare area of Sydney's harbor foreshore immediately adjoining the western edge of Sydney's CBD which has been identified for urban renewal by the NSW State Government. The redevelopment of the Barangaroo site with it 1.4km foreshore to Sydney Harbour will provide for approximately half of the site to be dedicated to open space and public domain with a new Headland Park at the northern end. [2]

The Barangaroo Headland Park and Northern Cove (BHP) project is the subject of an application under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act) comprising of redevelopment of the East Darling Harbour foreshore area generally over the disused Sydney Ports Corporation terminal. The Headland Park itself is the focus of redevelopment for a parkland between the sandstone escarpment and Sydney Harbour. Figure 1.1 provides an overall aerial view of the parkland.

Approved Concept Plan

On 9th February 2007 the Minister for Planning approved the Concept Plan for the site and on 12th October 2007 the land was rezoned to facilitate it s redevelopment via an amendment to Schedule 3 of the Major Project SEPP. [2]

The Concept Plan as originally approved by the Minister for Planning contemplated an urban structure comprising 11 hectares of foreshore promenade and public domain, street patterns and development blocks. The public domain includes a new Headland Park at the northern end of Barangaroo, new Northern Cove and Southern Cove water insertions and carparking under the Headland Park to ensure community access to the park.

On 11th November 2009 the Minister for Planning approved a modification to the Concept Plan which was primarily aimed at achieving a more naturalized design for the northern headland. [1] The modification was prepared in response to the requirement in the Minister's Terms of Approval requiring further detailed design for the northern headland and northern cove, particularly:-

- The reinstatement of a headland at the northern end of the site with a naturalized shape and form including a build up of height and a generous landscaped connection to physically link Clyne Reserve, to allow direct pedestrian access from Argyle Place and appreciation of the landform of the former headland; and
- An enlargement of the northern cove and a great naturalized shape, form and edges including treatment surrounding the cove. [2]

This Integrated Water Management Plan (IWMP) Report has been prepared for the Barangaroo Delivery Authority (BDA) specifically for BHP to:

- address the requirements of Section 38 of the MG Planning Report [2] to outline the Scope of Works for the Site Services Infrastructure and services associated with the proposed Headland Park, Carpark and Cultural Centre facility;
- address water, stormwater and wastewater management;
- provide site specific measures according to the principles of the overall Barangaroo Integrated Water Management Plan [2a].

It is further noted that Sydney Water requires the Developer (BDA) to provide an IWMP and IMP to address the following:[3]

- Proposed uses of potable and non potable water service;
- Water Sensitive Urban Design (WSUD);
- Water Conservation Measures;
- Impact of the BHP development on its existing services;
- Identification of augmentation to Water and Wastewater services.

Therefore this report addresses the following items of work:-

- Site Services Infrastructure including existing and proposed site Stormwater, Bio-Retention Swales and inlet pits, the Irrigation system, the Blackwater Effluent inlet and return pipeline and associated storage and distribution system;
- The Carpark and Cultural Centre facility Hydraulic Services including Stormwater Drainage, Sewer Drainage, Domestic Cold Water Service including Fire Hose Reels and Fire Hydrant Service;
- The Carpark and Cultural Centre facility Fire Services including the Fire Sprinkler Service to the building, Fire Detection and Alarm System, Building Occupant Warning System and Fire Extinguishers;
- Water Balance requirements for BHP;
- Findings of the Flood Study undertaken to determine rainfall and runoff, pipe flows and overflows within the BHP and within the upstream catchment external to the BHP and to determine the range of flows for storms ranging from the 1 Year, 20 Year and 100 Year Average Recurrence Interval (ARI) for the existing condition and for the proposed condition including the BHP.

On the 6th May 2010 the Department of Urban Planning released the Director General's Requirements (DGR's) for the proposed Early Works and Main Works [4] and therein Soil and Water (Item 8) and Infrastructure and Services Provision (Item 15) stipulate requirements and assessment of:-

- Assess the impacts of the proposal on surface and groundwater hydrology;
- Details proposal for management of groundwater across the site;
- Detail the existing infrastructure and services on site and outline what infrastructure and services will be decommissioned;
- Outline proposed infrastructure and services, including sustainability infrastructure and wastewater treatment facility and identify possible impacts;
- Provide information on the required water and wastewater services and any augmentation that may be required for the proposed development;
- Detail measures to mitigate the impacts of the proposal on any remaining infrastructure items including proposed relocation;
- Provide an IWMP, which should include any proposed alternative water supply, proposed end uses of potable and non-potable water, demonstration of WSUD and water conservation measures.



Figure 1.1 Proposed Headland Park and Northern Cove Project Application Areas

2. DESCRIPTION OF EXISTING SYSTEM

2.1 Existing Water Supply

Sydney Water currently has watermains located in surrounding streets summarized as follows:-

- A 300mm cast iron cement lined watermain in Towns Place;
- A 300mm cast iron cement lined watermain in Dalgety Road;
- A 150mm cast iron cement lined watermain in Merriman Street and Bettington Street;
- A 300mm cast iron cement lined watermain in Hickson Road adjacent to Gate No. 4.

The existing water supply to BHP is supplied adjacent to Gate 3 with a water service extending to the SPS0014 off the existing watermain in Towns Place.

2.2 Existing Sydney Water Sewerage Pumping Station SPS0014

The existing SPS0014 is located within the Barangaroo Headland Park approximately 100 metres west of Gate 3 and north west of the existing Headland residential precinct encompassing Dalgety Road, Merriman Street and Bettington Street.

The existing station is a below ground wet well and dry well and comprises an above ground brick and sandstone structure with tiled roof. The site is enclosed in a chain wire fence and vehicular access is currently available to the entry gates. The visible features of the station at ground level include access covers over the wet well, access covers over the valve pit, electrical switchboard adjacent to the western façade of the building, outdoor shower and incoming water service and water meter.

The brick and sandstone building includes timber style windows and sandstone lintels both over the windows and the front metal roller shutters. Access to the dry well of the station is via the front entry doors leading on to a platform area surrounded by hand rails, access ladders, overhead gantry and electrical switchboard. One duty and one standby pumps are located at the base of the dry well with the suction pipework extending into the adjacent wet well. It is understood that the dry well zone in the recent past, upgraded by Sydney Water to allow flooding of this dry well during wet weather overflows.

The capacity of this station is summarized as follows:-

- Peak dry weather flow (PDWF) = 14 L/sec (measured)
- Peak wet weather flow (PWWF) = 42 L/sec

2.3 Existing Gravity Reticulation and Overflow Sewers

The existing gravity reticulation sewers that traverse the site comprise a 300mm diameter sewer draining east to west across the site to the SPS0014 from Dalgety Road and Towns Place. This sewer system is at invert level RL -1.58m AHD.

The other existing gravity reticulation sewer is a 300mm diameter sewer draining onto the site from the Hungry Mile where it collects sewer flows along the Hungry Mile and the higher catchment within the High Street catchment. This sewer varies in depth from IL 0.3m AHD to IL -1.50m AHD adjacent to the station. Two 300m sewer overflows drain off this sewer line directly into Darling Harbour.

Other existing systems that indirectly affect the site are those serving the high level residential precinct within Bettington Street which drains onto the existing site. This sewer being a 150mm reticulation sewer drains diagonally south west and is required to be intercepted as part of the option that has been considered. This vertical drop is indicated by the vertical concrete element cast within the existing sandstone.

The existing Sydney Ports Control Tower is under current operation and is presently served by a DN150 existing house sewer drainage line which connects on to the existing 300mm diameter Sydney Water sewer running east to west within the site. This house sewer drainage will be reconnected into the new reticulation scheme in the Hungry Mile.

The Sydney Water Hydra database drawing presented below as Figure 2.1 provides a schematic layout of the aforementioned Sydney Water owned sewers.

2.4 Existing Sewerage Pumping Station SPS1129

The existing SPS1129 is located approximately 650 metres due south of SPS0014 and is located within the Barangaroo site on the western side of the Hungry Mile and opposite 30 The Bond building.

This station is a below ground wet well with submersible pumping machinery and valves that are located above the surface and visible at street level. Other appertances include above ground covers to the valve pit and wet well, electrical switchboard and outdoor safety shower.

It is understood that this pumping station was constructed in 2004 to replace other Sydney Water infrastructure in the vicinity of the Hungry Mile and for the facilitation of other recent Commercial development.

Typical details include the DN450mm diameter gravity borehole pipeline discharging from the south along the Hungry Mile to SPS1129 and the existence of the inlet chamber and incoming sewer line to the wet well with an emergency storage pipeline constructed immediately to the east of the station below the footway. This pumping station discharges to the Kent Street submain via a DN375mm diameter rising main which heads diagonally south east away from SPS1129.

It is understood that the invert level of the 450mm diameter inlet borehole is at approximately IL -5.20m. The capacity of this station is summarized as follows:-

- Peak dry weather flow (PDWF) = 48 L/sec (measured)
- Peak wet weather flow (PWWF) = 144 L/sec

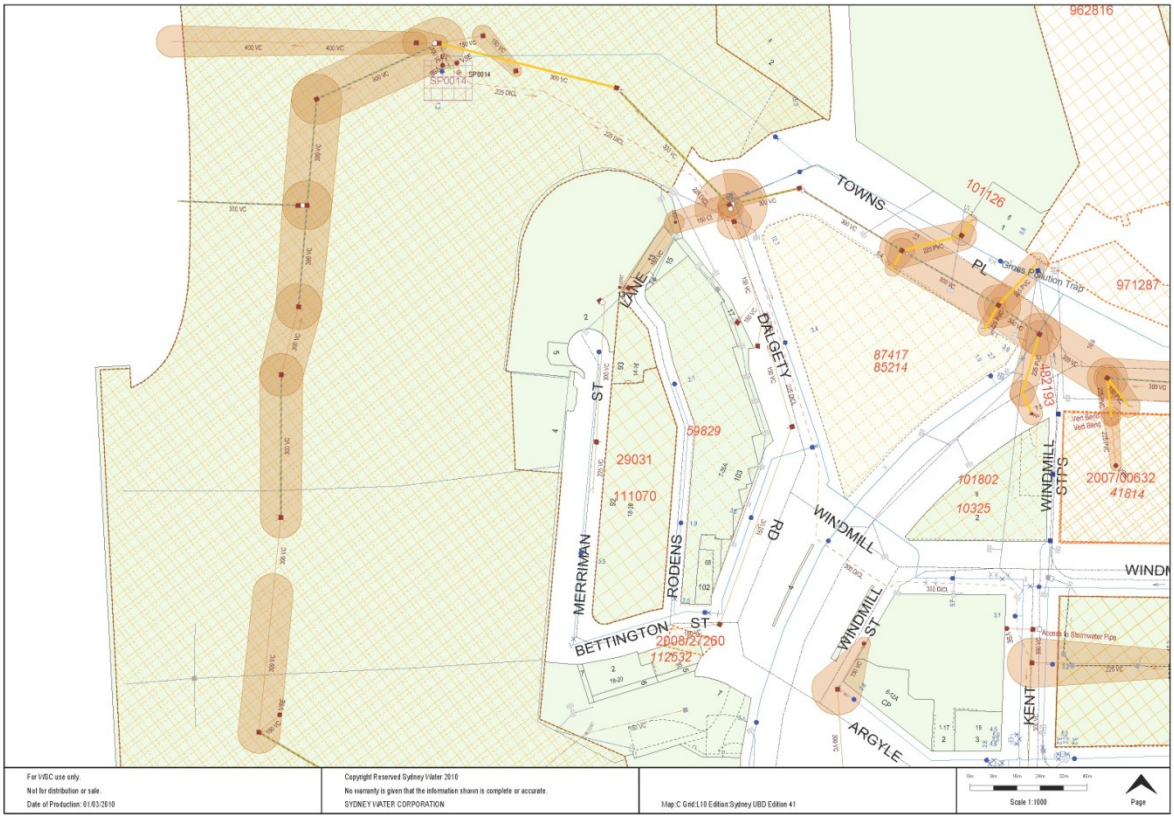


Figure 2.1 Sydney Water Hydra Data Base

3. AUTHORITY AND REGULATORY REQUIREMENTS

3.1 Sydney Water Requirements

3.1.1 Introduction and Overview

Consultation with Sydney Water was commenced initially with a site inspection in early March for Consultants to undertake a visual inspection of SPS0014 both externally, internally and to witness the topography of the surrounding ground and the location of the existing Sydney Water infrastructure being existing gravity reticulation sewers.

A meeting was held on 10th March 2010 between key Stakeholders including BDA, Sydney Water, Conybeare Morrison and Warren Smith and Partners. The purpose of this meeting was to discuss all matters relating to the existing infrastructure location within the Headland Park zone of Barangaroo including SPS0014, gravity sewer reticulation system, the condition of the station above ground and below ground, heritage impacts and proposed options for further consideration by the Consultant.

A historical overview was provided by BDA whilst Sydney Water undertook to explain the purpose of this station inclusive of the catchments draining to the station and discharge location. Sydney Water advised that in the past other stations such as No. 12 and 13 had been decommissioned and further indicated that the sub-structure and below ground wet well of SPS0014 was of greater significance than the super structure and also noting that there was likely to be no objection to relocation of the super structure, ie; above ground building and that there were many similar instances of this previously having been undertaken within the Sydney Water operations area.

Sydney Water also indicated that the station would require deregistration off the Sydney Water S170 register and likewise an approach would be required to delist this station off the City of Sydney Council Register.

Sydney Water indicated that its preferred position would be to decommission SPS0014 and construct a new gravity reticulation sewer extending through to SPS1129 and this was agreed to by BDA. A number of sub options were canvassed including diversion of the High Street catchment either to SPS1129 or to the Kent Street Submain. WSP later established that the option to divert this High Street catchment to the Kent Street submain was impossible due to the submain being of insufficient depth to contain such a redirection. The level of the High Street catchment drops significantly between Kent Street to High Street and there is a level difference of up to 10 to 15 metres drop in the land form.

3.1.2 Sydney Water Notice of Requirements

Sydney Water advised that the project could progress with an application by BDA for a Notice of Requirements and this application was made on the basis of the Major Works Approval Modification dated 11th November 2009 as issued by the Minister for Planning[1].

An application was made to Sydney Water by WSP as the appointed and accredited Water Servicing Coordinator, Project Manager and Designer on 31st March 2010. The focus of the application was the current preferred option.

The Sydney Water Notice of Requirements (NOR) is a notice provided under Case No. 119297 and dated 6th September 2010. It consists of Pages 1 to 8 and covers five main items listed on Pages 4 to 8. The Developer will be required in the future to execute a Major Works Agreement in order to accept the NOR and progress to submit a further Design for approval purposes, refer Page 4, Section 2.

The detailed requirements of the Notice Letter are addressed under Section 3 whereby Sydney Water accepts its preferred option as Option 1. A number of critical additional requirements are stipulated on Page 4, last paragraph being that the Developer must construct additional storage at SPS1129 equivalent to approximately 100m^3 to provide additional detention time within this station. In addition Sydney Water requires a review of the pumping machinery within SPS1129 and possible upgrade of the flow capacity.

Sydney Water is currently reviewing design criteria for the above upgrade and will provide supplementary advice to BDA to progress detailed design. This Notice of Requirements has been accepted by BDA and addresses the need for a temporary pumping station and the associated requirements for detailed design and documentation of this station.

In terms of Heritage impact, these requirements are addressed in detail on page 7 of the NOR.

3.2 Department Environment, Climate Change and Water

3.2.1 Stormwater Quality Criteria for Environmental Risk Management

Stormwater Quality Criteria are published by DECC and reference is made to the current guideline headed “Managing Urban Stormwater Harvesting and Reuse”. [16]

Typically, the following Stormwater Quality Criteria are quoted under Table 6.4 [16] viz:-

Level	Criteria[1]	Applications
Level 1	E.coli < cfu/100mL Turbidity ≤ 2 NTU[2] pH 6.5-8.5 1 mg/L Cl_2 residual after 30 minutes or equivalent level of pathogen reduction	Reticulated non-potable residential uses (eg, garden watering, toilet flushing, car washing)
Level 2	E.coli <10 cfu/100mL Turbidity ≤ 2 NTU[2] pH 6.5-8.5 1 mg/L Cl2 residual after 30 minutes or equivalent level of pathogen reduction	Spray or drip irrigation of open spaces, parks and sportsgrounds (no access controls) Ornamental waterbodies (no access controls) Fire fighting
Level 3	E.coli <1000 cfu/100mL pH 6.5-8.5	Spray or drip irrigation (controlled access) or subsurface irrigation of open spaces, parks and sportsgrounds Ornamental waterbodies (access controls)

1 Values are median for E.coli, 24 hour median for turbidity and 90th percentile for pH
2 Maximum is 5 NTU

Source: derived from NSW RWCC (1993), Dec (2004), ANZECC and ARMCANZ (2000)

3.2.2 Additional Stormwater Quality Criteria for Specific Applications (Irrigation)

Irrigation with stormwater has different water quality requirements to irrigation with treated sewerage effluent. The levels of pollutants in stormwater are normally much lower than in effluent. Further, effluent reuse schemes typically have higher application rates (higher hydraulic loadings) because they aim primarily to dispose of effluent, whereas stormwater schemes may have multiple objectives.

Urban stormwater is characterized by high loads of suspended solids, sand and grit. This can cause excessive wear and clogging of pumps and control equipment and may block irrigation sprays. The specific treatment level required would depend on the design of the irrigation systems. For irrigating playing fields and golf courses, suspended solids levels below 50mg/L are unlikely to result in operational problems. Limiting particle sizes to smaller than approximately 0.5 – 1.0mm may avoid operational problems in conventional spray irrigation schemes.

High nutrient levels can cause operational problems for irrigation schemes through biofilms clogging irrigation equipment. ANZECC and ARMCANZ (2000) provides trigger values for agricultural irrigation that could be used for stormwater irrigation. These are presented in the table below:-

Element	Long term (up to 100 years)	Short term (up to 20 years)
Total phosphorus (mg/L)	0.05	0.8-12[1]
Total nitrogen (mg/L)	5.00	25.0-125[1]

[1] Requires the site specific assessment (refer to ANZECC and ARMCANZ (2000)

3.2.3 Stormwater Treatment – Contaminants

Stormwater for harvesting and reuse is likely to need pre-treatment to remove gross pollutants, including litter, organic matter and coarse sediment before it enters a storage or downstream treatment measures.

Table 6.7 [16] shows indicative concentrations for pollutant retention and outflow from a range of stormwater treatment measures.

Stormwater Treatment Measure	Suspended solids	Total phosphorus	Total nitrogen	Turbidity	E.coli
Retention					
GPT	0-70%	0-30%	0-15%	0-70%	Negligible
Swale	55-75%	25-35%	5-10%	44-77%	Negligible
Sand filter	60-90%	40-70%	30-50%	55-90%	-25-95% (up to 1.5 log)
Bioretention system	70-90%	50-80%	30-50%	55-90%	-58-90% (up to 1 log)
Pond	50-75%	25045%	10-20%	35-88%	40-98% (0.5-2 log)
Wetland	50-90%	35-65%	15-30%	10-70%	-5-99% (up to 2 log)
Outflow*					
GPT	42-140	0.18-0.25	1.7-2.0	18-60	9,000
Swale	35-63	0.16-0.18	1.8-1.9	14-34	9,000
Sand filter	14-56	0.08-0.15	1.0-1.4	6-93	500-11,000
Bioretention system	14-42	0.05-0.13	1.0-1.4	6-93	900-15,000
Pond	35-70	0.14-0.19	1.6-1.8	7-81	200-5,000
Wetland	11-67	0.09-0.16	1.4-1.7	19-53	100-9,000

* concentrations in mg/L except for turbidity (NTU) and E.coli (cfu/100mL)

Source of retention data: DEC (2206), Fletcher et al. (2004), Victorian Stormwater Committee (1999).

3.3 Deep Fill Seepage Water – Irrigation Water Quality for protection of human health and phytotoxic effects

Reference is made to the report and data provided by JBS Environmental whereunder Table 3 has been reproduced for the purposes of explaining the relevant site specific criteria for irrigation water quality.

This site specific criteria as derived in JBS (2010a) [10] for the maximum allowable levels of constituents to be used in irrigation water on the Headland Park. All water that is proposed to be re-used on the Park for irrigation purposes will require to meet these criteria as summarized in Table 3. It should be noted that these criteria are based on water being used and retained within the Headland Park. These criteria are not suitable for irrigation waters which may be discharged from the Park to Darling Harbour.

Table 3: Proposed HHERA Risk Based Irrigation Water Criteria [10]

Constituent	Criteria (mg/L)
Arsenic	0.025
Benzene	0.19
Cadmium	0.91
Chromium	0.32
Cyanide (free)	1.6
Ethylbenzene	0.21
Lead	0.96
Cresols	147
Nickel	0.066
Phenol	0.23
Toluene	0.17
TPH C6-C9 (aliphatic)	0.3
TPH C10-C14 TPH C>16 (aliphatic) TPH C>16 (aromatic)	0.13
Xylene	1.1
Acenaphthene	0.066
Benz(a)anthracene	0.0025
Benzo(a)pyrene	0.0012
Benzo(b)fluoranthene	0.012
Benzo(k)fluoranthene	0.011
Chrysene	0.16
Dibenz (a,h)anthracene	0.0014
Fluoranthene	1.0
Fluorene	0.11
Indeno (1,2,3,c.d,)pyrene	0.0094
Naphthalene	204
Pyrene	3.7

4. DESCRIPTION OF PROPOSED HYDRAULIC SERVICES AND SITE INFRASTRUCTURE

4.1 General Overview

The site infrastructure associated with the BHP broadly includes the following services:-

- Identification of the existing external and site stormwater drainage traversing the site from Merriman and Bettington Streets and the upstream catchment of High Street and Hickson Road and redirection through to the existing headwalls at the Harbour Foreshore;
- Proposed disuse of sections of the above stormwater drainage and reuse of the downstream sections including the existing headwalls;
- Proposed bio-swales, subsoil drainage and stormwater drainage inlet pits and associated landscaping which form part of the water sensitive urban design (WSUD) solution for BHP to collect runoff;
- Proposed subsurface irrigation network;
- Proposed subsoil drainage system to contain deep fill seepage water and provision of pits and pumping stations to store and pump this water to a point of treatment and thereafter for reuse;
- Provision of storage tanks that provide a dual purpose including storage and treatment. A number of tanks are required including collection of Park runoff via the bio-retention swale and subsoil drainage system, tanks for collection of flows emanating from the external upstream catchments and tanks capable of receiving and storing treated sewerage effluent.

The above systems are presented on Drawings MW-WSP-H-1038, 1039, 1040, 1041, 1042 and 1043.

4.2 Sydney Water Gravity Sewer to SPS 1129 and Decommission SPS0014

The preferred option includes the following items of work:-

- Decommissioning of the existing SPS0014 super structure and relocation of this structure elsewhere within the Barangaroo site;
- Exposure of the existing concrete wet well and dry well within SPS0014 and recording the detail of this station for Heritage purposes;
- Possible reuse of SPS0014 substructure as a water tank or backfilling of this structure
- Decommissioning of the existing Sydney Water 300mm diameter gravity reticulation sewers traversing the site from the Hungry Mile and Towns Place;
- Decommissioning of the existing Sydney Water 400mm diameter overflow sewer discharging to Darling Harbour;
- Diversion of the existing 150mm diameter Bettington Street sewer onto the Hungry Mile and connection into the new gravity system within the Hungry Mile;

- Construction of approximately 760 meters of new gravity reticulation sewer by traditional construction or micro-tunnelling from Towns Place (intersection Dalgety Road) in a south east and southerly direction along the Hungry Mile and connection to SPS1129;
- Construction of approximately 100m^3 of additional overflow storage to increase the detention time within SPS1129 and satisfy Sydney Water requirements;
- Review by Sydney Water of the pumping machinery capacity and possible upgrade of the flow capacity by an impeller upgrade, installation of an additional pump or complete upgrade of the existing pumping machinery;
- Possible upgrade of the existing electrical equipment and communication equipment, ie; SCADA.

Refer to *Drawing MW-WSP-H-1043* for details of the existing and proposed scheme concept design.

4.3 Site Stormwater Drainage

There are numerous existing stormwater drainage lines that discharge into Sydney Harbour and which traverse across the site. One stormwater drainage line is located at the southern section of BHP and will remain unchanged. The next two stormwater drainage lines cut across and are interfered with by the proposed Carpark works and these two lines serve the existing high level Residential Precinct in Merriman Street and Bettington Street. The last of the four lines runs south to north in the vicinity of Gate 3. This existing stormwater system has been verified to exist at high level in Clyne Reserve with a vertical pipe dropper fixed to the rock sandstone wall.

It is proposed that the middle two stormwater drainage lines are intercepted on the eastern side of the proposed Carpark and diverted to the southernmost line. Where these lines are interfered with by deep fill or the Carpark it is proposed they be decommissioned and only the downstream ends of the lines are to be retained in the vicinity of the proposed Boardwalk and discharge point to the Harbour.
One of the existing stormwater lines is a DN450 diameter line and currently serves an existing open channel at the base of the rock face in the vicinity and south of the Sydney Ports Tower. The other existing stormwater is a DN525 diameter stormwater line which will also be decommissioned and both of these lines will be diverted via a proposed 450mm diameter stormwater line as shown on *Drawing MW-WSP-H-1038*. These lines will connect into the main southern most DN525 stormwater line draining west of Hickson Road.

It is also proposed that the new WSUD bio-swale collection system connects into these five stormwater drainage lines.

Refer to *Drawing MW-WSP-H-1038* for details of the existing and proposed system.

4.4 Water Sensitive Urban Design (WSUD)

The overall philosophy for drainage of the BHP is as follows:-

- Provision of a network of bio-retention swales of an overall nominal width of 3.6 metres inclusive of the banks at high level to contain high flows up to the 1 in 100 Year ARI event from the Upper Bluff;
- Provision of a network of half round 300mm wide dish drains and 150mm subsoil drainage with interconnecting pits and pipes as shown on *Drawing MW-WSP-H-1039* to adequately drain low flow and moderate flows up to the 20 Year event within the terraced lower slopes of the park;
- Provision of a network of bio-retention swales of an overall nominal width of 3.6 metres inclusive of the banks at the toe of the grass zone of the park where it meets the two level bicycle and walking paths.

Drawing MW-WSP-H-1038 presents the high level and lower level bio retention swales and inlet pits which are intended to collect and contain surface runoff off BHP. The stormwater drainage inlet pits are located at approximately 20 to 30 metre centres and are finished flush with the grassed surface.

The detail of the swale itself is presented on *Drawing MW-WSP-H1041* will be fitted out with surface planting consisting of sedges of 0.8m in approximate height and specific backfill capable of providing filtration and stormwater treatment. The cross section of the swale will typically have a 1.2m base width and a maximum water depth of 300m with batters of slope not exceeding 1:3 vertical to horizontal.

The surface runoff will be collected within the swale up to the 1 in 100 Year event and will filter through the backfill medium and be collected within a two cell wide Atlantis Flo-Channel box drain as detailed on *Drawing MW-WSP-H-1041*.

A MUSIC Model has been set up and computed and the BHP site catchment has been split into three sub catchments being Areas 1, 2 and 3 contributing runoff and pollutant load to the main stormwater outlets to Sydney Harbour. Area 1 is essentially the northern portion of BHP, whilst Area 3 is the southern portion of BHP and the remainder is Area 2. The inputs to the model include the proposed bio-retention swales which have been run for two cases, one being a vegetated swale and the other a non-vegetated swale with two differing types of pollution control device.

The Humegard Gross Pollutant Trap (GPT) is designed to contain a higher degree of litter and coarse pollutants whilst the Humeceptor GPT is tailored to treatment of heavy metals, grease and oil.

Table 4 represents a summary of the results for removal of target pollutants including suspended solids (SS), total Phosphorous (P), total Nitrogen (N) and Gross Pollutants. The level of removal per annum is tabulated and compared as a percentage of removal efficiency against published targets put by DECC.

Table 4 – MUSIC Removal Rates

Vegetated with Humegard GPT				
Area 1 - 10,523m²	Source	Residual	%	Targets
Flow (ML/yr)	5.4	4.14	23.1	-
Total Suspended Solids (kg/yr)	447.0	4.67	99.0	85.0
Total Phosphorus (kg/yr)	1.6	0.27	83.5	65.0
Total Nitrogen (kg/yr)	13.3	6.49	51.3	45.0
Gross Pollutants (kg/yr)	31.4	0.00	100.0	95.0
Area 2 - 11,356m²	Source	Residual	%	Targets
Flow (ML/yr)	5.8	4.78	17.7	-
Total Suspended Solids (kg/yr)	473.0	8.42	98.2	85.0
Total Phosphorus (kg/yr)	1.8	0.33	81.3	65.0
Total Nitrogen (kg/yr)	13.6	7.51	44.7	45.0
Gross Pollutants (kg/yr)	33.9	0.00	100.0	95.0
Area 3 - 12,099m²	Source	Residual	%	Targets
Flow (ML/yr)	6.2	5.16	16.7	-
Total Suspended Solids (kg/yr)	845.0	13.10	98.4	85.0
Total Phosphorus (kg/yr)	1.7	0.37	78.0	65.0
Total Nitrogen (kg/yr)	15.0	8.19	45.4	45.0
Gross Pollutants (kg/yr)	36.1	0.00	100.0	95.0
Vegetated with Humeceptor GPT				
Area 1 - 10,523m²	Source	Residual	%	Targets
Flow (ML/yr)	5.4	4.14	23.1	-
Total Suspended Solids (kg/yr)	536.0	1.94	99.6	85.0
Total Phosphorus (kg/yr)	1.7	0.19	88.8	65.0
Total Nitrogen (kg/yr)	14.2	4.53	68.1	45.0
Gross Pollutants (kg/yr)	31.4	0.00	100.0	95.0
Area 2 - 11,356m²	Source	Residual	%	Targets
Flow (ML/yr)	5.8	4.78	17.7	-
Total Suspended Solids (kg/yr)	587.0	4.20	99.3	85.0
Total Phosphorus (kg/yr)	1.8	0.24	86.7	65.0
Total Nitrogen (kg/yr)	13.9	5.33	61.8	45.0
Gross Pollutants (kg/yr)	33.9	0.00	100.0	95.0
Area 3 - 12,099m²	Source	Residual	%	Targets
Flow (ML/yr)	6.2	5.16	16.7	-
Total Suspended Solids (kg/yr)	721.0	5.23	99.3	85.0
Total Phosphorus (kg/yr)	1.8	0.27	85.1	65.0
Total Nitrogen (kg/yr)	16.9	6.11	63.9	45.0
Gross Pollutants (kg/yr)	36.1	0.00	100.0	95.0

Non-Vegetated with Humegard GPT				
Area 1 - 10,523m2	Source	Residual	%	Targets
Flow (ML/yr)	5.4	5.18	3.8	-
Total Suspended Solids (kg/yr)	447.0	5.72	98.7	85.0
Total Phosphorus (kg/yr)	1.6	0.47	70.9	65.0
Total Nitrogen (kg/yr)	13.3	149.00	-1021.3	45.0
Gross Pollutants (kg/yr)	31.4	0.00	100.0	95.0
Area 2 - 11,356m2	Source	Residual	%	Targets
Flow (ML/yr)	5.8	5.65	2.8	-
Total Suspended Solids (kg/yr)	473.0	9.30	98.0	85.0
Total Phosphorus (kg/yr)	1.8	0.53	70.3	65.0
Total Nitrogen (kg/yr)	13.6	155.00	-1039.1	45.0
Gross Pollutants (kg/yr)	33.9	0.00	100.0	95.0
Area 3 - 12,099m^2	Source	Residual	%	Targets
Flow (ML/yr)	6.2	6.03	2.6	-
Total Suspended Solids (kg/yr)	845.0	14.00	98.3	85.0
Total Phosphorus (kg/yr)	1.7	0.57	66.0	65.0
Total Nitrogen (kg/yr)	15.0	162.00	-982.5	45.0
Gross Pollutants (kg/yr)	36.1	0.00	100.0	95.0
Non-Vegetated with Humeceptor GPT				
Area 1 - 10,523m^2	Source	Residual	%	Targets
Flow (ML/yr)	5.4	5.18	3.8	-
Total Suspended Solids (kg/yr)	447.0	2.29	99.5	85.0
Total Phosphorus (kg/yr)	1.6	0.33	79.7	65.0
Total Nitrogen (kg/yr)	13.3	105.00	-684.9	45.0
Gross Pollutants (kg/yr)	31.4	0.00	100.0	95.0
Area 2 - 11,356m^2	Source	Residual	%	Targets
Flow (ML/yr)	5.8	5.65	2.8	-
Total Suspended Solids (kg/yr)	473.0	3.72	99.2	85.0
Total Phosphorus (kg/yr)	1.8	0.37	79.2	65.0
Total Nitrogen (kg/yr)	13.6	108.00	-697.4	45.0
Gross Pollutants (kg/yr)	33.9	0.00	100.0	95.0
Area 3 - 12,099m^2	Source	Residual	%	Targets
Flow (ML/yr)	6.2	6.03	2.6	-
Total Suspended Solids (kg/yr)	845.0	5.61	99.3	85.0
Total Phosphorus (kg/yr)	1.7	0.40	76.2	65.0
Total Nitrogen (kg/yr)	15.0	114.00	-657.7	45.0
Gross Pollutants (kg/yr)	36.1	0.00	100.0	95.0

The above results suggest that the proposed bio-retention swale system requires a level of vegetation to achieve the percent removal rate for Nitrogen. The best results are achieved by a combination of use of the vegetated bio-retention swale and Humeceptor GPT.

Refer to *Section 4* for details of the carrying capacity of the bio-retention swales and the below ground Atlantis Flo-Channel.

4.5 Sewage Effluent and Stormwater Quality Treatment

The proposed sewer discharge from toilet and other waste facilities within the Carpark and Cultural Centre will be collected and drained via a proposed Sydney Water sewer pipeline within the proposed Carpark. This system of drainage will interconnect with the proposed Hickson Road sewer and transfer all sewer flows to SPS1129. Blackwater reuse will be integrated within Stage 1 Lend Lease with one central wastewater treatment plant.

It is understood that a sewage effluent inflow pipeline will be provided from Stage 1 Lend Lease design and will consist of a pipeline of 200mm nominal diameter constructed in high density polyethylene PE100. This pipeline will deliver effluent to a proposed storage tank located within BHP. There will also be a need to provide a return pipe to Stage 1 from BHP to deliver top up stormwater effluent to the proposed Blackwater Treatment Plant.

There are typically three forms of stormwater capture within BHP summarized as follows:-

- Rainfall and runoff delivered onto the Carpark deck which is considered to be relatively free of pollutants;
- Rainfall and runoff directly off the grassland which is directly contained within the WSUD bio-swales. This stormwater effluent source is also considered to be relatively free of contaminants;
- Rainfall and infiltration within the deep soil layer of BHP which will pass through the imported fill from Stage 1 and which will be required to receive a high degree of treatment and storage.

A detailed Water Balance Study has been undertaken by AgEnviro Solutions, Attention: Dr Mick Battam and a proposed tank storage of 300 kL has been found to be effective for a single watering event for all turf areas. To reduce the average effluent top up to less than 10 megalitres per annum a tank larger than 1250 kL will be required. Reference should be made to *Figure 1 under Attachment A* which demonstrates the effect of tank size on the requirements of effluent top up at BHP.

A copy of this report is appended to this IWMP Report, *refer Attachment A*. Refer also to *Section 3* for further discussion on water balance.

Drawing MW-WSP-H1038 allocates for the proposed stormwater collection chamber of approximate dimensions 8m wide x 3m deep x 50m long situated on the lower Headland foreshore walking and bicycle track. Access to this structure will be available at this lower level.

4.6 Irrigation System

The proposed irrigation system for the park comprises the following:-

- A surface spray irrigation network for the Upper Bluff and northern portion of BHP;
- A drip irrigation system for the western and southern terraced sections of the BHP;

This scheme of pipework will be served by recycled stormwater, deep fill seepage water and Stage 1 sewage effluent that is treated prior to reuse. This recycled stormwater and effluent will be pumped from central storage tanks located on the promenade area of the bicycle and walking paths.

Reference should be made to *Drawing MW-WSP-H-1040* for the typical layout of the proposed irrigation system.

4.7 Deep Fill Seepage Water

JBS Environmental (JBS) have undertaken a detailed analysis of the likely required concentrations of elements or constituents contained within the deep fill seepage to render this water suitable for irrigation. This criteria is presented under Table 3 of the JBS Report, 20th August 2010, [10].

It is understood that the concentrations as presented by JBS Environmental are well within limits capable of being achieved for the intended purpose.

Deep fill seepage water is proposed to be contained within a horizontal drainage matrix and subsoil drainage system as proposed by the Civil Engineer, Robert Bird Group (RBG). The Civil drawings present a dual subsoil drainage trench system which reticulate to main low points at the toe of the terraced part of BHP. From these low points interconnection occurs and the seepage water is intended to be contained within two wet wells located within the upper bicycle and walking paths.

This deep fill seepage will undergo treatment as required to meet the above stipulated concentrations and will be subject to mixing with treated captured stormwater and sewage effluent for irrigation reuse. Refer to *Drawing MW-WSP-H-1041*.

A treatment system will be provided which will capable of managing the anticipated concentrations of contaminants and will also involve treatment of odour. This system will be a below ground tank structure housing the necessary equipment. There will be a provision for overflow into the main stormwater storage structure following treatment.

4.8 Carpark and Cultural Centre –Hydraulic Services

Hydraulic Systems will comprise:

- Drainage
- Sewer Drainage
- Domestic Cold Water Service including Fire Hose Reels
- Fire Hydrant Service

4.8.1 Authorities and Code Requirements

The design of the Hydraulic Services will conform with the following Authorities and Code requirements:-

- The Council of the City of Sydney
- Barangaroo Delivery Authority
- Environmental Planning and Assessment Act 1979
- Environmental Planning and Assessment Regulations
- Sydney Water
- Work Cover Authority
- NSW Department of Health
- Department of Infrastructure, Planning and Natural Resources
- Environmental Protection Authority
- Sydney Harbour Foreshore Authority
- NSW Maritime
- Jemena Limited
- Australian Competition and Consumer Commission
- NSW Department of Energy
- Energy Australia, Integral Energy
- Building Code of Australia
- Insurance Council of Australia
- New South Wales Fire Brigades
- Telstra, Austel, Optus
- Roads and Traffic Authority
- All relevant Australian Standards and reference International Standards referenced by the BCA unless noted otherwise by the Fire Services Specification or the Fire Engineering Solution Report.

4.8.2 Stormwater Drainage System

General

It is proposed that the stormwater drainage associated with the Carpark and Cultural Centre will include Basement entry ramp drainage. Sections of the proposed Carpark that are below Mean High Tide Level will require tanking of the perimeter wall system and should any subsoil drainage be provided to protect walls then this drainage will be contained and collected above Sea Level.

All stormwater infiltration above the level of the Carpark slab will be collected in an Atlantis type subsoil drainage system and transferred to the Park drainage system. The sealing of the Carpark concrete slab will be required to be sloped to ensure this subsoil system performs adequately.

Materials

The Stormwater drainage system will consist of HDPE (High Density Polyethylene) pipework and fittings as required throughout the development. Drainage from Basement perimeter dish drains will consist of solid HDPE pipe and fittings.

4.8.3 Sewer Drainage

General

Sewer drainage will be provided to the Basement levels and connection turnup points will be provided for future sanitary plumbing soil stacks to service future Amenities.

Sewer drainage will gravitate and connect to the Sydney Water sewer adjacent to the development site and sewer drainage from Amenities below the gravity sewer will connect to a sewer drainage pump out pit complete with two submersible pumps where sewerage will be pumped to the gravity sewer drainage system.

Materials

Sewer drainage in ground will be constructed of HDPE pipes and fittings.

4.8.4 Domestic Cold Water Service including Fire Hose Reels

General

It is proposed to extend a new domestic cold water service from the 225mm diameter Sydney Water watermain corner of Dalgety Road and Towns Place.

A new domestic cold water meter will be provided and boundary protection backflow prevention valve will be provided on the outlet side of the water meter. Other areas that will require zone or individual protection, but not limited to, will include landscaped irrigation or where hoses are installed adjacent to sanitary fixtures, Plantrooms and Garbage rooms. All valves will be located in accessible locations for maintenance purposes.

Domestic cold water will be reticulated throughout the development using Type B copper tube and fittings. All risers and individual zones will have isolation valves.

All branch lines will be fitted with pressure limiting valves to ensure that equal pressures are maintained.

Pipework will be sized to achieve flows with a maximum velocity of 3.0m/s in accordance with the Australian Standard.

Valving of the main distribution water services pipes within the buildings will be provided to allow maintenance shut downs to occur on portions of the service not entire floors.

Fire hose reels will be installed within four (4) metres of all Fire Stairs and Fire Exits and will connect to the domestic cold water service.

Materials

The Domestic Cold Water and Fire Hose Reel Service will consist of Type B copper tube and fittings with silver soldered joints.

4.8.5 Fire Hydrant Service

General

The proposed development will be provided with a fire hydrant service to satisfy the requirements of all current BCA requirements, Authority Codes, Standards and Regulations. It is proposed to extend a new fire hydrant service from the 225mm diameter Sydney Water watermain corner of Dalgety Road and Towns Place.

A fire hydrant Fire Brigade booster valve assembly will be provided at the carpark entry adjacent Towns Place and a fire hydrant service will extend to supply fire hydrants throughout the redevelopment. A diesel fire hydrant booster pump is required to be installed to provide adequate water pressures and flows to each hydrant.

Fire Hydrants will be installed in the Fire Stairs and Fire Exit corridors on all floors of the buildings.

Materials

The Fire Hydrant Service will consist of medium grade galvanised mild steel pipes and fittings with rolled grooved joints for suspended pipework above ground and any fire hydrant service pipework below ground will consist of ductile iron cement lined pipes and fittings.

4.9 Carpark and Cultural Centre - Fire Services

Fire Systems will comprise;

- Fire Sprinkler Service to the Buildings and external / internal wall wetting sprinklers as required by the BCA, AS 2118 and Fire Engineered Solutions
- Fire Detection and Alarm System
- Building Occupant Warning System
- Fire Extinguishers

4.9.1 Authorities and Code Requirements

The design of the Fire Services will conform with the following Authorities and Code Requirements:-

- The Council of the City of Sydney
- Barangaroo Delivery Authority
- Environmental Planning and Assessment Act
- Environmental Planning and Assessment Regulations
- Sydney Water
- Work Cover Authority
- NSW Department of Health
- Department of Infrastructure, Planning and Natural Resources
- Environment Protection Authority
- Sydney Harbour Foreshore Authority
- NSW Maritime
- Jemena Limited
- Australian Competition and Consumer Commission
- NSW Department of Energy
- Energy Australia, Integral Energy
- Building Code of Australia
- Insurance Council of Australia
- New South Wales Fire Brigade
- Telstra, Austel, Optus
- Roads and Traffic Authority
- All relevant Australian Standards and reference International Standards referenced by the BCA unless noted otherwise by the Fire Services Specification or the Fire Engineering Solution Report.
- Other relevant Australian Standards
- Scientific Services Laboratories
- Australian Construction Services
- And any other authority having jurisdiction over the works

4.9.2 Fire Sprinkler System

General

The proposed development will be provided with a fire sprinkler service throughout the facility as required by Table E1.5 of the BCA in accordance with the requirements of AS 2118.1 – 1999. The fire sprinkler service will be supplied from a Grade 3 water supply.

Hazard Classification

The system will be provided to meet the design densities required for the following occupancies:

Cultural Centre	Ordinary Hazard 3
Carpark	Ordinary Hazard 2

Key Components

- Primary water supply consisting of a separate 150mm diameter connection to the 225mm diameter Sydney Water watermain corner of Dalgety Road and Towns Place boosted via an electric booster pump as required.
- Anti-tamper monitoring of fire services isolation valves.
- Alarm Valve Assemblies will be located in the Sprinkler Alarm Valve Room.
- Automatic Jacking Pump to retain the Alarm Valve pressures requirements.
- Fire Brigade Booster facilities accessible from the street in view of the Front Entry to the building.

Sprinkler Heads

Sprinkler heads will be of appropriate temperature rating for positions and of a pattern compliant with AS 2118 and all other Authorities concerned and will be suitably arranged on the distributing pipework.

Type of Heads

Location	Sprinkler Head Type or Equal	Temp. Rating °C	Size	Colour	Escutcheon Plate	Colour
Cultural Centre	Pendant	68	15	White	Semi-recessed	White
Carpark, Plantrooms and Service Areas	Pendant / Upright	68	15	Brass	-	-

Materials

All sprinkler service piping will be in accordance with AS 1074 and AS 4118-2.1 suitable for screwed, roll grooved or welding jointing.

Design Standards

The fire sprinkler service will be designed and constructed in accordance with AS 2118.1 – 1999 and NSW Fire Brigade requirements.

4.9.3 Fire Detection and Alarm System

An addressable analogue Fire Detection and Alarm System shall be provided as required the BCA and referenced Standards. The Fire Indication Panel and Fire Fan Control Panels shall be located in the Fire Control Centre.

Smoke detectors shall be provided throughout the building in accordance with the requirements of AS 166.1-1998 Part 4 and E2.2 of the BCA.

The Fire Detection and Alarm System will interface the following:-

- Monitoring of isolation valves and fire pump;
- Remote test of flow switch, solenoid valves via the Fire Indication Panel;
- AS 1668.1-1998 interface at Mechanical Control Centres for the control and indication where required of the Smoke Control system;
- Occupant Warning System;
- Gas Detector monitoring.

4.9.4 Building Occupant Warning System

An Occupant Warning System will be provided throughout the Building in accordance with Specification E1.5 of the BCA and AS 1670.1-2004.

4.9.5 Portable Fire Extinguishers

General

Portable fire extinguishers will be provided and installed for the complete Project in accordance with Table E1.6 of the BCA and the Authorities requirements. The extinguishers shall be of a type suitable for the occupancy and use of the area.

The extinguishers shall be located and fixed in position so as to conform with AS 2444, Building Code of Australia, the NSW Fire Brigade and all relevant Authorities where the requirements exceed those set out in AS 2444 – 2002 Portable Fire Extinguishers and Fire Blankets – Selection and Location.

Design Standards

The extinguishers will conform to the requirements of AS 2444 and will be provided with standard identification and location signage in accordance with AS 2444.

5. WATER BALANCE

WSP commissioned the services of AgEnviro Solutions, attention Dr Mick Battam, Principal Soil Scientist to undertake a Water Balance Analysis and estimate the following:-

- Landscape watering requirements;
- Effluent top up requirements;
- Tank storage requirements.

A full copy of the AgEnviro Water Balance Report dated 29th September 2010 is enclosed under Attachment A.

The analysis was undertaken based on 34 years of daily weather data obtained from the Bureau of Meteorology (BOM) at Sydney Airport from 1975 to 2008 and daily rainfall data obtained from Observatory Hill. The model also assumes that irrigation events are skipped if significant rainfall events occur consisting of greater than 10mm of rainfall in a given day.

A summary of the water fluxes (ML/year) through the Headland Park is provided in Table 2. The average annual irrigation requirements are estimated to be 19.6 ML, which is less than the annual drainage/runoff capture in bio-swales, drains associated with the retaining wall (RBG, 18th August 2010) paths and stone paving areas of about 41.0 ML.

In further detail the allocation of inputs and outputs of water flux is as follows:-

- The total inputs attributable to rainfall, required irrigation and run-on stormwater = 93.5 ML / annum;
- In comparison the total output volumes allowing for runoff, evapotranspiration, irrigation evaporation losses, interface flow and deep fill infiltration = 94.8 ML / annum;
- Based on a saturated hydraulic conductivity 10^{-8} m/sec for the clay layer, it is estimated that seepage through this clay layer will be approximately 1.6 ML / annum;
- The deep drainage capture subsoil system will contain approximately 7.3 ML / annum.

5.1 Tank Sizing

The tanks should be at least 1250 kL representing a single watering event for the turf areas. A tank of 1250 kL would provide storage for two weeks in summer without rain and would enable almost 80% of the site water requirements to be met by drainage capture but this would vary from year to year.

The above assessment assumes that it is possible as anticipated to reuse both treated park runoff and treated deep fill seepage water. BHP is proposing to implement a network of pipes and storage tanks to integrate all water streams and allow effluent top up from Stage 1 and where this is lacking in availability potable cold water top up to meet long term irrigation needs.

6. FLOOD STUDY

6.1 Introduction and Overview

This Flood Study section of the report consists of a hydrological analysis of the catchment discharging into Sydney Harbour through the Barangaroo Headland Park in an existing and proposed scenario.

The proposed Barangaroo Headland Park Site is located at the north end of the suburb of Barangaroo and is bounded by the Hickson Road to the east, and Sydney Harbour to the north and west. (Refer Locality Plan - Figure 6.1).

The survey indicates that there is a minor ridge through the centre of the existing Barangaroo Site. A number of above ground detention basins are located between the ridge and Hickson Road. The runoff from these detention basins overflow a ridge that runs through the site in a north-south direction and travels in a westerly direction before overflowing to Sydney Harbour.



Figure 6.1 Flood Study Locality Plan

With reference to the aerial photograph (refer Figure 6.1), the site is surrounded by a substantially developed upstream catchment to the east. The total catchment extends to Kent St at Millers Point. Overflows from the inground drainage system in Kent St, which outfalls into Walsh Bay, travel overland into High St and from there to the Barangaroo site.

This report estimates the 1, 20 and 100 Year ARI catchment peak discharges in relation to local area rainfall and runoff. Three (3) drainage models have been generated for the following scenarios:-

- Existing Catchment Model estimating the flows discharging into Darling Harbour and Walsh Bay from the Barangaroo Site;
- Proposed Deviation Model diverting two (2) drainage networks away from the Headland Park Site;
- Proposed Model estimating the flows emanating from the Headland Park Site.

The above discharges are calculated based on a discharge into the harbour to a water level of 0.5m AHD.

The catchment discharges were calculated using the 'DRAINS' model. 'DRAINS' is a program for designing urban stormwater drainage systems and analysing their flooding behaviour. As well as modelling piped drainage systems, 'DRAINS' describes detention basins, rural and urban catchments. There are choices of hydrological models and between the basic and the unsteady flow hydraulic models.

6.2 Study Area

6.2.1 Existing Catchment

The total catchment for the existing model covers an area of 13.6 Ha, which consists primarily of residential housing lots, sealed pavements and parks. Pits throughout the catchment are typically grated of size 0.9m by 0.45m, with a 0.9m lintel and pipes typically start at a diameter of 225mm.

The catchment is broken down into a series of sub-catchments which extend from the development site to Kent St and Towns Place encompassing the following areas:-

- Kent St between High St and Argyle St;
- High Lane;
- High Street;
- Hickson Rd between the bridge at Argyle St and the junction of High and Kent Streets;
- Munn Reserve;
- Dalgety Road;
- Rhodens Lane;
- Merriman Street;
- Clyne Reserve;
- North Barangaroo including the rock cliffs.

The runoff from the sub-catchment between Kent and High streets is conveyed by a series of stormwater pits and pipes, located in High St, which collect stormwater and discharge it vertically down the retaining wall to the stormwater network located in Hickson Rd. An above ground detention basin is located at the sag of High St with a storage volume estimated at 38.2m^3. Hickson Rd consists of a number of sub-catchments and is relatively flat with minor gradients, reticulating stormwater into pits located along the kerb lines. Drainage lines run from Hickson Rd through the Barangaroo Site discharging stormwater into Sydney Harbour.

The DRAINS model has analysed six (6) stormwater lines emanating from Hickson Rd that traverse across Barangaroo and discharge into the harbour. Only one (1) of these lines, Line 10 (525Ø), is located in the proposed Headland Park Site. All other lines are located to the south of the park and have been analysed to understand overflows from adjoining catchments.

A series of grated pits, 0.3m wide and generally 6.0m long, intercept stormwater that sits in minor above ground detention basins in the development site. These grated pits discharge into the drainage lines that run through the site from Hickson Rd. The detention basin located in the Barangaroo catchment discharging to Line 10 has a volume estimated at 2,240m3. All stormwater west of the detention basins has been assumed to travel overland, discharging into Darling Harbour.

As is illustrated in the Catchment Plan, an upper catchment extending to Observatory Hill has been analysed in the model. This catchment discharges stormwater into the drainage network located in Kent St which outfalls into Walsh Bay. This area was included to understand the volume capacity of the stormwater network in Kent St, as overflows from Kent St West discharge into the Barangaroo Catchment.

A sub-catchment, located in the vicinity and including Munn Reserve, discharges stormwater down the cliff face via a vertical riser, encased in concrete. The riser outfalls to a continuous 350mm open channel located at the base of the cliff to capture sheeting rain that flows down the vertical face. The open channel was generally backed up with stormwater, at the time of inspections and it discharges into a series of stormwater lines that outfall to the harbour. The sub-catchment from Munn Reserve outfalls to Line 11 (525Ø). The detention basin located in the Barangaroo catchment discharging to Line 11 has a volume estimated at 2,754m3.

A sub-catchment, encompassing the area and rock face surrounding the Harbour Control Tower, collects stormwater into the open channel at the base of cliff and discharges into Line 16 (450Ø). A concrete encased vertical riser, which runs down the cliff face and discharges into the open channel, is visible on-site but City of Sydney infrastructure drawings, survey and WSP inspections have been unable to ascertain if any stormwater discharges into the riser. The detention basin located in the Barangaroo catchment discharging to Line 16 has a volume estimated at 1,215m3.

A 60m long drainage channel is located to the south of the sewer pumping station. Survey has been unable to locate a discharge from this channel. For analysis purposes, WSP has assumed that it outfalls in a westerly direction to Line 17 (assumed 450Ø) and also collects stormwater that emanates from the cliff face to the east. The detention basin located in the Barangaroo catchment discharging to Line 17 has a volume estimated at 345m3.

The catchment located east of the sewer pumping station drains into a 90m long drainage channel which grades from east to west. An above ground detention basin is located in the area surrounding the channel with a storage capacity estimated at 1,110m3. An upper sub-catchment encompassing Clyne Reserve, Merriman St, Rhodens Lane and Dalgety Rd drains into the lower catchment and outfalls to the north via Line 12 (assumed 375Ø). Discharges from the rock face located southeast of the pumping station have also been included in this catchment.

6.2.2 Proposed Catchment

The proposed catchment consists entirely of Barangaroo Headland Park situated between the new Northern Cove and the existing Towns Place, encompassing an area of 3.4 Ha. The site is predominantly pervious with pedestrian and bicycle pathways traversing through the upper and lower levels.

The upper level of the park is accessed from Merriman St and consists of a grassed area with contours falling towards the foreshore. The park possesses a drop in level of approximately 16m between the upper and lower level. The significant level drop will be constructed utilising a series of tiered retaining walls and embankments graded at 1 Vertical (V): 3 Horizontal (H). The lower extents of the park consist of a foreshore walk and bicycle path with additional landscaped areas.

Stormwater is proposed to be intercepted by adopting four (4) measures:-

- Stormwater Pits to capture overland flow;
- Stormwater pipe system consisting of a combination of traditional pipes and Atlantis 'Flo-Channel' matrixes;
- Bio-retention swales to intercept overflows from stormwater pits and safely convey them downstream;
- Retaining wall drainage consisting of a ground level 300Ø half pipe, a 30mm Atlantis Vertical Wall Panel and Filter Pipe, all of which shall be connected to the stormwater pit and pipe system.

The Bio-retention swales are being utilised for the treatment of gross pollutants and nutrients. The swale component provides pretreatment of stormwater to remove coarse to medium sediments while the Bio-retention system removes finer particulates and associated contaminants.

Bio-retention swales provide flow retardation for frequent storm events and are particularly efficient at removing nutrients. The system possesses a filter media, a series of low flow Atlantis 'Flo-Channel' Matrixes and a clay liner to treat the stormwater. The swale is 3.0m in width and 0.3m in depth with side slopes of 1V:3H.

6.3 Approach to the Study

The approach to the study can be summarised as follows:-

- Hydrologic Assessment

The 'DRAINS' model has been used to estimate the peak flows generated in the 1, 20, and 100 year ARI storm events for the existing and proposed scenarios.

- Hydraulic Analysis

The 'DRAINS 'model has been used to estimate the overland flows and their depths at all critical points.

- Consultation with City of Sydney

Stormwater Infrastructure drawings have been received from Mr Myl Senthilvasan, Senior Engineer – Drainage & Environment, City of Sydney, which have been included in *Attachment C*.

6.4 Hydrologic Assessment

6.4.1 Data

WSP obtained detailed survey plans by Rygate Land Surveyors illustrating Council's drainage infrastructure in the area. The survey plan has been used to define the existing catchment and sub-catchment boundaries. Council's stormwater plans and observations made from site visits were also used to verify the catchment and sub-catchment boundaries.

Landscaped plans received from JPW illustrate the structures and contours in the proposed Headland Park. Stormwater infrastructure has been designed taking into account the gradients and walls shown on these plans.

6.4.2 DRAINS Model

The catchment peak flows at all the relevant points of interest were calculated using the' DRAINS' model.

The existing catchment was divided into fifty-four (54) sub-catchments, extending to Observatory Hill as shown on WSP *Drawing MW-WSP-H-1035 and 1036*.

The adopted catchment characteristic factor values used in the Existing 'DRAINS' Model are listed below:

- Impervious fraction for fully developed catchment - upper catchment areas 95%
- Impervious fraction for fully developed catchment – Barangaroo area 100%
- Pervious fraction for parkland catchment – Observatory Hill, Munn Reserve, etc 50-100%
- Paved area depression storage 1mm
- Grassed area depression storage 5mm
- Soil group type 3
- Antecedent moisture content (AMC) 3
- Blockage factor for existing stormwater pits 0%
- Water Level at Discharge to Sydney Harbour 0.5m AHD

The overland flow times are calculated using abbreviated data.

The adopted catchment characteristic factor values used in the Proposed 'DRAINS' Model are listed below:

Impervious fraction for fully developed parkland catchment	100%
Paved area depression storage	1mm
Grassed area depression storage	5mm
Soil group type	2
Antecedent moisture content (AMC)	3
Blockage factor for proposed stormwater pits	30%
Water Level at Discharge to Sydney Harbour	0.5m AHD

The overland flow times are calculated using abbreviated data.

6.4.3 Catchment Discharges

6.4.3.1 Existing Development Model

The 'DRAINS' model has been used to estimate the pipe and overland flows for the 1, 20, and 100 Year ARI storms for the existing scenario.

The peak flow rates from the 'DRAINS' model at various discharge pipelines are summarised below:-

Table 6.4.3.1

	Catchment Pipe and Overland Flows to Sydney Harbour (m^3/sec)					
Catchment Location	1 Year ARI		20 Year ARI		100 Year ARI	
	Pipe	Overland	Pipe	Overland	Pipe	Overland
Line 10	0.085	0	0.109	0	0.115	0
Line 11	0.097	0	0.217	0	0.255	0
Line 16	0.045	0.032	0.099	0.288	0.118	0.348
Line 17	0.052	0	0.113	0.010	0.135	0.037
Line 12	0.228	0.160	0.230	0.584	0.231	0.694

6.4.3.2 Proposed Deviation Model

The 'DRAINS' model has been used to estimate the pipe and overland flows for the 1, 20, and 100 Year ARI storms for the proposed deviation scenario. The proposed deviation includes for the interception of Lines 11 and 16, with new interceptor pits constructed at base of the cliff, and a new 450Ø pipe connecting the new system up with Line 10.

The peak flow rates from the 'DRAINS' model at various discharge pipelines are summarised below:-

Table 6.4.3.2

	Catchment Pipe and Overland Flows to Sydney Harbour (L/sec)					
Catchment Location	1 Year ARI		20 Year ARI		100 Year ARI	
	Pipe	Overland	Pipe	Overland	Pipe	Overland
Line 10	0.212	0	0.347	0	0.354	0
Line 11	Removed	Removed	Removed	Removed	Removed	Removed
Line 16	Removed	Removed	Removed	Removed	Removed	Removed
Line 17	0.052	0	0.113	0.010	0.135	0.037
Line 12	0.228	0.159	0.230	0.584	0.231	0.694

6.4.3.3 Proposed Model

The 'DRAINS' model has been used to estimate the pipe and overland flows for the 1, 20, and 100 Year ARI storms for the proposed parkland scenario. The stormwater drainage system is proposed to be outfalled to Darling Harbour via three (3) existing stormwater pipelines.

The existing pipelines are to be decommissioned as part of the Headland Park Early Works Contract and shall have no catchments upstream of the park entering them. The discharges from these pipelines have been notated as follows in the proposed drains model:-

- Node North 1 - This node is an existing outfall, north of the development site, into Walsh Bay. The location and diameter of this pipeline is to be ascertained during the Early Works Contract. The diameter has been assumed to be 450Ø for analysis purposes with a 0.5% gradient;

- Node West 1 - This node is an existing outfall, west of the development site, into Darling Harbour. The pipe has been surveyed upstream to be 600Ø. A 0.5% gradient has been assumed for analysis purposes;
- Node West 2 - This node is an existing outfall, west of the development site, into Darling Harbour. The pipe has been surveyed upstream to be 525Ø. A 0.5% gradient has been assumed for analysis purposes;

The peak flow rates from the 'DRAINS' model at various discharge pipelines are summarised below:-

Table 6.4.3.3

	Catchment Pipe and Overland Flows to Sydney Harbour (L/sec)					
Catchment Location	1 Year ARI		20 Year ARI		100 Year ARI	
	Pipe	Overland	Pipe	Overland	Pipe	Overland
Node North 1	18.0	0	483.0	4.0	510.0	8.0
Node West 1	19.0	0	469.0	0	510.0	0
Node West 2	22.0	0	305.0	20.0	305.0	132.0

The stormwater catchments assigned to the Headland Park are presented on *Drawing MW-WSP-H-1037*.

7. ATTACHMENTS

ATTACHMENT A AG ENVIRO SOLUTIONS REPORT OF 29TH SEPTEMBER 2010

ATTACHMENT B FLOOD STUDY – MODEL DATA AND RESULTS

3. CATCHMENT ANALYSIS USING 'DRAINS' PROGRAM – EXISTING CONDITION
'Free to Atmosphere' at the outlet

- DRAINS Model Node Diagram
- DRAINS Model Data Sheet
- DRAINS Model 1 Year ARI Results
- DRAINS Model 20 Year ARI Results
- DRAINS Model 100 Year ARI Results

4. CATCHMENT ANALYSIS USING 'DRAINS' PROGRAM – EXISTING CONDITION
'Mean High Water Spring' tide at the outlet, RL 0.625m AHD

- DRAINS Model Node Diagram
- DRAINS Model Data Sheet
- DRAINS Model 1 Year ARI Results
- DRAINS Model 20 Year ARI Results
- DRAINS Model 100 Year ARI Results

ATTACHMENT C CITY OF SYDNEY COUNCIL STORMWATER INFRASTRUCTURE DRAWINGS

ATTACHMENT D HUMES WATER SOLUTIONS GROSS POLLUTANT TRAP DETAILS

FIGURES:

MW-WSP-H-1031	TITLE SHEET, DRAWING LIST AND LOCALITY PLAN
MW-WSP-H-1032	LEGEND AND ABBREVIATIONS
MW-WSP-H-1033	KEY PLAN
MW-WSP-H-1034	GENERAL NOTES AND SPECIFICATION
MW-WSP-H-1035	STORMWATER CATCHMENT EXISTING CONDITION SHEET 1 OF 2
MW-WSP-H-1036	STORMWATER CATCHMENT EXISTING CONDITION SHEET 2 OF 2
MW-WSP-H-1037	STORMWATER CATCHMENT PROPOSED PARK
MW-WSP-H-1038	STORMWATER DRAINAGE LAYOUT PLAN
MW-WSP-H-1039	RETAINING WALL SUBSOIL DRAINGE LAYOUT PLAN
MW-WSP-H-1040	IRRIGATION LAYOUT PLAN
MW-WSP-H-1041	SEEPAGE WATER LAYOUT PLAN
MW-WSP-H-1042	CIVIL DETAILS
MW-WSP-H-1043	SYDNEY WATER CORPORATION GRAVITY SEWER DEVIATION TO SPS1129 AND DECOMMISSIONING OF SPS0014

ATTACHMENT A

AG ENVIRO SOLUTIONS REPORT OF 29TH SEPTEMBER 2010

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Louis Panagopoulos
Director Civil and Water Engineer
Warren Smith and Partners
Level 1, 123 Clarence St
SYDNEY 2000

29th September 2010

Re: Barangaroo water balance

Dear Louis,

Please find enclosed a summary of the updated water balance modelling for Barangaroo Headland Park.

If we can be of any further assistance please do not hesitate to contact myself on either 0425 363 161 or 46 571 381.

Yours sincerely

Dr Mick Battam
Principal Soil Scientist

1. Background

Barangaroo is located at the northern end of Cockle Bay. The proposed headland park will include a cultural centre and an underground carpark. Warren Smith and Partners commissioned Dr Mick Battam of AgEnviro Solutions to perform a water balance for the site in order to estimate:

- landscape watering requirements;
- effluent top-up; and
- tank storage requirements.

Irrigation requirements

A sandy topsoil is proposed, with a sandy by slightly heavier textured subsoil (Leake, 2010a, b). The topsoil depth will vary from 200 to 400 mm depth, with the subsoil being similar or deeper (Leake, 2010b).

Based on its texture, the growing media soil was assumed to have:

- a saturated hydraulic conductivity of at least 10 to 20 mm hr^{-1} (Leake pers. com.); and
- at least 45 mm m^{-1} of readily available water holding capacity (NSW Agriculture 2001).

Based on the proposed plantings and the exposed microclimate the watering (rain or irrigation) requirements of the site have been estimated (Table 1).

Table 1. Watering requirements.

Description	Summer and spring	Autumn and winter
Turf (kikuyu)–2.64 Ha*	7 mm of water twice a week	7 mm of water once a week
Indigenous plantings–1.26 Ha*	12 mm of water once a fortnight	None

*** Areas based on areas in 10th September quantity estimate report (PWP and JPW 2010a) and draft quantity estimates cost plan 6 (PWP and JPW 2010b).**

Drainage capture

It is proposed that the underlying fill be sufficiently compacted to limit the infiltration of water. For the purposes of this report it is assumed that:

- all drainage and surface water from the upper sections of the park (2.04 Ha of turf, 1.10 Ha indigeneous plantings and 0.5426 Ha of paths) is captured for reuse in either the turf bioswales, the drains proposed behind the retaining walls on each tier of the steep indigenous planted slope and/or in the bio-swale on the bottom tier of the steep planted slope (PWP and JPW, 2010c). To assist in drainage capture a compacted clay layer is assumed to be present under the base of the drains and bio-swales (saturated hydraulic conductivity of 10^{-8} ms^{-1});
- runoff from the foreshore paths (0.8495 Ha) is captured directly in surface drains; and
- based on the meeting discussion (1st September, 2010), drainage water is not captured from the lower sections of the park (0.60 Ha turf and 0.16 Ha indigenous plantings).

The bio-swale locations and slopes on site were estimated based on PWP and JPW (2010c). Beneath the growing media the profile consists of:

- fill that has a saturated hydraulic conductivity of 10^{-7} ms^{-1} (John Braybrooke email, 27th July 2010), an approximate silt and clay content of about 20% (John Braybrooke, pers. com.) and can be aptly described using a Campbell function; overlying
- a drainage layer that is 300 to 500 mm thick with a permeability of 10^{-1} to 10^{-2} ms^{-1} (MoM, 23rd August 2010); overlying
- a clay drainage liner that is about 500 mm thick with a permeability of 10^{-8} (MoM, 23rd August 2010) and has a slope of 1 in 100 as specified in Bruce Gunn's email (26th August, 2010).

It is assumed that the water captured by the deep underlying drainage layer can be reused in the irrigation system (Paul Sancandi, pers. comm.).

2. Methodology

Water balance modelling

In addition to the above assumptions, the water balance was based on:

- 34 years (1975 to 2008) of daily weather data from the Bureau of Meteorology station at Sydney Airport
- daily rainfall data from Observatory Hill; and
- using the proposed irrigation schedule (Table 1) and assuming irrigation events were skipped if significant (>10 mm) rainfall events occurred.

A schematic representation of the model is presented associated with Table 2 (Figure 2). The degree to which the irrigation requirements for the site could be met by effluent was estimated for a range of storage sizes.

Irrigation system performance

A distribution uniformity (DU) of 72% was assumed for the proposed sprinkler irrigation system, which is slightly less than the minimum requirements specified in the Sydney Water Open Space Best Practices Guideline (due for release in late 2010). Of the irrigation water applied, 15% is assumed to be lost as evaporation.

3. Preliminary findings

Water fluxes

A summary of the water fluxes (ML/yr) through the headland park is provided in Table 2. The average annual irrigation requirements are estimated to be 19.6 ML, which is less than the annual drainage/runoff capture in bio-swales, drains associated with the retaining walls (RBG, 18th August, 2010), paths and stone paving areas of about 41.0 ML.

An additional 7.3 ML annually would be captured by the lower clay drainage layer and could be reused in the irrigation system (Paul Sancandi, pers. comm.), but treatment may be required. About 1.6 ML annually will move through the lower clay layer (Table 2).

Despite the net capture of water, effluent top-up is required because significant amounts of drainage capture occurs during periods when little irrigation is required, such as during:

- cooler months; and/or
- following large rainfall events.

Tank sizing

The relationship between tank size and reuse was calculated based on the assumption that at least 250 kL of effluent top-up can occur within a 24 hour period (2.9 L/sec).

The tank should be at least 300 kL in size, with 256 kL representing a single watering event for the turf areas. A tank of 1250 kL would provide storage for two weeks in summer without rain and would enable almost 80% of the site water requirements to be met by drainage capture (Figure 1), but this would vary from year to year.

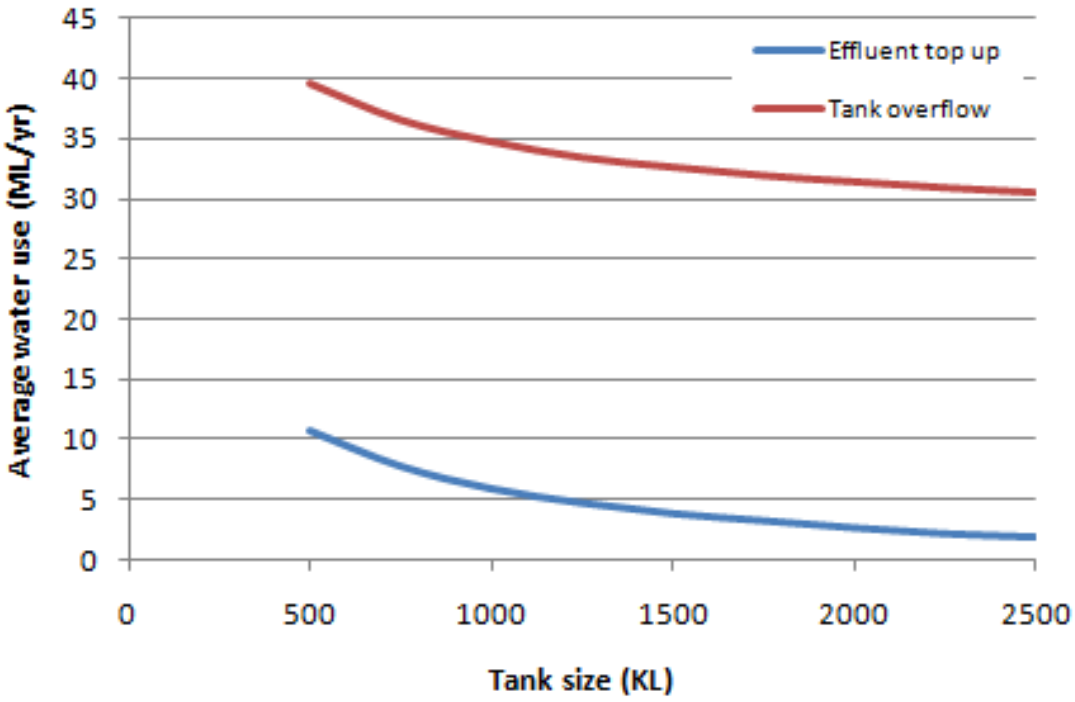


Figure 1. Effect of tank size on the requirements for effluent top-up at Barangaroo headland park (includes drainage capture from the 1 in 100 sloped clay layer)

4. References

Hazelton PA and Murphy BW (1992) What do all the numbers mean? A guide for the interpretation of soil test results. Department of Conservation and Land Management, Sydney.

Leake S (2010a) Soil requirements for Barangaroo report: a preliminary scoping paper. Sydney Environmental and Soil Laboratory.

Leake S (2010b) Technical note: soil volumes. Sydney Environmental and Soil Laboratory.

NSW Agriculture (2001) Irrigation Management: a waterwise farm course.

PWP and JPW (2010a). 10th September Barangaroo cost estimate report (draft) by PWP Landscape Architecture and Johnson Pilton Walker Architecture.

PWP and JPW (2010b). 10th September Barangaroo quantity estimates cost plan (draft) by PWP Landscape Architecture and Johnson Pilton Walker Architecture.

PWP and JPW (2010c) Design development headland park plan, 21st September 2010.

Table 2. Average annual water fluxes (ML) for the headland park.

	Inputs			Outputs				
	Rain	Irrigation	Run-on	Run-off	Evapotranspiration	Irri evap losses	Interface flow	Fill infilt[2]
Paths & stone paving (0.5426 Ha)	6.6	0	0	6	0.6	0	0	0
Turf and plantings (1.8358 Ha)	22.4	12.2	0	3.4	12	1.8	0	5.4
Turf bio-swales[3] (0.2 Ha)	2.4	1.3	7.9	0	1.3	0.2	23.43[1]	0.26
Indigenous slopes (1.0987 Ha)	13.35	1.79	1.5	0	4.5	0.27	8.08[1]	3.19
Foreshore path etc (0.8495 Ha)	10.35	0	0	0	0.96	0	9.4[1]	0
Turf and plantings (0.6042 Ha)	7.36	4.0	0	1.1[4]	4.0	0.6	2.96[4]	2.7
Indigenous plants (0.1643 Ha)	2	0.27	0	0.3[4]	1.1	0.04	0.76[4]	0.5
		Total inputs:	**93.5**				**Total outputs:**	**94.8**

1 interface flow is captured in drainage system

2 indicates movement through the underlying fill based on a saturated hydraulic conductivity function of 10^{-7} ms^{-1}.

3 to assist in drainage capture, a saturated hydraulic conductivity of 10^{-8} ms^{-1} was assumed for the material underlying the bioswales.

4 indicates water movement into the harbour

5 water captured in deep drain that is treated and reused

	Clay seepage	Deep drain capture
Paths & stone paving (0.5426 Ha)	0.0	0.0
Turf and plantings (1.8358 Ha)	0.9	4.5[5]
Turf bio-swales[3] (0.2 Ha)	0.2	0.0
Indigenous slopes (1.0987 Ha)	0.5	2.8[5]
Total:	**1.6**	**7.3**

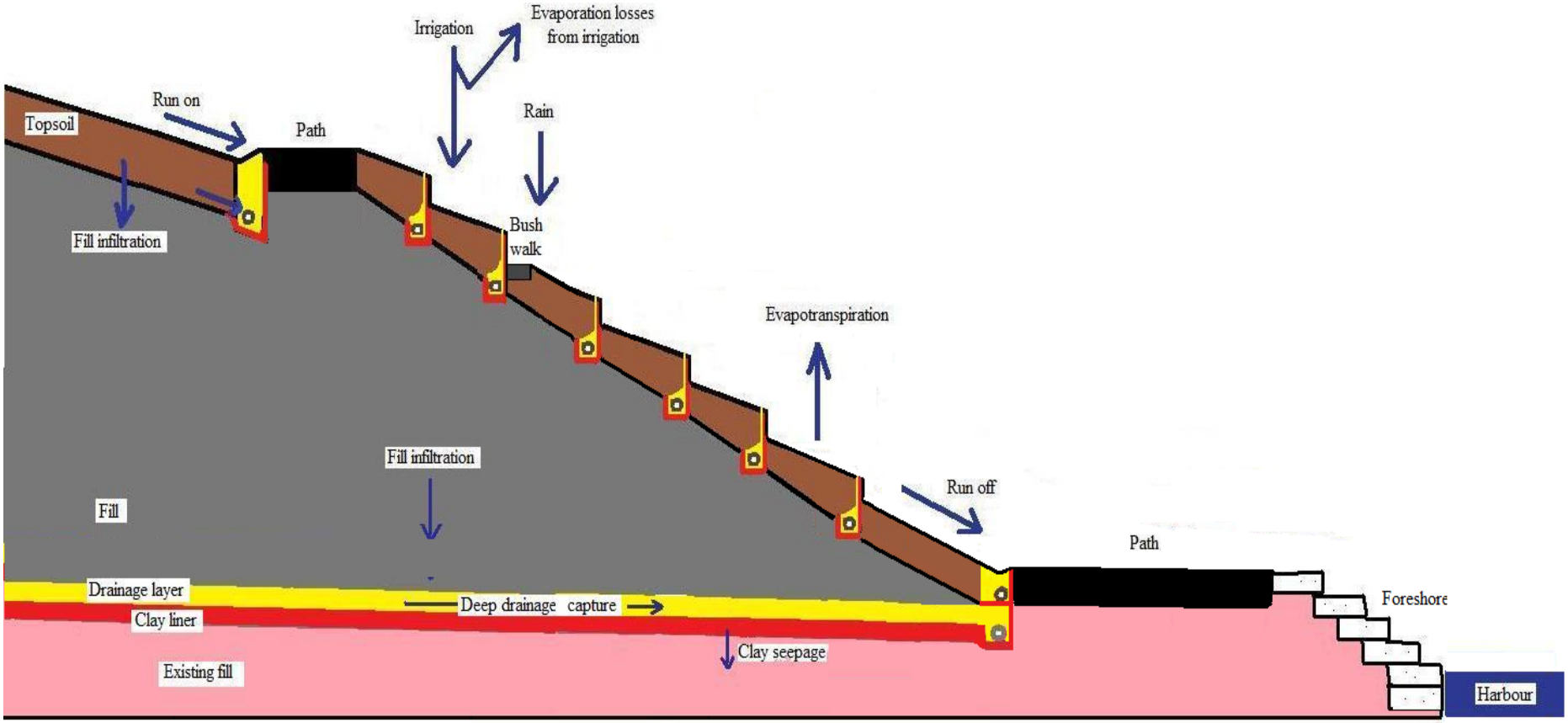


Figure 2. Schematic of water balance model showing various input components. The park is essentially divided into three areas: the upper sections (mostly turf) where runoff and interface flow are captured in bioswales. The steeper sloped areas consisting mainly of indigenous plants, where runoff is captured in drains associated with the retaining walls and a lower bioswale. The lower sections of the site where the path surface runoff is captured.

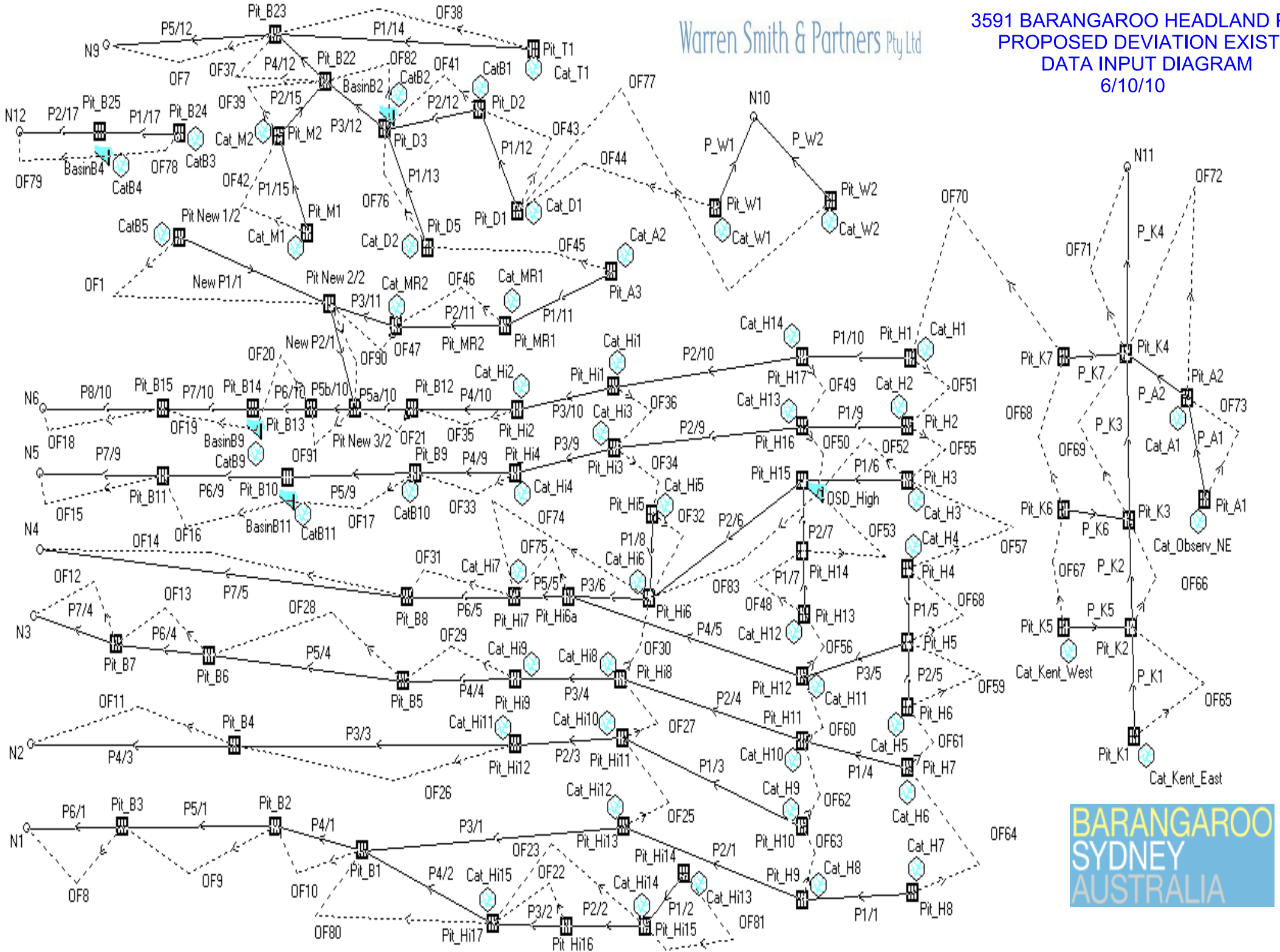
Underlying the upper and steep slope sections of the site is a clay liner (and overlying drainage layer) that assists in drainage capture, with this water reused in the irrigation system.

ATTACHMENT B

FLOOD STUDY – MODEL DATA AND RESULTS

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
PROPOSED DEVIATION EXISTING
DATA INPUT DIAGRAM
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
DRAINS DATA INPUT
DEVIATION OF STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

PIT / NODE DETAILS Version 9

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss
Pit_A1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	22.2		0	0	2023.254	-681.359	No	1	1 x Ku
Pit_A2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	21.2		0	0	1978.465	-509.665	No	7	1 x Ku
Pit_K4	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	21.19		0	0	1831.156	-436.01	No	8	1 x Ku
N11	Node					2		0		1834.142	-119.496		69	
Pit_K7	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	21.3		0	0	1678.871	-441.982	No	9	1 x Ku
Pit_K6	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	22.23		0	0	1679.866	-698.777	No	25	1 x Ku
Pit_K3	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	22.43		0	0	1837.128	-716.693	No	24	1 x Ku
Pit_K5	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	22.6		0	0	1678.871	-898.838	No	26	1 x Ku
Pit_K2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	22.58		0	0	1843.1	-898.838	No	27	1 x Ku
Pit_K1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	23.15		0	0	1849.072	-1083.97	No	28	1 x Ku
Pit_H8	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	18.29		0	0	1309.107	-1348.23	No	71	1 x Ku
Pit_H9	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	19.07		0	0	1040.368	-1358.32	No	72	1 x Ku
Pit_Hi13	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.65		0	0	607.4	-1236.25	No	943	1 x Ku
Pit_B1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.29		0	0	-29.61	-1276.07	No	1389	1 x Ku
Pit_B2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.46		0	0	-243.605	-1233.77	No	1396	1 x Ku
Pit_B3	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.48		0	0	-616.853	-1236.25	No	1402	1 x Ku
N1	Node					2		0		-848.267	-1238.74		1407	
Pit_H10	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	15.5		0	0	1040.368	-1235.63	No	73	1 x Ku
Pit_Hi11	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.3		0	0	602.424	-1084.47	No	938	1 x Ku
Pit_Hi12	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.42		0	0	343.638	-1096.91	No	939	1 x Ku
Pit_B4	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.46		0	0	-340.65	-1099.4	No	1367	1 x Ku
N2	Node					2		0		-838.314	-1096.91		1152	
Pit_H7	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	12.47		0	0	1299.153	-1136.72	No	74	1 x Ku
Pit_H11	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	12.45		0	0	1040.368	-1090.48	No	75	1 x Ku
Pit_Hi8	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.3		0	0	599.935	-984.934	No	909	1 x Ku
Pit_Hi9	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.37		0	0	343.638	-984.934	No	910	1 x Ku
Pit_B5	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.48		0	0	69.923	-989.91	No	928	1 x Ku
Pit_B6	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.48		0	0	-402.858	-945.121	No	1313	1 x Ku
Pit_B7	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.49		0	0	-631.783	-927.702	No	1314	1 x Ku
N3	Node					2		0		-830.849	-877.936		1151	
Pit_H6	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.83		0	0	1299.153	-1034.7	No	76	1 x Ku
Pit_H5	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.95		0	0	1299.153	-922.726	No	77	1 x Ku
Pit_H12	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.72		0	0	1042.096	-981.616	No	80	1 x Ku
Pit_Hi6a	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.34		0	0	473.031	-845.588	No	1937	1 x Ku
Pit_Hi7	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.34		0	0	341.15	-848.076	No	888	1 x Ku
Pit_B8	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.24		0	0	79.876	-848.076	No	1302	1 x Ku
N4	Node					2		0		-818.407	-765.962		1308	
Pit_H4	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.62		0	0	1299.153	-798.31	No	78	1 x Ku
Pit_H2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	13.22		0	0	1299.153	-559.431	No	81	1 x Ku
Pit_H16	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	13.17		0	0	1040.368	-558.256	No	140	1 x Ku
Pit_Hi3	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.21		0	0	585.005	-594.268	No	875	1 x Ku
Pit_Hi4	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.29		0	0	343.638	-636.569	No	876	1 x Ku
Pit_B9	OnGrade	Barangar	Grated Drain 6m L		1.5	2.23		0	0	97.295	-636.569	No	1262	1 x Ku
Pit_B10	OnGrade	Barangar	Grated Drain 6m L		1.5	2.16		0	0	-211.257	-644.034	No	1263	1 x Ku
Pit_B11	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.52		0	0	-517.32	-641.546	No	1264	1 x Ku
N5	Node					2		0		-815.919	-639.057		1289	
Pit_H3	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.71		0	0	1296.665	-649.011	No	136	1 x Ku
Pit_H15	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.52		0	0	1042.096	-649.84	No	82	1 x Ku
Pit_Hi6	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.28		0	0	669.608	-850.564	No	889	1 x Ku
Pit_H1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	16.45		0	0	1304.13	-442.48	No	139	1 x Ku
Pit_H17	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	16.33		0	0	1042.096	-440.752	No	141	1 x Ku
Pit_Hi1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.54		0	0	580.029	-492.246	No	864	1 x Ku
Pit_Hi2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.5		0	0	347.855	-530.332	No	865	1 x Ku
Pit_B12	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.7		0	0	89.83	-529.571	No	1213	1 x Ku
Pit New 3/2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.9		0	0	-49.516	-529.571	No	45830920	1 x Ku
Pit_B13	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.18		0	0	-154.026	-529.571	No	1214	1 x Ku
Pit_B14	OnGrade	Barangar	Grated Drain 6m L		1.5	2.64		0	0	-298.348	-529.571	No	1215	1 x Ku
Pit_B15	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.58		0	0	-514.832	-529.571	No	1216	1 x Ku
N6	Node					2		0		-808.454	-529.571		1228	
Pit_H13	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.53		0	0	1045.345	-875.448	No	149	1 x Ku
Pit_H14	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	9.52		0	0	1042.856	-768.45	No	83	1 x Ku
Pit_A3	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	16.41		0	0	577.264	-297.328	No	207	1 x Ku
Pit_MR1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	12.48		0	0	317.262	-388.235	No	206	1 x Ku
Pit_MR2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	16.42		0	0	50.017	-390.225	No	205	1 x Ku
Pit New 2/2	OnGrade	Barangar	Grated Drain 57m		1.5	2.9		0	0	-111.724	-352.9	No	45830893	1 x Ku
Pit_W1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	13.8		0	0	829.552	-190.192	No	218	1 x Ku
N10	Node					2		0		922.864	-34.672		226	
Pit_D5	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	6.01		0	0	127.155	-255.856	No	384	1 x Ku
Pit_D3	OnGrade	Barangar	Grated Drain 91m		1.5	4.12		0	0	25.133	-56.79	No	388	1 x Ku
Pit_B22	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.88		0	0	-121.677	25.324	No	419	1 x Ku
Pit_B23	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	3.1		0	0	-241.117	104.95	No	1497	1 x Ku
N9	Node					2		0		-656.666	85.044		427	
Pit_D1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	5.57		0	0	348.615	-196.136	No	385	1 x Ku
Pit_D2	OnGrade	Barangar	Grated Drain 57m		1.5	4.08		0	0	254.059	-21.954	No	387	1 x Ku
Pit_M1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	19.15		0	0	-163.979	-230.973	No	386	1 x Ku
Pit_M2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	12.98		0	0	-236.14	-66.744	No	389	1 x Ku
Pit_T1	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	3.46		0	0	385.94	80.067	No	390	1 x Ku
Pit_Hi5	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.23		0	0	674.585	-708.73	No	887	1 x Ku
Pit_Hi14	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.4		0	0	751.723	-1313.39	No	994	1 x Ku
Pit_Hi15	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.37		0	0	657.167	-1402.97	No	972	1 x Ku
Pit_Hi16	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.61		0	0	468.054	-1402.97	No	980	1 x Ku
Pit_Hi17	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	2.39		0	0	288.895	-1400.48	No	973	1 x Ku
Pit New 1/2	OnGrade	Barangar	Grated Drain 57m		1.5	2.8		0	0	-475.019	-238.438	No	1643	1 x Ku
Pit_W2	OnGrade	Sutherlar	Kerb inlet with 0.8		1.5	14.7		0	0	1110.041	-176.23	No	1966	1 x Ku
Pit_B24	OnGrade	Barangar	Grated Drain 57m		1.5	2.5		0	0	-475.019	-64.255	No	2046	1 x Ku
Pit_B25	OnGrade	Barangar	Grated Drain 57m		1.5	2.5		0	0	-671.596	-61.767	No	2047	1 x Ku
N12	Node					2		0		-868.173	-61.767		2048	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol.	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
OSD_High	9.52	84.9	0	None						1080.181	-671.405	No			1766
	9.97	84.9													
BasinB2	2.58	3700	0	None						35.087	-36.884	No			2143
	2.88	3700													
BasinB4	2.77	1725	0	None						-661.643	-101.58	No			2150
	2.97	1725													
BasinB9	2.16	2800	0	None						-290.883	-564.408	No			2197
	2.96	2800													

3591 BARANGAROO HEADLAND PARK
DRAINS DATA INPUT
DEVIATION OF STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

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BasinB11	2.16	2175	0	None				-208.769	-683.847	No		2198		
	2.66	2175												

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %
Cat_Observ_I	Pit_A1	1.11	5	95	0	5	5	5										0		
Cat_A1	Pit_A2	0.16	95	0	0	5	5	5										0		
Cat_Kent_We	Pit_K5	0.458	95	0	0	5	5	5										0		
Cat_Kent_Eas	Pit_K1	2.437	50	50	0	5	5	5										0		
Cat_H7	Pit_H8	0.026	95	5	0	5	5	5										0		
Cat_H8	Pit_H9	0.398	95	5	0	5	5	5										0		
Cat_Hi12	Pit_Hi13	0.064	95	5	0	5	5	5										0		
Cat_H9	Pit_H10	0.026	95	5	0	5	5	5										0		
Cat_Hi10	Pit_Hi11	0.06	95	5	0	5	5	5										0		
Cat_Hi11	Pit_Hi12	0.07	95	5	0	5	5	5										0		
Cat_H6	Pit_H7	0.096	95	5	0	5	5	5										0		
Cat_H10	Pit_H11	0.03	95	5	0	5	5	5										0		
Cat_Hi8	Pit_Hi8	0.08	95	5	0	5	5	5										0		
Cat_Hi9	Pit_Hi9	0.086	95	5	0	5	5	5										0		
Cat_H5	Pit_H6	0.049	95	5	0	5	5	5										0		
Cat_H11	Pit_H12	0.0392	95	5	0	5	5	5										0		
Cat_Hi7	Pit_Hi7	0.1	95	5	0	5	5	5										0		
Cat_H4	Pit_H4	0.26	95	5	0	5	5	5										0		
Cat_H2	Pit_H2	0.068	95	5	0	5	5	5										0		
Cat_H13	Pit_H16	0.04	95	5	0	5	5	5										0		
Cat_Hi3	Pit_Hi3	0.06	95	5	0	5	5	5										0		
Cat_Hi4	Pit_Hi4	0.089	95	5	0	5	5	5										0		
CatB10	Pit_B9	0.6	100	0	0	5	5	5										0		
Cat_H3	Pit_H3	0.37	95	5	0	5	5	5										0		
Cat_Hi6	Pit_Hi6	0.014	95	5	0	5	5	5										0		
Cat_H1	Pit_H1	0.486	95	5	0	5	5	5										0		
Cat_H14	Pit_H17	0.012	95	0	0	5	5	5										0		
Cat_Hi1	Pit_Hi1	0.07	95	5	0	5	5	5										0		
Cat_Hi2	Pit_Hi2	0.07	95	5	0	5	5	5										0		
Cat_H12	Pit_H13	0.044	95	5	0	5	5	5										0		
Cat_A2	Pit_A3	0.11	95	5	0	5	5	5										0		
Cat_MR1	Pit_MR1	0.145	50	50	0	5	5	5										0		
Cat_MR2	Pit_MR2	0.143	50	50	0	5	5	5										0		
Cat_W1	Pit_W1	0.084	95	5	0	5	5	5										0		
Cat_D2	Pit_D5	0.37	95	5	0	5	5	5										0		
Cat_D1	Pit_D1	0.093	95	5	0	5	5	5										0		
CatB1	Pit_D2	0.1785	100	0	0	5	5	5										0		
Cat_M1	Pit_M1	0.11	95	5	0	5	5	5										0		
Cat_M2	Pit_M2	0.69	50	50	0	5	5	5										0		
Cat_T1	Pit_T1	0.11	95	5	0	5	5	5										0		
Cat_Hi5	Pit_Hi5	0.077	95	5	0	5	5	5										0		
Cat_Hi13	Pit_Hi14	0.03	95	5	0	5	5	5										0		
Cat_Hi14	Pit_Hi15	0.17	95	5	0	5	5	5										0		
Cat_Hi15	Pit_Hi17	0.12	95	5	0	5	5	5										0		
CatB5	Pit New 1/2	0.161	100	0	0	5	5	5										0		
Cat_W2	Pit_W2	0.084	95	5	0	5	5	5										0		
CatB3	Pit_B24	0.184	100	0	0	5	5	5										0		
CatB2	BasinB2	0.74	100	0	0	5	5	5										0		
CatB4	BasinB4	0.345	100	0	0	5	5	5										0		
CatB9	BasinB9	0.56	100	0	0	5	5	5										0		
CatB11	BasinB11	0.435	100	0	0	5	5	5										0		

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
P_A1	Pit_A1	Pit_A2	64	21	20.3	1.09	Concrete,	375	375	0.3	New	1	Pit_A1	0					
P_A2	Pit_A2	Pit_K4	9	20.3	20.29	0.11	Concrete,	375	375	0.3	New	1	Pit_A2	0					
P_K4	Pit_K4	N11	50	20.29	1	38.58	Concrete,	375	375	0.3	New	1	Pit_K4	0					
P_K7	Pit_K7	Pit_K4	11	20.4	20.29	1	Concrete,	375	375	0.3	New	1	Pit_K7	0					
P_K6	Pit_K6	Pit_K3	11	21.58	21.53	0.45	Concrete,	375	375	0.3	New	1	Pit_K6	0					
P_K3	Pit_K3	Pit_K4	121	21.53	20.29	1.02	Concrete,	375	375	0.3	New	1	Pit_K3	0					
P_K5	Pit_K5	Pit_K2	11	21.7	21.68	0.18	Concrete,	375	375	0.3	New	1	Pit_K5	0					
P_K2	Pit_K2	Pit_K3	44	21.68	21.53	0.34	Concrete,	375	375	0.3	New	1	Pit_K2	0					
P_K1	Pit_K1	Pit_K2	113	22.25	21.68	0.5	Concrete,	375	375	0.3	New	1	Pit_K1	0					
P1/1	Pit_H8	Pit_H9	15	17.39	17.17	1.47	Concrete,	375	375	0.3	New	1	Pit_H8	0					
P2/1	Pit_H9	Pit_Hi13	27	1.59	1.43	0.59	Concrete,	375	375	0.3	New	1	Pit_H9	0					
P3/1	Pit_Hi13	Pit_B1	18	1.43	1.24	1.06	Concrete,	375	375	0.3	New	1	Pit_Hi13	0					
P4/1	Pit_B1	Pit_B2	23	1.24	1.13	0.48	Concrete,	375	375	0.3	New	1	Pit_B1	0					
P5/1	Pit_B2	Pit_B3	69	1.13	0.78	0.51	Concrete,	375	375	0.3	New	1	Pit_B2	0					
P6/1	Pit_B3	N1	90	0.78	0.33	0.5	Concrete,	375	375	0.3	New	1	Pit_B3	0					
P1/3	Pit_H10	Pit_Hi11	8	1.6	1.26	4.25	Concrete,	375	375	0.3	New	1	Pit_H10	0					
P2/3	Pit_Hi11	Pit_Hi12	27	1.4	1.26	0.52	Concrete,	375	375	0.3	New	1	Pit_Hi11	0					
P3/3	Pit_Hi12	Pit_B4	113	1.26	0.7	0.5	Concrete,	375	375	0.3	New	1	Pit_Hi12	0					
P4/3	Pit_B4	N2	88	0.7	0.26	0.5	Concrete,	375	375	0.3	New	1	Pit_B4	0					
P1/4	Pit_H7	Pit_H11	11	11.57	11.51	0.55	Concrete,	375	375	0.3	New	1	Pit_H7	0					
P2/4	Pit_H11	Pit_Hi8	5	1.5	1.4	2	Concrete,	375	375	0.3	New	1	Pit_H11	0					
P3/4	Pit_Hi8	Pit_Hi9	30	1.4	1.25	0.5	Concrete,	375	375	0.3	New	1	Pit_Hi8	0					
P4/4	Pit_Hi9	Pit_B5	41	1.25	1.04	0.51	Concrete,	375	375	0.3	New	1	Pit_Hi9	0					
P5/4	Pit_B5	Pit_B6	37	1.04	0.85	0.51	Concrete,	375	375	0.3	New	1	Pit_B5	0					
P6/4	Pit_B6	Pit_B7	36	0.85	0.67	0.5	Concrete,	375	375	0.3	New	1	Pit_B6	0					
P7/4	Pit_B7	N3	88	0.67	0.23	0.5	Concrete,	375	375	0.3	New	1	Pit_B7	0					
P2/5	Pit_H6	Pit_H5	6	8.95	8.16	13.17	Concrete,	225	225	0.3	New	1	Pit_H6	0					
P3/5	Pit_H5	Pit_H12	11	8.16	8.86	-6.36	Concrete,	375	375	0.3	New	1	Pit_H5	0					
P4/5	Pit_H12	Pit_Hi6a	24	1.6	1.1	2.08	Concrete,	450	450	0.3	New	1	Pit_H12	0					
P5/5	Pit_Hi6a	Pit_Hi7	14	1.07	1	0.5	Concrete,	450	450	0.3	New	1	Pit_Hi6a	0					
P6/5	Pit_Hi7	Pit_B8	32	1	0.84	0.5	Concrete,	450	450	0.3	New	1	Pit_Hi7	0					
P7/5	Pit_B8	N4	173	0.84	-0.025	0.5	Concrete,	450	450	0.3	New	1	Pit_B8	0					
P1/5	Pit_H4	Pit_H5	3	8.35	8.16	6.33	Concrete,	225	225	0.3	New	1	Pit_H4	0					
P1/9	Pit_H2	Pit_H16	11	12.32	12.19	1.18	Concrete,	225	225	0.3	New	1	Pit_H2	0					
P2/9	Pit_H16	Pit_Hi3	4.5	1.51	1.31	4.44	Concrete,	225	225	0.3	New	1	Pit_H16	0					
P3/9	Pit_Hi3	Pit_Hi4	23	1.13	0.6	2.3	Concrete,	450	450	0.3	New	1	Pit_Hi3	0					
P4/9	Pit_Hi4	Pit_B9	33	0.6	0.72	-0.36	Concrete,	450	450	0.3	New	1	Pit_Hi4	0					
P5/9	Pit_B9	Pit_B10	96	0.72	-0.041	0.79	Concrete,	600	600	0.3	New	1	Pit_B9	0					
P6/9	Pit_B10	Pit_B11	51	-0.041	-0.44	0.78	Concrete,	600	600	0.3	New	1	Pit_B10	0					
P7/9	Pit_B11	N5	29	-0.44	-0.69	0.86	Concrete,	600	600	0.3	New	1	Pit_B11	0					

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P1/6	Pit_H3	Pit_H15	11	8.81	8.45	3.27	Concrete,	225	225	0.3	New	1	Pit_H3	0
P2/6	Pit_H15	Pit_Hi6	4	1.5	1.38	3	Concrete,	375	375	0.3	New	1	Pit_H15	0
P3/6	Pit_Hi6	Pit_Hi6a	14	1.38	1.07	2.21	Concrete,	450	450	0.3	New	1	Pit_Hi6	0
P1/10	Pit_H1	Pit_H17	10.5	15.55	15.42	1.24	Concrete,	225	225	0.3	New	1	Pit_H1	0
P2/10	Pit_H17	Pit_Hi1	4.5	1.7	1.1	13.33	Concrete,	225	225	0.3	New	1	Pit_H17	0
P3/10	Pit_Hi1	Pit_Hi2	19	1.1	1.7	-3.16	Concrete,	225	225	0.3	New	1	Pit_Hi1	0
P4/10	Pit_Hi2	Pit_B12	49	1.7	1.1	1.22	Concrete,	450	450	0.3	New	1	Pit_Hi2	0
P5a/10	Pit_B12	Pit New 3	24	1.1	0.93	0.71	Concrete,	525	525	0.3	New	1	Pit_B12	0
P5b/10	Pit New 3/2	Pit_B13	40	0.93	0.78	0.38	Concrete,	525	525	0.3	New	1	Pit New 3/2	0
P6/10	Pit_B13	Pit_B14	22	0.64	0.54	0.45	Concrete,	525	525	0.3	New	1	Pit_B13	0
P7/10	Pit_B14	Pit_B15	51	0.67	0.42	0.49	Concrete,	525	525	0.3	New	1	Pit_B14	0
P8/10	Pit_B15	N6	29	0.42	0.27	0.52	Concrete,	525	525	0.3	New	1	Pit_B15	0
P1/7	Pit_H13	Pit_H14	8	8.92	8.8	1.5	Concrete,	300	300	0.3	New	1	Pit_H13	0
P2/7	Pit_H14	Pit_H15	0.5	8.8	8.32	96	Concrete,	300	300	0.3	New	1	Pit_H14	0
P1/11	Pit_A3	Pit_MR1	46	15.51	11.58	8.54	Concrete,	375	375	0.3	New	1	Pit_A3	0
P2/11	Pit_MR1	Pit_MR2	23	11.58	11.3	1.22	Concrete,	525	525	0.3	New	1	Pit_MR1	0
P3/11	Pit_MR2	Pit New 2	31	1.37	1.37	0	Concrete,	525	525	0.3	New	1	Pit_MR2	0
New P2/1	Pit New 2/2	Pit New 3	63	1.3	0.93	0.59	Concrete,	450	450	0.3	New	1	Pit New 2/2	0
P_W1	Pit_W1	N10	20	12.87	1	59.35	Concrete,	375	375	0.3	New	1	Pit_W1	0
P1/13	Pit_D5	Pit_D3	31	5.11	3.18	6.23	Concrete,	375	375	0.3	New	1	Pit_D5	0
P3/12	Pit_D3	Pit_B22	9	3.15	1.68	16.33	Concrete,	375	375	0.3	New	1	Pit_D3	0
P4/12	Pit_B22	Pit_B23	1	1.68	1.42	26	Concrete,	375	375	0.3	New	1	Pit_B22	0
P5/12	Pit_B23	N9	100	1.42	0.92	0.5	Concrete,	375	375	0.3	New	1	Pit_B23	0
P1/12	Pit_D1	Pit_D2	32	4.67	2.55	6.63	Concrete,	300	300	0.3	New	1	Pit_D1	0
P2/12	Pit_D2	Pit_D3	0.5	2.55	2.5	10	Concrete,	300	300	0.3	New	1	Pit_D2	0
P1/15	Pit_M1	Pit_M2	53	18.25	12.54	10.77	Concrete,	225	225	0.3	New	1	Pit_M1	0
P2/15	Pit_M2	Pit_B22	8	1.8	1.68	1.5	Concrete,	225	225	0.3	New	1	Pit_M2	0
P1/14	Pit_T1	Pit_B23	42	2.56	1.42	2.71	Concrete,	375	375	0.3	New	1	Pit_T1	0
P1/8	Pit_Hi5	Pit_Hi6	13	1.43	1.38	0.38	Concrete,	375	375	0.3	New	1	Pit_Hi5	0
P1/2	Pit_Hi14	Pit_Hi15	7	1.8	1.56	3.43	Concrete,	225	225	0.3	New	1	Pit_Hi14	0
P2/2	Pit_Hi15	Pit_Hi16	12	1.56	1.53	0.25	Concrete,	225	225	0.3	New	1	Pit_Hi15	0
P3/2	Pit_Hi16	Pit_Hi17	9	1.53	1.5	0.33	Concrete,	225	225	0.3	New	1	Pit_Hi16	0
P4/2	Pit_Hi17	Pit_B1	24	1.5	1.24	1.08	Concrete,	225	225	0.3	New	1	Pit_Hi17	0
New P1/1	Pit New 1/2	Pit New 2	66	1.53	1.3	0.35	Concrete,	450	450	0.3	New	1	Pit New 1/2	0
P_W2	Pit_W2	N10	60	13.77	1	21.28	Concrete,	375	375	0.3	New	1	Pit_W2	0
P1/17	Pit_B24	Pit_B25	56	1.6	1.18	0.75	Concrete,	375	375	0.3	New	1	Pit_B24	0
P2/17	Pit_B25	N12	102	1.18	0.67	0.5	Concrete,	375	375	0.3	New	1	Pit_B25	0

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height (m	Chg (m)	Bottom Elev (m)	Height of (m)	Chg (m)	Bottom Elev (m)	Height of Ser (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
OF73	Pit_A1	Pit_A2	2				Dummy us	0.3	0.3	0.6	1	0	446			20
OF72	Pit_A2	Pit_K4	2				Dummy us	0.3	0.3	0.6	1	0	507			20
OF71	Pit_K4	N11	2				Dummy us	0.3	0.3	0.6	1	0	498			20
OF70	Pit_K7	Pit_H1	2				Dummy us	0.3	0.3	0.6	1	0	502			20
OF68	Pit_K6	Pit_K7	2				Dummy us	0.3	0.3	0.6	1	0	560			20
OF69	Pit_K3	Pit_K4	2				Dummy us	0.3	0.3	0.6	1	0	488			20
OF67	Pit_K5	Pit_K6	2				Dummy us	0.3	0.3	0.6	1	0	550			20
OF66	Pit_K2	Pit_K3	2				Dummy us	0.3	0.3	0.6	1	0	486			20
OF65	Pit_K1	Pit_K2	2				Dummy us	0.3	0.3	0.6	1	0	450			20
OF64	Pit_H8	Pit_H7	2				Dummy us	0.3	0.3	0.6	1	0	320			20
OF63	Pit_H9	Pit_H10	2				Dummy us	0.3	0.3	0.6	1	0	334			20
OF25	Pit_Hi13	Pit_Hi11	2				Dummy us	0.3	0.3	0.6	1	0	1023			20
OF10	Pit_B1	Pit_B2	2				Dummy us	0.3	0.3	0.6	1	0	1410			20
OF9	Pit_B2	Pit_B3	2				Dummy us	0.3	0.3	0.6	1	0	1409			20
OF8	Pit_B3	N1	2				Dummy us	0.3	0.3	0.6	1	0	1417			20
OF62	Pit_H10	Pit_H11	2				Dummy us	0.3	0.3	0.6	1	0	339			20
OF27	Pit_Hi11	Pit_Hi8	2				Dummy us	0.3	0.3	0.6	1	0	1016			20
OF26	Pit_Hi12	Pit_B4	2				Dummy us	0.3	0.3	0.6	1	0	1057			20
OF11	Pit_B4	N2	2				Dummy us	0.3	0.3	0.6	1	0	1380			20
OF61	Pit_H7	Pit_H6	2				Dummy us	0.3	0.3	0.6	1	0	329			20
OF60	Pit_H11	Pit_H12	2				Dummy us	0.3	0.3	0.6	1	0	343			20
OF30	Pit_Hi8	Pit_Hi6	2				Dummy us	0.3	0.3	0.6	1	0	1012			20
OF29	Pit_Hi9	Pit_B5	2				Dummy us	0.3	0.3	0.6	1	0	1052			20
OF28	Pit_B5	Pit_B6	2				Dummy us	0.3	0.3	0.6	1	0	1337			20
OF13	Pit_B6	Pit_B7	2				Dummy us	0.3	0.3	0.6	1	0	1338			20
OF12	Pit_B7	N3	2				Dummy us	0.3	0.3	0.6	1	0	1339			20
OF59	Pit_H6	Pit_H5	2				Dummy us	0.3	0.3	0.6	1	0	317			20
OF68	Pit_H5	Pit_H4	2				Dummy us	0.3	0.3	0.6	1	0	286			20
OF56	Pit_H12	Pit_H13	2				Dummy us	0.3	0.3	0.6	1	0	346			20
OF75	Pit_Hi6a	Pit_Hi7	2				Dummy us	0.3	0.3	0.6	1	0	1945			20
OF31	Pit_Hi7	Pit_B8	2				Dummy us	0.3	0.3	0.6	1	0	1040			20
OF14	Pit_B8	N4	2				Dummy us	0.3	0.3	0.6	1	0	1334			20
OF57	Pit_H4	Pit_H3	2				Dummy us	0.3	0.3	0.6	1	0	294			20
OF55	Pit_H2	Pit_H3	2				Dummy us	0.3	0.3	0.6	1	0	285			20
OF50	Pit_H16	OSD_Hig	2				Dummy us	0.3	0.3	0.6	1	0	288			20
OF34	Pit_Hi3	Pit_Hi5	2				Dummy us	0.3	0.3	0.6	1	0	1002			20
OF33	Pit_Hi4	Pit_B9	2				Dummy us	0.3	0.3	0.6	1	0	1033			20
OF17	Pit_B9	BasinB11	2				Dummy us	0.3	0.3	0.6	1	0	1272			20
OF15	Pit_B11	N5	2				Dummy us	0.3	0.3	0.6	1	0	1298			20
OF52	Pit_H3	OSD_Hig	2				Dummy us	0.3	0.3	0.6	1	0	1734			20
OF74	Pit_Hi6	Pit_Hi7	2				Dummy us	0.3	0.3	0.6	1	0	1946			20
OF51	Pit_H1	Pit_H2	2				Dummy us	0.2	0.05	0.6	1	0	280			20
OF49	Pit_H17	Pit_H16	2				Dummy us	0.3	0.3	0.6	1	0	287			20
OF36	Pit_Hi1	Pit_Hi3	2				Dummy us	0.3	0.3	0.6	1	0	998			20
OF35	Pit_Hi2	Pit_B12	2				Dummy us	0.3	0.3	0.6	1	0	1027			20
OF21	Pit_B12	Pit New 3	2				Dummy us	0.3	0.3	0.6	1	0	1248			20
OF91	Pit New 3/2	Pit_B13	2				Dummy us	0.2	0.05	0.6	1	0	45830959			20
OF20	Pit_B13	BasinB9	2				Dummy us	0.3	0.3	0.6	1	0	1247			20
OF18	Pit_B15	N6	2				Dummy us	0.3	0.3	0.6	1	0	1250			20
OF48	Pit_H13	Pit_H14	2				Dummy us	0.3	0.3	0.6	1	0	312			20
OF53	Pit_H14	OSD_Hig	2				Dummy us	0.3	0.3	0.6	1	0	305			20
OF45	Pit_A3	Pit_D5	2				Dummy us	0.3	0.3	0.6	1	0	510			20

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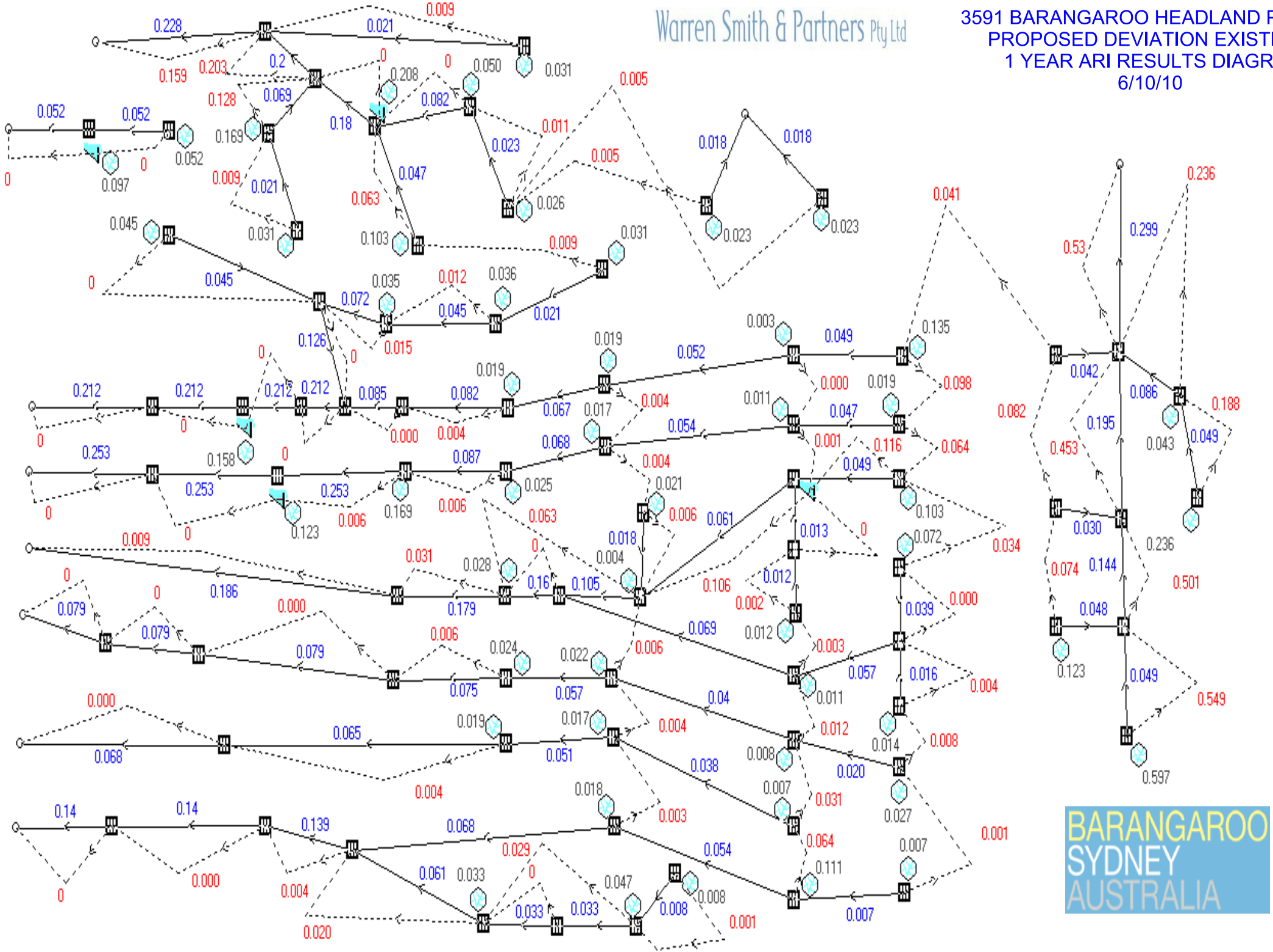
BARANGAROO SYDNEY AUSTRALIA

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OF46	Pit_MR1	Pit_MR2	2				Dummy us	0.3	0.3	0.6	1	0	520	20
OF47	Pit_MR2	Pit New 2	2				Dummy us	0.3	0.3	0.6	1	0	524	20
OF90	Pit New 2/2	Pit New 3	2				Dummy us	0.2	0.05	0.6	1	0	45830973	20
OF44	Pit_W1	Pit_D1	2				Dummy us	0.3	0.3	0.6	1	0	593	20
OF76	Pit_D5	Pit_D3	2				Dummy us	0.2	0.05	0.6	1	0	1994	20
OF37	Pit_B22	Pit_B23	2				Dummy us	0.3	0.3	0.6	1	0	1549	20
OF7	Pit_B23	N9	2				Dummy us	0.3	0.3	0.6	1	0	1509	20
OF43	Pit_D1	Pit_D2	2				Dummy us	0.3	0.3	0.6	1	0	1523	20
OF41	Pit_D2	Pit_D3	2				Dummy us	0.3	0.3	0.6	1	0	1529	20
OF42	Pit_M1	Pit_M2	2				Dummy us	0.3	0.3	0.6	1	0	530	20
OF39	Pit_M2	Pit_B22	2				Dummy us	0.3	0.3	0.6	1	0	1543	20
OF38	Pit_T1	Pit_B23	2				Dummy us	0.3	0.3	0.6	1	0	1519	20
OF32	Pit_Hi5	Pit_Hi6	2				Dummy us	0.3	0.3	0.6	1	0	1008	20
OF81	Pit_Hi14	Pit_Hi15	2				Dummy us	0.2	0.05	0.6	1	0	6230351	20
OF23	Pit_Hi15	Pit_Hi17	2				Dummy us	0.3	0.3	0.6	1	0	1066	20
OF22	Pit_Hi16	Pit_Hi17	2				Dummy us	0.3	0.3	0.6	1	0	1072	20
OF80	Pit_Hi17	Pit_B1	2				Dummy us	0.2	0.05	0.6	1	0	6230339	20
OF1	Pit New 1/2	Pit New 2	2				Dummy us	0.3	0.3	0.6	1	0	1647	20
OF83	OSD_High	Pit_Hi6	2	9.97	15	1.67	Dummy us	0.2	0.05	0.6	1	0	17825930	20
OF77	Pit_W2	Pit_D1	2				Dummy us	0.3	0.3	0.6	1	0	1980	20
OF78	Pit_B24	BasinB4	2				Dummy us	0.2	0.05	0.6	1	0	2065	20
OF82	BasinB2	Pit_B22	2	2.88	40	1.67	Dummy us	0.2	0.05	0.6	1	0	17825903	20
OF79	BasinB4	N12	2	2.97	30	1.67	Dummy us	0.2	0.05	0.6	1	0	2064	20
OF19	BasinB9	Pit_B15	2	2.96	30	1.67	Dummy us	0.3	0.3	0.6	1	0	1249	20
OF16	BasinB11	Pit_B11	2	2.66	30	1.67	Dummy us	0.3	0.3	0.6	1	0	1293	20

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3591 BARANGAROO HEADLAND PARK
PROPOSED DEVIATION EXISTING
1 YEAR ARI RESULTS DIAGRAM
6/10/10



BARANGAROO
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3591 BARANGAROO HEADLAND PARK
1 Year ARI Results
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BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

DRAINS results prepared 22 September, 2010 from Version 2010.04

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_A1	21.27		0.236		0.93	0.188	Inlet Capacity
Pit_A2	21.2		0.217		0	0.236	Outlet System
Pit_K4	21.19		0.578		0	0.53	Outlet System
N11	1.12		0.53				
Pit_K7	21.21		0.082		0.09	0.041	Inlet Capacity
Pit_K6	22.23		0.074		0	0.082	Outlet System
Pit_K3	22.23		0.501		0.2	0.453	Inlet Capacity
Pit_K5	22.58		0.123		0.02	0.074	Inlet Capacity
Pit_K2	22.56		0.549		0.02	0.501	Inlet Capacity
Pit_K1	22.64		0.597		0.51	0.549	Inlet Capacity
Pit_H8	17.48		0.007		0.81	0.001	Inlet Capacity
Pit_H9	1.93		0.111		17.14	0.064	Inlet Capacity
Pit_Hi13	1.89		0.018		0.76	0.003	Inlet Capacity
Pit_B1	1.84		0.02		0.45	0.004	Inlet Capacity
Pit_B2	1.64		0.004		0.82	0	Inlet Capacity
Pit_B3	1.26		0		1.22	0	None
N1	0.6		0				
Pit_H10	1.81		0.069		13.69	0.031	Inlet Capacity
Pit_Hi11	1.65		0.019		0.65	0.004	Inlet Capacity
Pit_Hi12	1.55		0.019		0.87	0.004	Inlet Capacity
Pit_B4	1		0.004		1.46	0	Inlet Capacity
N2	0.44		0				
Pit_H7	11.72		0.027		0.75	0.008	Inlet Capacity
Pit_H11	1.72		0.035		10.73	0.012	Inlet Capacity
Pit_Hi8	1.67		0.025		0.63	0.006	Inlet Capacity
Pit_Hi9	1.56		0.024		0.81	0.006	Inlet Capacity
Pit_B5	1.36		0.006		1.12	0	Inlet Capacity
Pit_B6	1.17		0		1.31	0	None
Pit_B7	0.99		0		1.5	0	None
N3	0.42		0				
Pit_H6	9.28		0.019		0.55	0.004	Inlet Capacity
Pit_H5	9.26		0.004		0.69	0	Inlet Capacity
Pit_H12	1.88		0.018		7.84	0.003	Inlet Capacity
Pit_Hi6a	1.68		0		0.66	0	None
Pit_Hi7	1.57		0.068		0.77	0.031	Inlet Capacity
Pit_B8	1.39		0.031		0.85	0.009	Inlet Capacity
N4	0.27		0.009				
Pit_H4	9.35		0.072		0.27	0.034	Inlet Capacity
Pit_H2	12.65		0.111		0.57	0.064	Inlet Capacity
Pit_H16	1.87		0.011		11.3	0.001	Inlet Capacity
Pit_Hi3	1.41		0.02		0.8	0.004	Inlet Capacity
Pit_Hi4	1.28		0.025		1.01	0.006	Inlet Capacity
Pit_B9	1.24		0.174		0.99	0.006	Inlet Capacity
Pit_B10	0.48		0		1.68		None
Pit_B11	0.08		0		2.44	0	None
N5	-0.44		0				
Pit_H3	9.15		0.164		0.56	0.116	Inlet Capacity
Pit_H15	1.79		0		7.73		None
Pit_Hi6	1.74		0.11		0.54	0.063	Inlet Capacity
Pit_H1	15.89		0.146		0.56	0.098	Inlet Capacity
Pit_H17	2.65		0.003		13.68	0	Inlet Capacity
Pit_Hi1	2.49		0.019		0.05	0.004	Inlet Capacity
Pit_Hi2	2.01		0.019		0.49	0.004	Inlet Capacity
Pit_B12	1.46		0.004		1.24	0	Inlet Capacity
Pit New 3/2	1.43		0		1.47	0	None
Pit_B13	1.28		0		0.9	0	None
Pit_B14	1.17		0		1.47		None
Pit_B15	0.92		0		1.66	0	None
N6	0.55		0				
Pit_H13	9.04		0.014		0.49	0.002	Inlet Capacity
Pit_H14	8.93		0.002		0.59	0	None
Pit_A3	15.67		0.031		0.74	0.009	Inlet Capacity
Pit_MR1	11.79		0.036		0.69	0.012	Inlet Capacity
Pit_MR2	1.72		0.042		14.7	0.015	Inlet Capacity
Pit New 2/2	1.69		0.015		1.21	0	None
Pit_W1	13.01		0.023		0.79	0.005	Inlet Capacity
N10	1.03		0				
Pit_D5	5.35		0.11		0.66	0.063	Inlet Capacity
Pit_D3	3.72		0.063		0.4		None
Pit_B22	2.88		0.128		0	0.203	Outlet System
Pit_B23	2.72		0.207		0.38	0.159	Inlet Capacity
N9	1.25		0.159				
Pit_D1	4.85		0.034		0.72	0.011	Inlet Capacity
Pit_D2	3.82		0.059		0.26	0	None
Pit_M1	18.44		0.031		0.71	0.009	Inlet Capacity
Pit_M2	3.23		0.176		9.75	0.128	Inlet Capacity
Pit_T1	2.74		0.031		0.72	0.009	Inlet Capacity
Pit_Hi5	1.74		0.024		0.49	0.006	Inlet Capacity
Pit_Hi14	2.37		0.008		0.03	0.001	Inlet Capacity
Pit_Hi15	2.37		0.048		0	0.029	Outlet System
Pit_Hi16	2.31		0		0.3	0	None
Pit_Hi17	2.26		0.052		0.13	0.02	Inlet Capacity
Pit New 1/2	1.75		0.045		1.05	0	None
Pit_W2	13.91		0.023		0.79	0.005	Inlet Capacity
Pit_B24	1.85		0.052		0.65	0	None
Pit_B25	1.43		0		1.07		None
N12	0.82		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_Observ_N	0.236	0.015	0.222	5	5	5	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
Cat_A1	0.043	0.043	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Kent_We	0.123	0.123	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Kent_Eas	0.597	0.343	0.254	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H7	0.007	0.007	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H8	0.111	0.106	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi12	0.018	0.017	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H9	0.007	0.007	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi10	0.017	0.016	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi11	0.019	0.019	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H6	0.027	0.026	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H10	0.008	0.008	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi8	0.022	0.021	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi9	0.024	0.023	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H5	0.014	0.013	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H11	0.011	0.01	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

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Cat_Hi7	0.028	0.027	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H4	0.072	0.07	0.003	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H2	0.019	0.018	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H13	0.011	0.011	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi3	0.017	0.016	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi4	0.025	0.024	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB10	0.169	0.169	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H3	0.103	0.099	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi6	0.004	0.004	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H1	0.135	0.13	0.005	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H14	0.003	0.003	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi1	0.019	0.019	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi2	0.019	0.019	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H12	0.012	0.012	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_A2	0.031	0.029	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_MR1	0.036	0.02	0.015	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_MR2	0.035	0.02	0.015	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_W1	0.023	0.022	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_D2	0.103	0.099	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_D1	0.026	0.025	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB1	0.05	0.05	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_M1	0.031	0.029	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_M2	0.169	0.097	0.072	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_T1	0.031	0.029	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi5	0.021	0.021	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi13	0.008	0.008	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi14	0.047	0.045	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi15	0.033	0.032	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB5	0.045	0.045	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_W2	0.023	0.022	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB3	0.052	0.052	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB2	0.208	0.208	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB4	0.097	0.097	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB9	0.158	0.158	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB11	0.123	0.123	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

Outflow Volumes for Total Catchment (9.42 impervious + 2.96 pervious = 12.4 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runo cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 1 year,	1062.63	721.84 (67.9%)	714.01 (88.3%)	7.82 (3.1%)
AR&R 1 year,	1630.06	1222.09 (75.0%)	1145.56 (92.4%)	76.54 (19.6%)
AR&R 1 year,	2042.73	1584.33 (77.6%)	1459.41 (93.9%)	124.93 (25.5%)
AR&R 1 year,	2393.51	1895.09 (79.2%)	1726.19 (94.8%)	168.90 (29.5%)
AR&R 1 year,	2682.38	2134.42 (79.6%)	1945.87 (95.4%)	188.55 (29.4%)
AR&R 1 year,	2921.73	2330.27 (79.8%)	2127.91 (95.8%)	202.36 (28.9%)
AR&R 1 year,	3519.07	2842.09 (80.8%)	2582.21 (96.5%)	259.88 (30.8%)
AR&R 1 year,	3986.42	3237.61 (81.2%)	2937.66 (96.9%)	299.95 (31.4%)
AR&R 1 year,	4624.01	3749.99 (81.1%)	3422.56 (97.3%)	327.44 (29.6%)
AR&R 1 year,	5125.4	4162.76 (81.2%)	3803.87 (97.6%)	358.89 (29.2%)
AR&R 1 year,	5905.36	4785.62 (81.0%)	4397.00 (97.9%)	388.62 (27.5%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P_A1	0.049	0.7	21.235	21.2	AR&R 1 year, 15 minutes storm, average 66 mm/h, Zone 1
P_A2	0.086	0.8	21.2	21.19	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P_K4	0.299	10	20.408	1.118	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
P_K7	0.042	0.4	21.207	21.19	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P_K6	0.03	0.3	22.23	22.232	AR&R 1 year, 5 minutes storm, average 103 mm/h, Zone 1
P_K3	0.195	1.8	22.029	21.19	AR&R 1 year, 30 minutes storm, average 47.2 mm/h, Zone 1
P_K5	0.048	0.4	22.565	22.559	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_K2	0.144	1.3	22.428	22.232	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_K1	0.049	0.4	22.618	22.559	AR&R 1 year, 3 hours storm, average 15.9 mm/h, Zone 1
P1/1	0.007	1	17.432	17.212	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/1	0.054	0.5	1.905	1.887	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/1	0.068	0.6	1.858	1.839	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/1	0.139	1.3	1.722	1.637	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/1	0.14	1.3	1.526	1.262	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/1	0.14	1.6	1.085	0.604	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/3	0.038	2.8	1.668	1.652	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/3	0.051	1.2	1.551	1.551	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P3/3	0.065	1.3	1.432	0.998	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/3	0.068	1.3	0.876	0.436	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/4	0.02	1.1	11.654	11.594	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/4	0.04	0.8	1.669	1.669	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P3/4	0.057	1.2	1.564	1.564	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/4	0.075	1.4	1.434	1.365	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/4	0.079	1.4	1.23	1.175	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/4	0.079	1.4	1.041	0.995	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/4	0.079	1.4	0.861	0.421	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/5	0.016	0.4	9.268	9.263	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/5	0.057	1.1	9.243	9.033	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/5	0.069	2.4	1.707	1.681	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/5	0.16	1	1.604	1.574	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/5	0.179	1.1	1.477	1.391	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/5	0.186	1.7	1.132	0.267	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/5	0.039	1	9.277	9.263	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/9	0.047	1.7	12.468	12.338	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/9	0.054	2.9	1.616	1.416	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/9	0.068	1.3	1.29	1.28	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/9	0.087	0.5	1.258	1.237	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/9	0.253	2.2	0.978	0.476	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/9	0.253	2.2	0.218	0.077	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/9	0.253	2.2	-0.187	-0.437	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/6	0.049	2.6	8.919	8.559	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
P2/6	0.061	0.8	1.737	1.737	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/6	0.105	0.9	1.691	1.681	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
P1/10	0.049	1.7	15.699	15.569	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/10	0.052	1.3	2.523	2.486	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/10	0.067	1.7	2.27	2.007	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/10	0.082	2	1.84	1.457	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5a/10	0.085	0.6	1.43	1.43	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5b/10	0.212	1.3	1.309	1.275	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/10	0.212	1	1.202	1.166	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/10	0.212	1.8	0.954	0.916	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P8/10	0.212	1.8	0.7	0.55	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/7	0.012	1.4	8.973	8.93	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/7	0.013	6.1	8.821	8.341	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/11	0.021	2.8	15.555	11.789	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/11	0.045	1.8	11.671	11.391	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/11	0.072	0.5	1.705	1.693	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
New P2/1	0.126	1.7	1.518	1.43	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_W1	0.018	5.6	12.895	1.025	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

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Warren Smith & Partners

P1/13	0.047	3.4	5.179	3.721	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/12	0.18	6.4	3.264	2.88	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/12	0.2	1.8	2.722	2.722	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P5/12	0.228	2.2	2.397	1.252	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/12	0.023	2.9	4.721	3.823	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/12	0.082	1.2	3.721	3.721	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/15	0.021	3.4	18.298	12.588	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/15	0.069	1.7	3	2.88	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/14	0.021	0.5	2.726	2.722	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/8	0.018	0.2	1.737	1.737	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/2	0.008	0.2	2.372	2.37	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/2	0.033	0.8	2.336	2.309	AR&R 1 year, 5 minutes storm, average 103 mm/h, Zone 1
P3/2	0.033	0.8	2.275	2.255	AR&R 1 year, 5 minutes storm, average 103 mm/h, Zone 1
P4/2	0.061	1.5	2.092	1.839	AR&R 1 year, 15 minutes storm, average 66 mm/h, Zone 1
New P1/1	0.045	0.9	1.693	1.693	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_W2	0.018	3	13.808	1.038	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/17	0.052	1.4	1.736	1.435	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/17	0.052	1.2	1.332	0.822	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
OF73	0.188	0.188	19.77	0.044	0.03	12.89	0.6	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
OF72	0.236	0.236	19.77	0.048	0.03	13.61	0.65	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF71	0.53	0.53	19.77	0.067	0.05	17.38	0.81	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF70	0.041	0.041	19.77	0.025	0.01	8.23	0.4	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF68	0.082	0.082	19.77	0.033	0.02	10.56	0.46	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF69	0.453	0.453	19.77	0.063	0.05	16.66	0.76	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF67	0.074	0.074	19.77	0.031	0.01	10.2	0.47	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF66	0.501	0.501	19.77	0.066	0.05	17.2	0.78	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF65	0.549	0.549	19.77	0.068	0.06	17.56	0.82	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF64	0.001	0.001	19.77	0.005	0	1.65	0.13	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF63	0.064	0.064	19.77	0.03	0.01	10.02	0.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF25	0.003	0.003	19.77	0.009	0	3.14	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF10	0.004	0.004	19.77	0.01	0	3.44	0.23	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF9	0	0	19.77	0	0	0	0	
OF8	0	0	19.77	0	0	0	0	
OF62	0.031	0.031	19.77	0.023	0.01	7.63	0.35	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF27	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF26	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF11	0	0	19.77	0	0	0	0	
OF61	0.008	0.008	19.77	0.013	0	4.34	0.27	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF60	0.012	0.012	19.77	0.016	0	5.24	0.28	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF30	0.006	0.006	19.77	0.012	0	4.04	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF29	0.006	0.006	19.77	0.012	0	4.04	0.23	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF28	0	0	19.77	0	0	0	0	
OF13	0	0	19.77	0	0	0	0	
OF12	0	0	19.77	0	0	0	0	
OF59	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF68	0	0	19.77	0	0	0	0	
OF56	0.003	0.003	19.77	0.009	0	3.14	0.22	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF75	0	0	19.77	0	0	0	0	
OF31	0.031	0.031	19.77	0.023	0.01	7.63	0.35	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF14	0.009	0.009	19.77	0.015	0	4.94	0.26	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF57	0.034	0.034	19.77	0.024	0.01	7.93	0.36	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF55	0.064	0.064	19.77	0.03	0.01	10.02	0.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF50	0.001	0.001	19.77	0.007	0	2.25	0.16	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF34	0.004	0.004	19.77	0.01	0	3.44	0.22	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF33	0.006	0.006	19.77	0.012	0	4.04	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF17	0.006	0.006	19.77	0.012	0	4.04	0.24	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF15	0	0	19.77	0	0	0	0	
OF52	0.116	0.116	19.77	0.037	0.02	11.45	0.51	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF74	0.063	0.063	19.77	0.029	0.01	9.73	0.44	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF51	0.098	0.098	0.256	0.035	0.02	10.91	0.5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF49	0	0	19.77	0	0	0	0	
OF36	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF35	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF21	0	0	19.77	0	0	0	0	
OF91	0	0	0.256	0	0	0	0	
OF20	0	0	19.77	0	0	0	0	
OF18	0	0	19.77	0	0	0	0	
OF48	0.002	0.002	19.77	0.008	0	2.54	0.19	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF53	0	0	19.77	0	0	0	0	
OF45	0.009	0.009	19.77	0.015	0	4.94	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF46	0.012	0.012	19.77	0.016	0	5.24	0.29	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF47	0.015	0.015	19.77	0.018	0.01	5.84	0.3	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF90	0	0	0.256	0	0	0	0	
OF44	0.005	0.005	19.77	0.012	0	4.04	0.22	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF76	0.063	0.063	0.256	0.03	0.01	10.02	0.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF37	0.203	0.203	19.77	0.045	0.03	13.07	0.62	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF7	0.159	0.159	19.77	0.042	0.02	12.35	0.57	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF43	0.011	0.011	19.77	0.016	0	5.24	0.27	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF41	0	0	19.77	0	0	0	0	
OF42	0.009	0.009	19.77	0.015	0	4.94	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF39	0.128	0.128	19.77	0.038	0.02	11.63	0.54	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF38	0.009	0.009	19.77	0.015	0	4.94	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF32	0.006	0.006	19.77	0.012	0	4.04	0.24	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF81	0.001	0.001	0.256	0.006	0	1.95	0.12	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF23	0.029	0.029	19.77	0.022	0.01	7.33	0.36	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF22	0	0	19.77	0	0	0	0	
OF80	0.02	0.02	0.256	0.019	0.01	6.44	0.32	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF1	0	0	19.77	0	0	0	0	
OF83	0.106	0.106	0.256	0.035	0.02	11.09	0.51	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF77	0.005	0.005	19.77	0.012	0	4.04	0.22	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF78	0	0	0.256	0	0	0	0	
OF82	0	0	0.256	0	0	0	0	
OF79	0	0	0.256	0	0	0	0	
OF19	0	0	19.77	0	0	0	0	
OF16	0	0	19.77	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD_High	10	40.4	0.106	0	0.106
BasinB2	2.67	345.6	0	0	0
BasinB4	2.86	161.1	0	0	0
BasinB9	2.25	261.5	0	0	0
BasinB11	2.25	206.5	0	0	0

CONTINUITY CHECK for AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1

3591 BARANGAROO HEADLAND PARK
1 Year ARI Results
DEVIATION OF STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

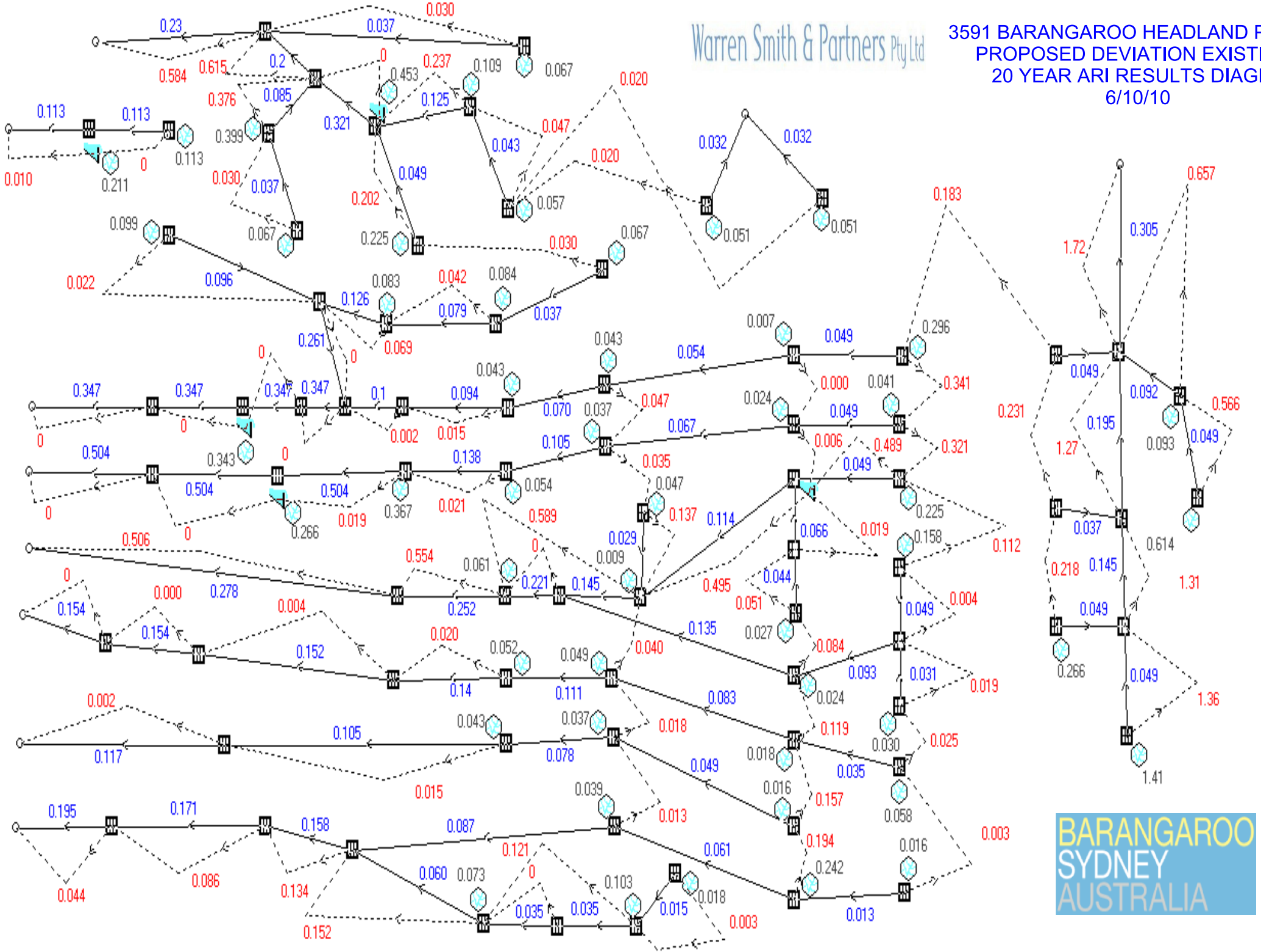
Warren Smith & Partners

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit_A1	136.64	136.61	0	0
Pit_A2	191.87	191.8	0	0
Pit_K4	917.72	917.73	0	0
N11	917.73	917.73	0	0
Pit_K7	29.48	29.42	0	0.2
Pit_K6	56.04	56	0	0.1
Pit_K3	706.02	705.77	0	0
Pit_K5	158.16	158.15	0	0
Pit_K2	679.61	679.5	0	0
Pit_K1	577.5	577.5	0	0
Pit_H8	9.12	9.04	0	0.9
Pit_H9	148.49	148.48	0	0
Pit_Hi13	124.75	124.64	0	0.1
Pit_B1	235.16	235.05	0	0
Pit_B2	235.05	235.05	0	0
Pit_B3	235.05	235.05	0	0
N1	235.05	235.05	0	0
Pit_H10	55.3	55.26	0	0.1
Pit_Hi11	64.72	64.61	0	0.2
Pit_Hi12	87.53	87.44	0	0.1
Pit_B4	87.44	87.41	0	0
N2	87.41	87.41	0	0
Pit_H7	33.87	33.78	0	0.3
Pit_H11	53.75	53.68	0	0.1
Pit_Hi8	80.39	80.31	0	0.1
Pit_Hi9	107.58	107.5	0	0.1
Pit_B5	107.5	107.47	0	0
Pit_B6	107.47	107.47	0	0
Pit_B7	107.47	107.47	0	0
N3	107.47	107.47	0	0
Pit_H6	20.87	20.71	0	0.8
Pit_H5	88.61	88.67	0	-0.1
Pit_H12	105.41	105.33	0	0.1
Pit_Hi6a	287.2	287.2	0	0
Pit_Hi7	336.42	336.33	0	0
Pit_B8	336.33	336.26	0	0
N4	336.26	336.26	0	0
Pit_H4	91.22	91.2	0	0
Pit_H2	92.89	92.85	0	0
Pit_H16	77.88	77.79	0	0.1
Pit_Hi3	100.17	100.06	0	0.1
Pit_Hi4	129.59	129.51	0	0.1
Pit_B9	347.61	347.6	0	0
Pit_B10	343.92	343.92	0	0
Pit_B11	343.92	343.92	0	0
N5	343.92	343.92	0	0
Pit_H3	182.11	182.11	0	0
Pit_H15	123.3	123.3	0	0
Pit_Hi6	196.97	196.92	0	0
Pit_H1	179.78	179.78	0	0
Pit_H17	114.89	114.85	0	0
Pit_Hi1	139.41	139.31	0	0.1
Pit_Hi2	162	161.9	0	0.1
Pit_B12	161.9	161.88	0	0
Pit New 3/2	322.22	322.22	0	0
Pit_B13	322.22	322.22	0	0
Pit_B14	322.22	322.62	0	-0.1
Pit_B15	322.62	322.62	0	0
N6	322.62	322.62	0	0
Pit_H13	16.35	16.26	0	0.6
Pit_H14	16.26	16.26	0	0
Pit_A3	38.59	38.49	0	0.3
Pit_MR1	68.07	68	0	0.1
Pit_MR2	101.89	101.82	0	0.1
Pit New 2/2	160.34	160.34	0	0
Pit_W1	29.47	29.39	0	0.3
N10	53.27	53.27	0	0
Pit_D5	134.6	134.59	0	0
Pit_D3	237.54	237.4	0	0.1
Pit_B22	439.4	439.35	0	0
Pit_B23	477.85	477.86	0	0
N9	477.86	477.86	0	0
Pit_D1	38.14	38.06	0	0.2
Pit_D2	102.95	102.95	0	0
Pit_M1	38.59	38.49	0	0.3
Pit_M2	202	202	0	0
Pit_T1	38.59	38.49	0	0.3
Pit_Hi5	28.72	28.63	0	0.3
Pit_Hi14	10.53	10.45	0	0.7
Pit_Hi15	70.09	70.02	0	0.1
Pit_Hi16	58.41	58.39	0	0
Pit_Hi17	112.1	112.05	0	0
Pit New 1/2	58.52	58.52	0	0
OSD_High	75.6	37.22	38.21	0.2
Pit_W2	29.47	29.39	0	0.3
Pit_B24	66.88	66.88	0	0
Pit_B25	66.88	66.88	0	0
N12	66.88	66.88	0	0
BasinB2	268.99	0	268.99	0
BasinB4	125.41	0	125.41	0
BasinB9	203.56	0	203.56	0
BasinB11	161.8	0	161.8	0

Run Log for 3591_Deviation_Ex_Catchment_100915.drn run at 14:40:43 on 22/9/2010

Upwelling occurred at Pit_B22, Pit_K6, Pit_A2
Freeboard was less than 0.15m at Pit_Hi14, Pit_Hi17, Pit_Hi15, Pit_Hi1, Pit_K2, Pit_K5, Pit_K7, Pit_K4

The following overflow routes carried water uphill (adding energy): OF74, OF52, OF37, OF10, OF23, OF26, OF29, OF35, OF32, OF34, OF46, OF59, OF57
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.


Warren Smith & Partners Pty Ltd
3591 BARANGAROO HEADLAND PARK
PROPOSED DEVIATION EXISTING
20 YEAR ARI RESULTS DIAGRAM
6/10/10
BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
20 Year ARI Results
DEVIATION OF STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

DRAINS results prepared 22 September, 2010 from Version 2010.04

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_A1	21.27		0.614	0.93	0.566	Inlet Capacity	
Pit_A2	21.2		0.63	0	0.657	Outlet System	
Pit_K4	21.19		1.772	0	1.724	Outlet System	
N11	0.5		1.724				
Pit_K7	21.22		0.231	0.08	0.183	Inlet Capacity	
Pit_K6	22.23		0.218	0	0.231	Outlet System	
Pit_K3	22.23		1.313	0.2	1.265	Inlet Capacity	
Pit_K5	22.58		0.266	0.02	0.218	Inlet Capacity	
Pit_K2	22.56		1.361	0.02	1.313	Inlet Capacity	
Pit_K1	22.64		1.409	0.51	1.361	Inlet Capacity	
Pit_H8	17.51		0.016	0.78	0.003	Inlet Capacity	
Pit_H9	2.41		0.242	16.66	0.194	Inlet Capacity	
Pit_Hi13	2.37		0.039	0.28	0.013	Inlet Capacity	
Pit_B1	2.29		0.152	0	0.134	Outlet System	
Pit_B2	2.17		0.134	0.29	0.086	Inlet Capacity	
Pit_B3	1.67		0.086	0.81	0.044	Inlet Capacity	
N1	0.65		0.044				
Pit_H10	1.85		0.205	13.65	0.157	Inlet Capacity	
Pit_Hi11	1.78		0.048	0.52	0.018	Inlet Capacity	
Pit_Hi12	1.7		0.043	0.72	0.015	Inlet Capacity	
Pit_B4	1.16		0.015	1.3	0.002	Inlet Capacity	
N2	0.5		0.002				
Pit_H7	11.78		0.06	0.69	0.025	Inlet Capacity	
Pit_H11	2.35		0.167	10.1	0.119	Inlet Capacity	
Pit_Hi8	2.3		0.063	0	0.04	Outlet System	
Pit_Hi9	2.16		0.052	0.21	0.02	Inlet Capacity	
Pit_B5	1.87		0.02	0.61	0.004	Inlet Capacity	
Pit_B6	1.54		0.004	0.94	0	Inlet Capacity	
Pit_B7	1.2		0	1.29	0	None	
N3	0.5		0				
Pit_H6	9.32		0.051	0.51	0.019	Inlet Capacity	
Pit_H5	9.28		0.019	0.67	0.004	Inlet Capacity	
Pit_H12	2.36		0.133	7.36	0.084	Inlet Capacity	
Pit_Hi6a	2.27		0	0.07	0	None	
Pit_Hi7	2.13		0.602	0.21	0.554	Inlet Capacity	
Pit_B8	1.83		0.554	0.41	0.506	Inlet Capacity	
N4	0.5		0.506				
Pit_H4	9.42		0.16	0.2	0.112	Inlet Capacity	
Pit_H2	12.66		0.369	0.56	0.321	Inlet Capacity	
Pit_H16	2.49		0.025	10.68	0.006	Inlet Capacity	
Pit_Hi3	2.21		0.075	0	0.035	Outlet System	
Pit_Hi4	2.15		0.054	0.14	0.021	Inlet Capacity	
Pit_B9	2.04		0.385	0.19	0.019	Inlet Capacity	
Pit_B10	1.36		0	0.8		None	
Pit_B11	0.88		0	1.64	0	None	
N5	0.5		0				
Pit_H3	9.15		0.537	0.56	0.489	Inlet Capacity	
Pit_H15	2.37		0	7.15		None	
Pit_Hi6	2.28		0.636	0	0.589	Outlet System	
Pit_H1	15.89		0.389	0.56	0.341	Inlet Capacity	
Pit_H17	2.73		0.007	13.6	0	Inlet Capacity	
Pit_Hi1	2.54		0.043	0	0.047	Outlet System	
Pit_Hi2	2.27		0.043	0.23	0.015	Inlet Capacity	
Pit_B12	2.23		0.015	0.47	0.002	Inlet Capacity	
Pit New 3/2	2.21		0.002	0.69	0	None	
Pit_B13	1.84		0	0.34	0	None	
Pit_B14	1.54		0	1.1		None	
Pit_B15	1.12		0	1.46	0	None	
N6	0.5		0				
Pit_H13	9.21		0.095	0.32	0.051	Inlet Capacity	
Pit_H14	9.16		0.051	0.36	0.019	Inlet Capacity	
Pit_A3	15.72		0.067	0.69	0.03	Inlet Capacity	
Pit_MR1	11.86		0.084	0.62	0.042	Inlet Capacity	
Pit_MR2	2.8		0.117	13.62	0.069	Inlet Capacity	
Pit New 2/2	2.77		0.092	0.13	0	None	
Pit_W1	13.06		0.051	0.74	0.02	Inlet Capacity	
N10	0.5		0				
Pit_D5	5.36		0.25	0.65	0.202	Inlet Capacity	
Pit_D3	4.12		0.413	0		Outlet System	
Pit_B22	2.88		0.376	0	0.615	Outlet System	
Pit_B23	2.75		0.632	0.35	0.584	Inlet Capacity	
N9	0.5		0.584				
Pit_D1	4.92		0.09	0.65	0.047	Inlet Capacity	
Pit_D2	4.08		0.147	0	0.237	Outlet System	
Pit_M1	18.54		0.067	0.61	0.03	Inlet Capacity	
Pit_M2	3.42		0.424	9.56	0.376	Inlet Capacity	
Pit_T1	2.79		0.067	0.67	0.03	Inlet Capacity	
Pit_Hi5	2.23		0.068	0	0.137	Outlet System	
Pit_Hi14	2.39		0.018	0.01	0.003	Inlet Capacity	
Pit_Hi15	2.37		0.106	0	0.121	Outlet System	
Pit_Hi16	2.39		0	0.22	0	None	
Pit_Hi17	2.39		0.18	0	0.152	Outlet System	
Pit New 1/2	2.8		0.099	0	0.022	Outlet System	
Pit_W2	13.96		0.051	0.74	0.02	Inlet Capacity	
Pit_B24	2.05		0.113	0.45	0	None	
Pit_B25	1.63		0	0.87		None	
N12	0.5		0.01				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_Observ_N	0.614	0.033	0.581	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
Cat_A1	0.093	0.093	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Kent_We	0.266	0.266	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Kent_Eas	1.409	0.746	0.664	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H7	0.016	0.015	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H8	0.242	0.231	0.011	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi12	0.039	0.037	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H9	0.016	0.015	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi10	0.037	0.035	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi11	0.043	0.041	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H6	0.058	0.056	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H10	0.018	0.017	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi8	0.049	0.047	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi9	0.052	0.05	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H5	0.03	0.028	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H11	0.024	0.023	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi7	0.061	0.058	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H4	0.158	0.151	0.007	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

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Cat_H2	0.041	0.04	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H13	0.024	0.023	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi3	0.037	0.035	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi4	0.054	0.052	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB10	0.367	0.367	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H3	0.225	0.215	0.01	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi6	0.009	0.008	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H1	0.296	0.283	0.013	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H14	0.007	0.007	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi1	0.043	0.041	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi2	0.043	0.041	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H12	0.027	0.026	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_A2	0.067	0.064	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_MR1	0.084	0.044	0.039	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_MR2	0.083	0.044	0.039	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_W1	0.051	0.049	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_D2	0.225	0.215	0.01	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_D1	0.057	0.054	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB1	0.109	0.109	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_M1	0.067	0.064	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_M2	0.399	0.211	0.188	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_T1	0.067	0.064	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi5	0.047	0.045	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi13	0.018	0.017	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi14	0.103	0.099	0.005	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi15	0.073	0.07	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB5	0.099	0.099	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_W2	0.051	0.049	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB3	0.113	0.113	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB2	0.453	0.453	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB4	0.211	0.211	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB9	0.343	0.343	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB11	0.266	0.266	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

Outflow Volumes for Total Catchment (9.42 impervious + 2.96 pervious = 12.4 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 20 year	2176.85	1826.20 (83.9%)	1561.41 (94.3%)	264.79 (50.8%)
AR&R 20 year	3425.19	3011.21 (87.9%)	2510.82 (96.4%)	500.40 (61.0%)
AR&R 20 year	4364.02	3896.08 (89.3%)	3224.82 (97.2%)	671.26 (64.2%)
AR&R 20 year	5158.42	4644.57 (90.0%)	3828.99 (97.6%)	815.58 (66.0%)
AR&R 20 year	5829.01	5268.13 (90.4%)	4338.99 (97.9%)	929.14 (66.6%)
AR&R 20 year	6437.7	5835.30 (90.6%)	4801.92 (98.1%)	1033.38 (67.0%)
AR&R 20 year	7892.38	7189.48 (91.1%)	5908.25 (98.4%)	1281.23 (67.8%)
AR&R 20 year	9037.55	8256.85 (91.4%)	6779.19 (98.6%)	1477.66 (68.3%)
AR&R 20 year	10585.07	9681.17 (91.5%)	7956.13 (98.8%)	1725.04 (68.1%)
AR&R 20 year	11587.87	10585.08 (91.3%	8718.82 (98.9%)	1866.26 (67.3%)
AR&R 20 year	13296.34	12119.62 (91.2%	10018.45 (99.1%)	2101.17 (66.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P_A1	0.049	0.7	21.235	21.2	AR&R 20 year, 45 minutes storm, average 85 mm/h, Zone 1
P_A2	0.092	0.8	21.198	21.19	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P_K4	0.305	10	20.41	1.12	AR&R 20 year, 3 hours storm, average 35.8 mm/h, Zone 1
P_K7	0.049	0.4	21.203	21.19	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P_K6	0.037	0.3	22.23	22.232	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P_K3	0.195	1.8	22.03	21.19	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P_K5	0.049	0.4	22.567	22.561	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P_K2	0.145	1.3	22.43	22.232	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P_K1	0.049	0.4	22.62	22.561	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/1	0.013	1.4	17.443	17.223	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/1	0.061	0.6	2.39	2.367	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/1	0.087	0.8	2.32	2.29	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/1	0.158	1.4	2.221	2.167	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P5/1	0.171	1.5	2.02	1.674	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P6/1	0.195	2	1.435	0.648	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/3	0.049	0.9	1.781	1.777	AR&R 20 year, 10 minutes storm, average 166 mm/h, Zone 1
P2/3	0.078	0.7	1.738	1.702	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/3	0.105	1.5	1.488	1.157	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/3	0.117	1.5	0.946	0.506	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/4	0.035	1.2	11.689	11.629	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/4	0.083	0.8	2.308	2.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/4	0.111	1	2.229	2.156	AR&R 20 year, 30 minutes storm, average 104 mm/h, Zone 1
P4/4	0.14	1.3	2.036	1.868	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P5/4	0.152	1.4	1.722	1.538	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P6/4	0.154	1.4	1.389	1.205	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/4	0.154	1.7	1.055	0.518	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/5	0.031	0.8	9.295	9.285	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/5	0.093	1.4	9.249	9.083	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/5	0.135	0.9	2.303	2.268	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/5	0.221	1.4	2.168	2.129	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P6/5	0.252	1.6	1.97	1.83	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P7/5	0.278	1.7	1.597	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/5	0.049	1.2	9.306	9.285	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P1/9	0.049	1.7	12.472	12.342	AR&R 20 year, 3 hours storm, average 35.8 mm/h, Zone 1
P2/9	0.067	1.7	2.272	2.21	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/9	0.105	0.7	2.177	2.155	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/9	0.138	0.9	2.097	2.045	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/9	0.504	1.8	1.801	1.357	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P6/9	0.504	1.8	1.113	0.877	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/9	0.504	1.8	0.634	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/6	0.049	2.6	8.919	8.559	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P2/6	0.114	1	2.291	2.28	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P3/6	0.145	0.9	2.272	2.268	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P1/10	0.049	1.7	15.699	15.569	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P2/10	0.054	1.4	2.582	2.54	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/10	0.07	1.8	2.42	2.27	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P4/10	0.094	0.6	2.252	2.227	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P5a/10	0.1	0.5	2.216	2.209	AR&R 20 year, 10 minutes storm, average 166 mm/h, Zone 1
P5b/10	0.347	1.6	2.012	1.836	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P6/10	0.347	1.6	1.639	1.542	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/10	0.347	1.6	1.345	1.12	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P8/10	0.347	2	0.923	0.667	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/7	0.044	0.7	9.171	9.164	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P2/7	0.066	10.2	8.844	8.364	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P1/11	0.037	3.6	15.566	11.862	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/11	0.079	2	11.704	11.424	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/11	0.126	0.6	2.783	2.769	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
New P2/1	0.261	1.6	2.562	2.209	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P_W1	0.032	5.2	12.909	1.039	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/13	0.049	3.4	5.18	4.12	AR&R 20 year, 30 minutes storm, average 104 mm/h, Zone 1
P3/12	0.321	7.3	3.307	2.88	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P4/12	0.2	1.8	2.755	2.755	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/12	0.23	2.2	2.422	1.253	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

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P1/12	0.043	3.3	4.741	4.08	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/12	0.125	1.8	4.091	4.12	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P1/15	0.037	3.7	18.317	12.607	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/15	0.085	2.1	3.066	2.88	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/14	0.037	0.6	2.768	2.755	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/8	0.029	0.3	2.231	2.28	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P1/2	0.015	0.4	2.378	2.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/2	0.035	0.9	2.372	2.39	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P3/2	0.035	0.9	2.39	2.39	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P4/2	0.06	1.5	2.352	2.29	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
New P1/1	0.096	0.6	2.789	2.769	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P_W2	0.032	4.3	13.814	1.044	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/17	0.113	1.8	1.807	1.632	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/17	0.113	1.5	1.419	0.909	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
OF73	0.566	0.566	19.77	0.069	0.06	17.74	0.82	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
OF72	0.657	0.657	19.77	0.073	0.06	18.64	0.86	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
OF71	1.724	1.724	19.77	0.109	0.12	25.82	1.1	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF70	0.183	0.183	19.77	0.044	0.03	12.71	0.6	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF68	0.231	0.231	19.77	0.048	0.03	13.61	0.64	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF69	1.265	1.265	19.77	0.096	0.1	23.13	1.02	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF67	0.218	0.218	19.77	0.047	0.03	13.43	0.62	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF66	1.313	1.313	19.77	0.097	0.1	23.49	1.03	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF65	1.361	1.361	19.77	0.099	0.1	23.85	1.03	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF64	0.003	0.003	19.77	0.009	0	2.84	0.21	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF63	0.194	0.194	19.77	0.044	0.03	12.89	0.62	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF25	0.013	0.013	19.77	0.017	0	5.54	0.29	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF10	0.134	0.134	19.77	0.039	0.02	11.81	0.54	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF9	0.086	0.086	19.77	0.033	0.02	10.56	0.48	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF8	0.044	0.044	19.77	0.026	0.01	8.53	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF62	0.157	0.157	19.77	0.042	0.02	12.35	0.56	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF27	0.018	0.018	19.77	0.018	0.01	6.14	0.32	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF26	0.015	0.015	19.77	0.018	0.01	5.84	0.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF11	0.002	0.002	19.77	0.009	0	2.84	0.19	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF61	0.025	0.025	19.77	0.021	0.01	7.03	0.34	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF60	0.119	0.119	19.77	0.037	0.02	11.45	0.52	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF30	0.04	0.04	19.77	0.025	0.01	8.23	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF29	0.02	0.02	19.77	0.019	0.01	6.44	0.33	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF28	0.004	0.004	19.77	0.01	0	3.44	0.23	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF13	0	0	19.77	0	0	0	0	
OF12	0	0	19.77	0	0	0	0	
OF59	0.019	0.019	19.77	0.019	0.01	6.44	0.31	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF68	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF56	0.084	0.084	19.77	0.033	0.02	10.56	0.47	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF75	0	0	19.77	0	0	0	0	
OF31	0.554	0.554	19.77	0.069	0.06	17.74	0.81	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF14	0.506	0.506	19.77	0.066	0.05	17.2	0.79	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF57	0.112	0.112	19.77	0.036	0.02	11.27	0.51	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF55	0.321	0.321	19.77	0.054	0.04	14.87	0.71	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF50	0.006	0.006	19.77	0.012	0	4.04	0.25	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF34	0.035	0.035	19.77	0.024	0.01	7.93	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF33	0.021	0.021	19.77	0.019	0.01	6.44	0.34	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF17	0.019	0.019	19.77	0.019	0.01	6.44	0.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF15	0	0	19.77	0	0	0	0	
OF52	0.489	0.489	19.77	0.065	0.05	17.02	0.78	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF74	0.589	0.589	19.77	0.07	0.06	18.1	0.82	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF51	0.341	0.341	0.256	0.056	0.04	15.23	0.71	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF49	0	0	19.77	0	0	0	0	
OF36	0.047	0.047	19.77	0.026	0.01	8.83	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF35	0.015	0.015	19.77	0.018	0.01	5.84	0.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF21	0.002	0.002	19.77	0.009	0	2.84	0.19	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF91	0	0	0.256	0	0	0	0	
OF20	0	0	19.77	0	0	0	0	
OF18	0	0	19.77	0	0	0	0	
OF48	0.051	0.051	19.77	0.027	0.01	9.13	0.41	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF53	0.019	0.019	19.77	0.019	0.01	6.44	0.31	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF45	0.03	0.03	19.77	0.022	0.01	7.33	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF46	0.042	0.042	19.77	0.026	0.01	8.53	0.38	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF47	0.069	0.069	19.77	0.031	0.01	10.2	0.43	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF90	0	0	0.256	0	0	0	0	
OF44	0.02	0.02	19.77	0.019	0.01	6.44	0.32	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF76	0.202	0.202	0.256	0.045	0.03	13.07	0.62	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF37	0.615	0.615	19.77	0.071	0.06	18.28	0.84	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF7	0.584	0.584	19.77	0.07	0.06	17.92	0.83	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF43	0.047	0.047	19.77	0.026	0.01	8.83	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF41	0.237	0.237	19.77	0.048	0.03	13.61	0.65	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF42	0.03	0.03	19.77	0.022	0.01	7.33	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF39	0.376	0.376	19.77	0.058	0.04	15.58	0.74	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF38	0.03	0.03	19.77	0.022	0.01	7.33	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF32	0.137	0.137	19.77	0.039	0.02	11.81	0.55	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF81	0.003	0.003	0.256	0.009	0	3.14	0.23	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF23	0.121	0.121	19.77	0.037	0.02	11.45	0.53	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF22	0	0	19.77	0	0	0	0	
OF80	0.152	0.152	0.256	0.041	0.02	12.17	0.56	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF1	0.022	0.022	19.77	0.02	0.01	6.74	0.33	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF83	0.495	0.495	0.256	0.065	0.05	17.02	0.79	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF77	0.02	0.02	19.77	0.019	0.01	6.44	0.32	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF78	0	0	0.256	0	0	0	0	
OF82	0	0	0.256	0	0	0	0	
OF79	0.01	0.01	0.256	0.015	0	4.94	0.27	AR&R 20 year, 3 hours storm, average 35.8 mm/h, Zone 1
OF19	0	0	19.77	0	0	0	0	
OF16	0	0	19.77	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD_High	10.04	44.4	0.495	0	0.495
BasinB2	2.79	787.4	0	0	0
BasinB4	2.97	350.8	0.01	0	0.01
BasinB9	2.37	595.8	0	0	0
BasinB11	2.38	477.6	0	0	0

CONTINUITY CHECK for AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit_A1	660.48	660.47	0	0
Pit_A2	788.91	788.9	0	0
Pit_K4	2787	2787.05	0	0
N11	2787.05	2787.05	0	0

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Pit_K7	193.15	193.08	0	0
Pit_K6	202.4	202.35	0	0
Pit_K3	1912.93	1912.7	0	0
Pit_K5	367.66	367.66	0	0
Pit_K2	1903.91	1903.72	0	0
Pit_K1	1738.64	1738.64	0	0
Pit_H8	21.63	21.51	0	0.5
Pit_H9	351.22	351.21	0	0
Pit_Hi13	230.41	230.18	0	0.1
Pit_B1	487.4	487.18	0	0
Pit_B2	487.18	487.21	0	0
Pit_B3	487.21	487.18	0	0
N1	487.18	487.18	0	0
Pit_H10	195.66	195.64	0	0
Pit_Hi11	161.84	161.79	0	0
Pit_Hi12	208.61	208.54	0	0
Pit_B4	208.54	208.52	0	0
N2	208.52	208.52	0	0
Pit_H7	81.23	81.21	0	0
Pit_H11	179.74	179.67	0	0
Pit_Hi8	208.47	208.51	0	0
Pit_Hi9	261.5	261.54	0	0
Pit_B5	261.54	261.51	0	0
Pit_B6	261.51	261.46	0	0
Pit_B7	261.46	261.53	0	0
N3	261.53	261.53	0	0
Pit_H6	59.74	59.66	0	0.1
Pit_H5	184.97	185.09	0	-0.1
Pit_H12	265.7	265.33	0	0.1
Pit_Hi6a	588.94	588.52	0	0.1
Pit_Hi7	1112.75	1112.37	0	0
Pit_B8	1112.37	1111.98	0	0
N4	1111.98	1111.98	0	0
Pit_H4	217.43	217.42	0	0
Pit_H2	391.93	391.92	0	0
Pit_H16	171.14	171.05	0	0
Pit_Hi3	234.22	234.16	0	0
Pit_Hi4	292.7	292.83	0	0
Pit_B9	799.82	800.06	0	0
Pit_B10	784.23	784.49	0	0
Pit_B11	784.49	784.5	0	0
N5	784.5	784.5	0	0
Pit_H3	654.16	654.15	0	0
Pit_H15	237.73	237.7	0	0
Pit_Hi6	792.05	791.73	0	0
Pit_H1	511.96	511.95	0	0
Pit_H17	186.22	186.15	0	0
Pit_Hi1	244.17	244.11	0	0
Pit_Hi2	285.58	285.5	0	0
Pit_B12	285.5	285.39	0	0
Pit New 3/2	694.94	694.97	0	0
Pit_B13	694.97	695.01	0	0
Pit_B14	695.01	695.84	0	-0.1
Pit_B15	695.84	695.98	0	0
N6	695.98	695.98	0	0
Pit_H13	63.68	63.58	0	0.1
Pit_H14	63.58	63.56	0	0
Pit_A3	91.5	91.49	0	0
Pit_MR1	171.96	171.95	0	0
Pit_MR2	273.97	273.96	0	0
Pit New 2/2	409.98	409.55	0	0.1
Pit_W1	69.87	69.84	0	0
N10	110.61	110.61	0	0
Pit_D5	330.76	330.76	0	0
Pit_D3	587.99	587.66	0	0.1
Pit_B22	1171.43	1171.4	0	0
Pit_B23	1262.89	1262.9	0	0
N9	1262.9	1262.9	0	0
Pit_D1	106.43	106.42	0	0
Pit_D2	257.25	257.23	0	0
Pit_M1	91.5	91.49	0	0
Pit_M2	583.76	583.77	0	0
Pit_T1	91.5	91.49	0	0
Pit_Hi5	79.55	79.49	0	0.1
Pit_Hi14	24.96	24.86	0	0.4
Pit_Hi15	166.27	166.25	0	0
Pit_Hi16	62.69	62.68	0	0
Pit_Hi17	266.06	266.07	0	0
Pit New 1/2	136.04	136.03	0	0
OSD_High	483.48	444.67	38.21	0.1
Pit_W2	69.87	69.84	0	0
Pit_B24	155.48	155.48	0	0
Pit_B25	155.48	155.51	0	0
N12	155.51	155.51	0	0
BasinB2	625.3	0	625.3	0
BasinB4	291.53	0	291.53	0
BasinB9	473.2	0	473.2	0
BasinB11	383.4	0	383.4	0

Run Log for 3591_Deviation_Ex_Catchment_100915.drn run at 14:44:41 on 22/9/2010Water was lost from the system at Pit_D3.

Is this correct? If this water re-enters the system further downstream you should draw an overflow route from this location.

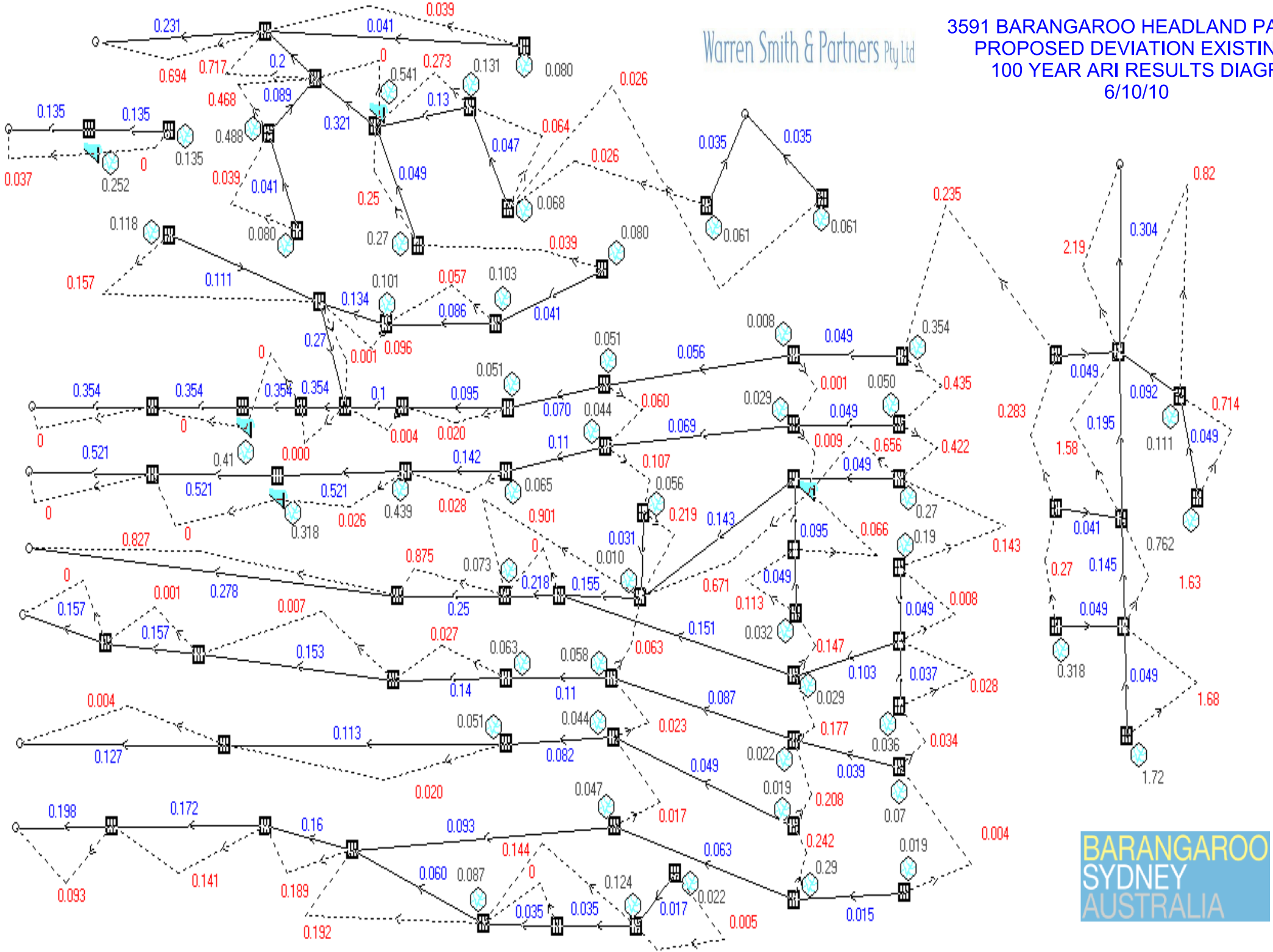
Upwelling occurred at Pit_Hi15, Pit_Hi5, Pit_Hi1, Pit_B22, Pit_D2, Pit_K6, Pit_A2
Freeboard was less than 0.15m at Pit New 2/2, Pit_Hi6a, Pit New 1/2, Pit_B1, Pit_Hi14, Pit_Hi17, Pit_Hi8, Pit_Hi6, Pit_Hi4, Pit_Hi3, Pit_D3, Pit_K2, Pit_K5, Pit_K7, Pit_K4
The maximum flow exceeded the safe value in the following overflow routes: OF83, OF51

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSD_High You might consider upsizing these, or removing them from the model.

The following overflow routes carried water uphill (adding energy): OF74, OF52, OF1, OF37, OF41, OF10, OF9, OF17, OF21, OF23, OF26, OF29, OF35, OF32, OF34, OF46, OF59, OF53, OF57
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

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PROPOSED DEVIATION EXISTING
100 YEAR ARI RESULTS DIAGRAM
6/10/10



BARANGAROO
SYDNEY
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DRAINS results prepared 22 September, 2010 from Version 2010.04

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_A1	21.27		0.762		0.93	0.714	Inlet Capacity
Pit_A2	21.2		0.793		0	0.82	Outlet System
Pit_K4	21.19		2.242		0	2.194	Outlet System
N11	0.5		2.194				
Pit_K7	21.22		0.283		0.08	0.235	Inlet Capacity
Pit_K6	22.23		0.27		0	0.283	Outlet System
Pit_K3	22.23		1.628		0.2	1.58	Inlet Capacity
Pit_K5	22.58		0.318		0.02	0.27	Inlet Capacity
Pit_K2	22.56		1.676		0.02	1.628	Inlet Capacity
Pit_K1	22.64		1.724		0.51	1.676	Inlet Capacity
Pit_H8	17.52		0.019		0.77	0.004	Inlet Capacity
Pit_H9	2.43		0.29		16.64	0.242	Inlet Capacity
Pit_Hi13	2.38		0.047		0.27	0.017	Inlet Capacity
Pit_B1	2.29		0.192		0	0.189	Outlet System
Pit_B2	2.18		0.189		0.28	0.141	Inlet Capacity
Pit_B3	1.7		0.141		0.78	0.093	Inlet Capacity
N1	0.65		0.093				
Pit_H10	1.85		0.256		13.65	0.208	Inlet Capacity
Pit_Hi11	1.8		0.058		0.5	0.023	Inlet Capacity
Pit_Hi12	1.71		0.051		0.71	0.02	Inlet Capacity
Pit_B4	1.17		0.02		1.29	0.004	Inlet Capacity
N2	0.5		0.004				
Pit_H7	11.79		0.072		0.68	0.034	Inlet Capacity
Pit_H11	2.36		0.225		10.09	0.177	Inlet Capacity
Pit_Hi8	2.3		0.077		0	0.063	Outlet System
Pit_Hi9	2.17		0.063		0.2	0.027	Inlet Capacity
Pit_B5	1.9		0.027		0.58	0.007	Inlet Capacity
Pit_B6	1.57		0.007		0.91	0.001	Inlet Capacity
Pit_B7	1.23		0.001		1.26	0	None
N3	0.5		0				
Pit_H6	9.32		0.065		0.51	0.028	Inlet Capacity
Pit_H5	9.28		0.028		0.67	0.008	Inlet Capacity
Pit_H12	2.39		0.195		7.33	0.147	Inlet Capacity
Pit_Hi6a	2.28		0		0.06	0	None
Pit_Hi7	2.14		0.923		0.2	0.875	Inlet Capacity
Pit_B8	1.84		0.875		0.4	0.827	Inlet Capacity
N4	0.5		0.827				
Pit_H4	9.42		0.191		0.2	0.143	Inlet Capacity
Pit_H2	12.66		0.47		0.56	0.422	Inlet Capacity
Pit_H16	2.51		0.03		10.66	0.009	Inlet Capacity
Pit_Hi3	2.21		0.096		0	0.107	Outlet System
Pit_Hi4	2.2		0.065		0.09	0.028	Inlet Capacity
Pit_B9	2.15		0.459		0.08	0.026	Inlet Capacity
Pit_B10	1.42		0		0.74		None
Pit_B11	0.9		0		1.62	0	None
N5	0.5		0				
Pit_H3	9.15		0.704		0.56	0.656	Inlet Capacity
Pit_H15	2.43		0		7.09		None
Pit_Hi6	2.28		0.895		0	0.901	Outlet System
Pit_H1	15.89		0.483		0.56	0.435	Inlet Capacity
Pit_H17	2.73		0.008		13.6	0.001	Inlet Capacity
Pit_Hi1	2.54		0.051		0	0.06	Outlet System
Pit_Hi2	2.32		0.051		0.18	0.02	Inlet Capacity
Pit_B12	2.28		0.02		0.42	0.004	Inlet Capacity
Pit New 3/2	2.26		0.004		0.64	0	Inlet Capacity
Pit_B13	1.88		0		0.3	0	None
Pit_B14	1.57		0		1.07		None
Pit_B15	1.13		0		1.45	0	None
N6	0.5		0				
Pit_H13	9.28		0.161		0.25	0.113	Inlet Capacity
Pit_H14	9.23		0.113		0.29	0.066	Inlet Capacity
Pit_A3	15.73		0.08		0.68	0.039	Inlet Capacity
Pit_MR1	11.88		0.103		0.6	0.057	Inlet Capacity
Pit_MR2	2.89		0.144		13.53	0.096	Inlet Capacity
Pit New 2/2	2.85		0.233		0.05	0.001	Inlet Capacity
Pit_W1	13.08		0.061		0.72	0.026	Inlet Capacity
N10	0.5		0				
Pit_D5	5.36		0.298		0.65	0.25	Inlet Capacity
Pit_D3	4.12		0.517		0		Outlet System
Pit_B22	2.88		0.468		0	0.717	Outlet System
Pit_B23	2.76		0.742		0.34	0.694	Inlet Capacity
N9	0.5		0.694				
Pit_D1	4.94		0.111		0.63	0.064	Inlet Capacity
Pit_D2	4.08		0.18		0	0.273	Outlet System
Pit_M1	18.55		0.08		0.6	0.039	Inlet Capacity
Pit_M2	3.47		0.516		9.51	0.468	Inlet Capacity
Pit_T1	2.81		0.08		0.65	0.039	Inlet Capacity
Pit_Hi5	2.23		0.147		0	0.219	Outlet System
Pit_Hi14	2.39		0.022		0.01	0.005	Inlet Capacity
Pit_Hi15	2.37		0.127		0	0.144	Outlet System
Pit_Hi16	2.39		0		0.22	0	None
Pit_Hi17	2.39		0.22		0	0.192	Outlet System
Pit New 1/2	2.8		0.118		0	0.157	Outlet System
Pit_W2	13.98		0.061		0.72	0.026	Inlet Capacity
Pit_B24	2.08		0.135		0.42	0	None
Pit_B25	1.66		0		0.84		None
N12	0.5		0.037				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_Observ_N	0.762	0.041	0.721	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_A1	0.111	0.111	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Kent_We	0.318	0.318	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Kent_Eas	1.724	0.891	0.833	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H7	0.019	0.018	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H8	0.29	0.276	0.014	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi12	0.047	0.044	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H9	0.019	0.018	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi10	0.044	0.042	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi11	0.051	0.049	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H6	0.07	0.067	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H10	0.022	0.021	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi8	0.058	0.056	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi9	0.063	0.06	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H5	0.036	0.034	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H11	0.029	0.027	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi7	0.073	0.069	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H4	0.19	0.181	0.009	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

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Cat_H2	0.05	0.047	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H13	0.029	0.028	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi3	0.044	0.042	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi4	0.065	0.062	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB10	0.439	0.439	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H3	0.27	0.257	0.013	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi6	0.01	0.01	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H1	0.354	0.338	0.017	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H14	0.008	0.008	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi1	0.051	0.049	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi2	0.051	0.049	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H12	0.032	0.031	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_A2	0.08	0.076	0.004	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_MR1	0.103	0.053	0.05	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_MR2	0.101	0.052	0.049	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_W1	0.061	0.058	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_D2	0.27	0.257	0.013	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_D1	0.068	0.065	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB1	0.131	0.131	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_M1	0.08	0.076	0.004	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_M2	0.488	0.252	0.236	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_T1	0.08	0.076	0.004	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi5	0.056	0.053	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi13	0.022	0.021	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi14	0.124	0.118	0.006	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi15	0.087	0.083	0.004	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB5	0.118	0.118	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_W2	0.061	0.058	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB3	0.135	0.135	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB2	0.541	0.541	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB4	0.252	0.252	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB9	0.41	0.41	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB11	0.318	0.318	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

Outflow Volumes for Total Catchment (9.42 impervious + 2.96 pervious = 12.4 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 yea	2785.55	2433.92 (87.4%)	2024.34 (95.6%)	409.58 (61.4%)
AR&R 100 yea	4415.6	4000.18 (90.6%)	3264.05 (97.2%)	736.12 (69.6%)
AR&R 100 yea	5663.94	5193.55 (91.7%)	4213.46 (97.8%)	980.09 (72.3%)
AR&R 100 yea	6726.58	6207.94 (92.3%)	5021.62 (98.2%)	1186.32 (73.6%)
AR&R 100 yea	7634.46	7068.99 (92.6%)	5712.10 (98.4%)	1356.89 (74.2%)
AR&R 100 yea	8418.54	7812.56 (92.8%)	6308.40 (98.5%)	1504.16 (74.6%)
AR&R 100 yea	10399.37	9693.95 (93.2%)	7814.94 (98.8%)	1879.02 (75.5%)
AR&R 100 yea	12008.79	11225.45 (93.5%)	9038.94 (99.0%)	2186.51 (76.0%)
AR&R 100 yea	13927.72	13022.10 (93.5%)	10498.37 (99.1%)	2523.73 (75.7%)
AR&R 100 yea	15351.45	14344.15 (93.4%)	11581.11 (99.2%)	2763.04 (75.2%)
AR&R 100 yea	17567.51	16378.87 (93.2%)	13267.23 (99.3%)	3111.64 (74.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P_A1	0.049	0.7	21.235	21.2	AR&R 100 year, 3 hours storm, average 47.3 mm/h, Zone 1
P_A2	0.092	0.8	21.198	21.19	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P_K4	0.304	10	20.409	1.119	AR&R 100 year, 45 minutes storm, average 112 mm/h, Zone 1
P_K7	0.049	0.4	21.207	21.19	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P_K6	0.041	0.4	22.23	22.232	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P_K3	0.195	1.8	22.03	21.19	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P_K5	0.049	0.4	22.567	22.561	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P_K2	0.145	1.3	22.43	22.232	AR&R 100 year, 30 minutes storm, average 136 mm/h, Zone 1
P_K1	0.049	0.4	22.62	22.561	AR&R 100 year, 3 hours storm, average 47.3 mm/h, Zone 1
P1/1	0.015	1.5	17.447	17.227	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/1	0.063	0.6	2.402	2.378	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/1	0.093	0.8	2.324	2.29	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/1	0.16	1.4	2.226	2.175	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P5/1	0.172	1.6	2.035	1.703	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P6/1	0.198	2	1.457	0.649	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P1/3	0.049	0.8	1.799	1.795	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/3	0.082	0.8	1.753	1.713	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P3/3	0.113	1.5	1.501	1.173	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/3	0.127	1.5	0.964	0.521	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P1/4	0.039	1.2	11.696	11.636	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/4	0.087	0.8	2.308	2.3	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/4	0.11	1	2.237	2.171	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P4/4	0.14	1.3	2.058	1.899	AR&R 100 year, 1 hour storm, average 97 mm/h, Zone 1
P5/4	0.153	1.4	1.755	1.574	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P6/4	0.157	1.4	1.419	1.228	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P7/4	0.157	1.7	1.073	0.521	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P2/5	0.037	0.9	9.295	9.285	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P3/5	0.103	1.4	9.249	9.094	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P4/5	0.151	0.9	2.321	2.276	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P5/5	0.218	1.4	2.175	2.136	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P6/5	0.25	1.6	1.976	1.837	AR&R 100 year, 3 hours storm, average 47.3 mm/h, Zone 1
P7/5	0.278	1.8	1.602	0.5	AR&R 100 year, 30 minutes storm, average 136 mm/h, Zone 1
P1/5	0.049	1.2	9.306	9.285	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/9	0.049	1.7	12.472	12.342	AR&R 100 year, 3 hours storm, average 47.3 mm/h, Zone 1
P2/9	0.069	1.7	2.276	2.21	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/9	0.11	0.7	2.202	2.197	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P4/9	0.142	0.9	2.173	2.151	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P5/9	0.521	1.8	1.891	1.416	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P6/9	0.521	1.8	1.156	0.903	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P7/9	0.521	1.8	0.643	0.5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/6	0.049	2.6	8.919	8.559	AR&R 100 year, 45 minutes storm, average 112 mm/h, Zone 1
P2/6	0.143	1.3	2.297	2.28	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P3/6	0.155	1	2.277	2.276	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P1/10	0.049	1.7	15.699	15.569	AR&R 100 year, 30 minutes storm, average 136 mm/h, Zone 1
P2/10	0.056	1.4	2.584	2.54	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/10	0.07	1.8	2.442	2.319	AR&R 100 year, 30 minutes storm, average 136 mm/h, Zone 1
P4/10	0.095	0.6	2.303	2.281	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P5a/10	0.1	0.5	2.27	2.263	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P5b/10	0.354	1.6	2.059	1.875	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P6/10	0.354	1.6	1.671	1.57	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P7/10	0.354	1.6	1.366	1.132	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P8/10	0.354	2	0.928	0.671	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P1/7	0.049	0.7	9.247	9.234	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P2/7	0.095	11.4	8.853	8.373	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P1/11	0.041	3.7	15.569	11.877	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/11	0.086	2	11.711	11.431	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/11	0.134	0.6	2.87	2.854	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
New P2/1	0.27	1.7	2.634	2.263	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P_W1	0.035	5.6	12.91	1.04	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/13	0.049	3.4	5.18	4.12	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P3/12	0.321	7.3	3.307	2.88	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/12	0.2	1.8	2.762	2.762	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P5/12	0.231	2.2	2.427	1.253	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

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100 Year ARI Results
DEVIATION OF STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

P1/12	0.047	3.4	4.745	4.08	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P2/12	0.13	1.8	4.095	4.12	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P1/15	0.041	3.8	18.321	12.611	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/15	0.089	2.2	3.083	2.88	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/14	0.041	0.6	2.778	2.762	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/8	0.031	0.3	2.231	2.28	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P1/2	0.017	0.4	2.38	2.37	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/2	0.035	0.9	2.373	2.39	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P3/2	0.035	0.9	2.39	2.39	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P4/2	0.06	1.5	2.352	2.29	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
New P1/1	0.111	0.7	2.801	2.854	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P_W2	0.035	4.6	13.816	1.046	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/17	0.135	1.5	1.887	1.665	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/17	0.135	1.6	1.457	0.939	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
OF73	0.714	0.714	19.77	0.076	0.07	19.18	0.87	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF72	0.82	0.82	19.77	0.08	0.07	20.08	0.9	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF71	2.194	2.194	19.77	0.121	0.14	28.16	1.17	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF70	0.235	0.235	19.77	0.048	0.03	13.61	0.65	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF68	0.283	0.283	19.77	0.052	0.04	14.33	0.68	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF69	1.58	1.58	19.77	0.106	0.11	25.1	1.07	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF67	0.27	0.27	19.77	0.051	0.03	14.15	0.67	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF66	1.628	1.628	19.77	0.106	0.12	25.28	1.09	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF65	1.676	1.676	19.77	0.107	0.12	25.46	1.1	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF64	0.004	0.004	19.77	0.01	0	3.44	0.2	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF63	0.242	0.242	19.77	0.049	0.03	13.79	0.65	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF25	0.017	0.017	19.77	0.018	0.01	6.14	0.3	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF10	0.189	0.189	19.77	0.044	0.03	12.89	0.6	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF9	0.141	0.141	19.77	0.04	0.02	11.99	0.54	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF8	0.093	0.093	19.77	0.034	0.02	10.74	0.49	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF62	0.208	0.208	19.77	0.046	0.03	13.25	0.61	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF27	0.023	0.023	19.77	0.02	0.01	6.74	0.34	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF26	0.02	0.02	19.77	0.019	0.01	6.44	0.31	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF11	0.004	0.004	19.77	0.01	0	3.44	0.22	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF61	0.034	0.034	19.77	0.024	0.01	7.93	0.36	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF60	0.177	0.177	19.77	0.044	0.03	12.71	0.58	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF30	0.063	0.063	19.77	0.029	0.01	9.73	0.44	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF29	0.027	0.027	19.77	0.021	0.01	7.03	0.36	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF28	0.007	0.007	19.77	0.013	0	4.34	0.26	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF13	0.001	0.001	19.77	0.005	0	1.65	0.13	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF12	0	0	19.77	0	0	0	0	
OF59	0.028	0.028	19.77	0.022	0.01	7.33	0.35	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF68	0.008	0.008	19.77	0.014	0	4.64	0.25	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF56	0.147	0.147	19.77	0.04	0.02	11.99	0.57	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF75	0	0	19.77	0	0	0	0	
OF31	0.875	0.875	19.77	0.082	0.08	20.43	0.93	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF14	0.827	0.827	19.77	0.08	0.07	20.08	0.91	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF57	0.143	0.143	19.77	0.04	0.02	11.99	0.55	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF55	0.422	0.422	19.77	0.062	0.05	16.3	0.75	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF50	0.009	0.009	19.77	0.014	0	4.64	0.27	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF34	0.107	0.107	19.77	0.035	0.02	11.09	0.52	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF33	0.028	0.028	19.77	0.022	0.01	7.33	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF17	0.026	0.026	19.77	0.021	0.01	7.03	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF15	0	0	19.77	0	0	0	0	
OF52	0.656	0.656	19.77	0.073	0.06	18.64	0.85	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF74	0.901	0.901	19.77	0.083	0.08	20.61	0.94	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF51	0.435	0.435	7.665	0.062	0.05	16.3	0.77	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF49	0.001	0.001	19.77	0.006	0	1.95	0.12	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF36	0.06	0.06	19.77	0.029	0.01	9.73	0.42	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF35	0.02	0.02	19.77	0.019	0.01	6.44	0.31	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF21	0.004	0.004	19.77	0.01	0	3.44	0.22	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF91	0	0	7.665	0	0	0	0	
OF20	0	0	19.77	0	0	0	0	
OF18	0	0	19.77	0	0	0	0	
OF48	0.113	0.113	19.77	0.036	0.02	11.27	0.52	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF53	0.066	0.066	19.77	0.03	0.01	10.02	0.44	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF45	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF46	0.057	0.057	19.77	0.028	0.01	9.43	0.43	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF47	0.096	0.096	19.77	0.035	0.02	10.91	0.48	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF90	0.001	0.001	7.665	0.006	0	1.95	0.14	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF44	0.026	0.026	19.77	0.021	0.01	7.03	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF76	0.25	0.25	7.665	0.05	0.03	13.97	0.64	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF37	0.717	0.717	19.77	0.076	0.07	19.18	0.87	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF7	0.694	0.694	19.77	0.075	0.06	19	0.86	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF43	0.064	0.064	19.77	0.03	0.01	10.02	0.42	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF41	0.273	0.273	19.77	0.052	0.03	14.33	0.66	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF42	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF39	0.468	0.468	19.77	0.064	0.05	16.84	0.77	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF38	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF32	0.219	0.219	19.77	0.047	0.03	13.43	0.62	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF81	0.005	0.005	7.665	0.011	0	3.74	0.23	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF23	0.144	0.144	19.77	0.04	0.02	11.99	0.56	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF22	0	0	19.77	0	0	0	0	
OF80	0.192	0.192	7.665	0.044	0.03	12.89	0.61	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF1	0.157	0.157	19.77	0.041	0.02	12.17	0.58	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF83	0.671	0.671	7.665	0.074	0.06	18.82	0.85	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF77	0.026	0.026	19.77	0.021	0.01	7.03	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF78	0	0	7.665	0	0	0	0	
OF82	0	0	7.665	0	0	0	0	
OF79	0.037	0.037	7.665	0.025	0.01	8.23	0.36	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF19	0	0	19.77	0	0	0	0	
OF16	0	0	19.77	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD_High	10.06	45.8	0.671	0	0.671
BasinB2	2.86	1042.7	0	0	0
BasinB4	2.98	359.1	0.037	0	0.037
BasinB9	2.44	789	0	0	0
BasinB11	2.45	635	0	0	0

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit_A1	959.55	959.54	0	0
Pit_A2	1129.01	1129.02	0	0
Pit_K4	3832.8	3832.93	0	0
N11	3832.93	3832.93	0	0

3591 BARANGAROO HEADLAND PARK
100 Year ARI Results
DEVIATION OF STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

Pit_K7	293.27	293.02	0	0.1
Pit_K6	293.56	293.56	0	0
Pit_K3	2587.57	2587.4	0	0
Pit_K5	485.14	485.13	0	0
Pit_K2	2587.49	2587.28	0	0
Pit_K1	2395.9	2395.9	0	0
Pit_H8	28.65	28.56	0	0.3
Pit_H9	464.75	464.75	0	0
Pit_Hi13	280.56	280.43	0	0
Pit_B1	618.85	618.78	0	0
Pit_B2	618.78	618.79	0	0
Pit_B3	618.79	618.8	0	0
N1	618.8	618.8	0	0
Pit_H10	283.35	283.34	0	0
Pit_Hi11	210.53	210.51	0	0
Pit_Hi12	269.05	269.06	0	0
Pit_B4	269.06	269.02	0	0
N2	269.02	269.02	0	0
Pit_H7	108.11	108.1	0	0
Pit_H11	265.04	265	0	0
Pit_Hi8	278.96	279.13	0	-0.1
Pit_Hi9	340.2	340.3	0	0
Pit_B5	340.3	340.2	0	0
Pit_B6	340.2	340.16	0	0
Pit_B7	340.16	340.15	0	0
N3	340.15	340.15	0	0
Pit_H6	83.05	82.97	0	0.1
Pit_H5	234.02	234.15	0	-0.1
Pit_H12	367.41	367.01	0	0.1
Pit_Hi6a	703.55	703.15	0	0.1
Pit_Hi7	1620.67	1620.5	0	0
Pit_B8	1620.5	1620.38	0	0
N4	1620.38	1620.38	0	0
Pit_H4	289.17	289.16	0	0
Pit_H2	582.33	582.33	0	0
Pit_H16	212.28	212.23	0	0
Pit_Hi3	305.46	305.43	0	0
Pit_Hi4	368.94	369.15	0	-0.1
Pit_B9	1038.16	1038.43	0	0
Pit_B10	1015.32	1015.4	0	0
Pit_B11	1015.4	1015.41	0	0
N5	1015.41	1015.41	0	0
Pit_H3	960.28	960.28	0	0
Pit_H15	303.26	303.31	0	0
Pit_Hi6	1203.61	1203.34	0	0
Pit_H1	712.12	712.12	0	0
Pit_H17	217.42	217.33	0	0
Pit_Hi1	294.08	294.07	0	0
Pit_Hi2	338.23	338.18	0	0
Pit_B12	338.18	337.94	0	0.1
Pit New 3/2	886.29	886.09	0	0
Pit_B13	886.09	886	0	0
Pit_B14	886	886.65	0	-0.1
Pit_B15	886.65	886.81	0	0
N6	886.81	886.81	0	0
Pit_H13	107.94	107.88	0	0.1
Pit_H14	107.88	107.77	0	0.1
Pit_A3	121.2	121.19	0	0
Pit_MR1	229.04	229.03	0	0
Pit_MR2	369.62	369.61	0	0
Pit New 2/2	549.13	548.35	0	0.1
Pit_W1	92.55	92.54	0	0
N10	140.31	140.31	0	0
Pit_D5	442.38	442.38	0	0
Pit_D3	788.64	756.72	0	4
Pit_B22	1556.29	1556.28	0	0
Pit_B23	1677.48	1677.51	0	0
N9	1677.51	1677.51	0	0
Pit_D1	147.25	147.24	0	0
Pit_D2	346.27	346.26	0	0
Pit_M1	121.2	121.19	0	0
Pit_M2	799.56	799.57	0	0
Pit_T1	121.2	121.19	0	0
Pit_Hi5	119.39	119.38	0	0
Pit_Hi14	33.05	32.95	0	0.3
Pit_Hi15	220.26	220.25	0	0
Pit_Hi16	69.49	69.47	0	0
Pit_Hi17	352.45	352.45	0	0
Pit New 1/2	179.51	179.51	0	0
OSD_High	770.63	731.8	38.21	0.1
Pit_W2	92.55	92.54	0	0
Pit_B24	205.16	205.16	0	0
Pit_B25	205.16	205.19	0	0
N12	244.45	244.45	0	0
BasinB2	825.1	0	825.1	0
BasinB4	384.68	39.29	345.37	0
BasinB9	624.4	0	624.4	0
BasinB11	508.14	0	508.14	0

Run Log for 3591_Deviation_Ex_Catchment_100915.drn run at 14:08:48 on 22/9/2010Water was lost from the system at Pit_D3.

Is this correct? If this water re-enters the system further downstream you should draw an overflow route from this location.

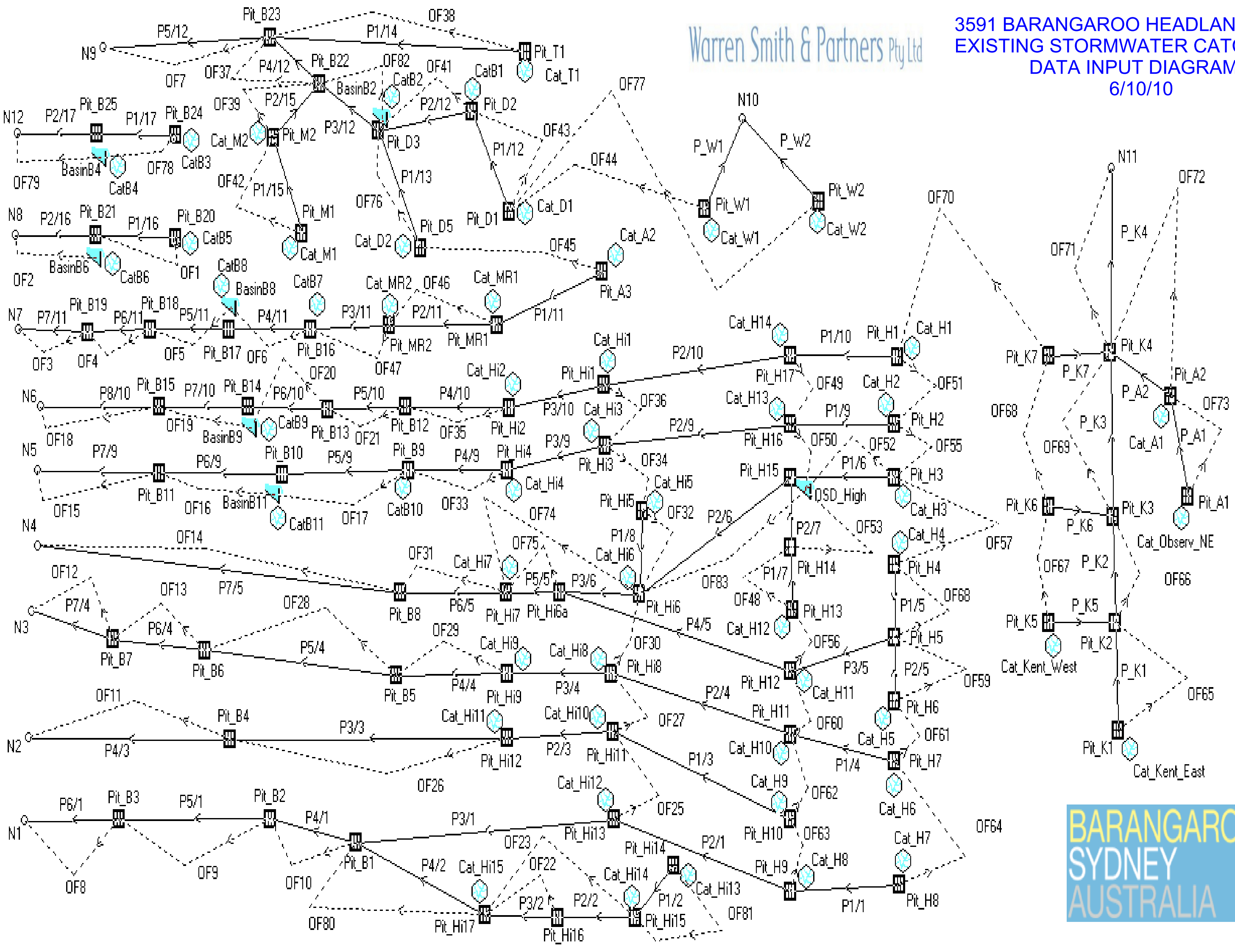
Upwelling occurred at Pit New 1/2, Pit_B1, Pit_Hi15, Pit_Hi6, Pit_Hi5, Pit_Hi3, Pit_Hi1, Pit_B22, Pit_D2, Pit_K6, Pit_A2
Freeboard was less than 0.15m at Pit New 2/2, Pit_Hi6a, Pit_B9, Pit_Hi14, Pit_Hi17, Pit_Hi8, Pit_Hi4, Pit_D3, Pit_K2, Pit_K5, Pit_K7, Pit_K4

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSD_High You might consider upsizing these, or removing them from the model.

The following overflow routes carried water uphill (adding energy): OF74, OF52, OF1, OF37, OF41, OF10, OF9, OF17, OF21, OF23, OF26, OF29, OF35, OF32, OF34, OF46, OF59, OF53, OF57
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
EXISTING STORMWATER CATCHMENT DATA INPUT DIAGRAM
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
DRAINS DATA INPUT
EXISTING STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

PIT / NODE DETAILS Version 9

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss
Pit_A1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	22.2		0	0	2023.254	-681.359	No	1	1 x Ku
Pit_A2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	21.2		0	0	1978.465	-509.665	No	7	1 x Ku
Pit_K4	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	21.19		0	0	1831.156	-436.01	No	8	1 x Ku
N11	Node					2		0		1834.142	-119.496		69	
Pit_K7	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	21.3		0	0	1678.871	-441.982	No	9	1 x Ku
Pit_K6	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	22.23		0	0	1679.866	-698.777	No	25	1 x Ku
Pit_K3	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	22.43		0	0	1837.128	-716.693	No	24	1 x Ku
Pit_K5	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	22.6		0	0	1678.871	-898.838	No	26	1 x Ku
Pit_K2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	22.58		0	0	1843.1	-898.838	No	27	1 x Ku
Pit_K1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	23.15		0	0	1849.072	-1083.97	No	28	1 x Ku
Pit_H8	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	18.29		0	0	1309.107	-1348.23	No	71	1 x Ku
Pit_H9	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	19.07		0	0	1040.368	-1358.32	No	72	1 x Ku
Pit_Hi13	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.65		0	0	607.4	-1236.25	No	943	1 x Ku
Pit_B1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.29		0	0	-29.61	-1276.07	No	1389	1 x Ku
Pit_B2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.46		0	0	-243.605	-1233.77	No	1396	1 x Ku
Pit_B3	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.48		0	0	-616.853	-1236.25	No	1402	1 x Ku
N1	Node					2		0		-848.267	-1238.74		1407	
Pit_H10	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	15.5		0	0	1040.368	-1235.63	No	73	1 x Ku
Pit_Hi11	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.3		0	0	602.424	-1084.47	No	938	1 x Ku
Pit_Hi12	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.42		0	0	343.638	-1096.91	No	939	1 x Ku
Pit_B4	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.46		0	0	-340.65	-1099.4	No	1367	1 x Ku
N2	Node					2		0		-838.314	-1096.91		1152	
Pit_H7	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	12.47		0	0	1299.153	-1136.72	No	74	1 x Ku
Pit_H11	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	12.45		0	0	1040.368	-1090.48	No	75	1 x Ku
Pit_Hi8	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.3		0	0	599.935	-984.934	No	909	1 x Ku
Pit_Hi9	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.37		0	0	343.638	-984.934	No	910	1 x Ku
Pit_B5	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.48		0	0	69.923	-989.91	No	928	1 x Ku
Pit_B6	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.48		0	0	-402.858	-945.121	No	1313	1 x Ku
Pit_B7	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.49		0	0	-631.783	-927.702	No	1314	1 x Ku
N3	Node					2		0		-830.849	-877.936		1151	
Pit_H6	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.83		0	0	1299.153	-1034.7	No	76	1 x Ku
Pit_H5	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.95		0	0	1299.153	-922.726	No	77	1 x Ku
Pit_H12	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.72		0	0	1042.096	-981.616	No	80	1 x Ku
Pit_Hi6a	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.34		0	0	473.031	-845.588	No	1937	1 x Ku
Pit_Hi7	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.34		0	0	341.15	-848.076	No	888	1 x Ku
Pit_B8	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.24		0	0	79.876	-848.076	No	1302	1 x Ku
N4	Node					2		0		-818.407	-765.962		1308	
Pit_H4	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.62		0	0	1299.153	-798.31	No	78	1 x Ku
Pit_H2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	13.22		0	0	1299.153	-559.431	No	81	1 x Ku
Pit_H16	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	13.17		0	0	1040.368	-558.256	No	140	1 x Ku
Pit_Hi3	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.21		0	0	585.005	-594.268	No	875	1 x Ku
Pit_Hi4	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.29		0	0	343.638	-636.569	No	876	1 x Ku
Pit_B9	OnGrade	Barangar	Grated Drain 6m L		1.5	2.23		0	0	97.295	-636.569	No	1262	1 x Ku
Pit_B10	OnGrade	Barangar	Grated Drain 6m L		1.5	2.16		0	0	-211.257	-644.034	No	1263	1 x Ku
Pit_B11	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.52		0	0	-517.32	-641.546	No	1264	1 x Ku
N5	Node					2		0		-815.919	-639.057		1289	
Pit_H3	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.71		0	0	1296.665	-649.011	No	136	1 x Ku
Pit_H15	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.52		0	0	1042.096	-649.84	No	82	1 x Ku
Pit_Hi6	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.28		0	0	669.608	-850.564	No	889	1 x Ku
Pit_H1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	16.45		0	0	1304.13	-442.48	No	139	1 x Ku
Pit_H17	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	16.33		0	0	1042.096	-440.752	No	141	1 x Ku
Pit_Hi1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.54		0	0	580.029	-492.246	No	864	1 x Ku
Pit_Hi2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.5		0	0	347.855	-530.332	No	865	1 x Ku
Pit_B12	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.7		0	0	89.83	-529.571	No	1213	1 x Ku
Pit_B13	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.18		0	0	-99.283	-532.06	No	1214	1 x Ku
Pit_B14	OnGrade	Barangar	Grated Drain 6m L		1.5	2.64		0	0	-298.348	-529.571	No	1215	1 x Ku
Pit_B15	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.58		0	0	-514.832	-529.571	No	1216	1 x Ku
N6	Node					2		0		-808.454	-529.571		1228	
Pit_H13	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.53		0	0	1045.345	-875.448	No	149	1 x Ku
Pit_H14	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	9.52		0	0	1042.856	-768.45	No	83	1 x Ku
Pit_A3	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	16.41		0	0	577.264	-297.328	No	207	1 x Ku
Pit_MR1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	12.48		0	0	317.262	-388.235	No	206	1 x Ku
Pit_MR2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	16.42		0	0	50.017	-390.225	No	205	1 x Ku
Pit_B16	OnGrade	Barangar	Grated Drain 57m l		1.5	3		0	0	-144.072	-395.202	No	1564	1 x Ku
Pit_B17	OnGrade	Barangar	Grated Drain 6m L		1.5	2.17		0	0	-345.626	-395.202	No	1570	1 x Ku
Pit_B18	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.6		0	0	-539.715	-395.202	No	1571	1 x Ku
Pit_B19	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.6		0	0	-691.503	-400.179	No	1572	1 x Ku
N7	Node					2		0		-865.685	-395.202		1579	
Pit_W1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	13.8		0	0	829.552	-190.192	No	218	1 x Ku
N10	Node					2		0		922.864	-34.672		226	
Pit_D5	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	6.01		0	0	127.155	-255.856	No	384	1 x Ku
Pit_D3	OnGrade	Barangar	Grated Drain 91m l		1.5	4.12		0	0	25.133	-56.79	No	388	1 x Ku
Pit_B22	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.88		0	0	-121.677	25.324	No	419	1 x Ku
Pit_B23	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	3.1		0	0	-241.117	104.95	No	1497	1 x Ku
N9	Node					2		0		-656.666	85.044		427	
Pit_D1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	5.57		0	0	348.615	-196.136	No	385	1 x Ku
Pit_D2	OnGrade	Barangar	Grated Drain 57m l		1.5	4.08		0	0	254.059	-21.954	No	387	1 x Ku
Pit_M1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	19.15		0	0	-163.979	-230.973	No	386	1 x Ku
Pit_M2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	12.98		0	0	-236.14	-66.744	No	389	1 x Ku
Pit_T1	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	3.46		0	0	385.94	80.067	No	390	1 x Ku
Pit_Hi5	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.23		0	0	674.585	-708.73	No	887	1 x Ku
Pit_Hi14	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.4		0	0	751.723	-1313.39	No	994	1 x Ku
Pit_Hi15	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.37		0	0	657.167	-1402.97	No	972	1 x Ku
Pit_Hi16	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.61		0	0	468.054	-1402.97	No	980	1 x Ku
Pit_Hi17	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	2.39		0	0	288.895	-1400.48	No	973	1 x Ku
Pit_B20	OnGrade	Barangar	Grated Drain 57m l		1.5	2.5		0	0	-475.019	-238.438	No	1643	1 x Ku
Pit_B21	OnGrade	Barangar	Grated Drain 6m L		1.5	2.18		0	0	-674.084	-235.949	No	1639	1 x Ku
N8	Node					2		0		-873.15	-235.949		1635	
Pit_W2	OnGrade	Sutherlan	Kerb inlet with	0.85	1.5	14.7		0	0	1110.041	-176.23	No	1966	1 x Ku
Pit_B24	OnGrade	Barangar	Grated Drain 57m l		1.5	2.5		0	0	-475.019	-64.255	No	2046	1 x Ku
Pit_B25	OnGrade	Barangar	Grated Drain 57m l		1.5	2.5		0	0	-671.596	-61.767	No	2047	1 x Ku
N12	Node					2		0		-868.173	-61.767		2048	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol.	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
OSD_High	9.52	84.9	0	None						1080.181	-671.405	No			1766
	9.97	84.9													
BasinB2	2.58	3700	0	None						35.087	-36.884	No			2143
	2.88	3700													
BasinB4	2.77	1725	0	None						-661.643	-101.58	No			2150
	2.97	1725													
BasinB6	2.16	243	0	None						-674.084	-273.274	No			2172
	2.66	243													
BasinB8	2.17	3240	0	None						-338.161	-360.365	No			2185
	3.02	3240													
BasinB9	2.16	2800	0	None						-290.883	-564.408	No			2197
	2.96	2800													
BasinB11	2.16	2175	0	None						-233.652	-678.87	No			2198
	2.66	2175													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough
Cat_Observ_N	Pit_A1	1.11	5	95		0	5	5	5						
Cat_A1	Pit_A2	0.16	95	0		0	5	5	5						
Cat_Kent_We	Pit_K5	0.458	95	0		0	5	5	5						
Cat_Kent_Eas	Pit_K1	2.437	50	50		0	5	5	5						

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BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

Cat_H7	Pit_H8	0.026	95	5	0	5	5	5
Cat_H8	Pit_H9	0.398	95	5	0	5	5	5
Cat_Hi12	Pit_Hi13	0.064	95	5	0	5	5	5
Cat_H9	Pit_H10	0.026	95	5	0	5	5	5
Cat_Hi10	Pit_Hi11	0.06	95	5	0	5	5	5
Cat_Hi11	Pit_Hi12	0.07	95	5	0	5	5	5
Cat_H6	Pit_H7	0.096	95	5	0	5	5	5
Cat_H10	Pit_H11	0.03	95	5	0	5	5	5
Cat_Hi8	Pit_Hi8	0.08	95	5	0	5	5	5
Cat_Hi9	Pit_Hi9	0.086	95	5	0	5	5	5
Cat_H5	Pit_H6	0.049	95	5	0	5	5	5
Cat_H11	Pit_H12	0.0392	95	5	0	5	5	5
Cat_Hi7	Pit_Hi7	0.1	95	5	0	5	5	5
Cat_H4	Pit_H4	0.26	95	5	0	5	5	5
Cat_H2	Pit_H2	0.068	95	5	0	5	5	5
Cat_H13	Pit_H16	0.04	95	5	0	5	5	5
Cat_Hi3	Pit_Hi3	0.06	95	5	0	5	5	5
Cat_Hi4	Pit_Hi4	0.089	95	5	0	5	5	5
CatB10	Pit_B9	0.6	100	0	0	5	5	5
Cat_H3	Pit_H3	0.37	95	5	0	5	5	5
Cat_Hi6	Pit_Hi6	0.014	95	5	0	5	5	5
Cat_H1	Pit_H1	0.486	95	5	0	5	5	5
Cat_H14	Pit_H17	0.012	95	0	0	5	5	5
Cat_Hi1	Pit_Hi1	0.07	95	5	0	5	5	5
Cat_Hi2	Pit_Hi2	0.07	95	5	0	5	5	5
Cat_H12	Pit_H13	0.044	95	5	0	5	5	5
Cat_A2	Pit_A3	0.11	95	5	0	5	5	5
Cat_MR1	Pit_MR1	0.145	50	50	0	5	5	5
Cat_MR2	Pit_MR2	0.143	50	50	0	5	5	5
CatB7	Pit_B16	0.057	100	0	0	5	5	5
Cat_W1	Pit_W1	0.084	95	5	0	5	5	5
Cat_D2	Pit_D5	0.37	95	5	0	5	5	5
Cat_D1	Pit_D1	0.093	95	5	0	5	5	5
CatB1	Pit_D2	0.1785	100	0	0	5	5	5
Cat_M1	Pit_M1	0.11	95	5	0	5	5	5
Cat_M2	Pit_M2	0.69	50	50	0	5	5	5
Cat_T1	Pit_T1	0.11	95	5	0	5	5	5
Cat_Hi5	Pit_Hi5	0.077	95	5	0	5	5	5
Cat_Hi13	Pit_Hi14	0.03	95	5	0	5	5	5
Cat_Hi14	Pit_Hi15	0.17	95	5	0	5	5	5
Cat_Hi15	Pit_Hi17	0.12	95	5	0	5	5	5
CatB5	Pit_B20	0.161	100	0	0	5	5	5
Cat_W2	Pit_W2	0.084	95	5	0	5	5	5
CatB3	Pit_B24	0.184	100	0	0	5	5	5
CatB2	BasinB2	0.74	100	0	0	5	5	5
CatB4	BasinB4	0.345	100	0	0	5	5	5
CatB6	BasinB6	0.486	100	0	0	5	5	5
CatB8	BasinB8	0.648	100	0	0	5	5	5
CatB9	BasinB9	0.56	100	0	0	5	5	5
CatB11	BasinB11	0.435	100	0	0	5	5	5

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)
P_A1	Pit_A1	Pit_A2	64	21	20.3	1.09	Concrete, u	375	375	0.3	New	1	Pit_A1	0	
P_A2	Pit_A2	Pit_K4	9	20.3	20.29	0.11	Concrete, u	375	375	0.3	New	1	Pit_A2	0	
P_K4	Pit_K4	N11	50	20.29	1	38.58	Concrete, u	375	375	0.3	New	1	Pit_K4	0	
P_K7	Pit_K7	Pit_K4	11	20.4	20.29	1	Concrete, u	375	375	0.3	New	1	Pit_K7	0	
P_K6	Pit_K6	Pit_K3	11	21.58	21.53	0.45	Concrete, u	375	375	0.3	New	1	Pit_K6	0	
P_K3	Pit_K3	Pit_K4	121	21.53	20.29	1.02	Concrete, u	375	375	0.3	New	1	Pit_K3	0	
P_K5	Pit_K5	Pit_K2	11	21.7	21.68	0.18	Concrete, u	375	375	0.3	New	1	Pit_K5	0	
P_K2	Pit_K2	Pit_K3	44	21.68	21.53	0.34	Concrete, u	375	375	0.3	New	1	Pit_K2	0	
P_K1	Pit_K1	Pit_K2	113	22.25	21.68	0.5	Concrete, u	375	375	0.3	New	1	Pit_K1	0	
P1/1	Pit_H8	Pit_H9	15	17.39	17.17	1.47	Concrete, u	375	375	0.3	New	1	Pit_H8	0	
P2/1	Pit_H9	Pit_Hi13	27	1.59	1.43	0.59	Concrete, u	375	375	0.3	New	1	Pit_H9	0	
P3/1	Pit_Hi13	Pit_B1	18	1.43	1.24	1.06	Concrete, u	375	375	0.3	New	1	Pit_Hi13	0	
P4/1	Pit_B1	Pit_B2	23	1.24	1.13	0.48	Concrete, u	375	375	0.3	New	1	Pit_B1	0	
P5/1	Pit_B2	Pit_B3	69	1.13	0.78	0.51	Concrete, u	375	375	0.3	New	1	Pit_B2	0	
P6/1	Pit_B3	N1	90	0.78	0.33	0.5	Concrete, u	375	375	0.3	New	1	Pit_B3	0	
P1/3	Pit_H10	Pit_Hi11	8	1.6	1.26	4.25	Concrete, u	375	375	0.3	New	1	Pit_H10	0	
P2/3	Pit_Hi11	Pit_Hi12	27	1.4	1.26	0.52	Concrete, u	375	375	0.3	New	1	Pit_Hi11	0	
P3/3	Pit_Hi12	Pit_B4	113	1.26	0.7	0.5	Concrete, u	375	375	0.3	New	1	Pit_Hi12	0	
P4/3	Pit_B4	N2	88	0.7	0.26	0.5	Concrete, u	375	375	0.3	New	1	Pit_B4	0	
P1/4	Pit_H7	Pit_H11	11	11.57	11.51	0.55	Concrete, u	375	375	0.3	New	1	Pit_H7	0	
P2/4	Pit_H11	Pit_Hi8	5	1.5	1.4	2	Concrete, u	375	375	0.3	New	1	Pit_H11	0	
P3/4	Pit_Hi8	Pit_Hi9	30	1.4	1.25	0.5	Concrete, u	375	375	0.3	New	1	Pit_Hi8	0	
P4/4	Pit_Hi9	Pit_B5	41	1.25	1.04	0.51	Concrete, u	375	375	0.3	New	1	Pit_Hi9	0	
P5/4	Pit_B5	Pit_B6	37	1.04	0.85	0.51	Concrete, u	375	375	0.3	New	1	Pit_B5	0	
P6/4	Pit_B6	Pit_B7	36	0.85	0.67	0.5	Concrete, u	375	375	0.3	New	1	Pit_B6	0	
P7/4	Pit_B7	N3	88	0.67	0.23	0.5	Concrete, u	375	375	0.3	New	1	Pit_B7	0	
P2/5	Pit_H6	Pit_H5	6	8.95	8.16	13.17	Concrete, u	225	225	0.3	New	1	Pit_H6	0	
P3/5	Pit_H5	Pit_H12	11	8.16	8.86	-6.36	Concrete, u	375	375	0.3	New	1	Pit_H5	0	
P4/5	Pit_H12	Pit_Hi6a	24	1.6	1.1	2.08	Concrete, u	450	450	0.3	New	1	Pit_H12	0	
P5/5	Pit_Hi6a	Pit_Hi7	14	1.07	1	0.5	Concrete, u	450	450	0.3	New	1	Pit_Hi6a	0	
P6/5	Pit_Hi7	Pit_B8	32	1	0.84	0.5	Concrete, u	450	450	0.3	New	1	Pit_Hi7	0	
P7/5	Pit_B8	N4	173	0.84	-0.025	0.5	Concrete, u	450	450	0.3	New	1	Pit_B8	0	
P1/5	Pit_H4	Pit_H5	3	8.35	8.16	6.33	Concrete, u	225	225	0.3	New	1	Pit_H4	0	
P1/9	Pit_H2	Pit_H16	11	12.32	12.19	1.18	Concrete, u	225	225	0.3	New	1	Pit_H2	0	
P2/9	Pit_H16	Pit_Hi3	4.5	1.51	1.31	4.44	Concrete, u	225	225	0.3	New	1	Pit_H16	0	
P3/9	Pit_Hi3	Pit_Hi4	23	1.13	0.6	2.3	Concrete, u	450	450	0.3	New	1	Pit_Hi3	0	
P4/9	Pit_Hi4	Pit_B9	33	0.6	0.72	-0.36	Concrete, u	450	450	0.3	New	1	Pit_Hi4	0	
P5/9	Pit_B9	Pit_B10	96	0.72	-0.041	0.79	Concrete, u	600	600	0.3	New	1	Pit_B9	0	
P6/9	Pit_B10	Pit_B11	51	-0.041	-0.44	0.78	Concrete, u	600	600	0.3	New	1	Pit_B10	0	
P7/9	Pit_B11	N5	29	-0.44	-0.69	0.86	Concrete, u	600	600	0.3	New	1	Pit_B11	0	
P1/6	Pit_H3	Pit_H15	11	8.81	8.45	3.27	Concrete, u	225	225	0.3	New	1	Pit_H3	0	
P2/6	Pit_H15	Pit_Hi6	4	1.5	1.38	3	Concrete, u	375	375	0.3	New	1	Pit_H15	0	
P3/6	Pit_Hi6	Pit_Hi6a	14	1.38	1.07	2.21	Concrete, u	450	450	0.3	New	1	Pit_Hi6	0	
P1/10	Pit_H1	Pit_H17	10.5	15.55	15.42	1.24	Concrete, u	225	225	0.3	New	1	Pit_H1	0	
P2/10	Pit_H17	Pit_Hi1	4.5	1.7	1.1	13.33	Concrete, u	225	225	0.3	New	1	Pit_H17	0	
P3/10	Pit_Hi1	Pit_Hi2	19	1.1	1.7	-3.16	Concrete, u	225	225	0.3	New	1	Pit_Hi1	0	
P4/10	Pit_Hi2	Pit_B12	49	1.7	1.1	1.22	Concrete, u	450	450	0.3	New	1	Pit_Hi2	0	
P5/10	Pit_B12	Pit_B13	64	1.1	0.78	0.5	Concrete, u	525	525	0.3	New	1	Pit_B12	0	
P6/10	Pit_B13	Pit_B14	22	0.78	0.67	0.5	Concrete, u	525	525	0.3	New	1	Pit_B13	0	
P7/10	Pit_B14	Pit_B15	51	0.67	0.42	0.49	Concrete, u	525	525	0.3	New	1	Pit_B14	0	
P8/10	Pit_B15	N6	29	0.42	0.27	0.52	Concrete, u	525	525	0.3	New	1	Pit_B15	0	
P1/7	Pit_H13	Pit_H14	8	8.92	8.8	1.5	Concrete, u	300	300	0.3	New	1	Pit_H13	0	
P2/7	Pit_H14	Pit_H15	0.5	8.8	8.32	96	Concrete, u	300	300	0.3	New	1	Pit_H14	0	
P1/11	Pit_A3	Pit_MR1	46	15.51	11.58	8.54	Concrete, u	375	375	0.3	New	1	Pit_A3	0	
P2/11	Pit_MR1	Pit_MR2	23	11.58	11.3	1.22	Concrete, u	525	525	0.3	New	1	Pit_MR1	0	
P3/11	Pit_MR2	Pit_B16	31	1.37	1.37	0	Concrete, u	525	525	0.3	New	1	Pit_MR2	0	
P4/11	Pit_B16	Pit_B17	46	1.37	0.79	1.26	Concrete, u	525	525	0.3	New	1	Pit_B16	0	
P5/11	Pit_B17	Pit_B18	22	0.79	0.35	2	Concrete, u	525	525	0.3	New	1	Pit_B17	0	
P6/11	Pit_B18	Pit_B19	51	0.35	0.095	0.5	Concrete, u	525	525	0.3	New	1	Pit_B18	0	
P7/11	Pit_B19	N7	29	0.095	-0.05	0.5	Concrete, u	525	525	0.3	New	1	Pit_B19	0	
P_W1	Pit_W1	N10	20	12.87	1	59.35	Concrete, u	375	375	0.3	New	1	Pit_W1	0	
P1/13	Pit_D5	Pit_D3	31	5.11	3.18	6.23	Concrete, u	375	375	0.3	New	1	Pit_D5	0	
P3/12	Pit_D3	Pit_B22	9	3.15	1.68	16.33	Concrete, u	375	375	0.3	New	1	Pit_D3	0	
P4/12	Pit_B22	Pit_B23	1	1.68	1.42	26	Concrete, u	375	375	0.3	New	1	Pit_B22	0	
P5/12	Pit_B23	N9	100	1.42	0.92	0.5	Concrete, u	375	375	0.3	New	1	Pit_B23	0	
P1/12	Pit_D1	Pit_D2	32	4.67	2.55	6.63	Concrete, u	300	300	0.3	New	1	Pit_D1	0	
P2/12	Pit_D2	Pit_D3	0.5	2.55	2.5	10	Concrete, u	300	300	0.3	New	1	Pit_D2	0	
P1/15	Pit_M1	Pit_M2	53	18.25	12.54	10.77	Concrete, u	225	225	0.3	New	1	Pit_M1	0	

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P2/15	Pit_M2	Pit_B22	8	1.8	1.68	1.5	Concrete, u	225	225	0.3	New	1	Pit_M2	0
P1/14	Pit_T1	Pit_B23	42	2.56	1.42	2.71	Concrete, u	375	375	0.3	New	1	Pit_T1	0
P1/8	Pit_Hi5	Pit_Hi6	13	1.43	1.38	0.38	Concrete, u	375	375	0.3	New	1	Pit_Hi5	0
P1/2	Pit_Hi14	Pit_Hi15	7	1.8	1.56	3.43	Concrete, u	225	225	0.3	New	1	Pit_Hi14	0
P2/2	Pit_Hi15	Pit_Hi16	12	1.56	1.53	0.25	Concrete, u	225	225	0.3	New	1	Pit_Hi15	0
P3/2	Pit_Hi16	Pit_Hi17	9	1.53	1.5	0.33	Concrete, u	225	225	0.3	New	1	Pit_Hi16	0
P4/2	Pit_Hi17	Pit_B1	24	1.5	1.24	1.08	Concrete, u	225	225	0.3	New	1	Pit_Hi17	0
P1/16	Pit_B20	Pit_B21	56	1.53	0.89	1.14	Concrete, u	450	450	0.3	New	1	Pit_B20	0
P2/16	Pit_B21	N8	102	0.87	0	0.85	Concrete, u	600	600	0.3	New	1	Pit_B21	0
P_W2	Pit_W2	N10	60	13.77	1	21.28	Concrete, u	375	375	0.3	New	1	Pit_W2	0
P1/17	Pit_B24	Pit_B25	56	1.6	1.18	0.75	Concrete, u	375	375	0.3	New	1	Pit_B24	0
P2/17	Pit_B25	N12	102	1.18	0.67	0.5	Concrete, u	375	375	0.3	New	1	Pit_B25	0

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height o	Chg (m)	Bottom Elev (m)	Height of (m)	Chg (m)	Bottom Elev (m)	Height of (m)	Serv etc	etc

CHANNEL DETAILS

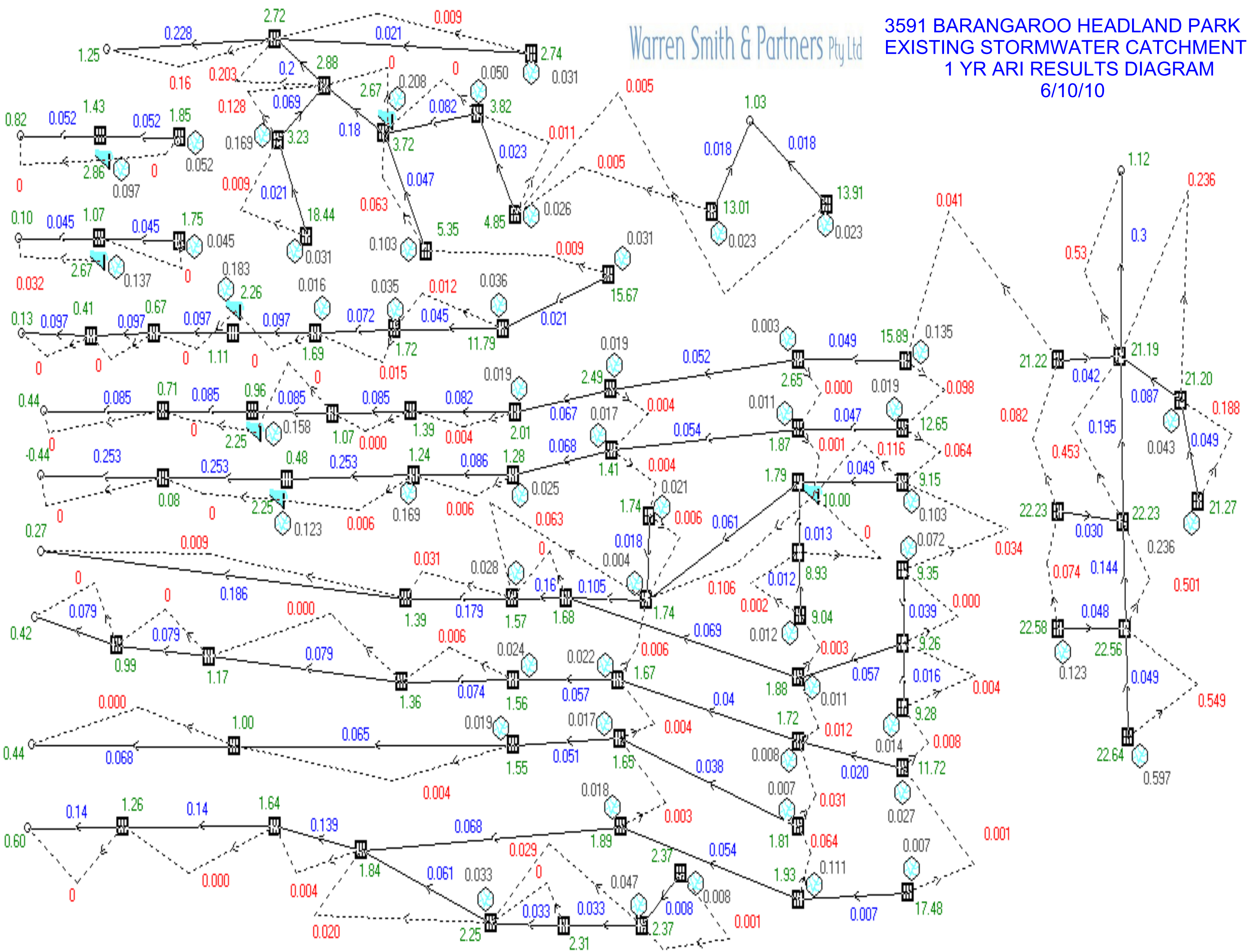
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	Length (m)
OF73	Pit_A1	Pit_A2	2				Dummy us	0.3	0.3	0.6	1	0	446	20
OF72	Pit_A2	Pit_K4	2				Dummy us	0.3	0.3	0.6	1	0	507	20
OF71	Pit_K4	N11	2				Dummy us	0.3	0.3	0.6	1	0	498	20
OF70	Pit_K7	Pit_H1	2				Dummy us	0.3	0.3	0.6	1	0	502	20
OF68	Pit_K6	Pit_K7	2				Dummy us	0.3	0.3	0.6	1	0	560	20
OF69	Pit_K3	Pit_K4	2				Dummy us	0.3	0.3	0.6	1	0	488	20
OF67	Pit_K5	Pit_K6	2				Dummy us	0.3	0.3	0.6	1	0	550	20
OF66	Pit_K2	Pit_K3	2				Dummy us	0.3	0.3	0.6	1	0	486	20
OF65	Pit_K1	Pit_K2	2				Dummy us	0.3	0.3	0.6	1	0	450	20
OF64	Pit_H8	Pit_H7	2				Dummy us	0.3	0.3	0.6	1	0	320	20
OF63	Pit_H9	Pit_H10	2				Dummy us	0.3	0.3	0.6	1	0	334	20
OF25	Pit_Hi13	Pit_Hi11	2				Dummy us	0.3	0.3	0.6	1	0	1023	20
OF10	Pit_B1	Pit_B2	2				Dummy us	0.3	0.3	0.6	1	0	1410	20
OF9	Pit_B2	Pit_B3	2				Dummy us	0.3	0.3	0.6	1	0	1409	20
OF8	Pit_B3	N1	2				Dummy us	0.3	0.3	0.6	1	0	1417	20
OF62	Pit_H10	Pit_H11	2				Dummy us	0.3	0.3	0.6	1	0	339	20
OF27	Pit_Hi11	Pit_Hi8	2				Dummy us	0.3	0.3	0.6	1	0	1016	20
OF26	Pit_Hi12	Pit_B4	2				Dummy us	0.3	0.3	0.6	1	0	1057	20
OF11	Pit_B4	N2	2				Dummy us	0.3	0.3	0.6	1	0	1380	20
OF61	Pit_H7	Pit_H6	2				Dummy us	0.3	0.3	0.6	1	0	329	20
OF60	Pit_H11	Pit_H12	2				Dummy us	0.3	0.3	0.6	1	0	343	20
OF30	Pit_Hi8	Pit_Hi6	2				Dummy us	0.3	0.3	0.6	1	0	1012	20
OF29	Pit_Hi9	Pit_B5	2				Dummy us	0.3	0.3	0.6	1	0	1052	20
OF28	Pit_B5	Pit_B6	2				Dummy us	0.3	0.3	0.6	1	0	1337	20
OF13	Pit_B6	Pit_B7	2				Dummy us	0.3	0.3	0.6	1	0	1338	20
OF12	Pit_B7	N3	2				Dummy us	0.3	0.3	0.6	1	0	1339	20
OF59	Pit_H6	Pit_H5	2				Dummy us	0.3	0.3	0.6	1	0	317	20
OF68	Pit_H5	Pit_H4	2				Dummy us	0.3	0.3	0.6	1	0	286	20
OF56	Pit_H12	Pit_H13	2				Dummy us	0.3	0.3	0.6	1	0	346	20
OF75	Pit_Hi6a	Pit_Hi7	2				Dummy us	0.3	0.3	0.6	1	0	1945	20
OF31	Pit_Hi7	Pit_B8	2				Dummy us	0.3	0.3	0.6	1	0	1040	20
OF14	Pit_B8	N4	2				Dummy us	0.3	0.3	0.6	1	0	1334	20
OF57	Pit_H4	Pit_H3	2				Dummy us	0.3	0.3	0.6	1	0	294	20
OF55	Pit_H2	Pit_H3	2				Dummy us	0.3	0.3	0.6	1	0	285	20
OF50	Pit_H16	OSD_High	2				Dummy us	0.3	0.3	0.6	1	0	288	20
OF34	Pit_Hi3	Pit_Hi5	2				Dummy us	0.3	0.3	0.6	1	0	1002	20
OF33	Pit_Hi4	Pit_B9	2				Dummy us	0.3	0.3	0.6	1	0	1033	20
OF17	Pit_B9	BasinB11	2				Dummy us	0.3	0.3	0.6	1	0	1272	20
OF15	Pit_B11	N5	2				Dummy us	0.3	0.3	0.6	1	0	1298	20
OF52	Pit_H3	OSD_High	2				Dummy us	0.3	0.3	0.6	1	0	1734	20
OF74	Pit_Hi6	Pit_Hi7	2				Dummy us	0.3	0.3	0.6	1	0	1946	20
OF51	Pit_H1	Pit_H2	2				Dummy us	0.2	0.05	0.6	1	0	280	20
OF49	Pit_H17	Pit_H16	2				Dummy us	0.3	0.3	0.6	1	0	287	20
OF36	Pit_Hi1	Pit_Hi3	2				Dummy us	0.3	0.3	0.6	1	0	998	20
OF35	Pit_Hi2	Pit_B12	2				Dummy us	0.3	0.3	0.6	1	0	1027	20
OF21	Pit_B12	Pit_B13	2				Dummy us	0.3	0.3	0.6	1	0	1248	20
OF20	Pit_B13	BasinB9	2				Dummy us	0.3	0.3	0.6	1	0	1247	20
OF18	Pit_B15	N6	2				Dummy us	0.3	0.3	0.6	1	0	1250	20
OF48	Pit_H13	Pit_H14	2				Dummy us	0.3	0.3	0.6	1	0	312	20
OF53	Pit_H14	OSD_High	2				Dummy us	0.3	0.3	0.6	1	0	305	20
OF45	Pit_A3	Pit_D5	2				Dummy us	0.3	0.3	0.6	1	0	510	20
OF46	Pit_MR1	Pit_MR2	2				Dummy us	0.3	0.3	0.6	1	0	520	20
OF47	Pit_MR2	Pit_B16	2				Dummy us	0.3	0.3	0.6	1	0	524	20
OF6	Pit_B16	BasinB8	2				Dummy us	0.3	0.3	0.6	1	0	1628	20
OF4	Pit_B18	Pit_B19	2				Dummy us	0.3	0.3	0.6	1	0	1615	20
OF3	Pit_B19	N7	2				Dummy us	0.3	0.3	0.6	1	0	1616	20
OF44	Pit_W1	Pit_D1	2				Dummy us	0.3	0.3	0.6	1	0	593	20
OF76	Pit_D5	Pit_D3	2				Dummy us	0.2	0.05	0.6	1	0	1994	20
OF37	Pit_B22	Pit_B23	2				Dummy us	0.3	0.3	0.6	1	0	1549	20
OF7	Pit_B23	N9	2				Dummy us	0.3	0.3	0.6	1	0	1509	20
OF43	Pit_D1	Pit_D2	2				Dummy us	0.3	0.3	0.6	1	0	1523	20
OF41	Pit_D2	Pit_D3	2				Dummy us	0.3	0.3	0.6	1	0	1529	20
OF42	Pit_M1	Pit_M2	2				Dummy us	0.3	0.3	0.6	1	0	530	20
OF39	Pit_M2	Pit_B22	2				Dummy us	0.3	0.3	0.6	1	0	1543	20
OF38	Pit_T1	Pit_B23	2				Dummy us	0.3	0.3	0.6	1	0	1519	20
OF32	Pit_Hi5	Pit_Hi6	2				Dummy us	0.3	0.3	0.6	1	0	1008	20
OF81	Pit_Hi14	Pit_Hi15	2				Dummy us	0.2	0.05	0.6	1	0	6230351	20
OF23	Pit_Hi15	Pit_Hi17	2				Dummy us	0.3	0.3	0.6	1	0	1066	20
OF22	Pit_Hi16	Pit_Hi17	2				Dummy us	0.3	0.3	0.6	1	0	1072	20
OF80	Pit_Hi17	Pit_B1	2				Dummy us	0.2	0.05	0.6	1	0	6230339	20
OF1	Pit_B20	Pit_B21	2				Dummy us	0.3	0.3	0.6	1	0	1647	20
OF83	OSD_High	Pit_Hi6	2	9.97	15	1.67	Dummy us	0.2	0.05	0.6	1	0	17825930	20
OF77	Pit_W2	Pit_D1	2				Dummy us	0.3	0.3	0.6	1	0	1980	20
OF78	Pit_B24	BasinB4	2				Dummy us	0.2	0.05	0.6	1	0	2065	20
OF82	BasinB2	Pit_B22	2	2.88	40	1.67	Dummy us	0.2	0.05	0.6	1	0	17825903	20
OF79	BasinB4	N12	2	2.97	30	1.67	Dummy us	0.2	0.05	0.6	1	0	2064	20
OF2	BasinB6	N8	2	2.66	30	1.67	Dummy us	0.3	0.3	0.6	1	0	1648	20
OF5	BasinB8	Pit_B18	2	3.02	30	1.67	Dummy us	0.3	0.3	0.6	1	0	1627	20
OF19	BasinB9	Pit_B15	2	2.96	30	1.67	Dummy us	0.3	0.3	0.6	1	0	1249	20
OF16	BasinB11	Pit_B11	2	2.66	30	1.67	Dummy us	0.3	0.3	0.6	1	0	1293	20

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
EXISTING STORMWATER CATCHMENT
1 YR ARI RESULTS DIAGRAM
6/10/10



3591 BARANGAROO HEADLAND PARK
1 Year ARI Results
EXISTING STORMWATER CATCHMENT
Sep-10

DRAINS results prepared 22 September, 2010 from Version 2010.04

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_A1	21.27		0.236		0.93	0.188	Inlet Capacity
Pit_A2	21.2		0.217		0	0.236	Outlet System
Pit_K4	21.19		0.578		0	0.53	Outlet System
N11	1.12		0.53				
Pit_K7	21.22		0.082		0.08	0.041	Inlet Capacity
Pit_K6	22.23		0.074		0	0.082	Outlet System
Pit_K3	22.23		0.501		0.2	0.453	Inlet Capacity
Pit_K5	22.58		0.123		0.02	0.074	Inlet Capacity
Pit_K2	22.56		0.549		0.02	0.501	Inlet Capacity
Pit_K1	22.64		0.597		0.51	0.549	Inlet Capacity
Pit_H8	17.48		0.007		0.81	0.001	Inlet Capacity
Pit_H9	1.93		0.111		17.14	0.064	Inlet Capacity
Pit_Hi13	1.89		0.018		0.76	0.003	Inlet Capacity
Pit_B1	1.84		0.02		0.45	0.004	Inlet Capacity
Pit_B2	1.64		0.004		0.82	0	Inlet Capacity
Pit_B3	1.26		0		1.22	0	None
N1	0.6		0				
Pit_H10	1.81		0.069		13.69	0.031	Inlet Capacity
Pit_Hi11	1.65		0.019		0.65	0.004	Inlet Capacity
Pit_Hi12	1.55		0.019		0.87	0.004	Inlet Capacity
Pit_B4	1		0.004		1.46	0	Inlet Capacity
N2	0.44		0				
Pit_H7	11.72		0.027		0.75	0.008	Inlet Capacity
Pit_H11	1.72		0.035		10.73	0.012	Inlet Capacity
Pit_Hi8	1.67		0.025		0.63	0.006	Inlet Capacity
Pit_Hi9	1.56		0.024		0.81	0.006	Inlet Capacity
Pit_B5	1.36		0.006		1.12	0	Inlet Capacity
Pit_B6	1.17		0		1.31	0	None
Pit_B7	0.99		0		1.5	0	None
N3	0.42		0				
Pit_H6	9.28		0.019		0.55	0.004	Inlet Capacity
Pit_H5	9.26		0.004		0.69	0	Inlet Capacity
Pit_H12	1.88		0.018		7.84	0.003	Inlet Capacity
Pit_Hi6a	1.68		0		0.66	0	None
Pit_Hi7	1.57		0.068		0.77	0.031	Inlet Capacity
Pit_B8	1.39		0.031		0.85	0.009	Inlet Capacity
N4	0.27		0.009				
Pit_H4	9.35		0.072		0.27	0.034	Inlet Capacity
Pit_H2	12.65		0.111		0.57	0.064	Inlet Capacity
Pit_H16	1.87		0.011		11.3	0.001	Inlet Capacity
Pit_Hi3	1.41		0.02		0.8	0.004	Inlet Capacity
Pit_Hi4	1.28		0.025		1.01	0.006	Inlet Capacity
Pit_B9	1.24		0.174		0.99	0.006	Inlet Capacity
Pit_B10	0.48		0		1.68		None
Pit_B11	0.08		0		2.44	0	None
N5	-0.44		0				
Pit_H3	9.15		0.164		0.56	0.116	Inlet Capacity
Pit_H15	1.79		0		7.73		None
Pit_Hi6	1.74		0.11		0.54	0.063	Inlet Capacity
Pit_H1	15.89		0.146		0.56	0.098	Inlet Capacity
Pit_H17	2.65		0.003		13.68	0	Inlet Capacity
Pit_Hi1	2.49		0.019		0.05	0.004	Inlet Capacity
Pit_Hi2	2.01		0.019		0.49	0.004	Inlet Capacity
Pit_B12	1.39		0.004		1.31	0	Inlet Capacity
Pit_B13	1.07		0		1.11	0	None
Pit_B14	0.96		0		1.68		None
Pit_B15	0.71		0		1.87	0	None
N6	0.44		0				
Pit_H13	9.04		0.014		0.49	0.002	Inlet Capacity
Pit_H14	8.93		0.002		0.59	0	None
Pit_A3	15.67		0.031		0.74	0.009	Inlet Capacity
Pit_MR1	11.79		0.036		0.69	0.012	Inlet Capacity
Pit_MR2	1.72		0.042		14.7	0.015	Inlet Capacity
Pit_B16	1.69		0.026		1.31	0	None
Pit_B17	1.11		0		1.06		None
Pit_B18	0.67		0		1.93	0	None
Pit_B19	0.41		0		2.19	0	None
N7	0.13		0				
Pit_W1	13.01		0.023		0.79	0.005	Inlet Capacity
N10	1.03		0				
Pit_D5	5.35		0.11		0.66	0.063	Inlet Capacity
Pit_D3	3.72		0.063		0.4		None
Pit_B22	2.88		0.128		0	0.203	Outlet System
Pit_B23	2.72		0.208		0.38	0.16	Inlet Capacity
N9	1.25		0.16				
Pit_D1	4.85		0.034		0.72	0.011	Inlet Capacity
Pit_D2	3.82		0.059		0.26	0	None
Pit_M1	18.44		0.031		0.71	0.009	Inlet Capacity
Pit_M2	3.23		0.176		9.75	0.128	Inlet Capacity
Pit_T1	2.74		0.031		0.72	0.009	Inlet Capacity
Pit_Hi5	1.74		0.024		0.49	0.006	Inlet Capacity
Pit_Hi14	2.37		0.008		0.03	0.001	Inlet Capacity
Pit_Hi15	2.37		0.048		0	0.029	Outlet System
Pit_Hi16	2.31		0		0.3	0	None
Pit_Hi17	2.25		0.052		0.14	0.02	Inlet Capacity
Pit_B20	1.75		0.045		0.75	0	None
Pit_B21	1.07		0		1.11		None
N8	0.1		0.032				
Pit_W2	13.91		0.023		0.79	0.005	Inlet Capacity
Pit_B24	1.85		0.052		0.65	0	None
Pit_B25	1.43		0		1.07		None
N12	0.82		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_Observ_N	0.236	0.015	0.222	5	5	5	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
Cat_A1	0.043	0.043	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Kent_Wes	0.123	0.123	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Kent_East	0.597	0.343	0.254	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H7	0.007	0.007	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H8	0.111	0.106	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi12	0.018	0.017	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H9	0.007	0.007	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi10	0.017	0.016	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi11	0.019	0.019	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H6	0.027	0.026	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H10	0.008	0.008	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi8	0.022	0.021	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi9	0.024	0.023	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H5	0.014	0.013	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H11	0.011	0.01	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

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Cat_Hi7	0.028	0.027	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H4	0.072	0.07	0.003	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H2	0.019	0.018	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H13	0.011	0.011	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi3	0.017	0.016	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi4	0.025	0.024	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB10	0.169	0.169	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H3	0.103	0.099	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi6	0.004	0.004	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H1	0.135	0.13	0.005	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H14	0.003	0.003	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi1	0.019	0.019	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi2	0.019	0.019	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_H12	0.012	0.012	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_A2	0.031	0.029	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_MR1	0.036	0.02	0.015	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_MR2	0.035	0.02	0.015	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB7	0.016	0.016	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_W1	0.023	0.022	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_D2	0.103	0.099	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_D1	0.026	0.025	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB1	0.05	0.05	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_M1	0.031	0.029	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_M2	0.169	0.097	0.072	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_T1	0.031	0.029	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi5	0.021	0.021	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi13	0.008	0.008	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi14	0.047	0.045	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_Hi15	0.033	0.032	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB5	0.045	0.045	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Cat_W2	0.023	0.022	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB3	0.052	0.052	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB2	0.208	0.208	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB4	0.097	0.097	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB6	0.137	0.137	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB8	0.183	0.183	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB9	0.158	0.158	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
CatB11	0.123	0.123	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

Outflow Volumes for Total Catchment (10.6 impervious + 2.96 pervious = 13.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 1 year, 5	1164.86	812.14 (69.7%)	804.33 (88.3%)	7.81 (3.1%)
AR&R 1 year, 1	1786.87	1367.01 (76.5%)	1290.46 (92.4%)	76.55 (19.6%)
AR&R 1 year, 1	2239.25	1768.94 (79.0%)	1644.01 (93.9%)	124.93 (25.5%)
AR&R 1 year, 2	2623.77	2113.45 (80.6%)	1944.53 (94.8%)	168.92 (29.5%)
AR&R 1 year, 2	2940.43	2380.57 (81.0%)	2192.01 (95.4%)	188.55 (29.4%)
AR&R 1 year, 3	3202.8	2599.44 (81.2%)	2397.08 (95.8%)	202.36 (28.9%)
AR&R 1 year, 4	3857.61	3168.72 (82.1%)	2908.84 (96.5%)	259.88 (30.8%)
AR&R 1 year, 1	4369.93	3609.18 (82.6%)	3309.23 (96.9%)	299.95 (31.4%)
AR&R 1 year, 1	5068.84	4182.91 (82.5%)	3855.47 (97.3%)	327.44 (29.6%)
AR&R 1 year, 2	5618.48	4643.93 (82.7%)	4285.04 (97.6%)	358.89 (29.2%)
AR&R 1 year, 3	6473.46	5341.80 (82.5%)	4953.19 (97.9%)	388.61 (27.5%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P_A1	0.049	0.7	21.235	21.2	AR&R 1 year, 45 minutes storm, average 37.9 mm/h, Zone 1
P_A2	0.087	0.8	21.2	21.19	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P_K4	0.3	10	20.409	1.119	AR&R 1 year, 30 minutes storm, average 47.2 mm/h, Zone 1
P_K7	0.042	0.4	21.211	21.19	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P_K6	0.03	0.3	22.23	22.232	AR&R 1 year, 5 minutes storm, average 103 mm/h, Zone 1
P_K3	0.195	1.8	22.029	21.19	AR&R 1 year, 30 minutes storm, average 47.2 mm/h, Zone 1
P_K5	0.048	0.4	22.565	22.559	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_K2	0.144	1.3	22.428	22.232	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_K1	0.049	0.4	22.618	22.559	AR&R 1 year, 3 hours storm, average 15.9 mm/h, Zone 1
P1/1	0.007	1	17.432	17.212	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/1	0.054	0.5	1.904	1.887	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/1	0.068	0.6	1.858	1.839	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/1	0.139	1.3	1.723	1.638	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/1	0.14	1.3	1.527	1.263	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/1	0.14	1.6	1.085	0.604	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/3	0.038	2.8	1.668	1.652	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/3	0.051	1.2	1.55	1.55	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P3/3	0.065	1.3	1.432	0.998	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/3	0.068	1.3	0.876	0.436	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/4	0.02	1.1	11.654	11.594	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/4	0.04	0.8	1.669	1.669	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P3/4	0.057	1.2	1.563	1.563	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/4	0.074	1.4	1.434	1.364	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/4	0.079	1.4	1.23	1.175	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/4	0.079	1.4	1.041	0.995	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/4	0.079	1.4	0.861	0.421	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/5	0.016	0.4	9.268	9.263	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/5	0.057	1.1	9.243	9.033	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/5	0.069	2.4	1.707	1.68	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/5	0.16	1	1.603	1.573	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/5	0.179	1.1	1.476	1.391	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/5	0.186	1.7	1.132	0.267	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/5	0.039	1	9.277	9.263	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/9	0.047	1.7	12.468	12.338	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/9	0.054	2.9	1.616	1.416	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/9	0.068	1.4	1.29	1.28	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/9	0.086	0.5	1.258	1.236	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/9	0.253	2.2	0.978	0.475	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/9	0.253	2.2	0.218	0.076	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/9	0.253	2.2	-0.188	-0.438	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/6	0.049	2.6	8.919	8.559	AR&R 1 year, 15 minutes storm, average 66 mm/h, Zone 1
P2/6	0.061	0.8	1.736	1.736	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/6	0.105	0.9	1.69	1.68	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
P1/10	0.049	1.7	15.699	15.569	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/10	0.052	1.3	2.523	2.486	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
P3/10	0.067	1.7	2.27	2.007	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/10	0.082	2	1.84	1.395	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/10	0.085	1.4	1.271	1.075	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/10	0.085	1.3	0.965	0.965	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/10	0.085	1.4	0.842	0.715	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P8/10	0.085	1.4	0.589	0.439	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/7	0.012	1.4	8.973	8.93	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/7	0.013	6.1	8.821	8.341	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/11	0.021	2.8	15.555	11.789	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/11	0.045	1.8	11.671	11.391	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/11	0.072	0.5	1.7	1.687	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/11	0.097	2.1	1.509	1.107	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/11	0.097	2.6	0.911	0.667	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/11	0.097	1.4	0.534	0.412	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/11	0.097	1.4	0.279	0.134	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_W1	0.018	5.6	12.895	1.025	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

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P1/13	0.047	3.4	5.179	3.721	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/12	0.18	6.4	3.264	2.88	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/12	0.2	1.8	2.722	2.722	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P5/12	0.228	2.2	2.397	1.252	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/12	0.023	2.9	4.721	3.822	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/12	0.082	1.2	3.721	3.721	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/15	0.021	3.4	18.298	12.588	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/15	0.069	1.7	3	2.88	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/14	0.021	0.4	2.726	2.722	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/8	0.018	0.2	1.736	1.736	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/2	0.008	0.2	2.372	2.37	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/2	0.033	0.8	2.336	2.309	AR&R 1 year, 5 minutes storm, average 103 mm/h, Zone 1
P3/2	0.033	0.8	2.275	2.255	AR&R 1 year, 5 minutes storm, average 103 mm/h, Zone 1
P4/2	0.061	1.5	2.092	1.839	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/16	0.045	1.7	1.63	1.071	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/16	0.045	1.6	0.966	0.096	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P_W2	0.018	3	13.808	1.038	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/17	0.052	1.4	1.736	1.435	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/17	0.052	1.2	1.332	0.822	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
OF73	0.188	0.188	19.77	0.044	0.03	12.89	0.6	AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1
OF72	0.236	0.236	19.77	0.048	0.03	13.61	0.65	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF71	0.53	0.53	19.77	0.067	0.05	17.38	0.81	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF70	0.041	0.041	19.77	0.025	0.01	8.23	0.4	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF68	0.082	0.082	19.77	0.033	0.02	10.56	0.46	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF69	0.453	0.453	19.77	0.063	0.05	16.66	0.76	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF67	0.074	0.074	19.77	0.031	0.01	10.2	0.47	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF66	0.501	0.501	19.77	0.066	0.05	17.2	0.78	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF65	0.549	0.549	19.77	0.068	0.06	17.56	0.82	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF64	0.001	0.001	19.77	0.005	0	1.65	0.13	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF63	0.064	0.064	19.77	0.03	0.01	10.02	0.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF25	0.003	0.003	19.77	0.009	0	3.14	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF10	0.004	0.004	19.77	0.01	0	3.44	0.23	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF9	0	0	19.77	0	0	0	0	
OF8	0	0	19.77	0	0	0	0	
OF62	0.031	0.031	19.77	0.023	0.01	7.63	0.35	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF27	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF26	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF11	0	0	19.77	0	0	0	0	
OF61	0.008	0.008	19.77	0.013	0	4.34	0.27	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF60	0.012	0.012	19.77	0.016	0	5.24	0.28	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF30	0.006	0.006	19.77	0.012	0	4.04	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF29	0.006	0.006	19.77	0.012	0	4.04	0.23	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF28	0	0	19.77	0	0	0	0	
OF13	0	0	19.77	0	0	0	0	
OF12	0	0	19.77	0	0	0	0	
OF59	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF68	0	0	19.77	0	0	0	0	
OF56	0.003	0.003	19.77	0.009	0	3.14	0.22	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF75	0	0	19.77	0	0	0	0	
OF31	0.031	0.031	19.77	0.023	0.01	7.63	0.35	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF14	0.009	0.009	19.77	0.015	0	4.94	0.26	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF57	0.034	0.034	19.77	0.024	0.01	7.93	0.36	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF55	0.064	0.064	19.77	0.03	0.01	10.02	0.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF50	0.001	0.001	19.77	0.007	0	2.25	0.16	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF34	0.004	0.004	19.77	0.01	0	3.44	0.22	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF33	0.006	0.006	19.77	0.012	0	4.04	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF17	0.006	0.006	19.77	0.012	0	4.04	0.24	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF15	0	0	19.77	0	0	0	0	
OF52	0.116	0.116	19.77	0.037	0.02	11.45	0.51	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF74	0.063	0.063	19.77	0.029	0.01	9.73	0.44	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF51	0.098	0.098	0.256	0.035	0.02	10.91	0.5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF49	0	0	19.77	0	0	0	0	
OF36	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF35	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF21	0	0	19.77	0	0	0	0	
OF20	0	0	19.77	0	0	0	0	
OF18	0	0	19.77	0	0	0	0	
OF48	0.002	0.002	19.77	0.008	0	2.54	0.19	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF53	0	0	19.77	0	0	0	0	
OF45	0.009	0.009	19.77	0.015	0	4.94	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF46	0.012	0.012	19.77	0.016	0	5.24	0.29	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF47	0.015	0.015	19.77	0.018	0.01	5.84	0.3	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF6	0	0	19.77	0	0	0	0	
OF4	0	0	19.77	0	0	0	0	
OF3	0	0	19.77	0	0	0	0	
OF44	0.005	0.005	19.77	0.012	0	4.04	0.22	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF76	0.063	0.063	0.256	0.03	0.01	10.02	0.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF37	0.203	0.203	19.77	0.045	0.03	13.07	0.62	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF7	0.16	0.16	19.77	0.042	0.02	12.35	0.57	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF43	0.011	0.011	19.77	0.016	0	5.24	0.27	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF41	0	0	19.77	0	0	0	0	
OF42	0.009	0.009	19.77	0.015	0	4.94	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF39	0.128	0.128	19.77	0.038	0.02	11.63	0.54	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF38	0.009	0.009	19.77	0.015	0	4.94	0.25	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF32	0.006	0.006	19.77	0.012	0	4.04	0.24	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF81	0.001	0.001	0.256	0.006	0	1.95	0.12	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF23	0.029	0.029	19.77	0.022	0.01	7.33	0.36	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF22	0	0	19.77	0	0	0	0	
OF80	0.02	0.02	0.256	0.019	0.01	6.44	0.32	AR&R 1 year, 20 minutes storm, average 58 mm/h, Zone 1
OF1	0	0	19.77	0	0	0	0	
OF83	0.106	0.106	0.256	0.035	0.02	11.09	0.51	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF77	0.005	0.005	19.77	0.012	0	4.04	0.22	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
OF78	0	0	0.256	0	0	0	0	
OF82	0	0	0.256	0	0	0	0	
OF79	0	0	0.256	0	0	0	0	
OF2	0.032	0.032	19.77	0.023	0.01	7.63	0.37	AR&R 1 year, 1 hour storm, average 32.2 mm/h, Zone 1
OF5	0	0	19.77	0	0	0	0	
OF19	0	0	19.77	0	0	0	0	
OF16	0	0	19.77	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD_High	10	40.4	0.106	0	0.106
BasinB2	2.67	345.6	0	0	0
BasinB4	2.86	161.1	0	0	0
BasinB6	2.67	123.3	0.032	0	0.032
BasinB8	2.26	302.6	0	0	0
BasinB9	2.25	261.5	0	0	0
BasinB11	2.25	206.5	0	0	0

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CONTINUITY CHECK for AR&R 1 year, 1.5 hours storm, average 24.9 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit_A1	136.64	136.62	0	0
Pit_A2	191.87	191.81	0	0
Pit_K4	917.67	917.65	0	0
N11	917.65	917.65	0	0
Pit_K7	29.48	29.42	0	0.2
Pit_K6	56.05	56.01	0	0.1
Pit_K3	706	705.72	0	0
Pit_K5	158.16	158.15	0	0
Pit_K2	679.61	679.47	0	0
Pit_K1	577.51	577.5	0	0
Pit_H8	9.12	9.06	0	0.7
Pit_H9	148.49	148.48	0	0
Pit_Hi13	124.75	124.67	0	0.1
Pit_B1	235.2	235.06	0	0.1
Pit_B2	235.06	235.04	0	0
Pit_B3	235.04	234.97	0	0
N1	234.97	234.97	0	0
Pit_H10	55.31	55.26	0	0.1
Pit_Hi11	64.75	64.67	0	0.1
Pit_Hi12	87.57	87.49	0	0.1
Pit_B4	87.49	87.47	0	0
N2	87.47	87.47	0	0
Pit_H7	33.89	33.81	0	0.2
Pit_H11	53.77	53.7	0	0.1
Pit_Hi8	80.44	80.37	0	0.1
Pit_Hi9	107.62	107.55	0	0.1
Pit_B5	107.55	107.52	0	0
Pit_B6	107.52	107.52	0	0
Pit_B7	107.52	107.52	0	0
N3	107.52	107.52	0	0
Pit_H6	20.88	20.73	0	0.7
Pit_H5	88.64	88.7	0	-0.1
Pit_H12	105.44	105.37	0	0.1
Pit_Hi6a	287.31	287.31	0	0
Pit_Hi7	336.52	336.41	0	0
Pit_B8	336.41	336.32	0	0
N4	336.32	336.32	0	0
Pit_H4	91.22	91.2	0	0
Pit_H2	92.89	92.85	0	0
Pit_H16	77.88	77.81	0	0.1
Pit_Hi3	100.21	100.12	0	0.1
Pit_Hi4	129.62	129.55	0	0.1
Pit_B9	347.64	347.64	0	0
Pit_B10	343.96	343.96	0	0
Pit_B11	343.96	343.96	0	0
N5	343.96	343.96	0	0
Pit_H3	182.11	182.11	0	0
Pit_H15	123.32	123.36	0	0
Pit_Hi6	197.02	196.99	0	0
Pit_H1	179.78	179.78	0	0
Pit_H17	114.89	114.86	0	0
Pit_Hi1	139.41	139.35	0	0
Pit_Hi2	162.01	161.94	0	0
Pit_B12	161.94	161.92	0	0
Pit_B13	161.92	161.92	0	0
Pit_B14	161.92	161.92	0	0
Pit_B15	161.92	161.92	0	0
N6	161.92	161.92	0	0
Pit_H13	16.36	16.28	0	0.5
Pit_H14	16.28	16.27	0	0
Pit_A3	38.59	38.54	0	0.1
Pit_MR1	68.07	68	0	0.1
Pit_MR2	101.89	101.83	0	0.1
Pit_B16	122.55	122.55	0	0
Pit_B17	122.55	122.55	0	0
Pit_B18	122.55	122.55	0	0
Pit_B19	122.55	122.55	0	0
N7	122.55	122.55	0	0
Pit_W1	29.47	29.4	0	0.2
N10	53.27	53.27	0	0
Pit_D5	134.65	134.64	0	0
Pit_D3	237.61	237.46	0	0.1
Pit_B22	439.51	439.49	0	0
Pit_B23	478.03	478.09	0	0
N9	478.09	478.09	0	0
Pit_D1	38.16	38.09	0	0.2
Pit_D2	102.97	102.97	0	0
Pit_M1	38.59	38.54	0	0.1
Pit_M2	202.05	202.05	0	0
Pit_T1	38.59	38.54	0	0.1
Pit_Hi5	28.75	28.68	0	0.2
Pit_Hi14	10.53	10.46	0	0.6
Pit_Hi15	70.11	70.06	0	0.1
Pit_Hi16	58.41	58.39	0	0
Pit_Hi17	112.13	112.1	0	0
Pit_B20	58.52	58.52	0	0
Pit_B21	58.52	58.52	0	0
N8	113.68	113.68	0	0
OSD_High	75.61	37.15	38.21	0.3
Pit_W2	29.47	29.4	0	0.2
Pit_B24	66.88	66.88	0	0
Pit_B25	66.88	66.88	0	0
N12	66.88	66.88	0	0
BasinB2	268.99	0	268.99	0
BasinB4	125.41	0	125.41	0
BasinB6	176.66	55.16	121.5	0
BasinB8	235.55	0	235.55	0
BasinB9	203.56	0	203.56	0
BasinB11	161.81	0	161.81	0

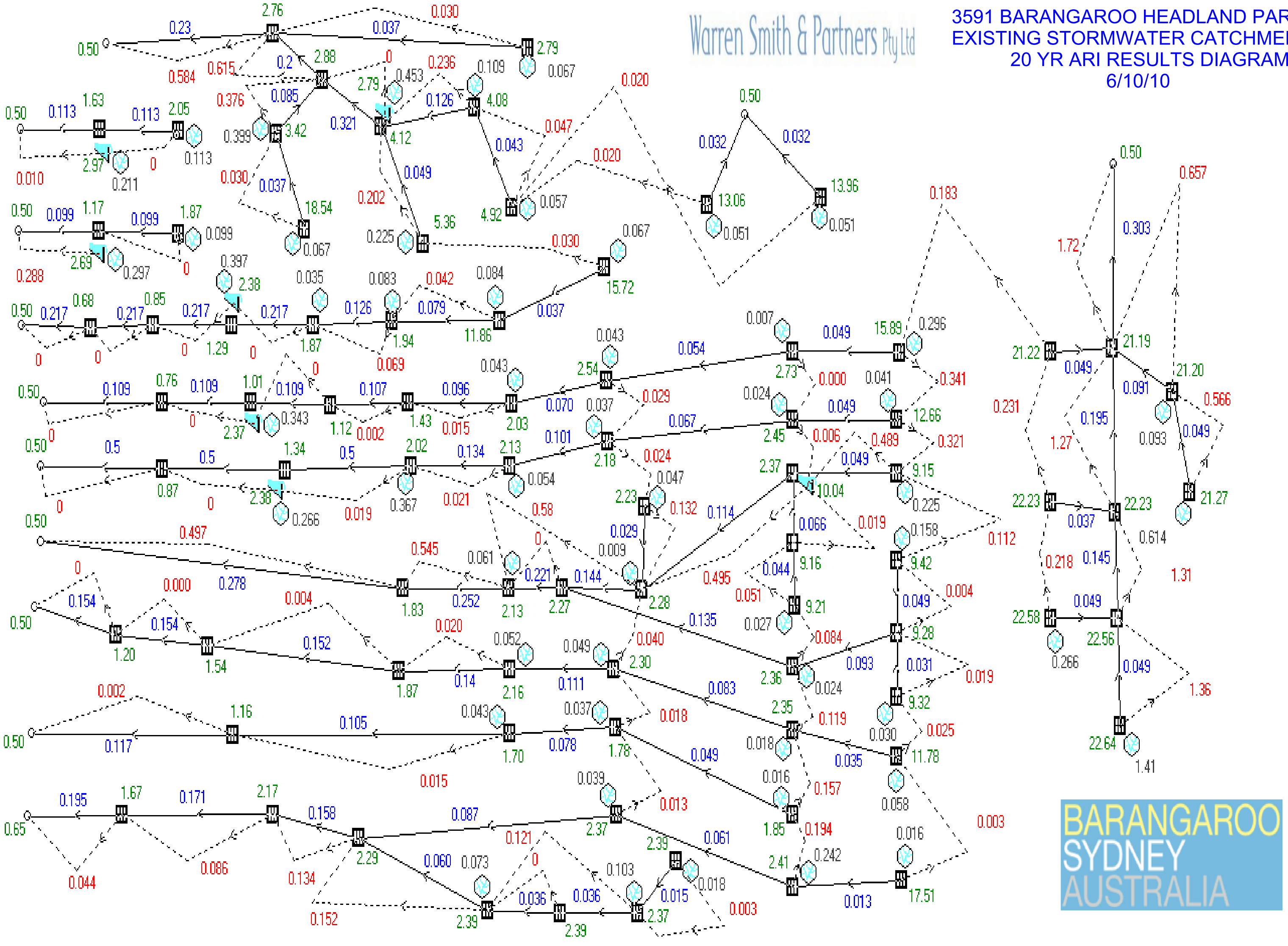
Run Log for 3591_Ex_Catchment_100914.drn run at 14:51:18 on 22/9/2010

Upwelling occurred at Pit_B22, Pit_K6, Pit_A2
Freeboard was less than 0.15m at Pit_Hi14, Pit_Hi17, Pit_Hi15, Pit_Hi1, Pit_K2, Pit_K5, Pit_K7, Pit_K4

The following overflow routes carried water uphill (adding energy): OF74, OF52, OF37, OF10, OF23, OF26, OF29, OF35, OF32, OF34, OF46, OF59, OF57
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
EXISTING STORMWATER CATCHMENT
20 YR ARI RESULTS DIAGRAM
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
20 Year ARI Results
EXISTING STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

DRAINS results prepared 22 September, 2010 from Version 2010.04

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_A1	21.27		0.614		0.93	0.566	Inlet Capacity
Pit_A2	21.2		0.63		0	0.657	Outlet System
Pit_K4	21.19		1.772		0	1.724	Outlet System
N11	0.5		1.724				
Pit_K7	21.22		0.231		0.08	0.183	Inlet Capacity
Pit_K6	22.23		0.218		0	0.231	Outlet System
Pit_K3	22.23		1.313		0.2	1.265	Inlet Capacity
Pit_K5	22.58		0.266		0.02	0.218	Inlet Capacity
Pit_K2	22.56		1.361		0.02	1.313	Inlet Capacity
Pit_K1	22.64		1.409		0.51	1.361	Inlet Capacity
Pit_H8	17.51		0.016		0.78	0.003	Inlet Capacity
Pit_H9	2.41		0.242		16.66	0.194	Inlet Capacity
Pit_Hi13	2.37		0.039		0.28	0.013	Inlet Capacity
Pit_B1	2.29		0.152		0	0.134	Outlet System
Pit_B2	2.17		0.134		0.29	0.086	Inlet Capacity
Pit_B3	1.67		0.086		0.81	0.044	Inlet Capacity
N1	0.65		0.044				
Pit_H10	1.85		0.205		13.65	0.157	Inlet Capacity
Pit_Hi11	1.78		0.048		0.52	0.018	Inlet Capacity
Pit_Hi12	1.7		0.043		0.72	0.015	Inlet Capacity
Pit_B4	1.16		0.015		1.3	0.002	Inlet Capacity
N2	0.5		0.002				
Pit_H7	11.78		0.06		0.69	0.025	Inlet Capacity
Pit_H11	2.35		0.167		10.1	0.119	Inlet Capacity
Pit_Hi8	2.3		0.063		0	0.04	Outlet System
Pit_Hi9	2.16		0.052		0.21	0.02	Inlet Capacity
Pit_B5	1.87		0.02		0.61	0.004	Inlet Capacity
Pit_B6	1.54		0.004		0.94	0	Inlet Capacity
Pit_B7	1.2		0		1.29	0	None
N3	0.5		0				
Pit_H6	9.32		0.051		0.51	0.019	Inlet Capacity
Pit_H5	9.28		0.019		0.67	0.004	Inlet Capacity
Pit_H12	2.36		0.133		7.36	0.084	Inlet Capacity
Pit_Hi6a	2.27		0		0.07	0	None
Pit_Hi7	2.13		0.593		0.21	0.545	Inlet Capacity
Pit_B8	1.83		0.545		0.41	0.497	Inlet Capacity
N4	0.5		0.497				
Pit_H4	9.42		0.16		0.2	0.112	Inlet Capacity
Pit_H2	12.66		0.369		0.56	0.321	Inlet Capacity
Pit_H16	2.45		0.025		10.72	0.006	Inlet Capacity
Pit_Hi3	2.18		0.059		0.03	0.024	Inlet Capacity
Pit_Hi4	2.13		0.054		0.16	0.021	Inlet Capacity
Pit_B9	2.02		0.385		0.21	0.019	Inlet Capacity
Pit_B10	1.34		0		0.82		None
Pit_B11	0.87		0		1.65	0	None
N5	0.5		0				
Pit_H3	9.15		0.537		0.56	0.489	Inlet Capacity
Pit_H15	2.37		0		7.15		None
Pit_Hi6	2.28		0.625		0	0.58	Outlet System
Pit_H1	15.89		0.389		0.56	0.341	Inlet Capacity
Pit_H17	2.73		0.007		13.6	0	Inlet Capacity
Pit_Hi1	2.54		0.043		0	0.029	Outlet System
Pit_Hi2	2.03		0.043		0.47	0.015	Inlet Capacity
Pit_B12	1.43		0.015		1.27	0.002	Inlet Capacity
Pit_B13	1.12		0.002		1.06	0	None
Pit_B14	1.01		0		1.63		None
Pit_B15	0.76		0		1.82	0	None
N6	0.5		0				
Pit_H13	9.21		0.095		0.32	0.051	Inlet Capacity
Pit_H14	9.16		0.051		0.36	0.019	Inlet Capacity
Pit_A3	15.72		0.067		0.69	0.03	Inlet Capacity
Pit_MR1	11.86		0.084		0.62	0.042	Inlet Capacity
Pit_MR2	1.94		0.117		14.48	0.069	Inlet Capacity
Pit_B16	1.87		0.094		1.13	0	None
Pit_B17	1.29		0		0.88		None
Pit_B18	0.85		0		1.75	0	None
Pit_B19	0.68		0		1.92	0	None
N7	0.5		0				
Pit_W1	13.06		0.051		0.74	0.02	Inlet Capacity
N10	0.5		0				
Pit_D5	5.36		0.25		0.65	0.202	Inlet Capacity
Pit_D3	4.12		0.413		0		Outlet System
Pit_B22	2.88		0.376		0	0.615	Outlet System
Pit_B23	2.76		0.632		0.34	0.584	Inlet Capacity
N9	0.5		0.584				
Pit_D1	4.92		0.09		0.65	0.047	Inlet Capacity
Pit_D2	4.08		0.147		0	0.236	Outlet System
Pit_M1	18.54		0.067		0.61	0.03	Inlet Capacity
Pit_M2	3.42		0.424		9.56	0.376	Inlet Capacity
Pit_T1	2.79		0.067		0.67	0.03	Inlet Capacity
Pit_Hi5	2.23		0.065		0	0.132	Outlet System
Pit_Hi14	2.39		0.018		0.01	0.003	Inlet Capacity
Pit_Hi15	2.37		0.106		0	0.121	Outlet System
Pit_Hi16	2.39		0		0.22	0	None
Pit_Hi17	2.39		0.18		0	0.152	Outlet System
Pit_B20	1.87		0.099		0.63	0	None
Pit_B21	1.17		0		1.01		None
N8	0.5		0.288				
Pit_W2	13.96		0.051		0.74	0.02	Inlet Capacity
Pit_B24	2.05		0.113		0.45	0	None
Pit_B25	1.63		0		0.87		None
N12	0.5		0.01				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_Observ_N	0.614	0.033	0.581	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
Cat_A1	0.093	0.093	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Kent_Wes	0.266	0.266	0	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Kent_Eas	1.409	0.746	0.664	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H7	0.016	0.015	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H8	0.242	0.231	0.011	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi12	0.039	0.037	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H9	0.016	0.015	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi10	0.037	0.035	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi11	0.043	0.041	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H6	0.058	0.056	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H10	0.018	0.017	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi8	0.049	0.047	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi9	0.052	0.05	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H5	0.03	0.028	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H11	0.024	0.023	0.001	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi7	0.061	0.058	0.003	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H4	0.158	0.151	0.007	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H2	0.041	0.04	0.002	5	5	5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

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Cat_H13	0.024	0.023	0.001	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi3	0.037	0.035	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi4	0.054	0.052	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB10	0.367	0.367	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H3	0.225	0.215	0.01	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi6	0.009	0.008	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H1	0.296	0.283	0.013	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H14	0.007	0.007	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi1	0.043	0.041	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi2	0.043	0.041	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_H12	0.027	0.026	0.001	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_A2	0.067	0.064	0.003	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_MR1	0.084	0.044	0.039	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_MR2	0.083	0.044	0.039	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB7	0.035	0.035	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_W1	0.051	0.049	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_D2	0.225	0.215	0.01	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_D1	0.057	0.054	0.003	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB1	0.109	0.109	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_M1	0.067	0.064	0.003	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_M2	0.399	0.211	0.188	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_T1	0.067	0.064	0.003	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi5	0.047	0.045	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi13	0.018	0.017	0.001	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi14	0.103	0.099	0.005	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_Hi15	0.073	0.07	0.003	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB5	0.099	0.099	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Cat_W2	0.051	0.049	0.002	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB3	0.113	0.113	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB2	0.453	0.453	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB4	0.211	0.211	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB6	0.297	0.297	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB8	0.397	0.397	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB9	0.343	0.343	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
CatB11	0.266	0.266	0	5	5	5 AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

Outflow Volumes for Total Catchment (10.6 impervious + 2.96 pervious = 13.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 20 year,	2386.27	2023.79 (84.8%)	1758.92 (94.3%)	264.88 (50.8%)
AR&R 20 year,	3754.7	3328.84 (88.7%)	2828.42 (96.4%)	500.43 (61.0%)
AR&R 20 year,	4783.85	4304.01 (90.0%)	3632.74 (97.2%)	671.27 (64.2%)
AR&R 20 year,	5654.67	5128.92 (90.7%)	4313.33 (97.6%)	815.59 (66.0%)
AR&R 20 year,	6389.77	5816.98 (91.0%)	4887.84 (97.9%)	929.14 (66.6%)
AR&R 20 year,	7057.02	6442.73 (91.3%)	5409.35 (98.1%)	1033.39 (67.0%)
AR&R 20 year,	8651.64	7936.83 (91.7%)	6655.60 (98.4%)	1281.23 (67.8%)
AR&R 20 year,	9906.98	9114.39 (92.0%)	7636.73 (98.6%)	1477.66 (68.3%)
AR&R 20 year,	11603.38	10687.54 (92.1%	8962.50 (98.8%)	1725.04 (68.1%)
AR&R 20 year,	12702.65	11687.95 (92.0%	9821.69 (98.9%)	1866.27 (67.3%)
AR&R 20 year,	14575.47	13386.78 (91.8%	11285.61 (99.1%)	2101.18 (66.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P_A1	0.049	0.7	21.235	21.2	AR&R 20 year, 3 hours storm, average 35.8 mm/h, Zone 1
P_A2	0.091	0.8	21.198	21.19	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P_K4	0.303	10	20.409	1.119	AR&R 20 year, 3 hours storm, average 35.8 mm/h, Zone 1
P_K7	0.049	0.4	21.203	21.19	AR&R 20 year, 10 minutes storm, average 166 mm/h, Zone 1
P_K6	0.037	0.3	22.23	22.232	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P_K3	0.195	1.8	22.03	21.19	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P_K5	0.049	0.4	22.567	22.561	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P_K2	0.145	1.3	22.43	22.232	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P_K1	0.049	0.4	22.62	22.561	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P1/1	0.013	1.4	17.443	17.223	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/1	0.061	0.6	2.39	2.367	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/1	0.087	0.8	2.32	2.29	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/1	0.158	1.4	2.221	2.167	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P5/1	0.171	1.5	2.02	1.674	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P6/1	0.195	2	1.435	0.648	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/3	0.049	0.9	1.781	1.777	AR&R 20 year, 45 minutes storm, average 85 mm/h, Zone 1
P2/3	0.078	0.7	1.738	1.702	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/3	0.105	1.5	1.488	1.157	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/3	0.117	1.5	0.946	0.506	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/4	0.035	1.2	11.689	11.629	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/4	0.083	0.8	2.308	2.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/4	0.111	1	2.229	2.156	AR&R 20 year, 30 minutes storm, average 104 mm/h, Zone 1
P4/4	0.14	1.3	2.036	1.868	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P5/4	0.152	1.4	1.722	1.538	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P6/4	0.154	1.4	1.389	1.205	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/4	0.154	1.7	1.055	0.518	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/5	0.031	0.8	9.295	9.285	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/5	0.093	1.4	9.249	9.083	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/5	0.135	0.9	2.302	2.268	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/5	0.221	1.4	2.168	2.13	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P6/5	0.252	1.6	1.97	1.831	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P7/5	0.278	1.7	1.597	0.5	AR&R 20 year, 30 minutes storm, average 104 mm/h, Zone 1
P1/5	0.049	1.2	9.307	9.285	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P1/9	0.049	1.7	12.472	12.342	AR&R 20 year, 45 minutes storm, average 85 mm/h, Zone 1
P2/9	0.067	1.7	2.24	2.178	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/9	0.101	0.6	2.147	2.127	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/9	0.134	0.8	2.072	2.022	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/9	0.5	1.8	1.783	1.344	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P6/9	0.5	1.8	1.105	0.872	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/9	0.5	1.8	0.632	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/6	0.049	2.6	8.919	8.559	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P2/6	0.114	1	2.291	2.28	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P3/6	0.144	0.9	2.272	2.268	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P1/10	0.049	1.7	15.699	15.569	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/10	0.054	1.4	2.582	2.54	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/10	0.07	1.8	2.312	2.035	AR&R 20 year, 45 minutes storm, average 85 mm/h, Zone 1
P4/10	0.096	2	1.852	1.435	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/10	0.107	1.5	1.296	1.117	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P6/10	0.109	1.2	1.007	1.007	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/10	0.109	1.4	0.869	0.757	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P8/10	0.109	1.5	0.615	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/7	0.044	0.7	9.171	9.165	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P2/7	0.066	10.2	8.844	8.364	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P1/11	0.037	3.6	15.566	11.862	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/11	0.079	2	11.704	11.424	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P3/11	0.126	0.6	1.914	1.873	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P4/11	0.217	2.5	1.591	1.293	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P5/11	0.217	2.9	0.986	0.855	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P6/11	0.217	1.2	0.758	0.684	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P7/11	0.217	1.1	0.551	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P_W1	0.032	5.2	12.909	1.039	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/13	0.049	3.4	5.18	4.12	AR&R 20 year, 1 hour storm, average 73 mm/h, Zone 1
P3/12	0.321	7.3	3.307	2.88	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P4/12	0.2	1.8	2.755	2.755	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
P5/12	0.23	2.2	2.422	1.253	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/12	0.043	3.3	4.741	4.08	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/12	0.126	1.8	4.091	4.12	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1

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P1/15	0.037	3.7	18.317	12.607	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/15	0.085	2.1	3.066	2.88	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/14	0.037	0.6	2.769	2.755	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/8	0.029	0.3	2.231	2.28	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P1/2	0.015	0.4	2.378	2.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/2	0.036	0.9	2.372	2.39	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P3/2	0.036	0.9	2.39	2.39	AR&R 20 year, 5 minutes storm, average 211 mm/h, Zone 1
P4/2	0.06	1.5	2.352	2.29	AR&R 20 year, 10 minutes storm, average 166 mm/h, Zone 1
P1/16	0.099	2	1.688	1.174	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/16	0.099	1.8	1.016	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P_W2	0.032	4.3	13.814	1.044	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/17	0.113	1.8	1.807	1.632	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P2/17	0.113	1.5	1.419	0.909	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
OF73	0.566	0.566	19.77	0.069	0.06	17.74	0.82	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
OF72	0.657	0.657	19.77	0.073	0.06	18.64	0.86	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
OF71	1.724	1.724	19.77	0.109	0.12	25.82	1.1	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF70	0.183	0.183	19.77	0.044	0.03	12.71	0.6	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF68	0.231	0.231	19.77	0.048	0.03	13.61	0.64	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF69	1.265	1.265	19.77	0.096	0.1	23.13	1.02	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF67	0.218	0.218	19.77	0.047	0.03	13.43	0.62	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF66	1.313	1.313	19.77	0.097	0.1	23.49	1.03	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF65	1.361	1.361	19.77	0.099	0.1	23.85	1.03	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF64	0.003	0.003	19.77	0.009	0	2.84	0.21	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF63	0.194	0.194	19.77	0.044	0.03	12.89	0.62	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF25	0.013	0.013	19.77	0.017	0	5.54	0.29	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF10	0.134	0.134	19.77	0.039	0.02	11.81	0.54	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF9	0.086	0.086	19.77	0.033	0.02	10.56	0.48	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF8	0.044	0.044	19.77	0.026	0.01	8.53	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF62	0.157	0.157	19.77	0.042	0.02	12.35	0.56	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF27	0.018	0.018	19.77	0.018	0.01	6.14	0.32	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF26	0.015	0.015	19.77	0.018	0.01	5.84	0.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF11	0.002	0.002	19.77	0.009	0	2.84	0.19	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF61	0.025	0.025	19.77	0.021	0.01	7.03	0.34	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF60	0.119	0.119	19.77	0.037	0.02	11.45	0.52	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF30	0.04	0.04	19.77	0.025	0.01	8.23	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF29	0.02	0.02	19.77	0.019	0.01	6.44	0.33	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF28	0.004	0.004	19.77	0.01	0	3.44	0.23	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF13	0	0	19.77	0	0	0	0	
OF12	0	0	19.77	0	0	0	0	
OF59	0.019	0.019	19.77	0.019	0.01	6.44	0.31	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF68	0.004	0.004	19.77	0.01	0	3.44	0.21	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF56	0.084	0.084	19.77	0.033	0.02	10.56	0.47	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF75	0	0	19.77	0	0	0	0	
OF31	0.545	0.545	19.77	0.068	0.06	17.56	0.81	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF14	0.497	0.497	19.77	0.065	0.05	17.02	0.8	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF57	0.112	0.112	19.77	0.036	0.02	11.27	0.51	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF55	0.321	0.321	19.77	0.054	0.04	14.87	0.71	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF50	0.006	0.006	19.77	0.012	0	4.04	0.25	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF34	0.024	0.024	19.77	0.021	0.01	7.03	0.33	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF33	0.021	0.021	19.77	0.019	0.01	6.44	0.34	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF17	0.019	0.019	19.77	0.019	0.01	6.44	0.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF15	0	0	19.77	0	0	0	0	
OF52	0.489	0.489	19.77	0.065	0.05	17.02	0.78	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF74	0.58	0.58	19.77	0.07	0.06	17.92	0.83	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF51	0.341	0.341	0.256	0.056	0.04	15.23	0.71	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF49	0	0	19.77	0	0	0	0	
OF36	0.029	0.029	19.77	0.022	0.01	7.33	0.35	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF35	0.015	0.015	19.77	0.018	0.01	5.84	0.3	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF21	0.002	0.002	19.77	0.009	0	2.84	0.19	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF20	0	0	19.77	0	0	0	0	
OF18	0	0	19.77	0	0	0	0	
OF48	0.051	0.051	19.77	0.027	0.01	9.13	0.41	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF53	0.019	0.019	19.77	0.019	0.01	6.44	0.31	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1
OF45	0.03	0.03	19.77	0.022	0.01	7.33	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF46	0.042	0.042	19.77	0.026	0.01	8.53	0.38	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF47	0.069	0.069	19.77	0.031	0.01	10.2	0.43	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF6	0	0	19.77	0	0	0	0	
OF4	0	0	19.77	0	0	0	0	
OF3	0	0	19.77	0	0	0	0	
OF44	0.02	0.02	19.77	0.019	0.01	6.44	0.32	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF76	0.202	0.202	0.256	0.045	0.03	13.07	0.62	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF37	0.615	0.615	19.77	0.071	0.06	18.28	0.84	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF7	0.584	0.584	19.77	0.07	0.06	17.92	0.83	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF43	0.047	0.047	19.77	0.026	0.01	8.83	0.4	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF41	0.236	0.236	19.77	0.048	0.03	13.61	0.65	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF42	0.03	0.03	19.77	0.022	0.01	7.33	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF39	0.376	0.376	19.77	0.058	0.04	15.58	0.74	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF38	0.03	0.03	19.77	0.022	0.01	7.33	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF32	0.132	0.132	19.77	0.039	0.02	11.81	0.53	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF81	0.003	0.003	0.256	0.009	0	3.14	0.23	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF23	0.121	0.121	19.77	0.037	0.02	11.45	0.53	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF22	0	0	19.77	0	0	0	0	
OF80	0.152	0.152	0.256	0.041	0.02	12.17	0.56	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF1	0	0	19.77	0	0	0	0	
OF83	0.495	0.495	0.256	0.065	0.05	17.02	0.79	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF77	0.02	0.02	19.77	0.019	0.01	6.44	0.32	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF78	0	0	0.256	0	0	0	0	
OF82	0	0	0.256	0	0	0	0	
OF79	0.01	0.01	0.256	0.015	0	4.94	0.27	AR&R 20 year, 3 hours storm, average 35.8 mm/h, Zone 1
OF2	0.288	0.288	19.77	0.053	0.04	14.51	0.68	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
OF5	0	0	19.77	0	0	0	0	
OF19	0	0	19.77	0	0	0	0	
OF16	0	0	19.77	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD_High	10.04	44.4	0.495	0	0.495
BasinB2	2.79	787.4	0	0	0
BasinB4	2.97	350.8	0.01	0	0.01
BasinB6	2.69	129.3	0.288	0	0.288
BasinB8	2.38	689.5	0	0	0
BasinB9	2.37	595.8	0	0	0
BasinB11	2.38	477.6	0	0	0

CONTINUITY CHECK for AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit_A1	660.48	660.47	0	0
Pit_A2	788.91	788.91	0	0
Pit_K4	2786.96	2787.03	0	0
N11	2787.02	2787.02	0	0
Pit_K7	193.16	193.09	0	0
Pit_K6	202.4	202.38	0	0

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Pit_K3	1912.91	1912.64	0	0
Pit_K5	367.66	367.66	0	0
Pit_K2	1903.91	1903.69	0	0
Pit_K1	1738.64	1738.64	0	0
Pit_H8	21.63	21.54	0	0.4
Pit_H9	351.22	351.21	0	0
Pit_Hi13	230.41	230.15	0	0.1
Pit_B1	487.38	487.14	0	0
Pit_B2	487.14	487.18	0	0
Pit_B3	487.18	487.16	0	0
N1	487.16	487.16	0	0
Pit_H10	195.67	195.65	0	0
Pit_Hi11	161.84	161.79	0	0
Pit_Hi12	208.6	208.55	0	0
Pit_B4	208.55	208.54	0	0
N2	208.54	208.54	0	0
Pit_H7	81.26	81.25	0	0
Pit_H11	179.79	179.72	0	0
Pit_Hi8	208.51	208.61	0	0
Pit_Hi9	261.55	261.63	0	0
Pit_B5	261.63	261.59	0	0
Pit_B6	261.59	261.58	0	0
Pit_B7	261.58	261.62	0	0
N3	261.62	261.62	0	0
Pit_H6	59.75	59.67	0	0.1
Pit_H5	184.98	185.12	0	-0.1
Pit_H12	265.76	265.33	0	0.2
Pit_Hi6a	588.91	588.43	0	0.1
Pit_Hi7	1110.69	1110.25	0	0
Pit_B8	1110.25	1109.83	0	0
N4	1109.83	1109.83	0	0
Pit_H4	217.43	217.42	0	0
Pit_H2	391.93	391.92	0	0
Pit_H16	171.16	171.09	0	0
Pit_Hi3	231.01	230.96	0	0
Pit_Hi4	291.36	291.46	0	0
Pit_B9	798.46	798.67	0	0
Pit_B10	782.84	783.06	0	0
Pit_B11	783.06	783.04	0	0
N5	783.04	783.04	0	0
Pit_H3	654.16	654.16	0	0
Pit_H15	237.76	237.71	0	0
Pit_Hi6	790.08	789.73	0	0
Pit_H1	511.96	511.96	0	0
Pit_H17	186.23	186.18	0	0
Pit_Hi1	244.18	244.12	0	0
Pit_Hi2	288.83	288.8	0	0
Pit_B12	288.8	288.78	0	0
Pit_B13	288.78	288.77	0	0
Pit_B14	288.77	288.77	0	0
Pit_B15	288.77	288.77	0	0
N6	288.77	288.77	0	0
Pit_H13	63.69	63.61	0	0.1
Pit_H14	63.61	63.59	0	0
Pit_A3	91.5	91.49	0	0
Pit_MR1	171.96	171.95	0	0
Pit_MR2	273.97	273.96	0	0
Pit_B16	322.13	322.13	0	0
Pit_B17	322.13	322.13	0	0
Pit_B18	322.13	322.13	0	0
Pit_B19	322.13	322.13	0	0
N7	322.13	322.13	0	0
Pit_W1	69.87	69.86	0	0
N10	110.61	110.61	0	0
Pit_D5	330.77	330.76	0	0
Pit_D3	588.01	587.68	0	0.1
Pit_B22	1171.45	1171.42	0	0
Pit_B23	1262.91	1262.91	0	0
N9	1262.91	1262.91	0	0
Pit_D1	106.47	106.46	0	0
Pit_D2	257.3	257.25	0	0
Pit_M1	91.5	91.49	0	0
Pit_M2	583.76	583.78	0	0
Pit_T1	91.5	91.49	0	0
Pit_Hi5	77.69	77.66	0	0
Pit_Hi14	24.96	24.88	0	0.3
Pit_Hi15	166.3	166.28	0	0
Pit_Hi16	62.69	62.67	0	0
Pit_Hi17	266.09	266.08	0	0
Pit_B20	136.05	136.05	0	0
Pit_B21	136.05	136.05	0	0
N8	425.2	425.2	0	0
OSD_High	483.51	444.47	38.21	0.2
Pit_W2	69.87	69.86	0	0
Pit_B24	155.48	155.48	0	0
Pit_B25	155.48	155.5	0	0
N12	155.5	155.5	0	0
BasinB2	625.3	0	625.3	0
BasinB4	291.53	0	291.52	0
BasinB6	410.67	289.16	121.5	0
BasinB8	547.56	0	547.56	0
BasinB9	473.2	0	473.2	0
BasinB11	383.41	0	383.41	0

Run Log for 3591_Ex_Catchment_100914.drn run at 14:54:40 on 22/9/2010Water was lost from the system at Pit_D3.

Is this correct? If this water re-enters the system further downstream you should draw an overflow route from this location.

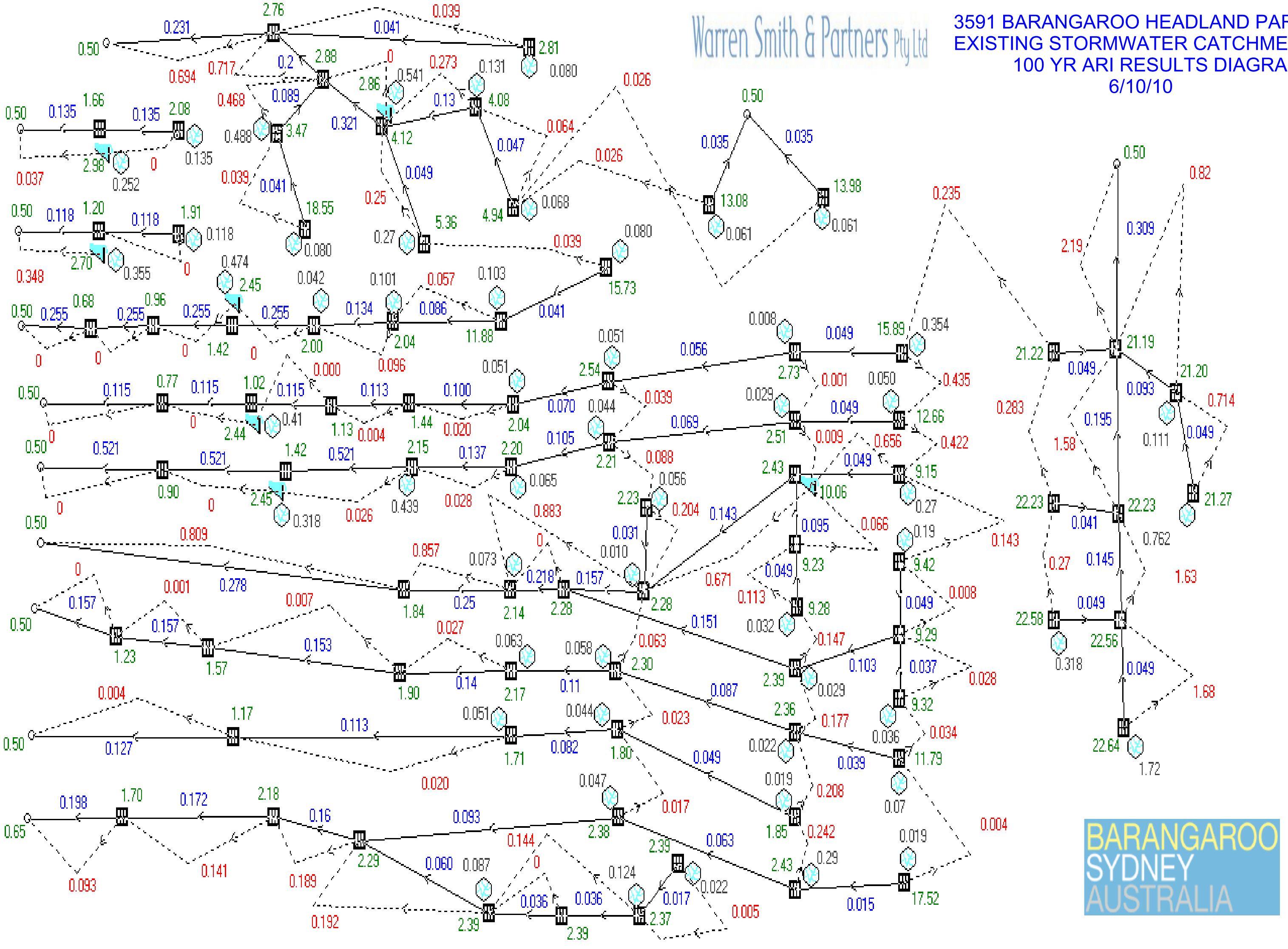
Upwelling occurred at Pit_Hi15, Pit_Hi5, Pit_B22, Pit_D2, Pit_K6, Pit_A2
Freeboard was less than 0.15m at Pit_Hi6a, Pit_B1, Pit_Hi14, Pit_Hi17, Pit_Hi8, Pit_Hi6, Pit_Hi3, Pit_Hi1, Pit_D3, Pit_K2, Pit_K5, Pit_K7, Pit_K4
The maximum flow exceeded the safe value in the following overflow routes: OF83, OF51

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSD_High You might consider upsizing these, or removing them from the model.

The following overflow routes carried water uphill (adding energy): OF74, OF52, OF37, OF41, OF10, OF9, OF17, OF23, OF26, OF29, OF35, OF32, OF34, OF46, OF59, OF53, OF57
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

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EXISTING STORMWATER CATCHMENT
100 YR ARI RESULTS DIAGRAM
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
100 Year ARI Results
EXISTING STORMWATER CATCHMENT
Sep-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

DRAINS results prepared 22 September, 2010 from Version 2010.04

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit_A1	21.27		0.762		0.93	0.714	Inlet Capacity
Pit_A2	21.2		0.793		0	0.82	Outlet System
Pit_K4	21.19		2.242		0	2.194	Outlet System
N11	0.5		2.194				
Pit_K7	21.22		0.283		0.08	0.235	Inlet Capacity
Pit_K6	22.23		0.27		0	0.283	Outlet System
Pit_K3	22.23		1.628		0.2	1.58	Inlet Capacity
Pit_K5	22.58		0.318		0.02	0.27	Inlet Capacity
Pit_K2	22.56		1.676		0.02	1.628	Inlet Capacity
Pit_K1	22.64		1.724		0.51	1.676	Inlet Capacity
Pit_H8	17.52		0.019		0.77	0.004	Inlet Capacity
Pit_H9	2.43		0.29		16.64	0.242	Inlet Capacity
Pit_Hi13	2.38		0.047		0.27	0.017	Inlet Capacity
Pit_B1	2.29		0.192		0	0.189	Outlet System
Pit_B2	2.18		0.189		0.28	0.141	Inlet Capacity
Pit_B3	1.7		0.141		0.78	0.093	Inlet Capacity
N1	0.65		0.093				
Pit_H10	1.85		0.256		13.65	0.208	Inlet Capacity
Pit_Hi11	1.8		0.058		0.5	0.023	Inlet Capacity
Pit_Hi12	1.71		0.051		0.71	0.02	Inlet Capacity
Pit_B4	1.17		0.02		1.29	0.004	Inlet Capacity
N2	0.5		0.004				
Pit_H7	11.79		0.072		0.68	0.034	Inlet Capacity
Pit_H11	2.36		0.225		10.09	0.177	Inlet Capacity
Pit_Hi8	2.3		0.077		0	0.063	Outlet System
Pit_Hi9	2.17		0.063		0.2	0.027	Inlet Capacity
Pit_B5	1.9		0.027		0.58	0.007	Inlet Capacity
Pit_B6	1.57		0.007		0.91	0.001	Inlet Capacity
Pit_B7	1.23		0.001		1.26	0	None
N3	0.5		0				
Pit_H6	9.32		0.065		0.51	0.028	Inlet Capacity
Pit_H5	9.29		0.028		0.66	0.008	Inlet Capacity
Pit_H12	2.39		0.195		7.33	0.147	Inlet Capacity
Pit_Hi6a	2.28		0		0.06	0	None
Pit_Hi7	2.14		0.905		0.2	0.857	Inlet Capacity
Pit_B8	1.84		0.857		0.4	0.809	Inlet Capacity
N4	0.5		0.809				
Pit_H4	9.42		0.191		0.2	0.143	Inlet Capacity
Pit_H2	12.66		0.47		0.56	0.422	Inlet Capacity
Pit_H16	2.51		0.03		10.66	0.009	Inlet Capacity
Pit_Hi3	2.21		0.077		0	0.088	Outlet System
Pit_Hi4	2.2		0.065		0.09	0.028	Inlet Capacity
Pit_B9	2.15		0.459		0.08	0.026	Inlet Capacity
Pit_B10	1.42		0		0.74		None
Pit_B11	0.9		0		1.62	0	None
N5	0.5		0				
Pit_H3	9.15		0.704		0.56	0.656	Inlet Capacity
Pit_H15	2.43		0		7.09		None
Pit_Hi6	2.28		0.877		0	0.883	Outlet System
Pit_H1	15.89		0.483		0.56	0.435	Inlet Capacity
Pit_H17	2.73		0.008		13.6	0.001	Inlet Capacity
Pit_Hi1	2.54		0.051		0	0.039	Outlet System
Pit_Hi2	2.04		0.051		0.46	0.02	Inlet Capacity
Pit_B12	1.44		0.02		1.26	0.004	Inlet Capacity
Pit_B13	1.13		0.004		1.05	0	Inlet Capacity
Pit_B14	1.02		0		1.62		None
Pit_B15	0.77		0		1.81	0	None
N6	0.5		0				
Pit_H13	9.28		0.161		0.25	0.113	Inlet Capacity
Pit_H14	9.23		0.113		0.29	0.066	Inlet Capacity
Pit_A3	15.73		0.08		0.68	0.039	Inlet Capacity
Pit_MR1	11.88		0.103		0.6	0.057	Inlet Capacity
Pit_MR2	2.04		0.144		14.38	0.096	Inlet Capacity
Pit_B16	2		0.128		1	0	None
Pit_B17	1.42		0		0.75		None
Pit_B18	0.96		0		1.64	0	None
Pit_B19	0.68		0		1.92	0	None
N7	0.5		0				
Pit_W1	13.08		0.061		0.72	0.026	Inlet Capacity
N10	0.5		0				
Pit_D5	5.36		0.298		0.65	0.25	Inlet Capacity
Pit_D3	4.12		0.517		0		Outlet System
Pit_B22	2.88		0.468		0	0.717	Outlet System
Pit_B23	2.76		0.742		0.34	0.694	Inlet Capacity
N9	0.5		0.694				
Pit_D1	4.94		0.111		0.63	0.064	Inlet Capacity
Pit_D2	4.08		0.18		0	0.273	Outlet System
Pit_M1	18.55		0.08		0.6	0.039	Inlet Capacity
Pit_M2	3.47		0.516		9.51	0.468	Inlet Capacity
Pit_T1	2.81		0.08		0.65	0.039	Inlet Capacity
Pit_Hi5	2.23		0.132		0	0.204	Outlet System
Pit_Hi14	2.39		0.022		0.01	0.005	Inlet Capacity
Pit_Hi15	2.37		0.127		0	0.144	Outlet System
Pit_Hi16	2.39		0		0.22	0	None
Pit_Hi17	2.39		0.22		0	0.192	Outlet System
Pit_B20	1.91		0.118		0.59	0	None
Pit_B21	1.2		0		0.98		None
N8	0.5		0.348				
Pit_W2	13.98		0.061		0.72	0.026	Inlet Capacity
Pit_B24	2.08		0.135		0.42	0	None
Pit_B25	1.66		0		0.84		None
N12	0.5		0.037				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat_Observ_N	0.762	0.041	0.721	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_A1	0.111	0.111	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Kent_Wes	0.318	0.318	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Kent_Eas	1.724	0.891	0.833	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H7	0.019	0.018	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H8	0.29	0.276	0.014	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi12	0.047	0.044	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H9	0.019	0.018	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi10	0.044	0.042	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi11	0.051	0.049	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H6	0.07	0.067	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H10	0.022	0.021	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi8	0.058	0.056	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi9	0.063	0.06	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H5	0.036	0.034	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H11	0.029	0.027	0.001	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi7	0.073	0.069	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H4	0.19	0.181	0.009	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H2	0.05	0.047	0.002	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

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Cat_H13	0.029	0.028	0.001	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi3	0.044	0.042	0.002	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi4	0.065	0.062	0.003	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB10	0.439	0.439	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H3	0.27	0.257	0.013	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi6	0.01	0.01	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H1	0.354	0.338	0.017	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H14	0.008	0.008	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi1	0.051	0.049	0.002	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi2	0.051	0.049	0.002	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_H12	0.032	0.031	0.002	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_A2	0.08	0.076	0.004	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_MR1	0.103	0.053	0.05	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_MR2	0.101	0.052	0.049	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB7	0.042	0.042	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_W1	0.061	0.058	0.003	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_D2	0.27	0.257	0.013	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_D1	0.068	0.065	0.003	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB1	0.131	0.131	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_M1	0.08	0.076	0.004	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_M2	0.488	0.252	0.236	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_T1	0.08	0.076	0.004	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi5	0.056	0.053	0.003	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi13	0.022	0.021	0.001	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi14	0.124	0.118	0.006	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_Hi15	0.087	0.083	0.004	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB5	0.118	0.118	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Cat_W2	0.061	0.058	0.003	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB3	0.135	0.135	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB2	0.541	0.541	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB4	0.252	0.252	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB6	0.355	0.355	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB8	0.474	0.474	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB9	0.41	0.41	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
CatB11	0.318	0.318	0	5	5	5 AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

Outflow Volumes for Total Catchment (10.6 impervious + 2.96 pervious = 13.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 yea	3053.52	2690.07 (88.1%)	2280.40 (95.6%)	409.67 (61.4%)
AR&R 100 yea	4840.4	4413.06 (91.2%)	3676.94 (97.2%)	736.12 (69.6%)
AR&R 100 yea	6208.82	5726.52 (92.2%)	4746.43 (97.8%)	980.09 (72.3%)
AR&R 100 yea	7373.69	6843.15 (92.8%)	5656.81 (98.2%)	1186.34 (73.6%)
AR&R 100 yea	8368.91	7791.55 (93.1%)	6434.65 (98.4%)	1356.89 (74.2%)
AR&R 100 yea	9228.42	8610.52 (93.3%)	7106.37 (98.5%)	1504.15 (74.6%)
AR&R 100 yea	11399.81	10682.44 (93.7%)	8803.42 (98.8%)	1879.03 (75.5%)
AR&R 100 yea	13164.07	12368.81 (94.0%)	10182.31 (99.0%)	2186.51 (76.0%)
AR&R 100 yea	15267.6	14350.03 (94.0%)	11826.30 (99.1%)	2523.73 (75.7%)
AR&R 100 yea	16828.29	15809.06 (93.9%)	13046.02 (99.2%)	2763.04 (75.2%)
AR&R 100 yea	19257.54	18056.82 (93.8%)	14945.17 (99.3%)	3111.65 (74.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P_A1	0.049	0.7	21.235	21.2	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P_A2	0.093	0.8	21.198	21.19	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P_K4	0.309	10.1	20.411	1.121	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P_K7	0.049	0.4	21.209	21.19	AR&R 100 year, 45 minutes storm, average 112 mm/h, Zone 1
P_K6	0.041	0.4	22.23	22.232	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P_K3	0.195	1.8	22.03	21.19	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P_K5	0.049	0.4	22.567	22.561	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P_K2	0.145	1.3	22.43	22.232	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P_K1	0.049	0.4	22.62	22.561	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P1/1	0.015	1.5	17.447	17.227	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/1	0.063	0.6	2.402	2.378	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/1	0.093	0.8	2.324	2.29	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/1	0.16	1.4	2.226	2.175	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P5/1	0.172	1.6	2.035	1.703	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P6/1	0.198	2	1.457	0.649	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P1/3	0.049	0.8	1.799	1.795	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P2/3	0.082	0.8	1.753	1.713	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P3/3	0.113	1.5	1.501	1.173	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/3	0.127	1.5	0.964	0.521	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P1/4	0.039	1.2	11.696	11.636	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/4	0.087	0.8	2.308	2.3	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/4	0.11	1	2.237	2.171	AR&R 100 year, 45 minutes storm, average 112 mm/h, Zone 1
P4/4	0.14	1.3	2.058	1.899	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P5/4	0.153	1.4	1.755	1.574	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P6/4	0.157	1.4	1.419	1.228	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P7/4	0.157	1.7	1.073	0.521	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P2/5	0.037	0.9	9.296	9.285	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P3/5	0.103	1.4	9.249	9.094	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P4/5	0.151	0.9	2.321	2.276	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P5/5	0.218	1.4	2.175	2.136	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P6/5	0.25	1.6	1.976	1.836	AR&R 100 year, 3 hours storm, average 47.3 mm/h, Zone 1
P7/5	0.278	1.8	1.602	0.5	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P1/5	0.049	1.2	9.307	9.285	AR&R 100 year, 30 minutes storm, average 136 mm/h, Zone 1
P1/9	0.049	1.7	12.472	12.342	AR&R 100 year, 1 hour storm, average 97 mm/h, Zone 1
P2/9	0.069	1.7	2.276	2.21	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/9	0.105	0.7	2.202	2.197	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P4/9	0.137	0.9	2.173	2.151	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P5/9	0.521	1.8	1.891	1.416	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P6/9	0.521	1.8	1.156	0.903	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P7/9	0.521	1.8	0.643	0.5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/6	0.049	2.6	8.919	8.559	AR&R 100 year, 1 hour storm, average 97 mm/h, Zone 1
P2/6	0.143	1.3	2.297	2.28	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P3/6	0.157	1	2.277	2.276	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P1/10	0.049	1.7	15.699	15.569	AR&R 100 year, 3 hours storm, average 47.3 mm/h, Zone 1
P2/10	0.056	1.4	2.584	2.54	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/10	0.07	1.8	2.316	2.042	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P4/10	0.1	2	1.856	1.445	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P5/10	0.113	1.5	1.302	1.128	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P6/10	0.115	1.2	1.018	1.018	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P7/10	0.115	1.5	0.874	0.768	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P8/10	0.115	1.5	0.622	0.5	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P1/7	0.049	0.7	9.247	9.234	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P2/7	0.095	11.4	8.853	8.373	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P1/11	0.041	3.7	15.569	11.877	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/11	0.086	2	11.711	11.431	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/11	0.134	0.6	2.017	1.997	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/11	0.255	2.6	1.611	1.417	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P5/11	0.255	3.1	1.005	0.96	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P6/11	0.255	1.3	0.798	0.685	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P7/11	0.255	1.2	0.57	0.5	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P_W1	0.035	5.6	12.91	1.04	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/13	0.049	3.4	5.18	4.12	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P3/12	0.321	7.3	3.307	2.88	AR&R 100 year, 45 minutes storm, average 112 mm/h, Zone 1
P4/12	0.2	1.8	2.762	2.762	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P5/12	0.231	2.2	2.427	1.253	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/12	0.047	3.4	4.745	4.08	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
P2/12	0.13	1.8	4.095	4.12	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1

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P1/15	0.041	3.8	18.321	12.611	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/15	0.089	2.2	3.083	2.88	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/14	0.041	0.6	2.778	2.762	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/8	0.031	0.3	2.231	2.28	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P1/2	0.017	0.4	2.38	2.37	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/2	0.036	0.9	2.373	2.39	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P3/2	0.036	0.9	2.39	2.39	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P4/2	0.06	1.5	2.352	2.29	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P1/16	0.118	2.1	1.705	1.205	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/16	0.118	1.9	1.033	0.5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P_W2	0.035	4.6	13.816	1.046	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/17	0.135	1.5	1.887	1.665	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/17	0.135	1.6	1.457	0.939	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
OF73	0.714	0.714	19.77	0.076	0.07	19.18	0.87	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF72	0.82	0.82	19.77	0.08	0.07	20.08	0.9	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF71	2.194	2.194	19.77	0.121	0.14	28.16	1.17	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF70	0.235	0.235	19.77	0.048	0.03	13.61	0.65	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF68	0.283	0.283	19.77	0.052	0.04	14.33	0.68	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF69	1.58	1.58	19.77	0.106	0.11	25.1	1.07	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF67	0.27	0.27	19.77	0.051	0.03	14.15	0.67	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF66	1.628	1.628	19.77	0.106	0.12	25.28	1.09	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF65	1.676	1.676	19.77	0.107	0.12	25.46	1.1	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF64	0.004	0.004	19.77	0.01	0	3.44	0.2	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF63	0.242	0.242	19.77	0.049	0.03	13.79	0.65	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF25	0.017	0.017	19.77	0.018	0.01	6.14	0.3	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF10	0.189	0.189	19.77	0.044	0.03	12.89	0.6	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF9	0.141	0.141	19.77	0.04	0.02	11.99	0.54	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF8	0.093	0.093	19.77	0.034	0.02	10.74	0.49	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF62	0.208	0.208	19.77	0.046	0.03	13.25	0.61	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF27	0.023	0.023	19.77	0.02	0.01	6.74	0.34	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF26	0.02	0.02	19.77	0.019	0.01	6.44	0.31	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF11	0.004	0.004	19.77	0.01	0	3.44	0.22	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF61	0.034	0.034	19.77	0.024	0.01	7.93	0.36	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF60	0.177	0.177	19.77	0.044	0.03	12.71	0.58	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF30	0.063	0.063	19.77	0.029	0.01	9.73	0.44	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF29	0.027	0.027	19.77	0.021	0.01	7.03	0.36	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF28	0.007	0.007	19.77	0.013	0	4.34	0.26	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF13	0.001	0.001	19.77	0.005	0	1.65	0.13	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF12	0	0	19.77	0	0	0	0	
OF59	0.028	0.028	19.77	0.022	0.01	7.33	0.35	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF68	0.008	0.008	19.77	0.014	0	4.64	0.25	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF56	0.147	0.147	19.77	0.04	0.02	11.99	0.57	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF75	0	0	19.77	0	0	0	0	
OF31	0.857	0.857	19.77	0.082	0.07	20.43	0.91	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF14	0.809	0.809	19.77	0.079	0.07	19.9	0.91	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF57	0.143	0.143	19.77	0.04	0.02	11.99	0.55	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF55	0.422	0.422	19.77	0.062	0.05	16.3	0.75	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF50	0.009	0.009	19.77	0.014	0	4.64	0.27	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF34	0.088	0.088	19.77	0.034	0.02	10.74	0.47	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF33	0.028	0.028	19.77	0.022	0.01	7.33	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF17	0.026	0.026	19.77	0.021	0.01	7.03	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF15	0	0	19.77	0	0	0	0	
OF52	0.656	0.656	19.77	0.073	0.06	18.64	0.85	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF74	0.883	0.883	19.77	0.083	0.08	20.61	0.92	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF51	0.435	0.435	7.665	0.062	0.05	16.3	0.77	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF49	0.001	0.001	19.77	0.006	0	1.95	0.12	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF36	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF35	0.02	0.02	19.77	0.019	0.01	6.44	0.31	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF21	0.004	0.004	19.77	0.01	0	3.44	0.22	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF20	0	0	19.77	0	0	0	0	
OF18	0	0	19.77	0	0	0	0	
OF48	0.113	0.113	19.77	0.036	0.02	11.27	0.52	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF53	0.066	0.066	19.77	0.03	0.01	10.02	0.44	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF45	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF46	0.057	0.057	19.77	0.028	0.01	9.43	0.43	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF47	0.096	0.096	19.77	0.035	0.02	10.91	0.48	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF6	0	0	19.77	0	0	0	0	
OF4	0	0	19.77	0	0	0	0	
OF3	0	0	19.77	0	0	0	0	
OF44	0.026	0.026	19.77	0.021	0.01	7.03	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF76	0.25	0.25	7.665	0.05	0.03	13.97	0.64	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF37	0.717	0.717	19.77	0.076	0.07	19.18	0.87	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF7	0.694	0.694	19.77	0.075	0.06	19	0.86	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF43	0.064	0.064	19.77	0.03	0.01	10.02	0.42	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF41	0.273	0.273	19.77	0.052	0.03	14.33	0.66	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF42	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF39	0.468	0.468	19.77	0.064	0.05	16.84	0.77	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF38	0.039	0.039	19.77	0.025	0.01	8.23	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF32	0.204	0.204	19.77	0.045	0.03	13.07	0.62	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF81	0.005	0.005	7.665	0.011	0	3.74	0.23	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF23	0.144	0.144	19.77	0.04	0.02	11.99	0.56	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF22	0	0	19.77	0	0	0	0	
OF80	0.192	0.192	7.665	0.044	0.03	12.89	0.61	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
OF1	0	0	19.77	0	0	0	0	
OF83	0.671	0.671	7.665	0.074	0.06	18.82	0.85	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
OF77	0.026	0.026	19.77	0.021	0.01	7.03	0.35	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF78	0	0	7.665	0	0	0	0	
OF82	0	0	7.665	0	0	0	0	
OF79	0.037	0.037	7.665	0.025	0.01	8.23	0.36	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF2	0.348	0.348	19.77	0.056	0.04	15.23	0.73	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
OF5	0	0	19.77	0	0	0	0	
OF19	0	0	19.77	0	0	0	0	
OF16	0	0	19.77	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD_High	10.06	45.8	0.671	0	0.671
BasinB2	2.86	1042.7	0	0	0
BasinB4	2.98	359.1	0.037	0	0.037
BasinB6	2.7	130.3	0.348	0	0.348
BasinB8	2.45	913	0	0	0
BasinB9	2.44	789	0	0	0
BasinB11	2.45	635	0	0	0

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit_A1	959.55	959.54	0	0
Pit_A2	1129.02	1129.02	0	0
Pit_K4	3832.72	3832.79	0	0
N11	3832.79	3832.79	0	0
Pit_K7	293.28	293.03	0	0.1
Pit_K6	293.56	293.55	0	0

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Warren Smith & Partners

Pit_K3	2587.54	2587.32	0	0
Pit_K5	485.14	485.14	0	0
Pit_K2	2587.5	2587.26	0	0
Pit_K1	2395.9	2395.9	0	0
Pit_H8	28.65	28.57	0	0.3
Pit_H9	464.75	464.75	0	0
Pit_Hi13	280.57	280.41	0	0.1
Pit_B1	618.84	618.77	0	0
Pit_B2	618.77	618.79	0	0
Pit_B3	618.79	618.77	0	0
N1	618.77	618.77	0	0
Pit_H10	283.35	283.34	0	0
Pit_Hi11	210.52	210.51	0	0
Pit_Hi12	269.05	269.06	0	0
Pit_B4	269.06	269.03	0	0
N2	269.03	269.03	0	0
Pit_H7	108.11	108.11	0	0
Pit_H11	265.05	265.02	0	0
Pit_Hi8	278.98	279.19	0	-0.1
Pit_Hi9	340.24	340.39	0	0
Pit_B5	340.39	340.32	0	0
Pit_B6	340.32	340.27	0	0
Pit_B7	340.27	340.23	0	0
N3	340.23	340.23	0	0
Pit_H6	83.06	83.03	0	0
Pit_H5	234.09	234.24	0	-0.1
Pit_H12	367.5	367.04	0	0.1
Pit_Hi6a	703.42	702.93	0	0.1
Pit_Hi7	1614.07	1613.89	0	0
Pit_B8	1613.88	1613.74	0	0
N4	1613.74	1613.74	0	0
Pit_H4	289.17	289.17	0	0
Pit_H2	582.33	582.33	0	0
Pit_H16	212.28	212.25	0	0
Pit_Hi3	296.09	296.07	0	0
Pit_Hi4	365.94	366.11	0	0
Pit_B9	1035.12	1035.4	0	0
Pit_B10	1012.3	1012.63	0	0
Pit_B11	1012.63	1012.63	0	0
N5	1012.63	1012.63	0	0
Pit_H3	960.29	960.29	0	0
Pit_H15	303.26	303.35	0	0
Pit_Hi6	1197.14	1196.81	0	0
Pit_H1	712.13	712.13	0	0
Pit_H17	217.43	217.35	0	0
Pit_Hi1	294.09	294.08	0	0
Pit_Hi2	347.62	347.67	0	0
Pit_B12	347.67	347.62	0	0
Pit_B13	347.62	347.61	0	0
Pit_B14	347.6	347.6	0	0
Pit_B15	347.6	347.6	0	0
N6	347.6	347.6	0	0
Pit_H13	107.96	107.91	0	0
Pit_H14	107.91	107.77	0	0.1
Pit_A3	121.2	121.19	0	0
Pit_MR1	229.04	229.04	0	0
Pit_MR2	369.63	369.62	0	0
Pit_B16	433.17	432.99	0	0
Pit_B17	432.99	433.03	0	0
Pit_B18	433.03	433	0	0
Pit_B19	433	433.06	0	0
N7	433.06	433.06	0	0
Pit_W1	92.55	92.54	0	0
N10	140.31	140.31	0	0
Pit_D5	442.38	442.37	0	0
Pit_D3	788.65	756.71	0	4.1
Pit_B22	1556.28	1556.28	0	0
Pit_B23	1677.47	1677.51	0	0
N9	1677.51	1677.51	0	0
Pit_D1	147.25	147.25	0	0
Pit_D2	346.27	346.27	0	0
Pit_M1	121.2	121.19	0	0
Pit_M2	799.56	799.58	0	0
Pit_T1	121.2	121.19	0	0
Pit_Hi5	113.03	113.03	0	0
Pit_Hi14	33.05	32.99	0	0.2
Pit_Hi15	220.29	220.28	0	0
Pit_Hi16	69.54	69.52	0	0
Pit_Hi17	352.48	352.46	0	0
Pit_B20	179.51	179.51	0	0
Pit_B21	179.51	179.51	0	0
N8	599.9	599.9	0	0
OSD_High	770.65	731.64	38.21	0.1
Pit_W2	92.55	92.54	0	0
Pit_B24	205.16	205.16	0	0
Pit_B25	205.16	205.23	0	0
N12	244.49	244.49	0	0
BasinB2	825.1	0	825.1	0
BasinB4	384.67	39.28	345.37	0
BasinB6	541.89	420.39	121.5	0
BasinB8	722.52	0	722.52	0
BasinB9	624.41	0	624.41	0
BasinB11	508.13	0	508.13	0

Run Log for 3591_Ex_Catchment_100914.drn run at 14:49:25 on 22/9/2010Water was lost from the system at Pit_D3.

Is this correct? If this water re-enters the system further downstream you should draw an overflow route from this location.

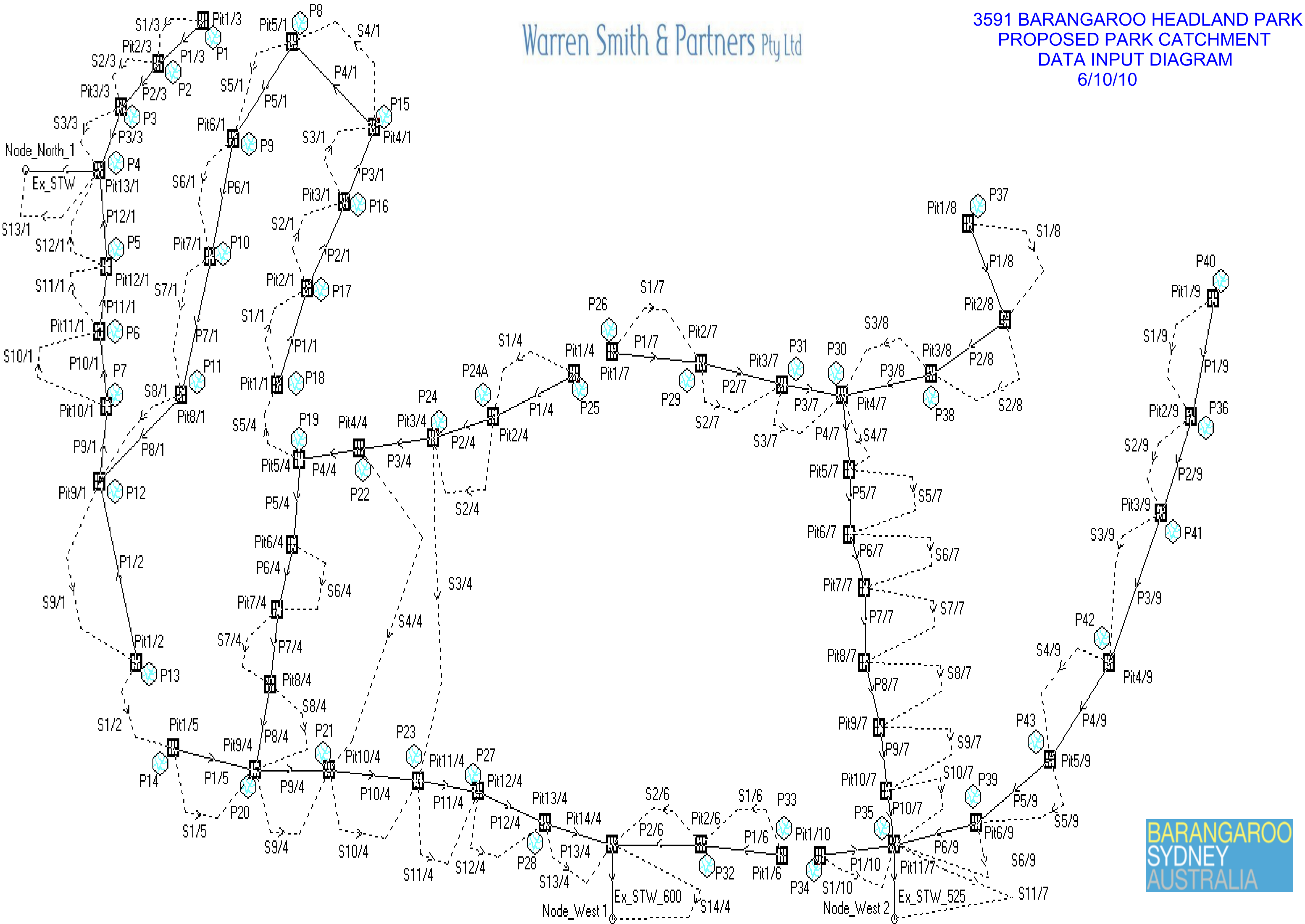
Upwelling occurred at Pit_B1, Pit_Hi15, Pit_Hi6, Pit_Hi5, Pit_Hi3, Pit_B22, Pit_D2, Pit_K6, Pit_A2
Freeboard was less than 0.15m at Pit_Hi6a, Pit_B9, Pit_Hi14, Pit_Hi17, Pit_Hi8, Pit_Hi4, Pit_Hi1, Pit_D3, Pit_K2, Pit_K5, Pit_K7, Pit_K4

The following detention basins have little effect (less than 2%) in reducing peak discharge: OSD_High You might consider upsizing these, or removing them from the model.

The following overflow routes carried water uphill (adding energy): OF74, OF52, OF37, OF41, OF10, OF9, OF17, OF23, OF26, OF29, OF35, OF32, OF34, OF46, OF59, OF53, OF57
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

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3591 BARANGAROO HEADLAND PARK
PROPOSED PARK CATCHMENT
DATA INPUT DIAGRAM
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
DRAINS DATA INPUT
PROPOSED PARK CATCHMENT
Oct-10

BARANGAROO SYDNEY AUSTRALIA

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PIT / NODE DETAILS

Version 9

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss
Pit1/3	OnGrade	900x900	900x900	SIP	1.5	3.5			0	0.3	-6.5E+09	6.25E+09	No	1 1 x Ku
Pit2/3	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	4 1 x Ku
Pit3/3	OnGrade	900x900	900x900	SIP	1.5	3.5			0	0.3	-6.5E+09	6.25E+09	No	6 1 x Ku
Pit13/1	OnGrade	900x900	900x900	SIP	1.5	3.5			0	0.3	-6.5E+09	6.25E+09	No	787 1 x Ku
Node_North_1	Node					2			0		-6.5E+09	6.25E+09		260
Pit1/2	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	32 1 x Ku
Pit9/1	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	14 1 x Ku
Pit10/1	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	13 1 x Ku
Pit11/1	OnGrade	900x900	900x900	SIP	1.5	3.9			0	0.3	-6.5E+09	6.25E+09	No	12 1 x Ku
Pit12/1	OnGrade	900x900	900x900	SIP	1.5	3.5			0	0.3	-6.5E+09	6.25E+09	No	7 1 x Ku
Pit1/5	OnGrade	900x900	900x900	SIP	1.5	4.2			0	0.3	-6.5E+09	6.25E+09	No	34 1 x Ku
Pit9/4	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	58 1 x Ku
Pit10/4	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	59 1 x Ku
Pit11/4	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	62 1 x Ku
Pit12/4	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	64 1 x Ku
Pit13/4	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	65 1 x Ku
Pit14/4	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	66 1 x Ku
Node_West 1	Node					2			0		-6.5E+09	6.25E+09		262
Pit1/1	OnGrade	900x900	900x900	SIP	1.5	13.6			0	0.3	-6.5E+09	6.25E+09	No	38 1 x Ku
Pit2/1	OnGrade	900x900	900x900	SIP	1.5	12.9			0	0.3	-6.5E+09	6.25E+09	No	39 1 x Ku
Pit3/1	OnGrade	900x900	900x900	SIP	1.5	11.8			0	0.3	-6.5E+09	6.25E+09	No	41 1 x Ku
Pit4/1	OnGrade	900x900	900x900	SIP	1.5	10.8			0	0.3	-6.5E+09	6.25E+09	No	42 1 x Ku
Pit5/1	OnGrade	900x900	900x900	SIP	1.5	8.5			0	0.3	-6.5E+09	6.25E+09	No	31 1 x Ku
Pit6/1	OnGrade	900x900	900x900	SIP	1.5	8			0	0.3	-6.5E+09	6.25E+09	No	30 1 x Ku
Pit7/1	OnGrade	900x900	900x900	SIP	1.5	6.9			0	0.3	-6.5E+09	6.25E+09	No	29 1 x Ku
Pit8/1	OnGrade	900x900	900x900	SIP	1.5	5			0	0.3	-6.5E+09	6.25E+09	No	27 1 x Ku
Pit1/4	OnGrade	900x900	900x900	SIP	1.5	17.8			0	0.3	-6.5E+09	6.25E+09	No	50 1 x Ku
Pit2/4	OnGrade	900x900	900x900	SIP	1.5	17.5			0	0.3	-6.5E+09	6.25E+09	No	49 1 x Ku
Pit3/4	OnGrade	900x900	900x900	SIP	1.5	16.1			0	0.3	-6.5E+09	6.25E+09	No	48 1 x Ku
Pit4/4	OnGrade	900x900	900x900	SIP	1.5	15			0	0.3	-6.5E+09	6.25E+09	No	1198 1 x Ku
Pit5/4	OnGrade	900x900	900x900	SIP	1.5	14.2			0	0.3	-6.5E+09	6.25E+09	No	36 1 x Ku
Pit6/4	OnGrade	900x900	900x900	SIP	1.5	10.8			0	0.3	-6.5E+09	6.25E+09	No	1094 1 x Ku
Pit7/4	OnGrade	900x900	900x900	SIP	1.5	8.75			0	0.3	-6.5E+09	6.25E+09	No	1095 1 x Ku
Pit8/4	OnGrade	900x900	900x900	SIP	1.5	6.7			0	0.3	-6.5E+09	6.25E+09	No	1096 1 x Ku
Pit1/6	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	72 1 x Ku
Pit2/6	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	67 1 x Ku
Pit1/10	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	74 1 x Ku
Pit11/7	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	75 1 x Ku
Node_West 2	Node					2			0		-6.5E+09	6.25E+09		263
Pit1/9	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	82 1 x Ku
Pit2/9	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	81 1 x Ku
Pit3/9	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	80 1 x Ku
Pit4/9	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	79 1 x Ku
Pit5/9	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	78 1 x Ku
Pit6/9	OnGrade	900x900	900x900	SIP	1.5	3.8			0	0.3	-6.5E+09	6.25E+09	No	76 1 x Ku
Pit1/7	OnGrade	900x900	900x900	SIP	1.5	19.7			0	0.3	-6.5E+09	6.25E+09	No	94 1 x Ku
Pit2/7	OnGrade	900x900	900x900	SIP	1.5	19.9			0	0.3	-6.5E+09	6.25E+09	No	93 1 x Ku
Pit3/7	OnGrade	900x900	900x900	SIP	1.5	19.8			0	0.3	-6.5E+09	6.25E+09	No	92 1 x Ku
Pit4/7	OnGrade	900x900	900x900	SIP	1.5	19.6			0	0.3	-6.5E+09	6.25E+09	No	91 1 x Ku
Pit5/7	OnGrade	900x900	900x900	SIP	1.5	16.95			0	0.3	-6.5E+09	6.25E+09	No	89 1 x Ku
Pit6/7	OnGrade	900x900	900x900	SIP	1.5	14.9			0	0.3	-6.5E+09	6.25E+09	No	1301 1 x Ku
Pit7/7	OnGrade	900x900	900x900	SIP	1.5	12.85			0	0.3	-6.5E+09	6.25E+09	No	1302 1 x Ku
Pit8/7	OnGrade	900x900	900x900	SIP	1.5	10.8			0	0.3	-6.5E+09	6.25E+09	No	1303 1 x Ku
Pit9/7	OnGrade	900x900	900x900	SIP	1.5	8.75			0	0.3	-6.5E+09	6.25E+09	No	1305 1 x Ku
Pit10/7	OnGrade	900x900	900x900	SIP	1.5	6.7			0	0.3	-6.5E+09	6.25E+09	No	1304 1 x Ku
Pit1/8	OnGrade	900x900	900x900	SIP	1.5	19.8			0	0.3	-6.5E+09	6.25E+09	No	107 1 x Ku
Pit2/8	OnGrade	900x900	900x900	SIP	1.5	19.6			0	0.3	-6.5E+09	6.25E+09	No	106 1 x Ku
Pit3/8	OnGrade	900x900	900x900	SIP	1.5	19.8			0	0.3	-6.5E+09	6.25E+09	No	105 1 x Ku

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol.	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length(m)

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %
P1	Pit1/3	0.0488	0	100	0	5		5	5					
P2	Pit2/3	0.0631	0	100	0	5		5	5					
P3	Pit3/3	0.0756	0	100	0	5		5	5					
P4	Pit13/1	0.0796	0	100	0	5		5	5					
P13	Pit1/2	0.0051	0	100	0	5		5	5					
P12	Pit9/1	0.0597	0	100	0	5		5	5					
P7	Pit10/1	0.0358	0	100	0	5		5	5					
P6	Pit11/1	0.0761	0	100	0	5		5	5					
P5	Pit12/1	0.0627	0	100	0	5		5	5					
P14	Pit1/5	0.0618	0	100	0	5		5	5					
P20	Pit9/4	0.2534	0	100	0	5		5	5					
P21	Pit10/4	0.0001	0	100	0	5		5	5					
P23	Pit11/4	0.0473	0	100	0	5		5	5					
P27	Pit12/4	0.2849	0	100	0	5		5	5					
P28	Pit13/4	0.0181	0	100	0	5		5	5					
P18	Pit1/1	0.0083	0	100	0	5		5	5					

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DRAINS DATA INPUT
PROPOSED PARK CATCHMENT
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BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

P17	Pit2/1	0.0323	0	100	0	5	5	5
P16	Pit3/1	0.1169	0	100	0	5	5	5
P15	Pit4/1	0.1371	0	100	0	5	5	5
P8	Pit5/1	0.0277	0	100	0	5	5	5
P9	Pit6/1	0.04	0	100	0	5	5	5
P10	Pit7/1	0.0859	0	100	0	5	5	5
P11	Pit8/1	0.0976	0	100	0	5	5	5
P25	Pit1/4	0.0606	0	100	0	5	5	5
P24A	Pit2/4	0.02	0	100	0	5	5	5
P24	Pit3/4	0.1854	0	100	0	5	5	5
P22	Pit4/4	0.1431	0	100	0	5	5	5
P19	Pit5/4	0.0239	0	100	0	5	5	5
P33	Pit1/6	0.0231	0	100	0	5	5	5
P32	Pit2/6	0.014	0	100	0	5	5	5
P34	Pit1/10	0.0219	0	100	0	5	5	5
P35	Pit11/7	0.0126	0	100	0	5	5	5
P40	Pit1/9	0.3255	0	100	0	5	5	5
P36	Pit2/9	0.0001	0	100	0	5	5	5
P41	Pit3/9	0.015	0	100	0	5	5	5
P42	Pit4/9	0.0324	0	100	0	5	5	5
P43	Pit5/9	0.0235	0	100	0	5	5	5
P39	Pit6/9	0.1913	0	100	0	5	5	5
P26	Pit1/7	0.1095	0	100	0	5	5	5
P29	Pit2/7	0.1271	0	100	0	5	5	5
P31	Pit3/7	0.0269	0	100	0	5	5	5
P30	Pit4/7	0.244	0	100	0	5	5	5
P37	Pit1/8	0.0495	0	100	0	5	5	5
P38	Pit3/8	0.0307	0	100	0	5	5	5
		3.398						

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)		Rough	Pipe Is	No. Pipes	Chg From	At Chg
P1/3	Pit1/3	Pit2/3	28	2.46	2.18	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/3	0
P2/3	Pit2/3	Pit3/3	30	2.18	1.88	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/3	0
P3/3	Pit3/3	Pit13/1	9	1.88	1.78	1.11	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit3/3	0
Ex_STW	Pit13/1	Node_No	45	1.145	0.92	0.5	Concrete, not unde		450	450	0.3	Existing	1	Pit13/1	0
P1/2	Pit1/2	Pit9/1	16	2.76	2.6	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/2	0
P9/1	Pit9/1	Pit10/1	9	2.6	2.51	1	Concrete, not unde		450	450	0.3	New	1	Pit9/1	0
P10/1	Pit10/1	Pit11/1	30	2.51	2.21	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit10/1	0
P11/1	Pit11/1	Pit12/1	27	2.21	2.05	0.59	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit11/1	0
P12/1	Pit12/1	Pit13/1	16	2.05	1.78	1.69	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit12/1	0
P1/5	Pit1/5	Pit9/4	35	3.16	2.76	1.14	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/5	0
P9/4	Pit9/4	Pit10/4	31	2.76	2.45	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit9/4	0
P10/4	Pit10/4	Pit11/4	36	2.45	2.09	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit10/4	0
P11/4	Pit11/4	Pit12/4	15	2.09	1.94	1	Concrete, not unde		375	375	0.3	New	1	Pit11/4	0
P12/4	Pit12/4	Pit13/4	25	1.94	1.69	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit12/4	0
P13/4	Pit13/4	Pit14/4	24	1.69	1.45	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit13/4	0
Ex_STW_600	Pit14/4	Node_We	45	0.225	0	0.5	Concrete, not unde		600	600	0.3	Existing	1	Pit14/4	0
P1/1	Pit1/1	Pit2/1	20	12.56	11.86	3.5	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/1	0
P2/1	Pit2/1	Pit3/1	30	11.76	10.76	3.33	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/1	0
P3/1	Pit3/1	Pit4/1	20	10.76	9.76	5	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit3/1	0
P4/1	Pit4/1	Pit5/1	23	9.18	7.46	7.48	Concrete, not unde		375	375	0.3	New	1	Pit4/1	0
P5/1	Pit5/1	Pit6/1	18	7.46	6.96	2.78	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit5/1	0
P6/1	Pit6/1	Pit7/1	32	6.96	5.86	3.44	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit6/1	0
P7/1	Pit7/1	Pit8/1	32	5.86	3.96	5.94	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit7/1	0
P8/1	Pit8/1	Pit9/1	25	3.96	2.6	5.44	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit8/1	0
P1/4	Pit1/4	Pit2/4	12	16.76	16.46	2.5	Concrete, not unde		300	300	0.3	New	1	Pit1/4	0
P2/4	Pit2/4	Pit3/4	27	16.46	15.06	5.19	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/4	0
P3/4	Pit3/4	Pit4/4	24	15.06	13.96	4.58	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit3/4	0
P4/4	Pit4/4	Pit5/4	27	13.96	13.16	2.96	Concrete, not unde		375	375	0.3	New	1	Pit4/4	0
P5/4	Pit5/4	Pit6/4	16	10.96	9.76	7.5	Concrete, not unde		375	375	0.3	New	1	Pit5/4	0
P6/4	Pit6/4	Pit7/4	15	8.01	7.71	2	Concrete, not unde		375	375	0.3	New	1	Pit6/4	0
P7/4	Pit7/4	Pit8/4	16	5.96	5.66	1.88	Concrete, not unde		375	375	0.3	New	1	Pit7/4	0
P8/4	Pit8/4	Pit9/4	4	3.06	2.76	7.5	Concrete, not unde		375	375	0.3	New	1	Pit8/4	0
P1/6	Pit1/6	Pit2/6	20	2.76	2.56	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/6	0
P2/6	Pit2/6	Pit14/4	17	2.56	2.4	0.94	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/6	0
P1/10	Pit1/10	Pit11/7	18	2.76	2.5	1.44	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/10	0
Ex_STW_525	Pit11/7	Node_We	30	0.115	-0.05	0.55	Concrete, not unde		300	300	0.3	New	1	Pit11/7	0
P1/9	Pit1/9	Pit2/9	35	2.76	2.41	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/9	0
P2/9	Pit2/9	Pit3/9	19	2.41	2.22	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/9	0
P3/9	Pit3/9	Pit4/9	18	2.22	2.04	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit3/9	0
P4/9	Pit4/9	Pit5/9	14	2.04	1.9	1	Concrete, not unde		375	375	0.3	New	1	Pit4/9	0
P5/9	Pit5/9	Pit6/9	25	1.9	1.65	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit5/9	0
P6/9	Pit6/9	Pit11/7	21	1.65	1.44	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit6/9	0
P1/7	Pit1/7	Pit2/7	32	18.66	18.34	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/7	0
P2/7	Pit2/7	Pit3/7	10	18.34	18.24	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/7	0
P3/7	Pit3/7	Pit4/7	29	18.24	17.95	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit3/7	0
P4/7	Pit4/7	Pit5/7	12	16.81	15.91	7.5	Concrete, not unde		375	375	0.3	New	1	Pit4/7	0
P5/7	Pit5/7	Pit6/7	4	14.06	13.86	5	Concrete, not unde		375	375	0.3	New	1	Pit5/7	0
P6/7	Pit6/7	Pit7/7	12	12.01	11.81	1.67	Concrete, not unde		375	375	0.3	New	1	Pit6/7	0
P7/7	Pit7/7	Pit8/7	4	10.06	9.76	7.5	Concrete, not unde		375	375	0.3	New	1	Pit7/7	0
P8/7	Pit8/7	Pit9/7	4	8.01	7.71	7.5	Concrete, not unde		375	375	0.3	New	1	Pit8/7	0
P9/7	Pit9/7	Pit10/7	4	5.96	5.66	7.5	Concrete, not unde		375	375	0.3	New	1	Pit9/7	0
P10/7	Pit10/7	Pit11/7	4	1.74	1.44	7.5	Concrete, not unde		375	375	0.3	New	1	Pit10/7	0
P1/8	Pit1/8	Pit2/8	20	18.76	18.56	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit1/8	0
P2/8	Pit2/8	Pit3/8	17	18.56	18.39	1	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit2/8	0
P3/8	Pit3/8	Pit4/7	28	18.39	17.95	1.57	Atlantis 2 Cells	0.748W x 0.44H			9	NewFixed	1	Pit3/8	0

3591 BARANGAROO HEADLAND PARK
DRAINS DATA INPUT
PROPOSED PARK CATCHMENT
Oct-10

BARANGAROO SYDNEY AUSTRALIA

Warren Smith & Partners

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height (m	Chg (m)	Bottom Elev (m)	Height of Chg (m)	Chg (m)	Bottom Elev (m)	Height of Serv (m)	etc	etc

CHANNEL DETAILS

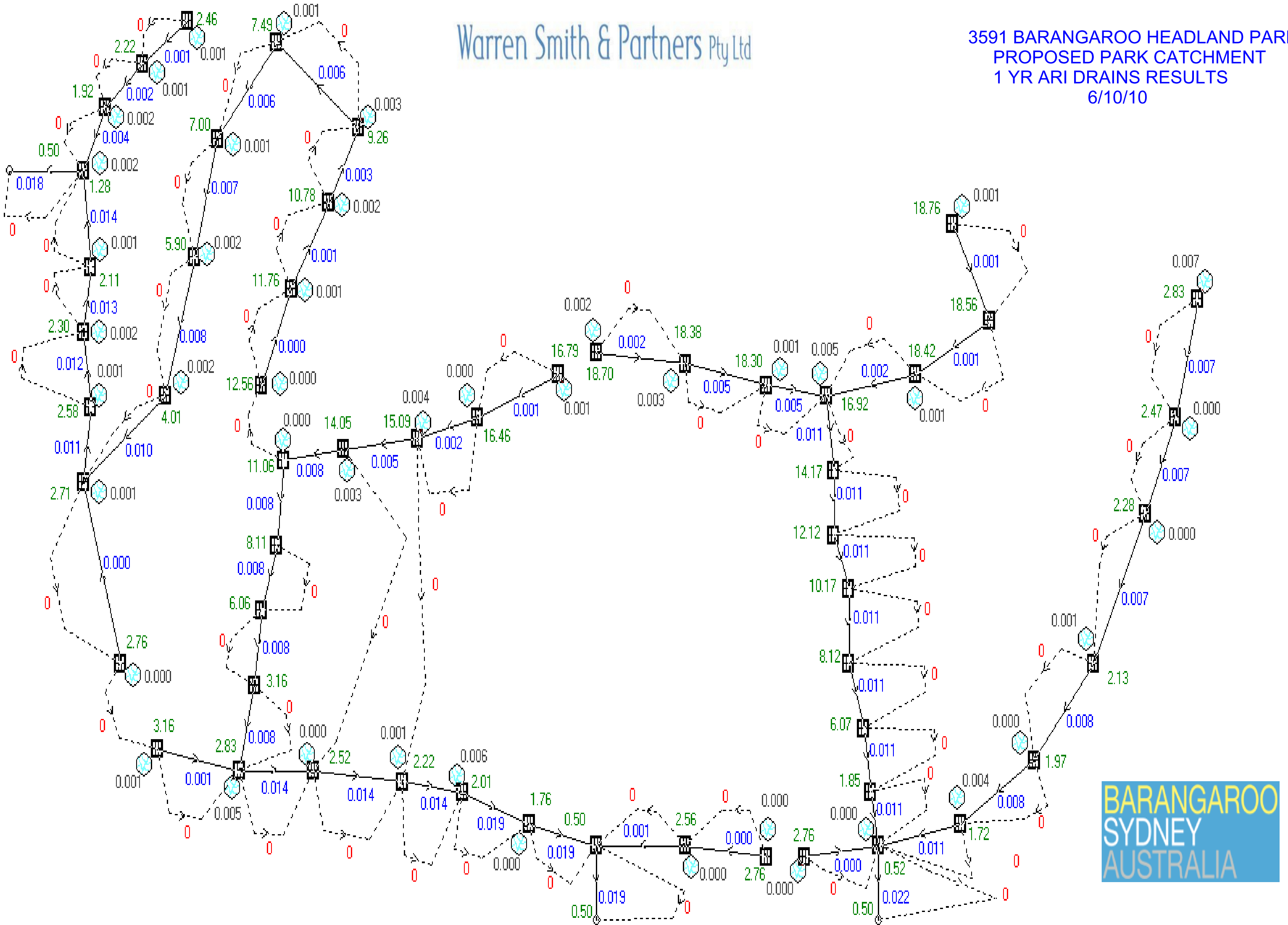
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
S1/3	Pit1/3	Pit2/3	2				Barangaroo Swale	0.3	0.3	0.6	1	0	269
S2/3	Pit2/3	Pit3/3	2				Barangaroo Swale	0.3	0.3	0.6	1	0	277
S3/3	Pit3/3	Pit13/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	278
S13/1	Pit13/1	Node_No	2				Barangaroo Swale	0.3	0.3	0.6	1	0	724
S1/2	Pit1/2	Pit1/5	2				Barangaroo Swale	0.3	0.3	0.6	1	0	319
S9/1	Pit9/1	Pit1/2	2				Barangaroo Swale	0.3	0.3	0.6	1	0	282
S10/1	Pit10/1	Pit11/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	280
S11/1	Pit11/1	Pit12/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	279
S12/1	Pit12/1	Pit13/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	807
S1/5	Pit1/5	Pit9/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	368
S9/4	Pit9/4	Pit10/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	374
S10/4	Pit10/4	Pit11/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	739
S11/4	Pit11/4	Pit12/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	434
S12/4	Pit12/4	Pit13/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	442
S13/4	Pit13/4	Pit14/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	449
S14/4	Pit14/4	Node_We	2				Barangaroo Swale	0.3	0.3	0.6	1	0	581
S1/1	Pit1/1	Pit2/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	382
S2/1	Pit2/1	Pit3/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	381
S3/1	Pit3/1	Pit4/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	380
S4/1	Pit4/1	Pit5/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	405
S5/1	Pit5/1	Pit6/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	328
S6/1	Pit6/1	Pit7/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	335
S7/1	Pit7/1	Pit8/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	339
S8/1	Pit8/1	Pit9/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	344
S1/4	Pit1/4	Pit2/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	412
S2/4	Pit2/4	Pit3/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	429
S3/4	Pit3/4	Pit11/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1224
S4/4	Pit4/4	Pit10/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	413
S5/4	Pit5/4	Pit1/1	2				Barangaroo Swale	0.3	0.3	0.6	1	0	400
S6/4	Pit6/4	Pit7/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1143
S7/4	Pit7/4	Pit8/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1144
S8/4	Pit8/4	Pit9/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1176
S1/6	Pit1/6	Pit2/6	2				Barangaroo Swale	0.3	0.3	0.6	1	0	462
S2/6	Pit2/6	Pit14/4	2				Barangaroo Swale	0.3	0.3	0.6	1	0	457
S1/10	Pit1/10	Pit11/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	559
S11/7	Pit11/7	Node_We	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1608
S1/9	Pit1/9	Pit2/9	2				Barangaroo Swale	0.3	0.3	0.6	1	0	531
S2/9	Pit2/9	Pit3/9	2				Barangaroo Swale	0.3	0.3	0.6	1	0	536
S3/9	Pit3/9	Pit4/9	2				Barangaroo Swale	0.3	0.3	0.6	1	0	537
S4/9	Pit4/9	Pit5/9	2				Barangaroo Swale	0.3	0.3	0.6	1	0	538
S5/9	Pit5/9	Pit6/9	2				Barangaroo Swale	0.3	0.3	0.6	1	0	553
S6/9	Pit6/9	Pit11/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	571
S1/7	Pit1/7	Pit2/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	467
S2/7	Pit2/7	Pit3/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	472
S3/7	Pit3/7	Pit4/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	473
S4/7	Pit4/7	Pit5/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	495
S5/7	Pit5/7	Pit6/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	521
S6/7	Pit6/7	Pit7/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1469
S7/7	Pit7/7	Pit8/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	564
S8/7	Pit8/7	Pit9/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1487
S9/7	Pit9/7	Pit10/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1488
S10/7	Pit10/7	Pit11/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	1499
S1/8	Pit1/8	Pit2/8	2				Barangaroo Swale	0.3	0.3	0.6	1	0	500
S2/8	Pit2/8	Pit3/8	2				Barangaroo Swale	0.3	0.3	0.6	1	0	507
S3/8	Pit3/8	Pit4/7	2				Barangaroo Swale	0.3	0.3	0.6	1	0	513

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
PROPOSED PARK CATCHMENT
1 YR ARI DRAINS RESULTS
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
1 Year ARI Results
PROPOSED STORMWATER CATCHMENT
Oct-10

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BARANGAROO SYDNEY AUSTRALIA

DRAINS results prepared 05 October, 2010 from Version 2010.10

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit1/3	2.46		0.001		1.04	0	None
Pit2/3	2.22		0.001		1.58	0	None
Pit3/3	1.92		0.002		1.58	0	None
Pit13/1	1.28		0.002		2.22	0	None
Node_North_1	0.5		0				
Pit1/2	2.76		0		1.04	0	None
Pit9/1	2.71		0.001		1.09	0	None
Pit10/1	2.58		0.001		1.22	0	None
Pit11/1	2.3		0.002		1.6	0	None
Pit12/1	2.11		0.001		1.39	0	None
Pit1/5	3.16		0.001		1.04	0	None
Pit9/4	2.83		0.005		0.97	0	None
Pit10/4	2.52		0		1.28	0	None
Pit11/4	2.22		0.001		1.58	0	None
Pit12/4	2.01		0.006		1.79	0	None
Pit13/4	1.76		0		2.04	0	None
Pit14/4	0.5		0		3.3	0	None
Node_West 1	0.5		0				
Pit1/1	12.56		0		1.04	0	None
Pit2/1	11.76		0.001		1.14	0	None
Pit3/1	10.78		0.002		1.02	0	None
Pit4/1	9.26		0.003		1.54	0	None
Pit5/1	7.49		0.001		1.01	0	None
Pit6/1	7		0.001		1	0	None
Pit7/1	5.9		0.002		1	0	None
Pit8/1	4.01		0.002		0.99	0	None
Pit1/4	16.79		0.001		1.01	0	None
Pit2/4	16.46		0		1.04	0	None
Pit3/4	15.09		0.004		1.01	0	None
Pit4/4	14.05		0.003		0.95	0	None
Pit5/4	11.06		0		3.14	0	None
Pit6/4	8.11		0		2.69	0	None
Pit7/4	6.06		0		2.69	0	None
Pit8/4	3.16		0		3.54	0	None
Pit1/6	2.76		0		1.04	0	None
Pit2/6	2.56		0		1.24	0	None
Pit1/10	2.76		0		1.04	0	None
Pit11/7	0.52		0		3.28	0	None
Node_West 2	0.5		0				
Pit1/9	2.83		0.007		0.97	0	None
Pit2/9	2.47		0		1.33	0	None
Pit3/9	2.28		0		1.52	0	None
Pit4/9	2.13		0.001		1.67	0	None
Pit5/9	1.97		0		1.83	0	None
Pit6/9	1.72		0.004		2.08	0	None
Pit1/7	18.7		0.002		1	0	None
Pit2/7	18.38		0.003		1.52	0	None
Pit3/7	18.3		0.001		1.5	0	None
Pit4/7	16.92		0.005		2.68	0	None
Pit5/7	14.17		0		2.78	0	None
Pit6/7	12.12		0		2.78	0	None
Pit7/7	10.17		0		2.68	0	None
Pit8/7	8.12		0		2.68	0	None
Pit9/7	6.07		0		2.68	0	None
Pit10/7	1.85		0		4.85	0	None
Pit1/8	18.76		0.001		1.04	0	None
Pit2/8	18.56		0		1.04	0	None
Pit3/8	18.42		0.001		1.38	0	None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
P1	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P13	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P12	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P14	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P20	0.005	0	0.005	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P21	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P23	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P27	0.006	0	0.006	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

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BARANGAROO SYDNEY AUSTRALIA

P28	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P18	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P17	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P16	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P15	0.003	0	0.003	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P8	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P9	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P10	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P11	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P25	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P24A	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P24	0.004	0	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P22	0.003	0	0.003	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P19	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P33	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P32	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P34	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P35	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P40	0.007	0	0.007	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P36	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P41	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P42	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P43	0	0	0	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P39	0.004	0	0.004	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P26	0.002	0	0.002	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P29	0.003	0	0.003	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P31	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P30	0.005	0	0.005	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P37	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P38	0.001	0	0.001	5	5	5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.00 impervious + 3.40 pervious = 3.40 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runof cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 1 year,	291.66	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)
AR&R 1 year,	447.4	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)
AR&R 1 year,	560.67	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)
AR&R 1 year,	656.95	0.78 (0.1%)	0.00 (0.0%)	0.78 (0.1%)
AR&R 1 year,	736.23	4.91 (0.7%)	0.00 (0.0%)	4.91 (0.7%)
AR&R 1 year,	801.93	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)
AR&R 1 year,	965.88	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)
AR&R 1 year,	1094.16	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)
AR&R 1 year,	1269.15	0.63 (0.0%)	0.00 (0.0%)	0.63 (0.0%)
AR&R 1 year,	1406.77	11.16 (0.8%)	0.00 (0.0%)	11.16 (0.8%)
AR&R 1 year,	1620.85	0.00 (0.0%)	0.00 (0.0%)	0.00 (0.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P1/3	0.001	1.7	2.461	2.216	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/3	0.002	0.1	2.216	1.916	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/3	0.004	0.4	1.914	1.793	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Ex_STW	0.018	1	1.221	0.996	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/2	0	0	2.76	2.706	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P9/1	0.011	1	2.654	2.581	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P10/1	0.012	0.2	2.579	2.299	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P11/1	0.013	0.3	2.296	2.107	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P12/1	0.014	0.7	2.078	1.807	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/5	0.001	1.8	3.161	2.83	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P9/4	0.014	0.3	2.828	2.522	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P10/4	0.014	0.3	2.52	2.217	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P11/4	0.014	1.3	2.15	2.009	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P12/4	0.019	0.4	2.007	1.759	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P13/4	0.019	0.6	1.755	1.489	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
Ex_STW_600	0.019	0.2	0.5	0.5	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/1	0	0	12.56	11.86	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/1	0.001	3.1	11.76	10.781	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/1	0.003	0.5	10.769	9.769	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/1	0.006	2.1	9.203	7.493	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/1	0.006	0.6	7.474	6.996	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/1	0.007	0.7	6.974	5.9	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/1	0.008	0.8	5.873	4.006	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P8/1	0.01	0.9	3.975	2.706	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/4	0.001	1.3	16.772	16.472	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/4	0.002	3.8	16.461	15.089	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/4	0.005	0.6	15.071	14.053	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/4	0.008	1.3	14	13.2	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/4	0.008	1.7	10.993	9.793	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/4	0.008	1.2	8.053	7.753	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P7/4	0.008	1.2	6.003	5.703	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P8/4	0.008	1.7	3.093	2.83	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/6	0	0	2.76	2.561	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

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P2/6	0.001	1.6	2.561	2.401	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P1/10	0	0	2.76	2.5	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
Ex_STW_525	0.022	0.3	0.511	0.5	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/9	0.007	0.2	2.824	2.469	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/9	0.007	0.2	2.467	2.28	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/9	0.007	0.2	2.278	2.132	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/9	0.008	1	2.086	1.967	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P5/9	0.008	0.2	1.965	1.716	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P6/9	0.011	0.5	1.714	1.468	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/7	0.002	0.1	18.697	18.384	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/7	0.005	0.2	18.382	18.296	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/7	0.005	0.4	18.294	17.967	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P4/7	0.011	1.8	16.849	15.949	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P5/7	0.011	1.7	14.101	13.901	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P6/7	0.011	1.3	12.058	11.858	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P7/7	0.011	1.8	10.099	9.799	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P8/7	0.011	1.8	8.049	7.749	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P9/7	0.011	1.8	5.999	5.699	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P10/7	0.011	1.8	1.779	1.479	AR&R 1 year, 2 hours storm, average 20.7 mm/h, Zone 1
P1/8	0.001	1.7	18.761	18.561	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P2/8	0.001	1.7	18.561	18.42	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1
P3/8	0.002	0.3	18.42	17.958	AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
S1/3	0	0	0.462	0	0	0	0	
S2/3	0	0	0.462	0	0	0	0	
S3/3	0	0	0.462	0	0	0	0	
S13/1	0	0	0.462	0	0	0	0	
S1/2	0	0	0.462	0	0	0	0	
S9/1	0	0	0.462	0	0	0	0	
S10/1	0	0	0.462	0	0	0	0	
S11/1	0	0	0.462	0	0	0	0	
S12/1	0	0	0.462	0	0	0	0	
S1/5	0	0	0.462	0	0	0	0	
S9/4	0	0	0.462	0	0	0	0	
S10/4	0	0	0.462	0	0	0	0	
S11/4	0	0	0.462	0	0	0	0	
S12/4	0	0	0.462	0	0	0	0	
S13/4	0	0	0.462	0	0	0	0	
S14/4	0	0	0.462	0	0	0	0	
S1/1	0	0	0.462	0	0	0	0	
S2/1	0	0	0.462	0	0	0	0	
S3/1	0	0	0.462	0	0	0	0	
S4/1	0	0	0.462	0	0	0	0	
S5/1	0	0	0.462	0	0	0	0	
S6/1	0	0	0.462	0	0	0	0	
S7/1	0	0	0.462	0	0	0	0	
S8/1	0	0	0.462	0	0	0	0	
S1/4	0	0	0.462	0	0	0	0	
S2/4	0	0	0.462	0	0	0	0	
S3/4	0	0	0.462	0	0	0	0	
S4/4	0	0	0.462	0	0	0	0	
S5/4	0	0	0.462	0	0	0	0	
S6/4	0	0	0.462	0	0	0	0	
S7/4	0	0	0.462	0	0	0	0	
S8/4	0	0	0.462	0	0	0	0	
S1/6	0	0	0.462	0	0	0	0	
S2/6	0	0	0.462	0	0	0	0	
S1/10	0	0	0.462	0	0	0	0	
S11/7	0	0	0.462	0	0	0	0	
S1/9	0	0	0.462	0	0	0	0	
S2/9	0	0	0.462	0	0	0	0	
S3/9	0	0	0.462	0	0	0	0	
S4/9	0	0	0.462	0	0	0	0	
S5/9	0	0	0.462	0	0	0	0	
S6/9	0	0	0.462	0	0	0	0	
S1/7	0	0	0.462	0	0	0	0	
S2/7	0	0	0.462	0	0	0	0	
S3/7	0	0	0.462	0	0	0	0	
S4/7	0	0	0.462	0	0	0	0	
S5/7	0	0	0.462	0	0	0	0	
S6/7	0	0	0.462	0	0	0	0	
S7/7	0	0	0.462	0	0	0	0	
S8/7	0	0	0.462	0	0	0	0	
S9/7	0	0	0.462	0	0	0	0	
S10/7	0	0	0.462	0	0	0	0	
S1/8	0	0	0.462	0	0	0	0	
S2/8	0	0	0.462	0	0	0	0	

3591 BARANGAROO HEADLAND PARK
1 Year ARI Results
PROPOSED STORMWATER CATCHMENT
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Warren Smith & Partners
BARANGAROO SYDNEY AUSTRALIA

S3/8	0	0	0.462	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 1 year, 25 minutes storm, average 52 mm/h, Zone 1

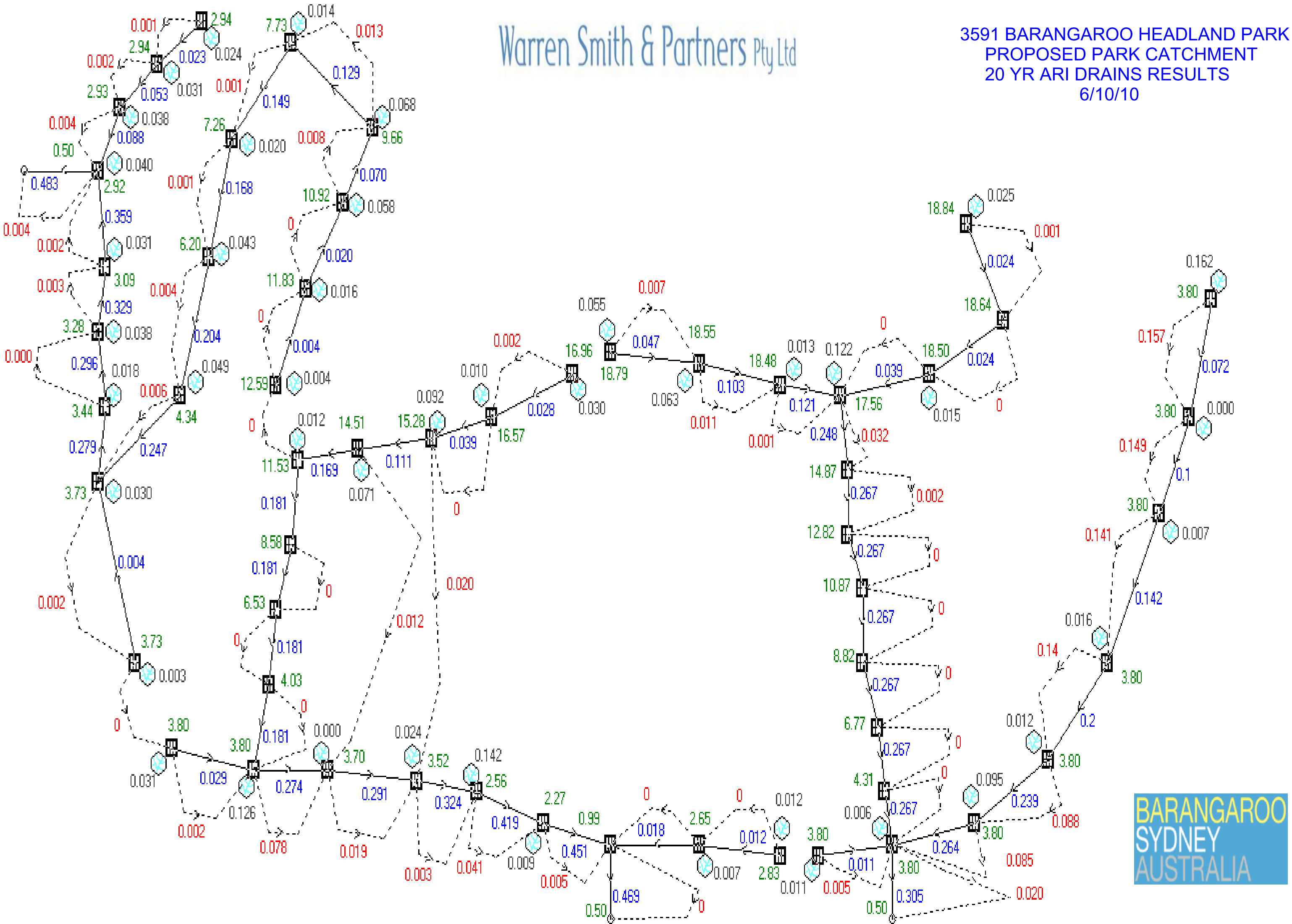
Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit1/3	0.07	0.07	0	0
Pit2/3	0.16	0.16	0	0
Pit3/3	0.27	0.27	0	0
Pit13/1	1.52	1.52	0	0
Node_North_1	1.52	1.52	0	0
Pit1/2	0.01	0.01	0	0
Pit9/1	0.88	0.88	0	0
Pit10/1	0.93	0.93	0	0
Pit11/1	1.04	1.04	0	0
Pit12/1	1.14	1.14	0	0
Pit1/5	0.09	0.09	0	0
Pit9/4	1.08	1.08	0	0
Pit10/4	1.08	1.08	0	0
Pit11/4	1.15	1.15	0	0
Pit12/4	1.56	1.56	0	0
Pit13/4	1.59	1.59	0	0
Pit14/4	1.64	1.64	0	0
Node_West 1	1.64	1.64	0	0
Pit1/1	0.01	0.01	0	0
Pit2/1	0.06	0.06	0	0
Pit3/1	0.23	0.23	0	0
Pit4/1	0.43	0.43	0	0
Pit5/1	0.47	0.47	0	0
Pit6/1	0.52	0.52	0	0
Pit7/1	0.65	0.65	0	0
Pit8/1	0.79	0.79	0	0
Pit1/4	0.09	0.09	0	0
Pit2/4	0.12	0.12	0	0
Pit3/4	0.38	0.38	0	0
Pit4/4	0.59	0.59	0	0
Pit5/4	0.63	0.63	0	0
Pit6/4	0.63	0.63	0	0
Pit7/4	0.63	0.63	0	0
Pit8/4	0.63	0.63	0	0
Pit1/6	0.03	0.03	0	0
Pit2/6	0.05	0.05	0	0
Pit1/10	0.03	0.03	0	0
Pit11/7	1.75	1.75	0	0
Node_West 2	1.75	1.75	0	0
Pit1/9	0.47	0.47	0	0
Pit2/9	0.47	0.47	0	0
Pit3/9	0.49	0.49	0	0
Pit4/9	0.54	0.54	0	0
Pit5/9	0.57	0.57	0	0
Pit6/9	0.85	0.85	0	0
Pit1/7	0.16	0.16	0	0
Pit2/7	0.34	0.34	0	0
Pit3/7	0.38	0.38	0	0
Pit4/7	0.85	0.85	0	0
Pit5/7	0.85	0.85	0	0
Pit6/7	0.85	0.85	0	0
Pit7/7	0.85	0.85	0	0
Pit8/7	0.85	0.85	0	0
Pit9/7	0.85	0.85	0	0
Pit10/7	0.85	0.85	0	0
Pit1/8	0.07	0.07	0	0
Pit2/8	0.07	0.07	0	0
Pit3/8	0.12	0.12	0	0

Run Log for 3591_BHP_100928_Revised n Value.drn run at 14:54:03 on 5/10/2010

No water upwelling from any pit. Freeboard was adequate at all pits.

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
PROPOSED PARK CATCHMENT
20 YR ARI DRAINS RESULTS
6/10/10



3591 BARANGAROO HEADLAND PARK
20 Year ARI Results
PROPOSED STORMWATER CATCHMENT
Oct-10

Warren Smith & Partners
BARANGAROO
SYDNEY
AUSTRALIA

DRAINS results prepared 05 October, 2010 from Version 2010.10

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit1/3	2.94		0.024		0.56	0.001	Inlet Capacity
Pit2/3	2.94		0.032		0.86	0.002	Inlet Capacity
Pit3/3	2.93		0.039		0.57	0.004	Inlet Capacity
Pit13/1	2.92		0.042		0.58	0.004	Inlet Capacity
Node_North_1	0.5		0.004				
Pit1/2	3.73		0.004		0.07	0	None
Pit9/1	3.73		0.033		0.07	0.002	Inlet Capacity
Pit10/1	3.44		0.018		0.36	0	Inlet Capacity
Pit11/1	3.28		0.038		0.62	0.003	Inlet Capacity
Pit12/1	3.09		0.033		0.41	0.002	Inlet Capacity
Pit1/5	3.8		0.031		0.4	0.002	Inlet Capacity
Pit9/4	3.8		0.127		0	0.078	Outlet System
Pit10/4	3.7		0.091		0.1	0.019	Inlet Capacity
Pit11/4	3.52		0.037		0.28	0.003	Inlet Capacity
Pit12/4	2.56		0.143		1.24	0.041	Inlet Capacity
Pit13/4	2.27		0.047		1.53	0.005	Inlet Capacity
Pit14/4	0.99		0.005		2.81	0	None
Node_West 1	0.5		0				
Pit1/1	12.59		0.004		1.01	0	None
Pit2/1	11.83		0.016		1.07	0	None
Pit3/1	10.92		0.058		0.88	0.008	Inlet Capacity
Pit4/1	9.66		0.073		1.14	0.013	Inlet Capacity
Pit5/1	7.73		0.022		0.77	0.001	Inlet Capacity
Pit6/1	7.26		0.02		0.74	0.001	Inlet Capacity
Pit7/1	6.2		0.043		0.7	0.004	Inlet Capacity
Pit8/1	4.34		0.051		0.66	0.006	Inlet Capacity
Pit1/4	16.96		0.03		0.84	0.002	Inlet Capacity
Pit2/4	16.57		0.011		0.93	0	None
Pit3/4	15.28		0.092		0.82	0.02	Inlet Capacity
Pit4/4	14.51		0.071		0.49	0.012	Inlet Capacity
Pit5/4	11.53		0.012		2.67	0	None
Pit6/4	8.58		0		2.22	0	None
Pit7/4	6.53		0		2.22	0	None
Pit8/4	4.03		0		2.67	0	None
Pit1/6	2.83		0.012		0.97	0	None
Pit2/6	2.65		0.007		1.15	0	None
Pit1/10	3.8		0.011		0	0.005	Outlet System
Pit11/7	3.8		0.093		0	0.02	Outlet System
Node_West 2	0.5		0.02				
Pit1/9	3.8		0.162		0	0.157	Outlet System
Pit2/9	3.8		0.158		0	0.149	Outlet System
Pit3/9	3.8		0.151		0	0.141	Outlet System
Pit4/9	3.8		0.144		0	0.14	Outlet System
Pit5/9	3.8		0.144		0	0.088	Outlet System
Pit6/9	3.8		0.117		0	0.085	Outlet System
Pit1/7	18.79		0.055		0.91	0.007	Inlet Capacity
Pit2/7	18.55		0.067		1.35	0.011	Inlet Capacity
Pit3/7	18.48		0.02		1.32	0.001	Inlet Capacity
Pit4/7	17.56		0.122		2.04	0.032	Inlet Capacity
Pit5/7	14.87		0.032		2.08	0.002	Inlet Capacity
Pit6/7	12.82		0.002		2.08	0	None
Pit7/7	10.87		0		1.98	0	None
Pit8/7	8.82		0		1.98	0	None
Pit9/7	6.77		0		1.98	0	None
Pit10/7	4.31		0		2.39	0	None
Pit1/8	18.84		0.025		0.96	0.001	Inlet Capacity
Pit2/8	18.64		0.001		0.96	0	None
Pit3/8	18.5		0.015		1.3	0	None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
P1	0.024	0	0.024	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2	0.031	0	0.031	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P3	0.038	0	0.038	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P4	0.04	0	0.04	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P13	0.003	0	0.003	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P12	0.03	0	0.03	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P7	0.018	0	0.018	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P6	0.038	0	0.038	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P5	0.031	0	0.031	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P14	0.031	0	0.031	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P20	0.126	0	0.126	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P21	0	0	0	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P23	0.024	0	0.024	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P27	0.142	0	0.142	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P28	0.009	0	0.009	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P18	0.004	0	0.004	5	5	5	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1

3591 BARANGAROO HEADLAND PARK
20 Year ARI Results
PROPOSED STORMWATER CATCHMENT
Oct-10

Warren Smith & Partners
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P17	0.016	0	0.016	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P16	0.058	0	0.058	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P15	0.068	0	0.068	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P8	0.014	0	0.014	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P9	0.02	0	0.02	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P10	0.043	0	0.043	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P11	0.049	0	0.049	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P25	0.03	0	0.03	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P24A	0.01	0	0.01	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P24	0.092	0	0.092	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P22	0.071	0	0.071	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P19	0.012	0	0.012	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P33	0.012	0	0.012	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P32	0.007	0	0.007	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P34	0.011	0	0.011	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P35	0.006	0	0.006	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P40	0.162	0	0.162	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P36	0	0	0	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P41	0.007	0	0.007	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P42	0.016	0	0.016	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P43	0.012	0	0.012	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P39	0.095	0	0.095	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P26	0.055	0	0.055	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P29	0.063	0	0.063	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P31	0.013	0	0.013	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P30	0.122	0	0.122	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P37	0.025	0	0.025	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P38	0.015	0	0.015	5	5	5 AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.00 impervious + 3.40 pervious = 3.40 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 20 year	597.48	193.52 (32.4%)	0.00 (0.0%)	193.52 (32.4%)
AR&R 20 year	940.11	394.27 (41.9%)	0.00 (0.0%)	394.27 (41.9%)
AR&R 20 year	1197.8	535.81 (44.7%)	0.00 (0.0%)	535.81 (44.7%)
AR&R 20 year	1415.83	660.83 (46.7%)	0.00 (0.0%)	660.83 (46.7%)
AR&R 20 year	1599.89	730.99 (45.7%)	0.00 (0.0%)	730.99 (45.7%)
AR&R 20 year	1766.96	798.79 (45.2%)	0.00 (0.0%)	798.79 (45.2%)
AR&R 20 year	2166.22	993.78 (45.9%)	0.00 (0.0%)	993.78 (45.9%)
AR&R 20 year	2480.54	1126.49 (45.4%)	0.00 (0.0%)	1126.49 (45.4%)
AR&R 20 year	2905.29	1253.82 (43.2%)	0.00 (0.0%)	1253.82 (43.2%)
AR&R 20 year	3180.53	1308.38 (41.1%)	0.00 (0.0%)	1308.38 (41.1%)
AR&R 20 year	3649.45	1403.61 (38.5%)	0.00 (0.0%)	1403.61 (38.5%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P1/3	0.023	0.1	2.938	2.937	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/3	0.053	0.2	2.935	2.932	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P3/3	0.088	0.3	2.925	2.924	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
Ex_STW	0.483	3.1	2.219	1.354	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/2	0.004	0	3.727	3.727	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P9/1	0.279	1.8	3.495	3.439	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P10/1	0.296	0.9	3.367	3.279	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P11/1	0.329	1	3.19	3.092	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P12/1	0.359	1.1	2.986	2.924	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/5	0.029	0.1	3.801	3.8	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P9/4	0.274	0.8	3.756	3.7	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
P10/4	0.291	0.9	3.63	3.524	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P11/4	0.324	2.9	2.879	2.558	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P12/4	0.419	1.3	2.411	2.268	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P13/4	0.451	1.8	2.022	1.782	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
Ex_STW_600	0.469	1.9	0.781	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/1	0.004	0.5	12.57	11.87	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/1	0.02	1	11.788	10.925	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P3/1	0.07	1.7	10.814	9.814	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P4/1	0.129	4.4	9.297	7.734	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P5/1	0.149	1.8	7.568	7.256	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P6/1	0.168	2.1	7.069	6.198	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P7/1	0.204	2.6	5.964	4.343	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P8/1	0.247	2.7	4.081	3.727	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/4	0.028	2.1	16.835	16.572	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/4	0.039	1.4	16.497	15.285	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P3/4	0.111	2	15.135	14.508	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P4/4	0.169	3.3	14.137	13.337	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P5/4	0.181	4.7	11.103	9.903	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P6/4	0.181	2.9	8.214	7.914	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P7/4	0.181	2.9	6.168	5.868	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P8/4	0.181	1.6	3.828	3.8	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/6	0.012	0.2	2.824	2.651	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/6	0.018	0.6	2.647	2.439	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/10	0.011	0	3.8	3.8	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
Ex_STW_525	0.305	4.3	2.378	0.5	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/9	0.072	0.2	3.8	3.8	AR&R 20 year, 20 minutes storm, average 125 mm/h, Zone 1

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P2/9	0.1	0.3	3.8	3.8	AR&R 20 year, 10 minutes storm, average 166 mm/h, Zone 1
P3/9	0.142	0.4	3.8	3.8	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P4/9	0.2	1.8	3.8	3.8	AR&R 20 year, 15 minutes storm, average 141 mm/h, Zone 1
P5/9	0.239	0.7	3.8	3.8	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P6/9	0.264	0.8	3.8	3.8	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
P1/7	0.047	0.9	18.731	18.554	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/7	0.103	1	18.479	18.479	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P3/7	0.121	1.2	18.371	18.081	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P4/7	0.248	5.2	16.978	16.078	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P5/7	0.267	4.6	14.257	14.057	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P6/7	0.267	2.9	12.306	12.106	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P7/7	0.267	5.3	10.236	9.936	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P8/7	0.267	5.3	8.186	7.886	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P9/7	0.267	5.3	6.136	5.836	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P10/7	0.267	2.4	3.86	3.8	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P1/8	0.024	0.5	18.824	18.641	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P2/8	0.024	0.5	18.622	18.502	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
P3/8	0.039	1	18.444	18.004	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
S1/3	0.001	0.001	0.462	0.007	0	1.24	0.13	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S2/3	0.002	0.002	0.462	0.011	0	1.27	0.16	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S3/3	0.004	0.004	0.462	0.014	0	1.29	0.2	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S13/1	0.004	0.004	0.462	0.016	0	1.3	0.21	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S1/2	0	0	0.462	0	0	0	0	
S9/1	0.002	0.002	0.462	0.011	0	1.27	0.17	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S10/1	0	0	0.462	0	0	0	0	
S11/1	0.003	0.003	0.462	0.014	0	1.29	0.19	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S12/1	0.002	0.002	0.462	0.011	0	1.27	0.17	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S1/5	0.002	0.002	0.462	0.01	0	1.26	0.15	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S9/4	0.078	0.078	0.462	0.09	0.05	1.74	0.59	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S10/4	0.019	0.019	0.462	0.04	0.01	1.44	0.36	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S11/4	0.003	0.003	0.462	0.014	0	1.28	0.19	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
S12/4	0.041	0.041	0.462	0.062	0.03	1.57	0.48	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S13/4	0.005	0.005	0.462	0.018	0	1.31	0.22	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S14/4	0	0	0.462	0	0	0	0	
S1/1	0	0	0.462	0	0	0	0	
S2/1	0	0	0.462	0	0	0	0	
S3/1	0.008	0.008	0.462	0.024	0.01	1.35	0.27	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S4/1	0.013	0.013	0.462	0.031	0.01	1.39	0.32	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S5/1	0.001	0.001	0.462	0.006	0	1.24	0.11	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
S6/1	0.001	0.001	0.462	0.005	0	1.23	0.1	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S7/1	0.004	0.004	0.462	0.017	0	1.3	0.21	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S8/1	0.006	0.006	0.462	0.02	0	1.32	0.24	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S1/4	0.002	0.002	0.462	0.01	0	1.26	0.15	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S2/4	0	0	0.462	0	0	0	0	
S3/4	0.02	0.02	0.462	0.041	0.02	1.44	0.37	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S4/4	0.012	0.012	0.462	0.031	0.01	1.38	0.31	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S5/4	0	0	0.462	0	0	0	0	
S6/4	0	0	0.462	0	0	0	0	
S7/4	0	0	0.462	0	0	0	0	
S8/4	0	0	0.462	0	0	0	0	
S1/6	0	0	0.462	0	0	0	0	
S2/6	0	0	0.462	0	0	0	0	
S1/10	0.005	0.005	0.462	0.018	0	1.31	0.22	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
S11/7	0.02	0.02	0.462	0.041	0.02	1.45	0.37	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
S1/9	0.157	0.157	0.462	0.133	0.1	2	0.74	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S2/9	0.149	0.149	0.462	0.129	0.09	1.97	0.73	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S3/9	0.141	0.141	0.462	0.126	0.09	1.95	0.71	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S4/9	0.14	0.14	0.462	0.124	0.09	1.95	0.71	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
S5/9	0.088	0.088	0.462	0.096	0.06	1.78	0.61	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
S6/9	0.085	0.085	0.462	0.095	0.06	1.77	0.61	AR&R 20 year, 25 minutes storm, average 113 mm/h, Zone 1
S1/7	0.007	0.007	0.462	0.023	0.01	1.34	0.25	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S2/7	0.011	0.011	0.462	0.029	0.01	1.37	0.3	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S3/7	0.001	0.001	0.462	0.005	0	1.23	0.1	AR&R 20 year, 2 hours storm, average 46.8 mm/h, Zone 1
S4/7	0.032	0.032	0.462	0.054	0.02	1.52	0.44	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S5/7	0.002	0.002	0.462	0.011	0	1.27	0.16	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S6/7	0	0	0.462	0	0	0	0	
S7/7	0	0	0.462	0	0	0	0	
S8/7	0	0	0.462	0	0	0	0	
S9/7	0	0	0.462	0	0	0	0	
S10/7	0	0	0.462	0	0	0	0	
S1/8	0.001	0.001	0.462	0.007	0	1.24	0.13	AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1
S2/8	0	0	0.462	0	0	0	0	
S3/8	0	0	0.462	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

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Warren Smith & Partners
BARANGAROO
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CONTINUITY CHECK for AR&R 20 year, 1.5 hours storm, average 57 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit1/3	18.01	18	0	0
Pit2/3	41.28	41.27	0	0
Pit3/3	69.17	69.15	0	0
Pit13/1	388.34	388.31	0	0
Node_North_1	388.31	388.31	0	0
Pit1/2	2.36	2.36	0	0
Pit9/1	225.71	225.71	0	0
Pit10/1	238.44	238.5	0	0
Pit11/1	266.58	266.65	0	0
Pit12/1	289.79	289.82	0	0
Pit1/5	22.8	22.8	0	0
Pit9/4	266.32	266.11	0	0.1
Pit10/4	269.72	269.48	0	0.1
Pit11/4	293.17	293.13	0	0
Pit12/4	398.25	398.26	0	0
Pit13/4	404.93	404.89	0	0
Pit14/4	418.58	418.65	0	0
Node_West 1	418.65	418.65	0	0
Pit1/1	3.06	3.06	0	0
Pit2/1	14.98	14.98	0	0
Pit3/1	58.11	58.09	0	0
Pit4/1	108.68	108.67	0	0
Pit5/1	118.89	118.89	0	0
Pit6/1	133.64	133.64	0	0
Pit7/1	165.33	165.32	0	0
Pit8/1	201.34	201.32	0	0
Pit1/4	22.36	22.36	0	0
Pit2/4	29.74	29.74	0	0
Pit3/4	98.15	98.14	0	0
Pit4/4	144.71	144.7	0	0
Pit5/4	149.95	149.96	0	0
Pit6/4	149.96	149.98	0	0
Pit7/4	149.98	149.98	0	0
Pit8/4	149.98	150.02	0	0
Pit1/6	8.52	8.52	0	0
Pit2/6	13.69	13.69	0	0
Pit1/10	8.08	8.05	0	0.4
Pit11/7	446.93	446.87	0	0
Node_West 2	446.87	446.87	0	0
Pit1/9	120.11	120.09	0	0
Pit2/9	120.12	119.85	0	0.2
Pit3/9	125.38	125.25	0	0.1
Pit4/9	137.21	137.3	0	-0.1
Pit5/9	145.97	146.28	0	-0.2
Pit6/9	216.87	217.35	0	-0.2
Pit1/7	40.4	40.39	0	0
Pit2/7	87.29	87.27	0	0
Pit3/7	97.2	97.19	0	0
Pit4/7	216.81	216.76	0	0
Pit5/7	216.76	216.76	0	0
Pit6/7	216.76	216.78	0	0
Pit7/7	216.78	216.81	0	0
Pit8/7	216.81	216.83	0	0
Pit9/7	216.83	216.86	0	0
Pit10/7	216.86	216.88	0	0
Pit1/8	18.27	18.26	0	0
Pit2/8	18.26	18.26	0	0
Pit3/8	29.59	29.58	0	0

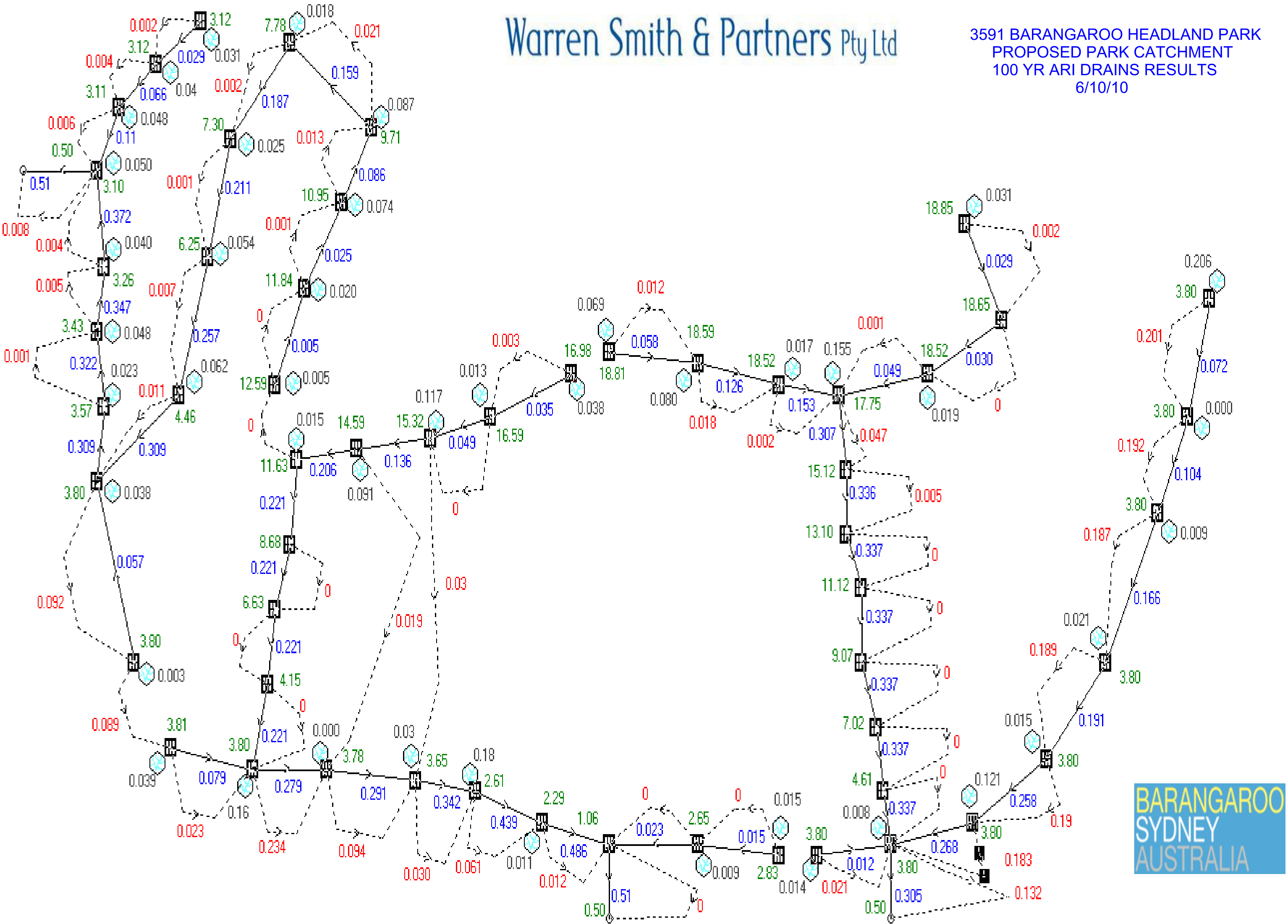
Run Log for 3591_BHP_100928_Revised n Value.drn run at 11:23:38 on 5/10/2010

Upwelling occurred at Pit1/9, Pit2/9, Pit3/9, Pit4/9, Pit5/9
Freeboard was less than 0.15m at Pit6/9, Pit11/7, Pit1/10, Pit10/4, Pit9/4, Pit1/2, Pit9/1

The following overflow routes carried water uphill (adding energy): S1/7, S1/3
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

Warren Smith & Partners Pty Ltd

3591 BARANGAROO HEADLAND PARK
PROPOSED PARK CATCHMENT
100 YR ARI DRAINS RESULTS
6/10/10



BARANGAROO
SYDNEY
AUSTRALIA

3591 BARANGAROO HEADLAND PARK
100 Year ARI Results
PROPOSED STORMWATER CATCHMENT
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AUSTRALIA

DRAINS results prepared 05 October, 2010 from Version 2010.10

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit1/3	3.12		0.031		0.38	0.002	Inlet Capacity
Pit2/3	3.12		0.041		0.68	0.004	Inlet Capacity
Pit3/3	3.11		0.05		0.39	0.006	Inlet Capacity
Pit13/1	3.1		0.056		0.4	0.008	Inlet Capacity
Node_North_1	0.5		0.008				
Pit1/2	3.8		0.095		0	0.089	Outlet System
Pit9/1	3.8		0.043		0	0.092	Outlet System
Pit10/1	3.57		0.023		0.23	0.001	Inlet Capacity
Pit11/1	3.43		0.048		0.47	0.005	Inlet Capacity
Pit12/1	3.26		0.043		0.24	0.004	Inlet Capacity
Pit1/5	3.81		0.102		0.39	0.023	Inlet Capacity
Pit9/4	3.8		0.162		0	0.234	Outlet System
Pit10/4	3.78		0.245		0.02	0.094	Inlet Capacity
Pit11/4	3.65		0.117		0.15	0.03	Inlet Capacity
Pit12/4	2.61		0.183		1.19	0.061	Inlet Capacity
Pit13/4	2.29		0.069		1.51	0.012	Inlet Capacity
Pit14/4	1.06		0.012		2.74	0	None
Node_West 1	0.5		0				
Pit1/1	12.59		0.005		1.01	0	None
Pit2/1	11.84		0.02		1.06	0.001	Inlet Capacity
Pit3/1	10.95		0.074		0.85	0.013	Inlet Capacity
Pit4/1	9.71		0.095		1.09	0.021	Inlet Capacity
Pit5/1	7.78		0.033		0.72	0.002	Inlet Capacity
Pit6/1	7.3		0.026		0.7	0.001	Inlet Capacity
Pit7/1	6.25		0.055		0.65	0.007	Inlet Capacity
Pit8/1	4.46		0.066		0.54	0.011	Inlet Capacity
Pit1/4	16.98		0.038		0.82	0.003	Inlet Capacity
Pit2/4	16.59		0.014		0.91	0	None
Pit3/4	15.32		0.117		0.78	0.03	Inlet Capacity
Pit4/4	14.59		0.091		0.41	0.019	Inlet Capacity
Pit5/4	11.63		0.015		2.57	0	None
Pit6/4	8.68		0		2.12	0	None
Pit7/4	6.63		0		2.12	0	None
Pit8/4	4.15		0		2.55	0	None
Pit1/6	2.83		0.015		0.97	0	None
Pit2/6	2.65		0.009		1.15	0	None
Pit1/10	3.8		0.014		0	0.021	Outlet System
Pit11/7	3.8		0.201		0	0.132	Outlet System
Node_West 2	0.5		0.132				
Pit1/9	3.8		0.206		0	0.201	Outlet System
Pit2/9	3.8		0.201		0	0.192	Outlet System
Pit3/9	3.8		0.196		0	0.187	Outlet System
Pit4/9	3.8		0.194		0	0.189	Outlet System
Pit5/9	3.8		0.195		0	0.19	Outlet System
Pit6/9	3.8		0.218		0	0.183	Outlet System
Pit1/7	18.81		0.069		0.89	0.012	Inlet Capacity
Pit2/7	18.59		0.087		1.31	0.018	Inlet Capacity
Pit3/7	18.52		0.03		1.28	0.002	Inlet Capacity
Pit4/7	17.75		0.155		1.85	0.047	Inlet Capacity
Pit5/7	15.12		0.047		1.83	0.005	Inlet Capacity
Pit6/7	13.1		0.005		1.8	0	None
Pit7/7	11.12		0		1.73	0	None
Pit8/7	9.07		0		1.73	0	None
Pit9/7	7.02		0		1.73	0	None
Pit10/7	4.61		0		2.09	0	None
Pit1/8	18.85		0.031		0.95	0.002	Inlet Capacity
Pit2/8	18.65		0.002		0.95	0	None
Pit3/8	18.52		0.019		1.28	0.001	Inlet Capacity

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
P1	0.031	0	0.031	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2	0.04	0	0.04	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3	0.048	0	0.048	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4	0.05	0	0.05	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P13	0.003	0	0.003	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P12	0.038	0	0.038	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P7	0.023	0	0.023	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P6	0.048	0	0.048	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P5	0.04	0	0.04	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P14	0.039	0	0.039	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P20	0.16	0	0.16	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P21	0	0	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P23	0.03	0	0.03	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P27	0.18	0	0.18	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P28	0.011	0	0.011	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P18	0.005	0	0.005	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

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P17	0.02	0	0.02	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P16	0.074	0	0.074	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P15	0.087	0	0.087	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P8	0.018	0	0.018	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P9	0.025	0	0.025	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P10	0.054	0	0.054	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P11	0.062	0	0.062	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P25	0.038	0	0.038	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P24A	0.013	0	0.013	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P24	0.117	0	0.117	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P22	0.091	0	0.091	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P19	0.015	0	0.015	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P33	0.015	0	0.015	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P32	0.009	0	0.009	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P34	0.014	0	0.014	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P35	0.008	0	0.008	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P40	0.206	0	0.206	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P36	0	0	0	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P41	0.009	0	0.009	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P42	0.021	0	0.021	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P43	0.015	0	0.015	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P39	0.121	0	0.121	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P26	0.069	0	0.069	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P29	0.08	0	0.08	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P31	0.017	0	0.017	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P30	0.155	0	0.155	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P37	0.031	0	0.031	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P38	0.019	0	0.019	5	5	5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.00 impervious + 3.40 pervious = 3.40 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 yea	764.55	355.95 (46.6%)	0.00 (0.0%)	355.95 (46.6%)
AR&R 100 yea	1211.95	659.30 (54.4%)	0.00 (0.0%)	659.30 (54.4%)
AR&R 100 yea	1554.59	880.86 (56.7%)	0.00 (0.0%)	880.86 (56.7%)
AR&R 100 yea	1846.25	1067.24 (57.8%)	0.00 (0.0%)	1067.24 (57.8%)
AR&R 100 yea	2095.43	1203.62 (57.4%)	0.00 (0.0%)	1203.62 (57.4%)
AR&R 100 yea	2310.64	1324.58 (57.3%)	0.00 (0.0%)	1324.58 (57.3%)
AR&R 100 yea	2854.32	1647.41 (57.7%)	0.00 (0.0%)	1647.41 (57.7%)
AR&R 100 yea	3296.06	1906.45 (57.8%)	0.00 (0.0%)	1906.45 (57.8%)
AR&R 100 yea	3822.75	2135.88 (55.9%)	0.00 (0.0%)	2135.88 (55.9%)
AR&R 100 yea	4213.52	2283.53 (54.2%)	0.00 (0.0%)	2283.53 (54.2%)
AR&R 100 yea	4821.76	2493.04 (51.7%)	0.00 (0.0%)	2493.04 (51.7%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P1/3	0.029	0.1	3.123	3.122	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/3	0.066	0.2	3.119	3.114	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/3	0.11	0.3	3.104	3.102	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
Ex_STW	0.51	3.2	2.316	1.361	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/2	0.057	0.2	3.8	3.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P9/1	0.309	1.9	3.614	3.568	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P10/1	0.322	1	3.508	3.434	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P11/1	0.347	1.1	3.353	3.264	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P12/1	0.372	1.1	3.162	3.102	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/5	0.079	0.2	3.808	3.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P9/4	0.279	0.8	3.792	3.781	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P10/4	0.291	0.9	3.729	3.649	AR&R 100 year, 15 minutes storm, average 183 mm/h, Zone 1
P11/4	0.342	3.1	2.94	2.609	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P12/4	0.439	1.3	2.447	2.29	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P13/4	0.486	1.9	2.041	1.826	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Ex_STW_600	0.51	2	0.813	0.5	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
P1/1	0.005	0.6	12.572	11.872	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/1	0.025	1	11.792	10.949	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/1	0.086	1.9	10.822	9.822	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/1	0.159	4.6	9.312	7.778	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P5/1	0.187	2	7.585	7.305	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P6/1	0.211	2.2	7.087	6.253	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P7/1	0.257	2.8	5.98	4.465	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P8/1	0.309	3	4.1	3.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/4	0.035	2.1	16.845	16.591	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/4	0.049	1.5	16.503	15.317	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/4	0.136	2.1	15.147	14.592	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/4	0.206	3.5	14.157	13.357	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P5/4	0.221	5	11.118	9.918	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P6/4	0.221	3.1	8.244	7.944	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P7/4	0.221	3	6.2	5.9	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P8/4	0.221	2	3.841	3.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/6	0.015	0.3	2.824	2.651	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/6	0.023	0.7	2.647	2.446	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/10	0.012	0	3.8	3.8	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1
Ex_STW_525	0.305	4.3	2.378	0.5	AR&R 100 year, 25 minutes storm, average 148 mm/h, Zone 1
P1/9	0.072	0.2	3.8	3.8	AR&R 100 year, 20 minutes storm, average 163 mm/h, Zone 1

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P2/9	0.104	0.3	3.8	3.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/9	0.166	0.5	3.8	3.8	AR&R 100 year, 5 minutes storm, average 270 mm/h, Zone 1
P4/9	0.191	1.7	3.8	3.8	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P5/9	0.258	0.8	3.8	3.8	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P6/9	0.268	0.8	3.8	3.8	AR&R 100 year, 10 minutes storm, average 214 mm/h, Zone 1
P1/7	0.058	0.9	18.742	18.587	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/7	0.126	0.9	18.518	18.518	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/7	0.153	1.3	18.394	18.104	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P4/7	0.307	5.5	17	16.1	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P5/7	0.336	4.8	14.287	14.087	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P6/7	0.337	3.1	12.385	12.182	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P7/7	0.337	5.6	10.259	9.959	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P8/7	0.337	5.6	8.209	7.909	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P9/7	0.337	5.6	6.159	5.859	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P10/7	0.337	3	3.894	3.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P1/8	0.029	0.6	18.824	18.655	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P2/8	0.03	0.7	18.622	18.52	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
P3/8	0.049	1	18.452	18.012	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Widt	Max V	Due to Storm
S1/3	0.002	0.002	0.462	0.01	0	1.26	0.15	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S2/3	0.004	0.004	0.462	0.016	0	1.29	0.21	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S3/3	0.006	0.006	0.462	0.02	0	1.32	0.23	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S13/1	0.008	0.008	0.462	0.023	0.01	1.34	0.26	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S1/2	0.089	0.089	0.462	0.096	0.06	1.78	0.62	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S9/1	0.092	0.092	0.462	0.099	0.06	1.79	0.63	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S10/1	0.001	0.001	0.462	0.006	0	1.24	0.12	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S11/1	0.005	0.005	0.462	0.019	0	1.31	0.23	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S12/1	0.004	0.004	0.462	0.017	0	1.3	0.21	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S1/5	0.023	0.023	0.462	0.045	0.02	1.47	0.39	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S9/4	0.234	0.234	0.462	0.165	0.14	2.19	0.84	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S10/4	0.094	0.094	0.462	0.1	0.06	1.8	0.63	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S11/4	0.03	0.03	0.462	0.051	0.02	1.51	0.43	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S12/4	0.061	0.061	0.462	0.078	0.04	1.67	0.55	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S13/4	0.012	0.012	0.462	0.03	0.01	1.38	0.3	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S14/4	0	0	0.462	0	0	0	0	
S1/1	0	0	0.462	0	0	0	0	
S2/1	0.001	0.001	0.462	0.006	0	1.23	0.1	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S3/1	0.013	0.013	0.462	0.032	0.01	1.39	0.32	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S4/1	0.021	0.021	0.462	0.042	0.02	1.45	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S5/1	0.002	0.002	0.462	0.011	0	1.27	0.17	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S6/1	0.001	0.001	0.462	0.007	0	1.24	0.12	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S7/1	0.007	0.007	0.462	0.023	0.01	1.34	0.26	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S8/1	0.011	0.011	0.462	0.028	0.01	1.37	0.29	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S1/4	0.003	0.003	0.462	0.014	0	1.29	0.19	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S2/4	0	0	0.462	0	0	0	0	
S3/4	0.03	0.03	0.462	0.052	0.02	1.51	0.43	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S4/4	0.019	0.019	0.462	0.04	0.01	1.44	0.36	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S5/4	0	0	0.462	0	0	0	0	
S6/4	0	0	0.462	0	0	0	0	
S7/4	0	0	0.462	0	0	0	0	
S8/4	0	0	0.462	0	0	0	0	
S1/6	0	0	0.462	0	0	0	0	
S2/6	0	0	0.462	0	0	0	0	
S1/10	0.021	0.021	0.462	0.042	0.02	1.45	0.38	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S11/7	0.132	0.132	0.462	0.121	0.08	1.93	0.7	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S1/9	0.201	0.201	0.462	0.153	0.12	2.12	0.8	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S2/9	0.192	0.192	0.462	0.148	0.12	2.09	0.79	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S3/9	0.187	0.187	0.462	0.147	0.11	2.08	0.78	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S4/9	0.189	0.189	0.462	0.147	0.12	2.08	0.78	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S5/9	0.19	0.19	0.462	0.148	0.12	2.09	0.78	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S6/9	0.183	0.183	0.462	0.145	0.11	2.07	0.77	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S1/7	0.012	0.012	0.462	0.03	0.01	1.38	0.31	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S2/7	0.018	0.018	0.462	0.038	0.01	1.43	0.36	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S3/7	0.002	0.002	0.462	0.01	0	1.26	0.14	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
S4/7	0.047	0.047	0.462	0.067	0.03	1.6	0.5	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S5/7	0.005	0.005	0.462	0.018	0	1.31	0.22	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S6/7	0	0	0.462	0	0	0	0	
S7/7	0	0	0.462	0	0	0	0	
S8/7	0	0	0.462	0	0	0	0	
S9/7	0	0	0.462	0	0	0	0	
S10/7	0	0	0.462	0	0	0	0	
S1/8	0.002	0.002	0.462	0.01	0	1.26	0.16	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1
S2/8	0	0	0.462	0	0	0	0	
S3/8	0.001	0.001	0.462	0.005	0	1.23	0.09	AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

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CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 75 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Pit1/3	30.67	30.66	0	0
Pit2/3	70.33	70.28	0	0.1
Pit3/3	117.8	117.71	0	0.1
Pit13/1	652.59	652.54	0	0
Node_North_1	652.54	652.54	0	0
Pit1/2	15.43	15.42	0	0
Pit9/1	386.71	386.93	0	-0.1
Pit10/1	397.21	397.37	0	0
Pit11/1	445.21	445.35	0	0
Pit12/1	484.76	484.85	0	0
Pit1/5	48.07	48.06	0	0
Pit9/4	459.1	458.75	0	0.1
Pit10/4	466.33	465.7	0	0.1
Pit11/4	508.39	508.14	0	0
Pit12/4	687.22	687.28	0	0
Pit13/4	698.66	698.58	0	0
Pit14/4	721.9	722.04	0	0
Node_West 1	722.04	722.04	0	0
Pit1/1	5.22	5.22	0	0
Pit2/1	25.52	25.51	0	0
Pit3/1	98.99	98.99	0	0
Pit4/1	185.17	185.12	0	0
Pit5/1	202.53	202.53	0	0
Pit6/1	227.67	227.66	0	0
Pit7/1	281.66	281.64	0	0
Pit8/1	342.99	342.99	0	0
Pit1/4	38.09	38.07	0	0
Pit2/4	50.65	50.65	0	0
Pit3/4	167.18	167.15	0	0
Pit4/4	244.15	244.13	0	0
Pit5/4	251.64	251.66	0	0
Pit6/4	251.66	251.7	0	0
Pit7/4	251.7	251.72	0	0
Pit8/4	251.72	251.76	0	0
Pit1/6	14.52	14.52	0	0
Pit2/6	23.32	23.32	0	0
Pit1/10	13.77	13.75	0	0.1
Pit11/7	761.09	761.11	0	0
Node_West 2	761.11	761.11	0	0
Pit1/9	204.6	204.58	0	0
Pit2/9	204.64	204.4	0	0.1
Pit3/9	213.83	213.84	0	0
Pit4/9	234.21	234.43	0	-0.1
Pit5/9	249.2	249.45	0	-0.1
Pit6/9	369.7	369.96	0	-0.1
Pit1/7	68.83	68.83	0	0
Pit2/7	148.72	148.69	0	0
Pit3/7	165.6	165.6	0	0
Pit4/7	369.36	369.34	0	0
Pit5/7	369.34	369.37	0	0
Pit6/7	369.37	369.4	0	0
Pit7/7	369.4	369.45	0	0
Pit8/7	369.45	369.43	0	0
Pit9/7	369.43	369.5	0	0
Pit10/7	369.5	369.46	0	0
Pit1/8	31.11	31.1	0	0
Pit2/8	31.1	31.1	0	0
Pit3/8	50.4	50.39	0	0

Run Log for 3591_BHP_100928_Revised n Value.drn run at 14:46:44 on 5/10/2010

Upwelling occurred at Pit1/9, Pit2/9, Pit3/9, Pit4/9, Pit5/9, Pit11/7, Pit1/10, Pit9/4, Pit1/2, Pit9/1
Freeboard was less than 0.15m at Pit6/9, Pit10/4

The following overflow routes carried water uphill (adding energy): S1/7, S1/2, S1/3
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

ATTACHMENT C

CITY OF SYDNEY COUNCIL STORMWATER INFRASTRUCTURE DRAWINGS

Hydra Legend

Sewer

Sewer Main (with flow arrow & size type annotation) — 225 PVC
Disused Main
Proposed Main
Rising Main
Maintenance Hole with upstream depth to invert — 1.7
Maintenance Hole with Overflow Weir
Ventshaft EDUCT — VSE
Ventshaft INDUCT — VSI
Property Connection Point with chainage to downstream MH — 10.6
Concrete Encased Section — Conc. Enc
Terminal Maintenance Shaft — TMS
Maintenance Shaft — MS
Rodding Point — 7.1 RP
Lamphole
Vertical — VERT
Pumping Station — SP0882

Sewer - Pressure

Pressure Sewer Main
Pump Unit (Alarm, Electrical Cable, Pump Unit)
Property Valve Boundary Assembly
Stop Valve
Reducer / Taper
Flushing Point — FP

Sewer - Vacuum

Vacuum Sewer Main
Divisional Valve
Vacuum Chamber
Clean Out Point

Stormwater

Stormwater Pipe
Stormwater Channel
Stormwater Gully
Stormwater Maintenance Hole

Property Details

Boundary Line
Lot Number — SMITH 25 6
House Number
Development Application Received
ROAD

Location of SWC Heritage item - Please call **13 20 92** during office hours and ask for the **Heritage Unit**.

Water

Water Main - Potable (with size type annotation) — 200 PVC
Disconnected Main - Potable
Proposed Main - Potable
Water Main - Recycled
Special Supply Conditions - Potable
Special Supply Conditions - Recycled
Restrained Joints - Potable
Restrained Joints - Recycled
Hydrant
Maintenance Hole
Stop Valve
Stop Valve with By-pass
Stop Valve with Tapers
Closed Stop Valve
Air Valve
Valve
Scour
Reducer / Taper
Vertical Bends
Reservoir

Symbols for Recycled Water as per Potable above. Main and Symbol colour as indicated.

Private Mains

Potable Water Main
Recycled Water Main
Sewer Main

Symbols for Private Mains shown grey. Main colour as indicated.

Sydney Water – 9th March 2006

PIPELINE MATERIAL ABBREVIATIONS

ABBREVIATION	INTERPRETATION
ABS	acrylonitrile butadiene styrene
AC	asbestos cement
BRICK	brick
CI	cast iron
CICL	cast iron cement lined
CONC	concrete
COPPER	copper
DI	ductile iron
DICL	ductile iron cement (mortar) lined
EPDM	ethylene propylene diene monomer
EW	earthenware
FIBG	fibreglass
FL BAR	forged locking bar
GI	galvanised iron
GRP	glass reinforced polyester
HDPE	high density polyethylene
MS	mild steel
MSCL	mild steel cement lined
PE	polyethylene
PP	polypropylene
PVC	polyvinylchloride
PVC-M	polyvinylchloride modified
PVC-O	polyvinylchloride oriented
PVC PW	polyvinylchloride profile wall
PVC SW	polyvinylchloride smooth wall
PVC-U	polyvinylchloride unplasticised
RC	reinforced concrete
S	steel
SCL	steel cement (mortar) lined
SGW	salt glazed ware
SS	stainless steel
STONE	stone
VC	vitrified clay
WI	wrought iron
WS	woodstave

GOAT ISLAND

CLYNE RESERVE

TOWNS PL

HICKSON

POTTINGER

WINDMILL ST

WINDMILL

MERRIMAN ST

ROBENS ST

BETTINGTON ST

DALGETY RD

LANE

FERRY L

AVE

TRINITY

GEORGE

LOWE

SHORE TRAIL

SP0314

City Of Sydney

Produced By: Sydney Water
Date: 14/12/2006

Suburb: SYDNEY HARBOUR
Map:C Grid:L5 Edition:Sydney UBD Edition 41

CMA Sheet: 1852-73-34
MGA Zone 56 (m) Central Co-ord: 333642 6252528

Scale: 1:1000

Plot Theme: None
Plot Request: None

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SYDNEY WATER CORPORATION

City Of Sydney

Produced By: Sydney Water
Date: 14/12/2006

Suburb: MILLERS POINT
Map:C Grid:L15 Edition:Sydney UBD Edition 41

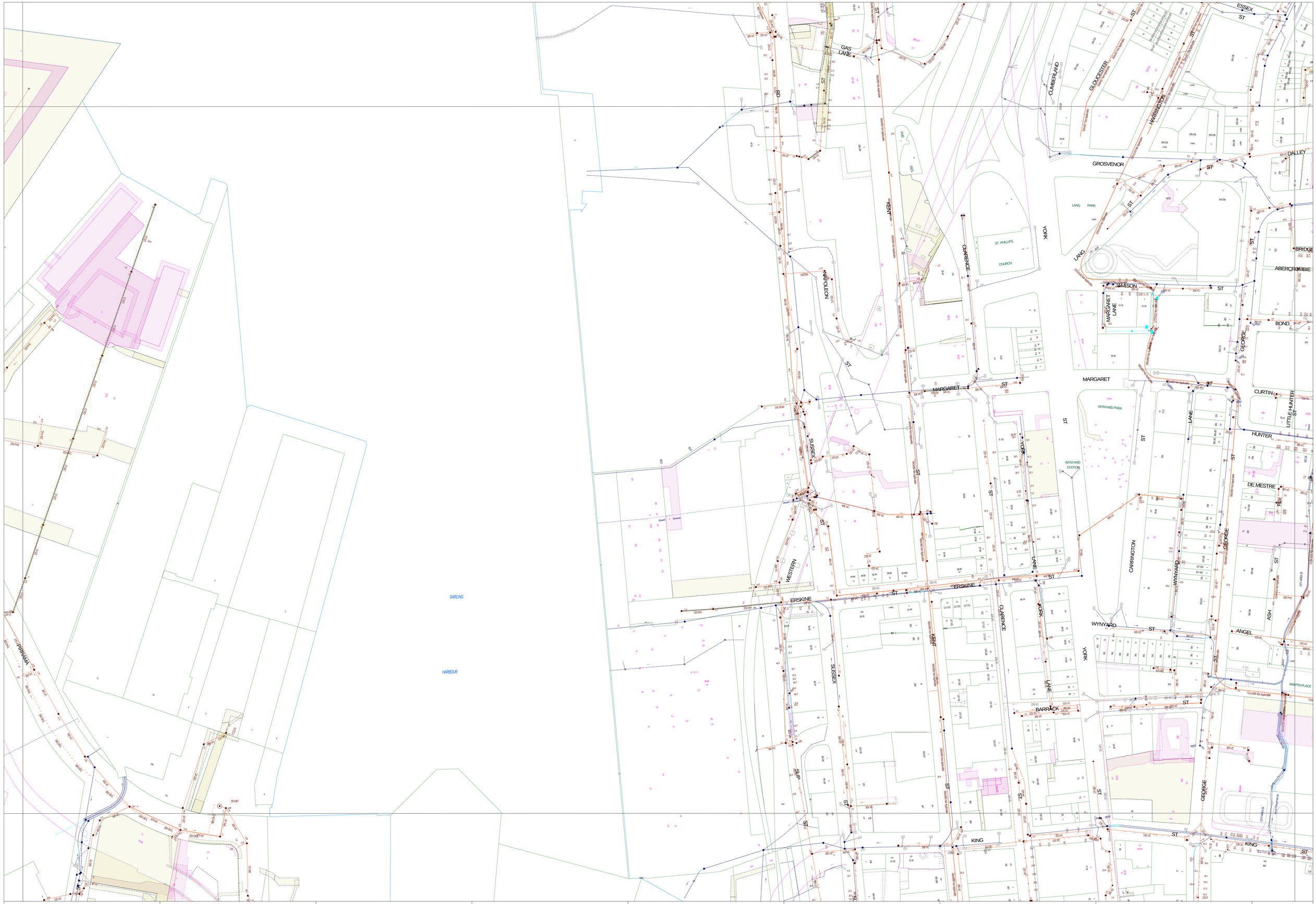
CMA Sheet: 1845-11-32
MGA Zone 56 (m) Central Co-ord: 333654 6251888

Scale: 1:1000

Plot Theme: None
Plot Request: None

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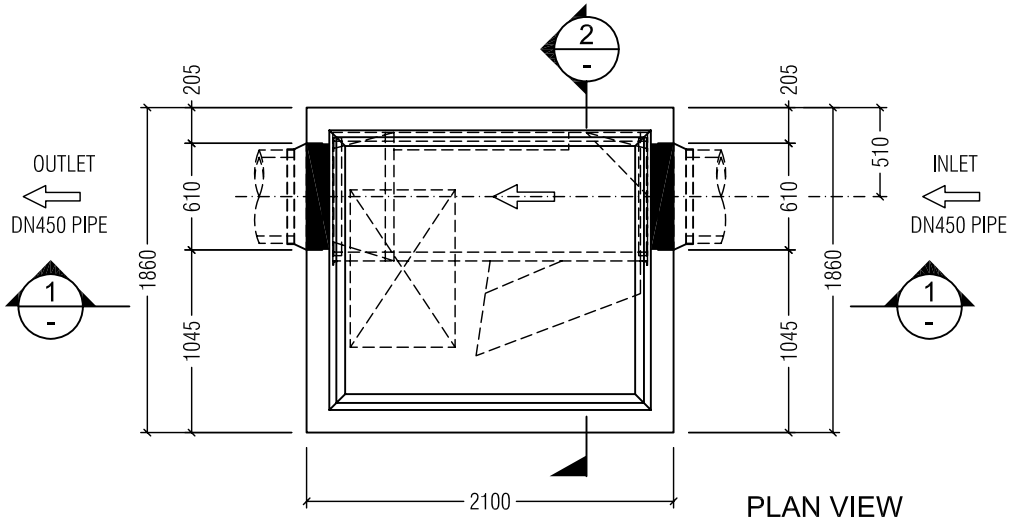
SYDNEY WATER CORPORATION



City Of Sydney	Produced By: Sydney Water Date: 14/12/2006	Suburb: SYDNEY Map:E Grid:LS Edition:Sydney UBD Edition 41	CMA Sheet: 1845-11-34 MGA Zone 56 (m) Central Co-ord: 333666 6251283	Scale: 1:1000	Plot Theme: None Plot Request: None	Copyright Reserved Sydney Water 2006 No warranty is given that this is complete or accurate.	SYDNEY WATER CORPORATION	Page 8

ATTACHMENT D

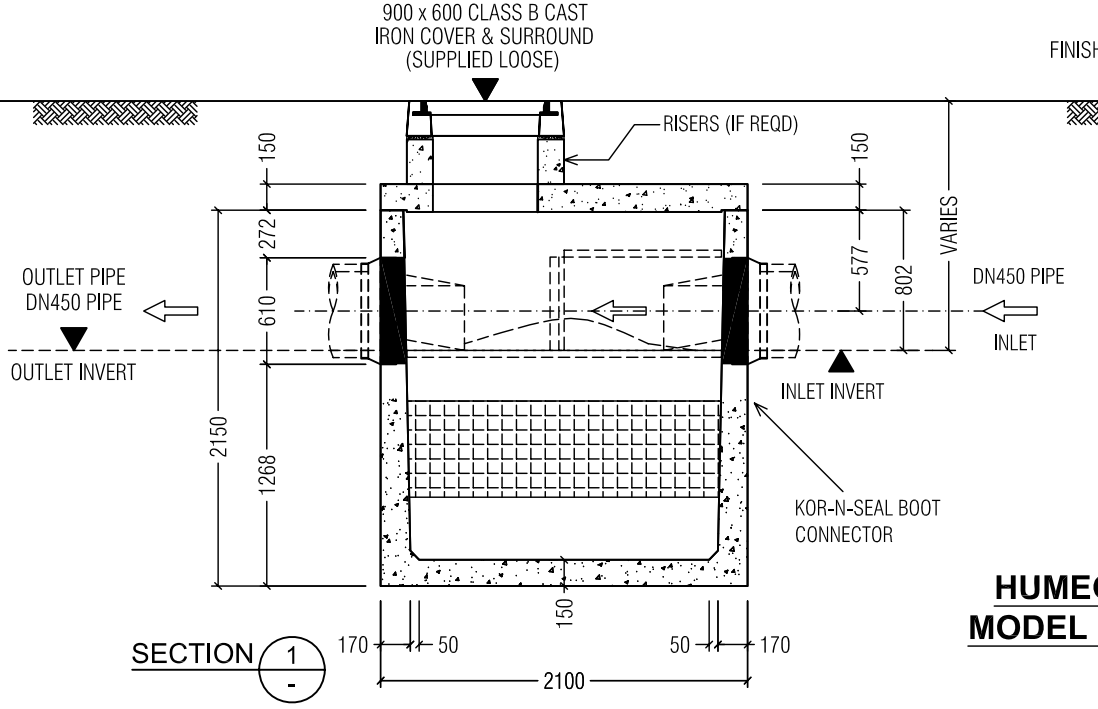
HUMES WATER SOLUTIONS GROSS POLLUTANT TRAP DETAILS



PLAN VIEW
(LID REMOVED)

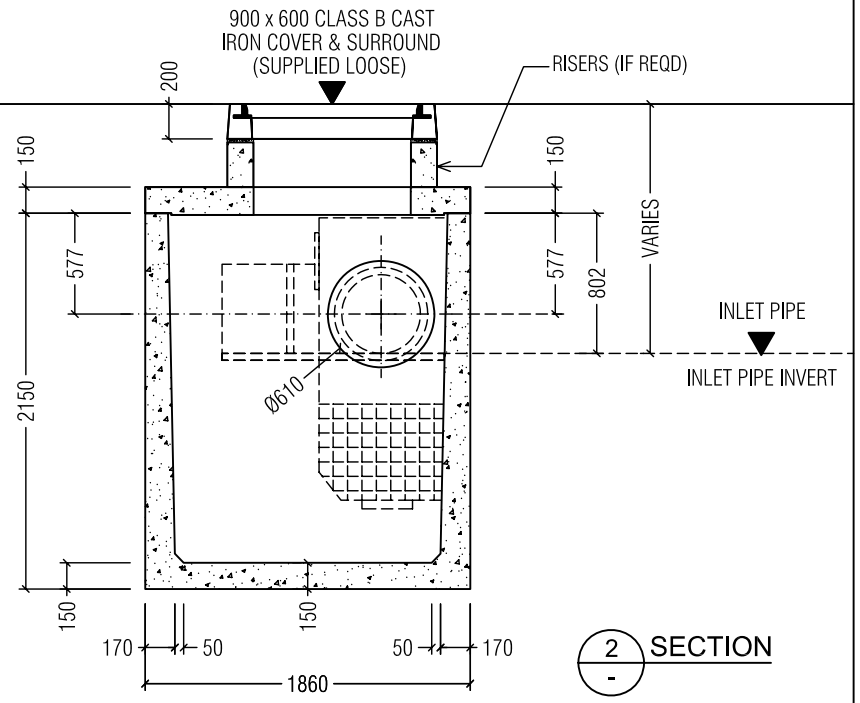
NOTES:

1. STEEL INSERTS MANUFACTURED FROM 3mm GALVANISED SHEET.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: MASS OF BASE = 7000 Kg
   MASS OF LID = 1350 Kg
4. DESIGN BASIS: DESIGNED TO AS3600 FOR 0 TO 2m FILL OVER TOP OF LID AND VEHICLE LIVE LOADS W7, T44 TO AUSTROADS BRIDGE DESIGN CODE.
5. DESIGN SUITABLE UP TO B2 EXPOSURE CLASSIFICATION TO AS3600.



SECTION 1 -

HUMEGARD
MODEL HG15-L



2 - SECTION

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE
A	FIRST ISSUE	R.P.	-

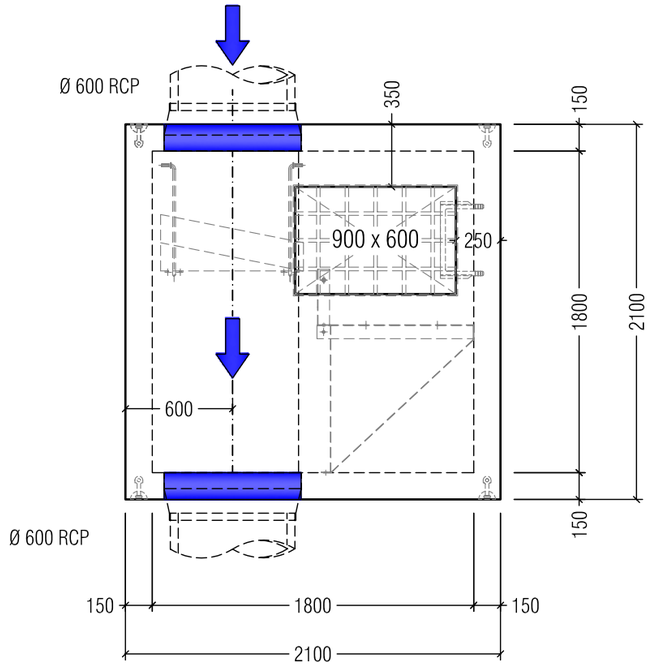
Humes™ WATER SOLUTIONS

CEMEX Australia Pty Limited

Dsn	-	-
Drn	R.P.	-
Ckd	-	-
App	-	-
Supersedes		

HUMES N.S.W.
HUMEGARD MODEL HG15 - L
(LEFT HAND UNIT)
GENERAL ARRANGEMENT

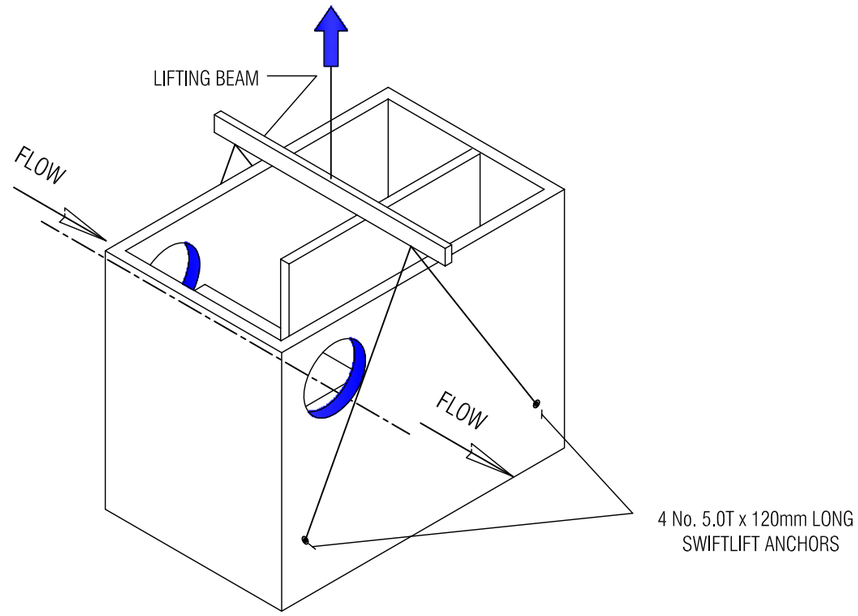
SCALE	SIZE	DRG. NO.	ISSUE
N.T.S	A4	HG15-L	A



PLAN

1. DIMENSIONS INCLUDED ARE STANDARD.
2. STORAGE VOLUMES:
   TOTAL = 3 m3
3. COMPONENT MASSES:
   CHAMBER MASS = 7.8 TONNES
   CHAMBER LID = 1.9 TONNES
4. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.
5. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS. THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED:
   FOR CHAMBER - 4 No. 5.0 TONNE
   FOR LID - 3 No. 5.0 TONNE
6. STEP IRONS, INSPECTION AND MAINTENANCE OPENINGS TO BE AS PER PLAN VIEW.

Ø 600 RCP INLET & OUTLET PIPES
KOR-N-SEAL PART No. S206-30L
CLAMP PART No. M-240 x 4

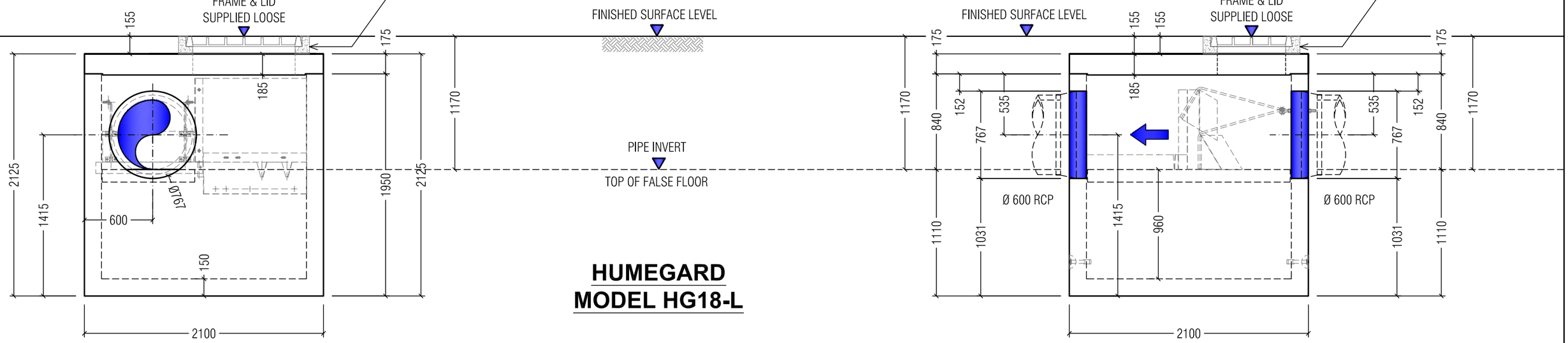


ISOMETRIC VIEW

ALL CONCRETE COMPONETS EXCEPT LID

ELEVATION

STEP IRONS OMMITTED



HUMEGARD MODEL HG18-L

SIDE ELEVATION

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
A	FIRST ISSUE	R.P.	27.05.09	

CEMEX Australia Pty Limited

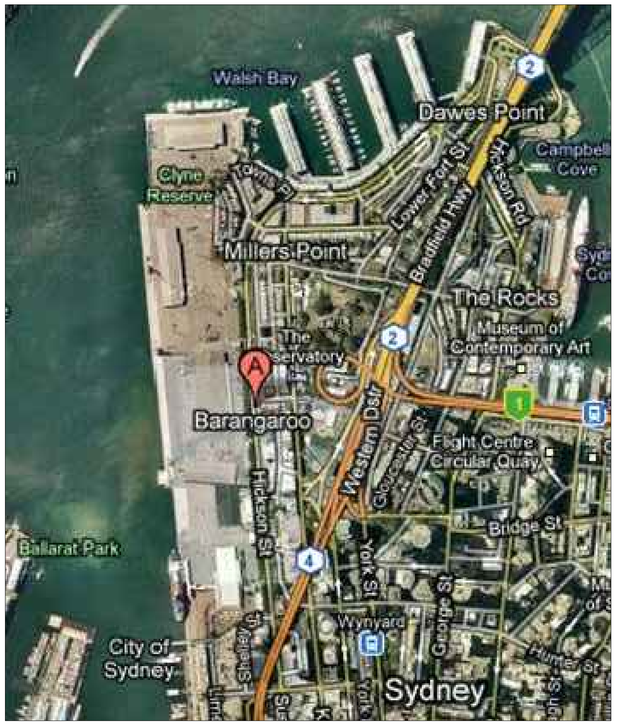
Dsn	-	-
Drn	RP	27.05.09
Ckd	-	-
App	-	-
Supersedes		

HUMES NSW
HUMEGARD MODEL HG18 - L
-
PRODUCT DRAWING

SCALE	SIZE	DRG. NO.	ISSUE
N.T.S	A3	HG18-STD	A

FIGURES

BARANGAROO HEADLAND PARK
BARANGAROO DELIVERY AUTHORITY
INTEGRATED WATER MANAGEMENT PLAN



LOCALITY PLAN
Scale: NTS

DRAWING LIST:

MW-WSP-H-1031	TITLE SHEET, DRAWING LIST AND LOCALITY PLAN
MW-WSP-H-1032	LEGEND AND ABBREVIATIONS
MW-WSP-H-1033	KEY PLAN
MW-WSP-H-1034	GENERAL NOTES AND SPECIFICATIONS
MW-WSP-H-1035	STORMWATER CATCHMENT EXISTING CONDITION SHEET 1 OF2
MW-WSP-H-1036	STORMWATER CATCHMENT EXISTING CONDITION SHEET 2 OF2
MW-WSP-H-1037	STORMWATER CATCHMENT PROPOSED PARK SHEET 1 OF1
MW-WSP-H-1038	STORMWATER DRAINAGE LAYOUT PLAN SHEET 1 OF1
MW-WSP-H-1039	RETAINING WALL SUBSOIL DRAINAGE LAYOUT PLAN SHEET 1 OF1
MW-WSP-H-1040	IRRIGATION LAYOUT PLAN SHEET 1 OF1
MW-WSP-H-1041	SEEPAGE WATER LAYOUT PLAN SHEET 1 OF1
MW-WSP-H-1042	CIVIL DETAILS
MW-WSP-H-1043	SYDNEY WATER CORPORATION GRAVITY SEWER DEVIATION TO SPS1129 AND DECOMMISSIONING OF SPS0014

AUSTRALIAN HEIGHT DATUM

ISSUE FOR APPROVAL

DO NOT SCALE FROM DRAWINGS. CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK.

THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARREN SMITH AND PARTNERS.

NORTH POINT

NOTES
1. THIS DRAWING SHOW BE READ IN CONJUNCTION WITH WSP 'INTEGRATED WATER MANAGEMENT PLAN'. DRAWINGS No. 1031, 1032, 1033 & 1034.

ISSUE	AMENDMENT	DATE	ISSUE	AMENDMENT	DATE
A	PRELIMINARY ISSUE	01.10.10			
B	PRELIMINARY ISSUE (ARCH REVISION)	07.10.10			
C	ISSUE FOR APPROVAL	13.10.10			

CLIENT
BARANGAROO SYDNEY AUSTRALIA
Barangaroo Delivery Authority
Level 3, Foreshore House
66 Harrington Street
Sydney 2000
NSW Australia

PROJECT
BARANGAROO HEADLAND PARK

Warren Smith & Partners Pty Ltd
A 1st Floor, 123 Clarence Street, Sydney 2000 NSW Australia
T 02 9299 1312 F 02 9290 1295 E wsp@warrensmith.com.au
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TITLE
INTEGRATED WATER MANAGEMENT PLAN
TITLE SHEET, DRAWING LIST AND LOCALITY PLAN

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
	JM	LP	LP	LP
DATE: SEPT. 2010	DRAWING No: MW-WSP-H-1031		ISSUE: C	
JOB No: 3591				

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
SHEET SIZE: A0

Plot Date: Wednesday, 13 October, 2010 12:41:47 PM

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Xrefs: T:\3591\CAD\Drawings\ 1031 Mw_Layout1.dwg T:\3591\CAD\Drawings\ 1031 Mw_Layout2.dwg T:\3591\CAD\Drawings\ 1031 Mw_Layout3.dwg

LEGEND

CIVIL DRAINAGE SYMBOLS

- STW — STORMWATER DRAINAGE PIPE
- STWRM — STORMWATER RISING MAIN
- STORMWATER DRAINAGE CHANNEL
- RW — SUB SOIL DRAINAGE WITH CLEAN OUT
- CO / SS — RAINWATER
- SSRM — SUB SOIL RISING MAIN
- EB-LF — EARTH BANK LOW FLOW
- EB-HF — EARTH BANK HIGH FLOW
- EM — EXCAVATED MATERIAL
- FLUME
- DD — DIVERSION DRAIN
- DIVERSION DRAIN
- OFP — OVERFLOW PATH
- OFD — OVERFLOW DRAIN
- CLD — CONCRETE LINED DRAIN
- RLD — ROCK LINED DRAIN
- TD — TABLE DRAIN
- V DRAIN (L)
- V DRAIN (R)
- SWALE or SPEED HUMP
- OVERLAND FLOW DIRECTIONAL ARROW
- OVERLAND FLOW PATH
- DP — DOWN PIPE
- PAVED AREA DRAIN
- DROP TO OR RISE FROM
- RISE TO OR DROP FROM
- TEE DROP
- TEE RISE
- VERT — VERTICAL RISER IN DRAINAGE
- FLOW DIRECTIONAL ARROWS ON ALL PIPING SERVICES
- PIPELINE TERMINATED WITH BLANK FLANGE
- PIPELINE PLUGGED OFF
- CO — CLEAROUT
- F.P — FLUSHING POINT
- NEW PIPE
- RISER
- SERVICE
- SIZE
- DROPPER
- NON-RETURN FLAP VALVE ON INSIDE FACE OF PIT AT ALL DOWN PIPES & SUB SOIL DRAINAGE LINES TO OSD SYSTEM

CIVIL ABBREVIATIONS

DRAINAGE LEVELS

BWL	BOTTOM WATER LEVEL
IL	INVERT LEVEL
OL	OBVERT LEVEL
SL	SURFACE LEVEL
TWL	TOP WATER LEVEL

GRATES & COVERS

LD	LIGHT DUTY CLASS 'B'
MD	MEDIUM DUTY CLASS 'C'
HD	HEAVY DUTY CLASS 'D'
EHD	EXTRA HEAVY DUTY CLASS 'E'
MP	MULTI PART COVER OR GRATE

PITS

CDS	CDS TECHNOLOGIES, STORMWATER TRAPS
DCP	DISCHARGE CONTROL PIT
DGGP	DOUBLE GRATED GULLY PIT (CAST IRON)
GPT	GROSS POLLUTANT TRAP
JP	JUNCTION PIT
KEP	KERB ENTRY PIT
KEU	KERB ENTRY UNIT
MPC	MULTI PART COVER
MPG	MULTI PART GRATE
RR	RAINWATER REUSE
SGGP	SINGLE GRATED GULLY PIT (GMS)
SWP	STORMWATER PIT

DRAINAGE LINES

RW	RAIN WATER (REUSE)
SS	SUBSOIL DRAINAGE
STRM	STORMWATER RISING MAIN
STW	STORMWATER DRAIN
GD	GRATED DRAIN
OLD	OPEN LINED DRAIN
OUD	OPEN UNLINED DRAIN

FEATURES

CO	CLEAROUT
DP	DOWN PIPE
FP	FLUSHING POINT
IO	INSPECTION OPENING
OF	GUTTER OVERFLOW PIPE
RO	RAINWATER OUTLET
DTU	DRAINAGE TURNUP

OSD

OSD	ONSITE DETENTION
PSD	PERMISSIBLE SITE DISCHARGE
OFP	OVERFLOW PATH
SWMP	STORM WATER MANAGEMENT PLAN
ESCP	EROSION & SEDIMENT CONTROL PLAN

- OSD ABOVE GROUND
- KEP - KERB ENTRY PIT
- DOUBLE GRATED GULLY PIT
- JUNCTION PIT WITH COVER
- SURFACE INLET PIT (FLUSH/RAISED)
- SURFACE INLET PIT (DEPRESSED)
- GRATED TRENCH DRAIN

EROSION & SEDIMENTATION SYMBOLS

FENCES
- B — BARRIER FENCE
- X — SEDIMENT FENCE
- SILT FENCE ON LEVEL
- SILT FENCE ON GRADE
- W — WIND FENCE

BANKS
- DIVERSION CHANNEL/BANK
- LEVEL SPREADER
- EB — EARTH BANK
- EBLF — EARTH BANK LOW FLOW
- EBHF — EARTH BANK HIGH FLOW
- EM — EXCAVATED MATERIAL

TRAPS
- GEOTEXTILE SEDIMENT TRAP
- CHECK DAMS (STRAW BALE OR ROCK)
- CONCRETE ENERGY DISSIPATER
- STABILISED CONSTRUCTION SITE VEHICLE ENTRY/EXIT GRID
- SEDIMENT TRAP
- GEOTEXTILE FILTER BAGS OR SOCK

ROAD LANE MARKING SYMBOLS

- C1 CONTINUITY LINE 1m, 3m, w0.200
- E1 EDGE LINE 35m, 1m, w0.120
- L1 LANE LINE 3m, 9m, w0.080
- S1 SEPARATION LINE 3m, 9m, w0.100
- S2 SEPARATION LINE 6m, 6m, w0.100
- S3 SEPARATION LINE 3m, 3m, w0.100
- T1 TURN LINE 0.6m, 0.6m, w0.100
- TB GIVEWAY LINE 0.6m, 0.6m, w0.200
- PAVEMENT MARKERS SQ, 1m CTS

LEGEND

SURVEY & MAPPING SYMBOLS

- PROPERTY BOUNDARY
- EASEMENT
- FENCE OFF BOUNDARY
- FENCE ALONG BOUNDARY
- FENCE ON BOUNDARY
- STATE BOUNDARY
- X — COUNTY BOUNDARY
- PARISH BOUNDARY
- SHIRE/MUNICIPLE BOUNDARY
- P — NATIONAL PARK BOUNDARY
- R — STATE RECREATION BOUNDARY
- STATE FOREST BOUNDARY
- TELSTRA EXCHANGE BOUNDARY

GENERAL ABBREVIATIONS

CTS	CENTRES
℄	CENTRE LINE
DIA	DIAMETER
DMR	DEPARTMENT OF MAIN ROADS
DWG	DRAWING
EX.	EXISTING
GALV	GALVANIZED
HD GALV	HOT DIPPED GALVANIZED
ID	INTERNAL DIAMETER
L.O.C.	LIMIT OF CONTRACT
MAX	MAXIMUM
MIN	MINIMUM
NB	NOMINAL BORE
N.I.C.	NOT IN CONTRACT
No.	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
REV	REVISION
RTA	ROADS AND TRAFFIC AUTHORITY
SQ	SQUARE
SRA	STATE RAIL AUTHORITY
STD	STANDARD
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
WBO	WORK BY OTHERS
ESL1	EXISTING SEWER LINE 1
ESOF1	EXISITING SEWER OVERFLOW LINE 1
CEMP	CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

LEVELS ABBREVIATIONS

CL	CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
GL	EXISTING GROUND LEVEL
HL	HIGH LEVEL
HP	HIGH POINT
LL	LOW LEVEL
ML	MID LEVEL
NS	NATURAL SURFACE LEVEL
PL	PLATFORM LEVEL
RL	REDUCED LEVEL
US	UNDER SIDE
USFL	UNDERSIDE FLOOR

ROAD PAVEMENT ABBREVIATIONS

AC	ASPHALTIC CONCRETE
CBR	CALIFORNIA BEARING RATIO
DGB	DENSELY GRADED BASE COURSE
DGS	DENSELY GRADED SUB BASE
DSL	DESIGN SUBGRADE LEVEL
F.C.R.	FINE CRUSHED ROCK
O.T.R.	OTHER THEN ROCK
RC	REINFORCED CONCRETE
SF	STRIP FOOTING
-	RECYCLED CONCRETE

JOINTS

BJ	BUTT JOINT
CJ	CRACK INDUCED JOINT
CJ	CONSTRUCTION JOINT
CJ	CONTRACTION JOINT
CJ	CONTROL JOINT
DJ	DOWELLED JOINT
DKJ	DOWELLED KEY JOINT
EJ	EXPANSION JOINT
IJ	ISOLATION JOINT
KJ	KEYED JOINT
SC	SAW CUT
TJ	TOOL JOINT
TKJ	TOBY KEYED JOINT

FEATURES

JK	NEW JERSEY KERB BARRIER
LP	LIGHT POLE
NKL	NOMINAL KERB LINE
PP	POWER POLE
SL	STREET LIGHT
TL	TRAFFIC LIGHT

SURVEY ABBREVIATIONS

AHD	AUSTRALIAN HEIGHT DATUM
BK	BOTTOM OF KERB
BM	BENCH MARK
CL	CENTRE LINE
D.E.	DRAINAGE EASEMENT
DH&W	DRILL HOLE & WING
FD	FOUND
INV	INVERT
K & G	KERB & GUTTER
R.O.W.	RIGHT OF CARRIAGEWAY
SSM	STATE SURVEY MARK
TK	TOP OF KERB

- RL 165.40 — PROPOSED SURFACE LEVEL

SERVICES & UTILITIES SYMBOLS

- A — AIR
- C — CABLES
- D — DRAINS
- E — ELECTRICAL
- LV — LOW VOLTAGE
- HV — HIGH VOLTAGE
- V — TRANSMISSION POWER LINES
- EFF — COMMON EFFLUENT
- ERM — EFFLUENT RISING MAIN
- F — FUEL
- G — GAS
- G(HP) — GAS HIGH PRESSURE
- G(MP) — GAS MEDIUM PRESSURE
- G(LP) — GAS LOW PRESSURE
- GAS — GAS
- NG — NATURAL GAS
- H — HYDRAULIC POWER
- I — IRRIGATION
- RTA — RTA ROADS & TRAFFIC AUTHORITY
- SRA — SRA STATE RAIL SERVICE
- S — SEWER
- SRM — SEWER RISING MAIN
- T — TELECOMMUNICATIONS TELSTRA
- OF — OPTICAL FIBRE OF
- SMOF — OPTICAL FIBRE CABLE SMOF
- OP — OPTUS
- OCC — OVERHEAD COMMUNICATION CABLE
- W — WATER
- WRM — WATER RISING MAIN
- MS — MISCELLANEOUS SERVICE
- X — X
- Y — Y
- Z — Z
- DRAINAGE CULVERTS & PIPE SIZES GREATER THAN & INCLUDING 450 DIA TO BE SHOWN IN FULL WIDTH

NOTE:-
'e' ON SERVICE LINE REPRESENTS EXISTING SERVICE OR THE USE OF LOWER CASE LETTER.

'x' ON SERVICE LINE REPRESENTS SERVICE TO BE ABANDONED.

DRAFTING SYMBOLS

SCALE BARS — AMENDMENT No.

2 0 4 8 12m
SCALE 1:200

2000 0 4000 8000 12000mm
SCALE 1:200

SECTION SYMBOL

- A / C-03 — SECTION No. / REFERENCE DRAWING
- 22 / 33 — PIT No. / LINE No.
- PIPE CAP
- PRV — PRESSURE REDUCTION VALVE
- STOP VALVE
- STOP VALVE AND PRESSURE REDUCING VALVE PIT

AC	ACCESS CHAMBER
BT	BOUNDARY TRAP
GM	GRAVITY MAIN
HYD	HYDRANT
IO	INSPECTION OUTLET
kL	KILO LITRES
LH	LAMP HOLE
MH	MAN HOLE
PS	PUMP STATION
RM	RISING MAIN
RW	RECYCLED WATER
RWT	RECYCLED WATER TANK
STP	SEWER TREATMENT PLANT
SV	STOP VALVE
W	WATERMAIN
WM	WATER METER
WWTP	WASTE WATER TREATMENT PLANT

WATER & SEWER SYMBOLS

- PROPOSED SEWER
- FUTURE SEWER
- S — EXISTING SEWER
- EXISTING SEWER
- EXISTING SEWER TO BE DISUSED.

RECYCLED WATER SYMBOLS

RECYCLED WATER PE 125 PN 16
(GRAVITY MAIN) PE 180 PN 16
PE 225 PN 16
PE 375 PN 16 — — — RW-375.00 —
RECYCLED WATER FUTURE (WBO)
RECYCLED WATER RISING MAIN
PE 250 PN 20

EXISTING IRRIGATION PIPELINES

MATERIALS

Br	BRASS
CI	CAST IRON
CCL	CAST IRON CEMENT LINED
CONC	CONCRETE
CP	CHROMIUM PLATED
Cu	COPPER
DICL	DUCTILE IRON CEMENT LINED
FRC	FIBRE REINFORCED CEMENT GALVANISED
GMS	GALVANIZED MILD STEEL
MS	MILD STEEL
NY	NYLON
PE	POLYETHYLENE
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RHS	RECTANGULAR HOLLOW SECTION
SS	STAINLESS STEEL

CATCHMENT SYMBOLS

- X — PIT CATCHMENT
- XX — LINE CATCHMENT
- XXX — MAJOR CATCHMENT
- SUB CATCHMENT
- LIMIT OF CATCHMENT

CATCHMENT ABBREVIATIONS

P( )	PAVED CATCHMENT AREA
R( )	ROOFED CATCHMENT AREA
A( )	LANDSCAPE CATCHMENT AREA
T( )	TERRACE CATCHMENT AREA
ARI	AVERAGE RECURRENCE INTERVAL
CA	CATCHMENT AREA
Hа	HECTARE
L/s	LITRES PER SECOND (VELOCITY)
m/s	METRES PER SECOND (VELOCITY)
CUMECS	CUBIC METRES PER SECOND
Q	QUANTITY OF FLOW

AUSTRALIAN HEIGHT DATUM

ISSUE FOR APPROVAL

DO NOT SCALE FROM DRAWINGS, CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK.

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NORTH POINT

NOTES
1. THIS DRAWING SHOW BE READ IN CONJUNCTION WITH WSP 'INTEGRATED WATER MANAGEMENT PLAN' DRAWINGS No. 1031, 1032, 1033 & 1034.

ISSUE	AMENDMENT	DATE	ISSUE	AMENDMENT	DATE
A	PRELIMINARY ISSUE	01.10.10			
B	PRELIMINARY ISSUE (ARCH REVISION)	07.10.10			
C	ISSUE FOR APPROVAL	13.10.10			

CLIENT
BARANGAROO SYDNEY AUSTRALIA
Barangaroo Delivery Authority
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66 Harrington Street
Sydney 2000
NSW Australia

PROJECT
BARANGAROO
HEADLAND PARK

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• Design and Project Management

TITLE
INTEGRATED WATER MANAGEMENT PLAN
LEGEND AND ABBREVIATIONS

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
	JM	LP	LP	LP
DATE: SEPT. 2010	DRAWING No.: MW-WSP-H-1032		ISSUE: C	
JOB No.: 3591				

Plot Date: Wednesday, 13 October, 2010 12:41:49 PM

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
SHEET SIZE: A0

File: S:\01_JOBS\3591\3591-WSP-PLAN-Layout-LEGEND_ABBREVIATIONS.dgn 13/10/2010 12:41:48 John Mercer Last Saved by: John Mercer Plan Date: 13/10/2010 12:41:48 Plot Scale: 1.000 Plot Device: DWG To PDF.pc3 Plot Style: MW-WSP-A1-100.ctb Plot Size: ISO full bleed A1 (841.00 x 594.00 MM) Plot Date: 13/10/2010 12:41:49 PM

WALSH BAY
CAHILL EXPRESSWAY
SYDNEY OBSERVATORY
ARGYLE STREET
WATSON ROAD
GROSVENOR ST
JAMISON STREET
HUNGRY MILE
WINDMILL STREET
MILLERS POINT
KENT STREET
HIGH LANE
HIGH STREET
CAST LANE
JENKIN'S LANE
NAPOLEON STREET
MOORES WHARF
TOWNS PLACE
ARGYLE PLACE
Car Park Entrance
Harbour Recreational Boating Access
Low Tide
Water Bollard
RHODENS LANE
CLYDE RESERVE
MERRIMAN STREET
TIDAL POOLS
UPPER BLUFF
HEADLAND FORESHORE
STONE BEACH
Harbour Recreational Access
Oyster Bar
Stray Fountain
NORTHERN COVE
Public Wharf
Amphitheatre
Play Fields
Band Shell
Community Event Space Picnic and Barbeque Area
SOUTHERN COVE
GLOBE STREET NORTH LOOP
GLOBE STREET SOUTH LOOP
BARANGAROO CRESCENT
CITY WALK
HOTEL
PUBLIC FORSHORE
Public Docks
Stage 3
Stage 2
Stage 2
Stage 1
C10
R3
C1
C8
C2
R5
C7
C3
C4
R6
R2
R4
R8
HEADLAND PARK
PUBLIC FORESHORE
BARANGAROO CENTRAL
BARANGAROO SOUTH

0 10 20 40 60m
SCALE 1:1000

AUSTRALIAN HEIGHT DATUM

ISSUE FOR APPROVAL

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Sydney Water Accredited •Water Servicing Co-ordinator
• Design and Project Management

TITLE
INTEGRATED WATER MANAGEMENT PLAN
KEY PLAN

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
1:1000	JM	LP	LP	LP

DATE	DRAWING No.	ISSUE
SEPT. 2010	MW-WSP-H-1033	C

JOB No. 3591

Plot Date: Wednesday, 13 October, 2010 12:41:55 PM

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
SHEET SIZE: A0

File Path: \\SYDSVR01\JOBS\3591\CAD\Arch\Drawings\3591-MW-WSP-H-1033.dwg
Date Time: 13/10/2010 12:41:53 Login Name: jmarshall

NOTES

GENERAL

G1. DESIGN HEREIN HAS BEEN PREPARED
BY WARREN SMITH AND PARTNERS PTY LTD
CONSULTING CIVIL ENGINEERS.
LEVEL 1, 123 CLARENCE ST, SYDNEY NSW 2000.
TEL:- (02) 9299 1312. FAX:- (02) 9290 1295.

G2. THE DRAWINGS HEREIN SHALL BE READ AS
REQUIRED IN CONJUNCTION WITH DRAWINGS
BY JPW ARCHITECTS PTY LTD.
LEVEL 10, 95 PITT STREET SYDNEY
TEL:-(02) 9259 5900. FAX:-(02) 9259 5999

G3. ALL DIMENSIONS IN MILLIMETRES UNO.
REDUCED LEVELS AND CHAINAGES ARE IN METRES.
DO NOT SCALE DRAWINGS. USE FIGURED DIMENSIONS.

G4. THE PROPOSED WORKS DETAILED HEREIN
SHALL BE CONSTRUCTED TO THE REQUIREMENTS
AS DETAILED HEREUNDER.

G5. ALL EXISTING SERVICES SHALL BE VERIFIED FOR
DEPTH AND HORIZONTAL POSITION BY PHYSICAL MEANS
PRIOR TO EXCAVATION. ANY DISCREPANCIES SHALL
BE BROUGHT FORTHWITH TO THE CONTRACT ADMINISTRATOR'S
ATTENTION.

STORMWATER & SUB-SOIL DRAINAGE

MATERIALS:

STW1. PIPES AND FITTINGS FOR STORMWATER
DRAINAGE SHALL BE AS FOLLOWS UNO ON THE
DRAWINGS:

A. POLYVINYL CHLORIDE (PVC) WITH SOLVENT
WELDED JOINTS FOR BELOW GROUND DRAINAGE
UP TO 225mm.

B. REINFORCED CONCRETE, CLASS 3,
WITH RUBBER RING JOINTS
FOR PIPE DIA'S GREATER THAN 225mm. UNO.

C. INSTALL IN ACCORDANCE WITH AUSTRALIAN
STANDARD AS3500 EXCEPT WHERE
VARIED BY THE CONTRACT DOCUMENTS.

STW2. PIPES & FITTINGS FOR SUBSOIL DRAINAGE SHALL BE
SLOTTED POLYVINYL CHLORIDE (PVC) WITH SOLVENT
WELDED JOINTS, MIN. 150mm DIAMETER.

STW3. IN GROUND DRAINAGE PIPEWORK SERVING DP's
SHALL BE MINIMUM 150mm DIA. UNO.

STW4. GRATED DRAINS SHALL BE 150mm NOM.
A. 150mm NOM. WIDTH IN NON TRAFFICABLE AREAS.
B. 225mm NOM. WIDTH IN TRAFFICABLE AREAS.

STW5. STORMWATER PITS ARE AS SHOWN & SPECIFIED ON
THE PLANS. PRECAST TYPE ACCEPTABLE WITH STEP IRONS
FOR DEPTH GREATER THAN 1000
BENCH ALL PITS MIN. 50mm & FORM SMOOTH TRANSITION
FROM INLET TO OUTLET

STW6. SELECT FILL SHALL BE MATERIAL OBTAINED FROM
EXCAVATION OF THE PIPE TRENCH OR IMPORTED WITH
A PARTICLE SIZE NOT GREATER THAN 100mm
AND A CBR NOT LESS THAN 4 FOR THE FRACTION
PASSING THE 19mm SIEVE

STW7. IMPORTED FILL WHERE SPECIFIED SHALL EITHER
CONSIST OF SINGLE SIZED AGGREGATE WITH PARTICLE
SIZE NOT GREATER THAN 5mm WRAPPED ALL ROUND
WITH GEOTEXTILE FILTER FABRIC OR APPROVED HIGH
COMPACTION SAND OR APPROVED CRUSHED ROAD
GRAVEL CONFORMING TO RTA FORM 3051 OR SIMILAR.

STW8. STORMWATER GRATES TO BE SUPPLIED IN CLASS SHOWN ON
THE DRAWINGS.

INSTALLATION REQUIREMENTS:

STW9. PIPES SHALL BE TRUE TO GRADES SHOWN AND
ALIGNED SO THAT THE CENTRES OF THE INLET PIPES
INTERSECT WITH THE CENTRE OF THE OUTLET PIPE AT
THE DOWNSTREAM FACE OF THE PIT.

STW10. MINIMUM GRADES FOR GRAVITY STORMWATER DRAINAGE
SHALL CONFORM TO AS3500 PART3 AS FOLLOWS, UNO:
1% FOR 100 AND 150 mm DIA.
0.5% FOR 225 mm DIA
0.4% FOR 300 mm DIA
0.35% FOR 375 mm DIA

STW11. MINIMUM DEPTH OF COVER SHALL BE :-
- 300mm IN PRIVATE PROPERTY (NON VEHICULAR TRAFFIC).
- 450mm IN PUBLIC AREAS,
- 600mm IN VEHICULAR TRAFFICABLE AREAS (FOOTWAY/ROADWAY).

STW12. BED ALL PIPES FIRMLY AND EVENLY ONTO IMPORTED
BEDDING FILL MATERIAL.

STW13. LAY AND JOINT ALL PIPES IN ACCORDANCE WITH THE
MANUFACTURERS RECOMMENDATIONS AND
AS 3725-1989 LOADS ON BURIED CONCRETE PIPES
AS 2566-1998 BURIED FLEXIBLE PIPELINES
AS 1597.2-1996 PRECAST REINFORCED CONCRETE BOX CULVERTS.
AS 3500-1990 NATIONAL PLUMBING & DRAINAGE CODE.

STW14. ALLOW TO TEST ALL PIPES AND PITS TO
MANUFACTURERS REQUIREMENTS.

SEWER DRAINAGE AND SYDNEY WATER SEWER

1. ALL SYDNEY WATER GRAVITY SEWER PIPELINES SHALL BE DN 150
CLASS SN8 TO SYDNEY WATER PRODUCT SPECIFICATION

SEWER RISING MAIN

1. PIPES AND FITTINGS SHALL BE PE 100 CLASS PN 20

2. FITTINGS SHALL BE ELECTRO FUSION TYPE

CONCRETE WORKS

C1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE
WITH AS3600, THE STANDARDS ASSOCIATION AUSTRALIA, STANDARDS
CITED IN AS3600, THE DRAWINGS AND THE SPECIFICATION.

C2. ALL CONCRETE SHALL BE 80mm NOMINAL SLUMP, 20mm MAXIMUM
AGGREGATE WITH NO ADMIXTURES OR FLY ASH,
UNLESS OTHERWISE APPROVED.

ALL CONCRETE WORK IN CONTACT WITH SEWER TO HAVE
TYPE SL PORTLAND CEMENT, OTHERWISE TYPE A CEMENT

FOR BRIDGE WORKS, A MAXIMUM 56 DAYS SHRINKAGE OF
600 MICROSTRAIN, A MINIMUM CEMENT CONTENT 350kg/m3 AND
MAXIMUM WATER:CEMENT RATIO OF 0.60

C3. STRENGTH GRADE OF CONCRETE SHALL BE :
25 MPa (KERBS, EDGE STRIPS & CONCRETE ENCASEMENT)
AND 20 MPa ELSEWHERE.

C4. CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED
ONLY WHERE SHOWN OR APPROVED.
GENERALLY FOR HAND PLACED KERB & GUTTER 6mm THICK APPROVED
BITUMINOUS MASTIC JOINTING MATERIAL SHALL BE PROVIDED AT
INTERVALS NOT EXCEEDING 6m. FOR MACHINE PLACED KERB & GUTTER
6mm THICK APPROVED BITUMINOUS MASTIC JOINTING MATERIAL
SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 12m. & GUILLOTINED
DUMMY GROOVED JOINTS, 25mm IN DEPTH, SHALL BE FORMED EVERY
3m OF GUTTER. JOINTS ARE ALSO REQUIRED AT EACH END OF GUTTER
CROSSING AND GULLY PITS. JOINTS SHALL BE SET VERTICAL AND
SQUARE TO THE KERB.

C5. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND IS NOT
NECESSARILY SHOWN IN TRUE PROJECTION.

C6. WELDING OR SPLICES IN REINFORCEMENT SHALL BE USED ONLY IN
POSITIONS APPROVED BY THE ENGINEER.

C7. CONCRETE CURING SHALL BE IN ACCORDANCE WITH AS3600. CURING
SHALL BE COMMENCED WITHIN TWO HOURS OF FINISHING OPERATIONS
AND SHALL BE CONTINUED FOR A MINIMUM OF SEVEN DAYS BY AN
APPROVED PROPRIETARY COMPOUND OR BY KEEPING CONTINUOUSLY
WET.

C8. FORMWORK SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE
WITH AS3610. FORMWORK SHALL NOT BE STRIPPED NOR PROPS
REMOVED WITHOUT APPROVAL.

C9. FABRIC LAP DETAILS SHALL BE IN ACCORDANCE WITH FIG.13.2.4 OF
AS3600.

C10. HOOKS, LAPS AND BENDS SHALL BE IN ACCORDANCE WITH
AS3600 UNO.

C11. ALL CHEMICAL ANCHORS SHALL BE EITHER 'CHEMSET' BY
"RAMSET" WITH THE GLASS CAPSULE SYSTEM INSTALLED IN
STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS
OR

HILTI HVU ADHESIVE ANCHOR WITH FOIL CAPSULE SYSTEM
INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS
INSTRUCTION. ALL CHEMICAL ANCHORS SHALL BE HOT DIPPED
GALVANIZED AND BE MIN M16 DIA. U.N.O.

C12. ALL EDGES TO HAVE 20mm CHAMFERS, WHERE VISIBLE
IN THE FINISHED WORK.

GENERAL EARTHWORKS, SITEWORKS & FILLING:

FILLING:

SGE1. STRIP ALL TOPSOIL AND UNDERLYING FILL AND STOCKPILE
TOPSOIL FOR LATER REUSE FOR LANDSCAPING PURPOSES. IN
LOCATION APPROVED BY CONTRACT ADMINISTRATOR.

SGE2. NEW FILL REQUIRED TO REINSTATE CUT LEVELS TO PROPOSED
BENCHING LEVELS SHALL BE SOURCED FROM OTHER PARTS OF THE
EXCAVATION AS SELECT FILL OR IMPORTED FILL AS SPECIFIED
BELOW IN SGE 3 AND SGE 4.

SGE3. SELECT FILL SHALL CONSIST OF LOCALLY DERIVED OR CUT
NATURAL CLAYS.

SGE4. IMPORTED FILL SHALL CONSIST OF RIPPED SANDSTONE OR SHALE
OR SIMILAR MATERIAL WITH MAXIMUM PARTICLE SIZE NOT
GREATER THAN 120mm AND A MOISTURE CONTENT WITHIN 2-3%
OF STANDARD OPTIMUM.

SGE5. ALL FILL (COHESIVE SOIL) SHALL BE PLACED IN LAYERS OF 200mm
MAXIMUM THICKNESS, COMPACTED BY MACHINE ROLLING TO
ACHIEVE A DRY DENSITY RATIO OF NOT LESS THAN 98%
STANDARD MAXIMUM AT A CORRESPONDING MOISTURE CONTENT
WITHIN 2-3% OF STANDARD OPTIMUM.

SGE6. IN AREAS WHERE HIGH IMPACT ROLLING IS USED TEST EACH FINAL
LAYER OF NOT GREATER THAN 300mm TO 400mm TO ACHIEVE A
DRY DENSITY RATIO OF NOT LESS THAN 98% STANDARD
MAXIMUM AT A CORRESPONDING MOISTURE CONTENT WITHIN 2-3%
OF STANDARD OPTIMUM.

TRAFFIC NOTE:

1. A TRAFFIC CONTROL PLAN IS TO BE PREPARED AND SUBMITTED
FOR APPROVAL TO THE CONTRACT ADMINISTRATOR.

TEMPORARY SEWER PUMPING STATION

1. THE PUMPING STATION WET WELL SHALL CONSIST OF A 1.8 m
INTERNAL DIAMETER FIBREGLASS TANK (4 m DEEP NOMINAL)
FLYGT MODEL No. TOP 1800 COMPLETE WITH

- GALVANISED SAFETY GRILL
- GALVANISED GUIDE RAILS
- GALVANISED LIFTING CHAINS
- MP 3085 MT PUMPS (DUTY AND STANBY)
- FLYGT SUBMERGED LEVEL SENSOR MODEL LTV 501
- FLYGT FGC 323 PUMP CONTROL CABINET AND ELECTRICS

2. ALLOW TO PROVIDE CONCRETE BALLAST TO THE BASE OF THE
STATION

EXCAVATION BATTERS: (UPPER LIMITS OF SLOPE)

SGE7. ALL TEMPORARY BATTERS CUT IN CLAY SUBSTRATE
SHALL BE 1 HORIZ : 1 VERT.
ALL LONG TERM EXPOSED BATTERS CUT IN CLAY SUBSTRATE
SHALL BE 2 HORIZ : 1 VERT.
ALL DETENTION BASIN BATTERS IN CLAY SUBSTRATE
SHALL BE 3 HORIZ : 1 VERT.
ALL DETENTION BASIN BATTERS IN ROCK SUBSTRATE
SHALL BE NEAR VERTICAL.

SGE8. GEOTECHNICAL TESTING IS TO BE UNDERTAKEN TO
AT LEAST LEVEL 1 CONTROL OF FILL COMPACTION
STANDARD, AS DEFINED IN AS. 3738 AS FOLLOWS

- FOR GENERAL FILL OR CUT AREAS OVER THE AREA
PROVIDE ONE (1) TEST PER 200mm LAYER, OVER
AN AREA NOT GREATER THAN 500 m².

- FOR GENERAL FILL AREAS IN CONCENTRATED AREAS ADJACENT
TO AND BEHIND THE STRUCTURE AND ADJACENT TO AND
BEHIND RETAINING WALLS PROVIDE ONE (1) TEST PER 200mm
LAYER, OVER AN AREA NOT GREATER THAN 50m².

SGE9. SUBMIT ALL GEOTECHNICAL TEST RESULTS TO THE
CONTRACT ADMINISTRATOR FOR REVIEW PRIOR TO
CONTINUATION WITH SUBSEQUENT SECTION OF WORK.

EARTH WORKS FOR SERVICES

E1. EXCAVATE TRENCHES AND STOCKPILE ALL MATERIAL FOR
INSPECTION WITH REGARD TO RE-USE FOR TRENCH BACKFILL.
REMAINING MATERIAL TO BE REMOVED AS DIRECTED

E2. BEDDING MATERIAL SHALL CONSIST OF IMPORTED MATERIAL
ONLY. THICKNESS OF BEDDING LAYER SHALL BE 100mm
IN O.T.R. AND 200mm IN ROCK.

E3. EMBED ALL PIPES WITH IMPORTED FILL. PROVIDE
200mm SIDE SUPPORT AND 150mm OVERLAY ABOVE
PIPE CROWN.

E4. TRENCH FILL ABOVE THE EMBEDMENT ZONE TO THE
UNDERSIDE OF THE ROAD PAVEMENT OR FOOTWAY FILL
MATERIAL SHALL BE AS FOLLOWS:
UNDER ROADWAY
TRENCH FILL MATERIAL SHALL CONSIST OF IMPORTED FILL
AS SPECIFIED HEREIN OF EITHER HIGH GRADE COMPACTION SAND
OR APPROVED CRUSHED ROAD GRAVEL CONFORMING TO
RTA FORM 3051 OR SIMILAR
OTHER THAN ROADWAY
TRENCH FILL MATERIAL EXCAVATED SHALL CONSIST OF
SELECT FILL AS SPECIFIED HEREIN AND SHALL NOT CONTAIN
MORE THAN 20% OF STONES OF SIZE BETWEEN 75mm & 150mm
AND NONE LARGER THAN 150mm.
PRIOR TO THE USE OF THE EXCAVATED MATERIAL IT SHALL
BE INSPECTED AND APPROVED BY THE CONSULTANT.

E5. COMPACT BEDDING, EMBEDMENT AND TRENCH FILL
MATERIALS AS FOLLOWS:

EMBEDMENT:-
FOR GRANULAR FILL MATERIAL (NON-COHESIVE SOILS)
EG. COARSE AGGREGATE FILL, HIGH GRADE
COMPACTION SAND, THE DENSITY INDEX (ID) SHALL BE
NOT LESS THAN 70%.

TRENCH FILL:-
FOR GRANULAR MATERIAL (NON-COHESIVE SOILS), THE
DENSITY INDEX (ID) SHALL BE NOT LESS THAN 70%.

FOR NON-GRANULAR FILL MATERIAL (COHESIVE SOILS),
THE DRY DENSITY RATIO (RD) SHALL BE NOT LESS
THAN 95%.

E6. MEASURE OF COMPACTION:-
THE DEGREE OF COMPACTION SHALL BE MEASURED
BY ONE OF THE FOLLOWING PARAMETERS :-

GRANULAR FILL (NON-COHESIVE SOILS). THE DENSITY
INDEX (ID) DETERMINED IN ACCORDANCE WITH AS
1289.6.6.1 BASED ON THE MAXIMUM AND MINIMUM DRY
DENSITIES IN ACCORDANCE WITH AS 1289.5.1 AND
THE FIELD DRY DENSITY IN ACCORDANCE WITH AS
1289.5.3.2, AS 1289.E3.5 OR AS 1289.E8.1.

NON-GRANULAR FILL (COHESIVE SOILS). THE DRY
DENSITY RATION (RD) DETERMINED IN ACCORDANCE
WITH AS 1289.5.4.1 BASED ON THE FIELD DRY DENSITY
IN ACCORDANCE WITH AS 1289.5.3.2 AND THE MAXIMUM
DRY DENSITY IN ACCORDANCE WITH AS 1289.5.1.1

E7. GEOTECHNICAL TESTING IS TO BE UNDERTAKEN TO
AT LEAST LEVEL 1 CONTROL OF FILL COMPACTION
STANDARD, AS DEFINED IN AS. 3738 AS FOLLOWS

- TEST EACH 300mm LAYER ABOVE PIPE CROWN.
- TEST BASE & SUB-BASE LAYERS WHERE APPLICABLE.
- TESTS SHALL BE REQUIRED AT EACH 50m CENTRES WHERE
THE LENGTH OF TRENCH IS WITHIN THE 50m REQUIREMENT.

E8. SUBMIT ALL GEOTECHNICAL TEST RESULTS TO
CONTRACT ADMINISTRATOR FOR REVIEW PRIOR TO
CONTINUATION WITH SUBSEQUENT SECTION OF WORK.

RESTORATION:

RES1. RESTORE ALL TRAFFIC AREAS TO PRE EXISTING
CONDITION

RES2. FOR ALL SURFACES OTHER THAN IN TRAFFIC AREAS
RESTORE DISTURBED SURFACES TO PRE-EXISTING
CONDITIONS AND COMPACT AS SPECIFIED.

ROAD WORKS, DRIVEWAYS & CARPARKS

R1. ALLOW FOR LEVEL 1 TESTING AND SUB-GRADE CONDITIONS
& PAVEMENT THICKNESS TO BE VERIFIED BY
GEOTECHNICAL CONSULTANT AFTER INSPECTION
OF PRELIMINARY BOXING.

R2. ALLOW FOR ANY SUB-GRADE REPLACEMENT WORK TO BE
DETERMINED AS REQUIRED BY GEOTECHNICAL CONSULTANT
AT THE TIME OF PAVEMENT CONSTRUCTION
IN ACCORDANCE WITH CONTRACT CONDITIONS.

R3. MINIMUM DRY DENSITY RATIOS (AS 1289 3.4.1-1993) TO BE:

BASECOURSE	98% MODIFIED
SUB-BASE	95% MODIFIED
SUB-GRADE	100% STANDARD
SUB-GRADE REPLACEMENT	100% STANDARD

R4. PAVEMENT MATERIALS TO COMPLY WITH RTA SPECIFICATION
No. 3051 OR SIMILAR AS APPROVED BY
GEOTECHNICAL CONSULTANT.

R5. PROVIDE (1) TEST FOR EACH LAYER NOT EXCEEDING
250mm THICK BEING BASECOURSE, SUB-BASE &
SUB-GRADE OVER AN AREA NOT GREATER THAN 500m².

R6. SUBMIT ALL GEOTECHNICAL TEST RESULTS TO CONTRACT
ADMINISTRATOR FOR REVIEW PRIOR TO CONTINUATION WITH
SUBSEQUENT SECTION OF WORK.

APPROVALS

A1. THE AS CONSTRUCTED WORKS SHALL BE INSPECTED
BY DESIGN CONSULTANT. MINIMUM 48 HOURS
NOTICE SHALL APPLY TO ALL INSPECTIONS.

A2. THE DESIGN PLANS HEREIN ARE SUBJECT TO APPROVAL OF THE
CONTRACT ADMINISTRATOR PRIOR TO CONSTRUCTION. OBTAIN
EXPRESS (WRITTEN) ADVICE TO PROCEED FROM CONTRACT
ADMINISTRATOR PRIOR TO COMMENCEMENT.

A3. SUBMIT WORK-AS-EXECUTED DRAWINGS IN CIVILCAD OR DXF
DIGITAL FORMAT AND HARD COPY FORMAT. VERIFY ALL
CONSTRUCTION WORKS SHOWN HEREON.

A4. CERTIFY THAT THE AS CONSTRUCTED SYSTEM HAS BEEN
BUILT IN ACCORDANCE WITH THE APPROVED PLANS
ISSUED FOR CONSTRUCTION.

SERVICES UNDER ROAD SURFACES

S1. ALL OTHER SERVICES INCLUDING BUT NOT LIMITED TO WATER,
HYDRANT, GAS, SEWER, ELECTRICAL AND COMMUNICATIONS
CONDUITS OR CABLES SHALL BE LAID WITH MINIMUM 600mm U.N.O.
COVER BELOW PROPOSED ROAD SURFACE OR APPROVED OTHER
MEANS TO PROTECT DURING CONSTRUCTION.

ROAD SIGNS & LINE MARKING

RS1. ALL SIGNS AND LINEMARKING SHALL BE TO ROADS & TRAFFIC AUTHORITY
STANDARDS AND SPECIFICATIONS AND AS.1742, MANUAL OF UNIFORM
TRAFFIC CONTROL DEVICES

RS2. ALL LINEMARKING SHALL BE AUGMENTED BY RETROREFLECTIVE RAISED
PAVEMENT MARKERS (RRPMs) AND ALL SHALL BE TO AS 1742.2 – 1994 AND
AS 1742.2 /AMDT 1/1997-10-05

RS3. ALL ROAD SIGNS AND POSTS SHALL BE TO AS 1742.2 – 1994
AND AS 1742.2 /AMDT 1/1997-10-05

HYDRAULIC SERVICES

H1. ALL WORKS CARRIED OUT SHALL COMPLY WITH AS-3500 REQUIREMENTS.
OBTAIN NECESSARY AUTHORITIES APPROVALS PRIOR TO COMMENCING
WORKS.

H2. PRIOR TO COMMENCING WORKS SURVEY & INSPECT SITE & CONFIRM
LOCATION & LEVELS OF ALL HYDRAULIC SERVICES PIPEWORK.
NO CLAIMS FOR ADDITIONAL COSTS RESULTING FROM THE LACK OF
KNOWLEDGE OF SITE CONDITIONS RELATING TO WORKS TO BE DONE
OR LOCATIONS AND LEVELS OF EXISTING AND NEW SERVICES WILL
BE ACCEPTED.

H3. PRIOR TO CAPPING OFF & REMOVAL OF REDUNDANT SERVICES
CONFIRM ON SITE THAT SERVICE IS NOT SUPPLYING EXISTING
BUILDINGS OR AMENITIES.

H4. COLD WATER PIPEWORK SHALL CONSIST OF COPPER TUBE &
FITTINGS IN ACCORDANCE WITH AS 1432 TYPE B. PIPES AND
FITTINGS SHALL BE JOINTED WITH 15% SILVER SOLDER.

H5. ALL NEW UNDERGROUND METAL PIPEWORK SHALL BE INSTALLED WITH
POLYETHYLENE SLEEVING AND INSTALLED TO MANUFACTURE'S
REQUIREMENTS.

H6. LANDSCAPE IRRIGATION WATERING PIPEWORK SHALL CONSIST OF
MEDIUM DENSITY POLYETHYLENE PIPE CLASS PN16 WITH ELECTRO
FUSION JOINTS OR EQUAL TO EXISTING PIPEWORK.

H7. RECYCLED EFFLUENT IRRIGATION OUTLETS, FLUSHING HYDRANTS AND
ALL ABOVE GROUND PIPE & FITTINGS SHALL BE IDENTIFIED BY A PURPLE
COLOUR IN ACCORDANCE WITH AS 2700, BEING NO DARKER THEN P24
JACARANDA, P12 PURPLE & NO LIGHTER THEN P23 LILAC.

H8. OUTLETS TO BE USED ON RECYCLED WATER MUST BE CLEARLY &
PERMANENTLY IDENTIFIED "RECYCLED WATER - DO NOT DRINK"

PROTECTION OF FLORA

1. ANY TRENCHES WITHIN 3m OF TREES SHALL BE
HAND DUG TO AVOID DAMAGE TO TREE ROOTS.

2. THE SEWERAGE WORKS HAVE BEEN LOCATED TO MINIMISE CLEARING
AND DAMAGE TO THE EXISTING FLORA ENVIRONMENT. NO TREES ARE
PERMITTED TO BE REMOVED OR DAMAGED UNO. CONSTRUCTION OF THE
SEWER GRAVITY OR RISING MAIN IN THE VICINITY OF EXISTING TREES
SHALL BE HAND EXCAVATED ONLY, ENSURING IRREVERSIBLE
DAMAGE OF THE ROOT SYSTEM DOES NOT OCCUR.

3. IF IT IS CONSIDERED NECESSARY TO PERFORM ANY WORK ON TREES,
INCLUDING TRIMMING, LOPPING, ROOT CUTTING, REPAIR AND REMOVAL,
APPLICATION IN WRITING SHALL BE MADE BY THE CONTRACTOR TO
THE CONTRACT ADMINISTRATOR.
ANY WORK PERMITTED TO BE DONE ON TREES TO BE RETAINED SHALL
BE PERFORMED BY AN APPROVED TREE SURGEON.

4. NO MATURE TREES OR SHRUBS ARE TO BE REMOVED FOR THE
PURPOSES OF THE WORKS WITHOUT PRIOR APPROVAL OF THE
CONTRACT ADMINISTRATOR.

TEMPORARY WATER SUPPLY

1. CONTRACTOR TO APPLY TO SYDNEY WATER FOR WATER SERVICE
PAY ALL FEES, OBTAIN TEE AND VALVE METER CONNECTION,
METER AND CONNECT SITE TO PROVIDE CONSTRUCTION SITE WITH
AN APPROPIATE WATER SUPPLY.

SURVEY AND SETOUT

1. REFERENCE IS REQUIRED TO THE SURVEY TO DETERMINE ALL
ASPECTS OF TAKE OFF, MEASUREMENTS OF ITEM NUMBERS,
LENGTHS AND EXTENT OF WORK

2. SETOUT DIMENSIONS REFER TO PIPELINE OR STRUCTURE CENTRES
OR CENTRELINES UNO.

AUSTRALIAN HEIGHT DATUM

ISSUE FOR APPROVAL

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ISSUE	AMENDMENT	DATE	ISSUE	AMENDMENT	DATE
A	PRELIMINARY ISSUE	01.10.10			
B	PRELIMINARY ISSUE (ARCH REVISION)	07.10.10			
C	ISSUE FOR APPROVAL	13.10.10			

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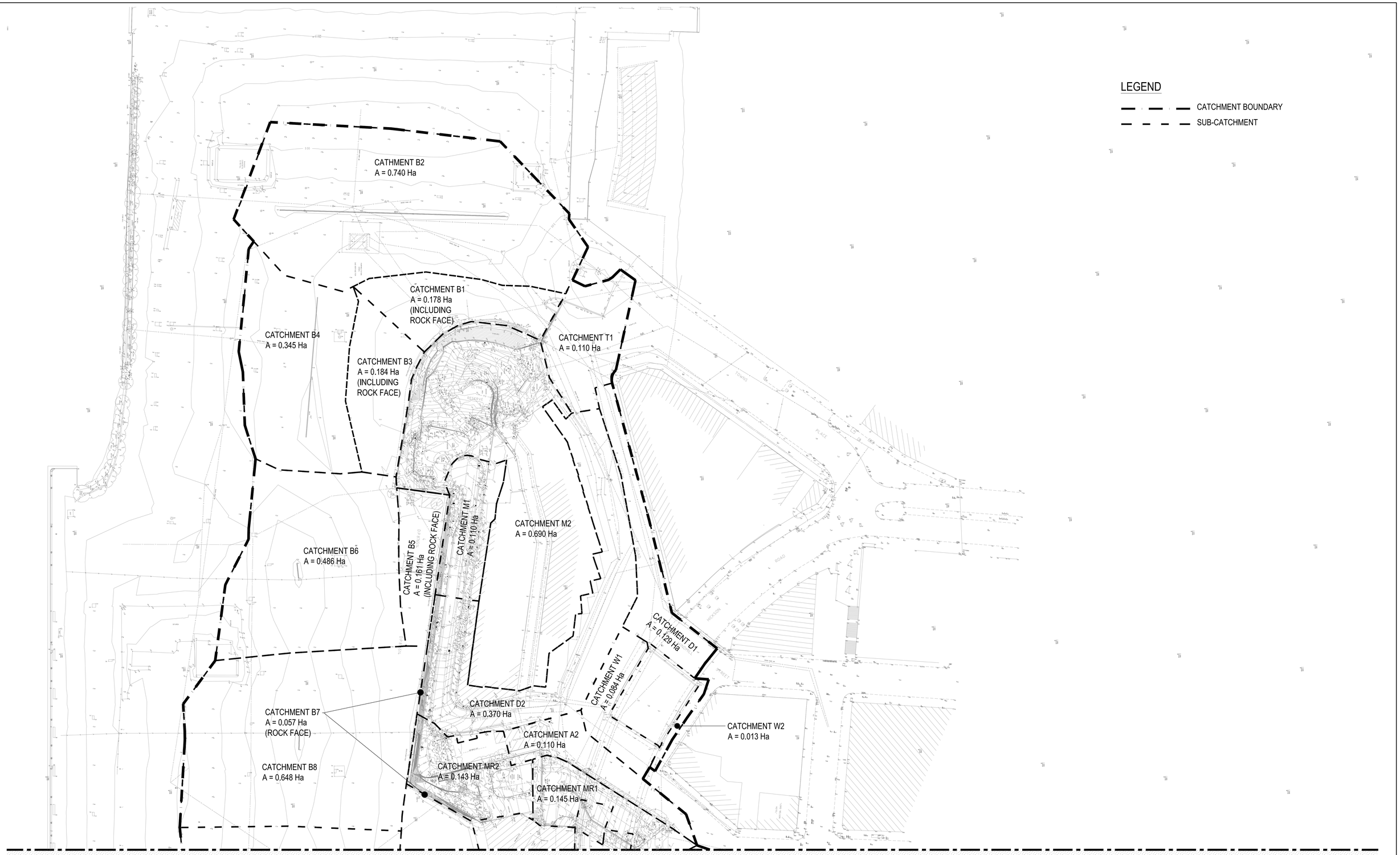
TITLE
INTEGRATED WATER MANAGEMENT PLAN
GENERAL NOTES AND SPECIFICATION

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
	JM	LP	LP	LP
DATE: SEPT. 2010	DRAWING No. MW-WSP-H-1034		ISSUE C	
JOB No. 3591				

Plot Date: Wednesday, 13 October, 2010 12:41:50 PM

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
SHEET SIZE: A0

File: P:\JPW ARCHITECTS\JPW\3591 SHP Dr Rel\Arch Dr\PITT\3500 MW-WSP-H-1031 MW-WSP PLAN
Plot Date: 13 OCTOBER 2010 12:41:50 PM Login Name: jmartin Software: Adobe Illustrator CS4 on Windows
Plot Style: Warren Smith & Partners Pty Ltd.ctb Plot Scale: 1.000 CAD Operator: Mike Margetts



AUSTRALIAN HEIGHT DATUM

SCALE 1:500

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ISSUE	AMENDMENT	DATE

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TITLE

INTEGRATED WATER MANAGEMENT PLAN
STORMWATER CATCHMENT
EXISTING CONDITION

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
A0 @ 1: 500 A2 @ 1: 1000	JM	M.C.	LP	LP

DATE	DRAWING No.	ISSUE
SEPT 2010	MW-WSP-H-1035	C

JOB No. 3591

SHEET 1 OF 2

Plot Date: Wednesday, 13 October, 2010 12:42:17 PM

SHEET SIZE: A0

Drwl. Ref: C:\SITE\DWG\Hydraulic\Water Management Plan\1031_MW-WSP-H-1035-1035.dwg
Cad File: T:\SITE\DWG\Hydraulic\Water Management Plan\1031_MW-WSP-H-1035-1035.dwg
Plotted: 13.10.2010@12:42:17 - User Name: jmagdica

FOR CONTINUATION REFER TO SHEET 1

CATCHMENT H2
A = 0.052 Ha

CATCHMENT H1
A = 0.040 Ha

CATCHMENT Hi12
A = 0.012 Ha

CATCHMENT B9
A = 0.560 Ha

CATCHMENT B10
A = 0.600 Ha

CATCHMENT A1
A = 0.160 Ha

CATCHMENT H4
A = 0.089 Ha

CATCHMENT H3
A = 0.060 Ha

CATCHMENT Hi5
A = 0.040 Ha

CATCHMENT Hi2
A = 0.068 Ha

CATCHMENT OBSERV_NE
A = 1.110 Ha

CATCHMENT B11
A = 0.435 Ha

CATCHMENT H7
A = 0.1 Ha

CATCHMENT H5
A = 0.077 Ha

CATCHMENT Hi12
A = 0.044 Ha

CATCHMENT Hi1
A = 0.486 Ha

SYDNEY OBSERVATORY

CATCHMENT Hi3
A = 0.370 Ha

CATCHMENT H6
A = 0.014 Ha

CATCHMENT H9
A = 0.086 Ha

CATCHMENT H8
A = 0.08 Ha

CATCHMENT Hi11
A = 0.039 Ha

CATCHMENT Hi5
A = 0.049 Ha

CATCHMENT Hi4
A = 0.260 Ha

CATCHMENT KENT_EAST
A = 2.437 Ha

CATCHMENT H11
A = 0.07 Ha

CATCHMENT H10
A = 0.06 Ha

CATCHMENT Hi10
A = 0.030 Ha

CATCHMENT Hi6
A = 0.096 Ha

CATCHMENT KENT-WEST
A = 0.458 Ha

CATCHMENT H15
A = 0.12 Ha

CATCHMENT H12
A = 0.064 Ha

CATCHMENT Hi9
A = 0.026 Ha

CATCHMENT Hi7
A = 0.026 Ha

CATCHMENT Hi8
A = 0.398 Ha

CATCHMENT H13
A = 0.03 Ha

CATCHMENT H14
A = 0.017 Ha

HICKSON

HIGH STREET

KENT

NORTH

LEGEND

CATCHMENT BOUNDARY

SUB-CATCHMENT

AUSTRALIAN HEIGHT DATUM

SCALE 1:500

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TITLE
INTEGRATED WATER MANAGEMENT PLAN
STORMWATER CATCHMENT
EXISTING CONDITION

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
A0 @ 1: 500 A2 @ 1: 1000	JM	M.C.	LP	LP

DATE	DRAWING No.	ISSUE
SEPT 2010	MW-WSP-H-1036	C

JOB No. 3591

SHEET 2 OF 2

SHEET SIZE: A0

Plot Date: Wednesday, 13 October, 2010 12:42:25 PM

File: P:\3591\CAD\Drainage\Site Management Plan\3591_MW-WSP-H-1033.dwg
Last Saved by: LUKE.PLAW
Plot Date: 13/10/2010 12:42:25
Login Name: plawl

MOORES WHARF

TOWNS PLACE

KENT STREET

HIGH LANE

HIGH STREET

ARGYLE PLACE

MUNN RESERVE

HUNGRY

Car Park Entrance

RHODENS LANE

CLYNE RESERVE

MERRIMAN STREET

Harbour Recreational Boating Access

Low Tide

Toilet Block

Existing Caissons

Cultural Facility Entrance

Harbour Recreational Access

Oyster Bar

Elevators

Spray Fountain

Amphi

Bush Walk

UPPER BLUFF HEADLAND

FORESHORE

ROCKY SHORE

NORTHERN COVE

Public Wharf

STONE BEACH

Low Tide

P1 = 488m²
P2 = 631m²
P3 = 756m²
P4 = 796m²
P5 = 627m²
P6 = 761m²
P7 = 358m²
P8= 277m²
P9= 400m²
P10= 859m²
P11= 976m²
P12 = 597m²
P13= 51m²
P14= 618m²
P15= 1371m²
P16= 1169m²
P17= 323m²
P18= 83m²
P19= 239m²
P20= 604m²
P21= 1930m²
P22= 1431m²
P23= 473m²
P24= 1854m²
P24A= 200m²
P25= 606m²
P26= 1095m²
P27= 2849m²
P28= 181m²
P29= 1271m²
P30= 2440m²
P31= 269m²
P32= 140 m²
P33= 231 m²
P34= 219 m²
P35= 126 m²
P36= 3068m²
P37= 495m²
P38= 307m²
P39= 1913m²
P40= 187m²
P41= 150m²
P42= 32m²
P43= 25m²

AUSTRALIAN HEIGHT DATUM

SCALE 1:500

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TITLE

INTEGRATED WATER MANAGEMENT PLAN
STORMWATER CATCHMENT
PROPOSED PARK

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
A0 @ 1: 500 A2 @ 1: 1000	JM	MC	LP	LP

DATE	DRAWING No.	ISSUE
SEPT 2010	MW-WSP-H-1037	C

JOB No. 3591

SHEET 1 OF 1

Plot Date: Wednesday, 13 October, 2010 12:42:37 PM

SHEET SIZE A0

Date: 2010 | Time: 12:42:37 PM | User: JMARTIN | Style: MW_Standard.ctb | Layout: H1037 | Drawing Name: 3591 WSP DA DWG.dwg
Xref Path: C:\3591\CAD\Engineering\Water Management Plan\3591 DA WSP.dwg

MOORES WHARF
TOWNS PLACE
KENT STREET
HIGH LANE
HIGH STREET
HUNGRY
ARGYLE PLACE
MUNN RESERVE
RHODENS LANE
CLYNE RESERVE
MERRIMAN STREET
Car Park Entrance
Existing Caissons
COGH WATERS AREA
Low Tide
Harbour Recreational Boating Access
Trailer
PORTIONS OF EXISTING STW TO REMAIN FOR USE OF CONNECTION FOR HARBOUR
GROSS POLLUTANT TRAP. HUMEGARD MODEL No. HG18 OR SIMILAR APPROVED
EXISTING HEADWALL TO HARBOUR TO REMAIN FOR REUSE
1200 SQ. SWP CLASS E GRATE RL. 2.80
IL. 1.53
IL. 1.53
DIVERT EXISTING STW AND CONCRETE ENCASE
STW 450 @ 0.35%
IL. 0.93
IL. 0.93
1200 SQ. SWP CLASS E GRATE RL. 2.90
STW 450 @ 0.58%
1200 SQ. SWP CLASS E GRATE RL. 2.90
IL. 0.93
EXISTING STW TO REMAIN
CONSTRUCT SWP OVER EXISTING STW LINE AT "MM" TO INTERCEPT AND DEVIATE STW INTO NEW DN 450 PIPE
HEADLAND PARK STAGE 1 INCOMING SEWAGE EFFLUENT & TRANSFER PIPELINE
HEADLAND PARK STAGE 1 RETURN SEWAGE EFFLUENT & TRANSFER PIPELINE
Access
Cultural Facility Entrance
Elevators
Oyster Bar
Spray Fountain
Amphi
Public Wharf
Bush Walk
NORTHERN COVE
UPPER BLUFF
HEADLAND FORESHORE
ROCKY SHORE
STONE BEACH
A 1041
A 1042
GROSS POLLUTANT TRAP. HUMEGARD MODEL No. HG15 OR SIMILAR APPROVED
DROP TRANSITION PITS (TYP) REFER DETAIL DWG. 1041
PORTIONS OF EXISTING STW TO REMAIN FOR USE OF CONNECTION FOR HARBOUR
EXISTING HEADWALL TO HARBOUR TO REMAIN FOR REUSE
STORMWATER COLLECTION CHAMBER 1250m³ 8.0m W x 3.0m DEEP x 50m LONG
EFFLUENT STORAGE TANK
GROSS POLLUTANT TRAP. HUMEGARD MODEL No. HG15 OR SIMILAR APPROVED
PORTIONS OF EXISTING STW TO REMAIN FOR USE OF CONNECTION FOR HARBOUR
EXISTING HEADWALL TO HARBOUR TO REMAIN FOR REUSE
EXISTING HEADWALL TO HARBOUR TO REMAIN FOR REUSE
GROSS POLLUTANT TRAP. HUMEGARD MODEL No. HG18 OR SIMILAR APPROVED
Ex STWMH
eSTW 450
eSTW 600
eSTW 525

AUSTRALIAN HEIGHT DATUM

6 0 10 20 30m
SCALE 1:500

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CLIENT
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TITLE
INTEGRATED WATER MANAGEMENT PLAN
STORMWATER DRAINAGE LAYOUT PLAN

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
A0 @ 1:500 A2 @ 1:1000	JM	LP	LP	LP

DATE	DRAWING No.	ISSUE
SEPT. 2010	MW-WSP-H-1038	C
JOB No. 3591	SHEET 1 OF 1	

Plot Date: Wednesday, 13 October, 2010 05:03:26 PM

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
SHEET SIZE: A0

Date: 2010 AM AUSTRALIA Author: SCHEFFLER, Jim Login: jschefflerJim Drawing: C:\01\3591\Cad\Arch\Plot Plan\3591_1038.dwg
Plot Date: 13/10/2010 12:05:26 PM Plot By: SCHEFFLER, Jim Software: progress - Cad Ver: 19.0 (LMS Tech) Description: Xrefs: Model: A1 Layout: A1



AUSTRALIAN HEIGHT DATUM

SCALE 1:500

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TITLE

INTEGRATED WATER MANAGEMENT PLAN
RETAINING WALL
SUBSOIL DRAINAGE LAYOUT PLAN

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
A0 @ 1:500 A2 @ 1:1000	JM	LP	LP	LP

DATE	DRAWING No.	ISSUE
SEPT. 2010	MW-WSP-H-1039	C

JOB No. 3591

SHEET 1 OF 1

Plot Date: Wednesday, 13 October, 2010 12:42:54 PM

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 SHEET SIZE: A0

File: [W]_WSP_MW_AUTOCAD_Jobs\3591_HWDP_HLP_Title Block_2011.WSP Xref: MW-WSP-H-1039-1004.dwg
Plot Date: 13 October 2010 12:42:54 PM Plotted By: Lee Pearce Plot Scale: 1.000 Plot Device: DWG To PDF.pc3

MOORES WHARF

TOWNS PLACE

COACH PARKING AREA

Existing Caissons

Car Park Entrance

Harbour Recreational Boating Access

Low Tide

Toilet Block

RHODENS LANE

CLYNE RESERVE

MERRIMAN STREET

ARGYLE PLACE

MUNN RESERVE

KENT STREET

HIGH LANE

HIGH STREET

HUNGRY

Cultural Facility Entrance

Harbour Recreational Access

TIDAL POOLS

U P P E R B L U F F

Elevators

Bush Walk

SURFACE SPRAY IRRIGATION LAYOUT (TYP)

DRIP IRRIGATION LAYOUT (TYP)

Oyster Bar

Spray Fountain

Amphi

NORTHERN COVE

Public Wharf

HEADLAND FORESHORE

ROCKY SHORE

STONE BEACH

Low Tide

-2

AUSTRALIAN HEIGHT DATUM

SCALE 1:500

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TITLE

INTEGRATED WATER MANAGEMENT PLAN
IRRIGATION LAYOUT PLAN

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
A0 @ 1:500 A2 @ 1:1000	JM	LP	LP	LP

DATE	DRAWING No.	ISSUE
SEPT. 2010	MW-WSP-H-1040	C

JOB No. 3591

SHEET 1 OF 1

Plot Date: Wednesday, 13 October, 2010 12:43:00 PM

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SHEET SIZE: A0

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Plot Date: 13 October 2010 12:43:00 PM Plotted By: Kristin Jones

MOORES WHARF

TOWNS PLACE

COACH WAITING AREA

Existing Caissons

SEEPAGE SUB-SOIL COLLECTION DRAIN. AS SHOWN ON CIVIL DRAWINGS.

Car Park Entrance

Harbour Recreational Boating Access

Low Tide

Toilet Block

RHODENS LANE

CLYNE RESERVE

MERRIMAN STREET

ARGYLE PLACE

MUNN RESERVE

KENT STREET

HIGH LANE

HIGH STREET

HUNGRY

Cultural Facility Entrance

Harbour Recreational Access

Elevators

Oyster Bar

Spray Fountain

Amphi

NORTHERN COVE

Public Wharf

UPPER BLUFF

20.5

Bush Walk

Bush Walk

HEADLAND FORESHORE

ROCKY SHORE

Low Tide

COLLECTION DRAIN PUMPOUT PIT
REFER TO EARLY WORKS DRAWINGS

SEEPAGE SUB-SOIL COLLECTION DRAIN. AS SHOWN ON CIVIL DRAWINGS, BY OTHERS

SEEPAGE SUB-SOIL COLLECTION DRAIN. AS SHOWN ON CIVIL DRAWINGS.

STONE BEACH

Low Tide

SEEPAGE SUB-SOIL COLLECTION DRAIN. AS SHOWN ON CIVIL DRAWINGS.

COLLECTION DRAIN PUMPOUT PIT
REFER TO EARLY WORKS DRAWINGS

-2

AUSTRALIAN HEIGHT DATUM

SCALE 1:500

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ISSUE	AMENDMENT	DATE	ISSUE	AMENDMENT	DATE
A	PRELIMINARY ISSUE	01.10.10			
B	PRELIMINARY ISSUE (ARCH REVISION)	07.10.10			
C	ISSUE FOR APPROVAL	13.10.10			

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HEADLAND PARK

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TITLE

INTEGRATED WATER MANAGEMENT PLAN
SEEPAGE WATER LAYOUT PLAN

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
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DATE	DRAWING No.	ISSUE
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JOB No. 3591

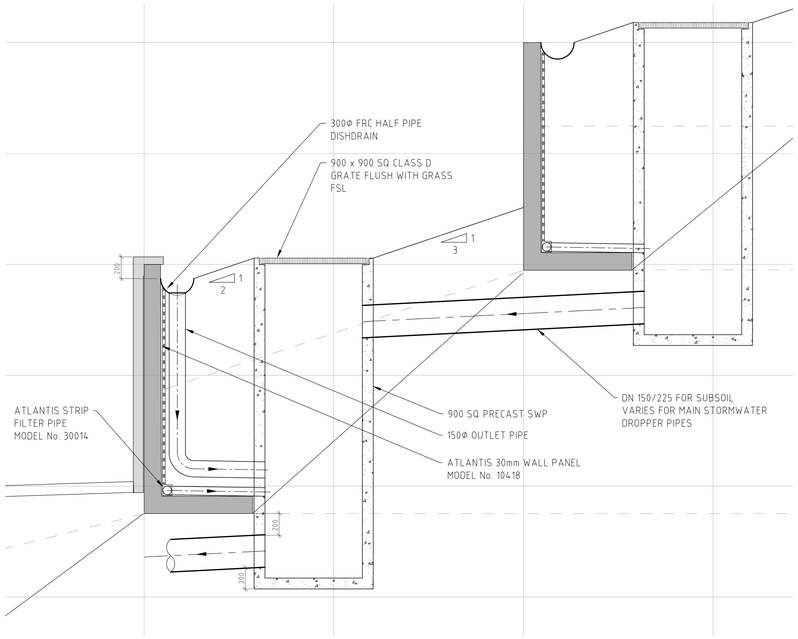
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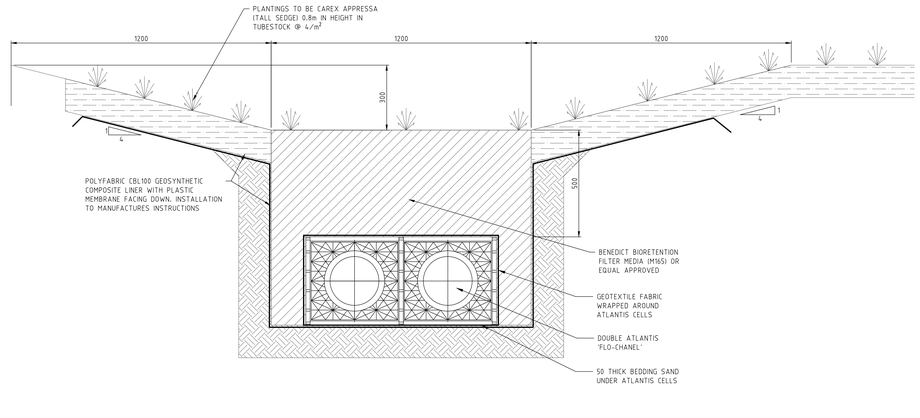
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TYPICAL SECTION THRU SUB-SOIL DRAINAGE
Scale: 1:20



A / 1038 ATLANTIS BIORETENTION SWALE
Scale: 1:10

AUSTRALIAN HEIGHT DATUM

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TITLE
INTEGRATED WATER MANAGEMENT PLAN
CIVIL DETAILS

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
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DATE	DRAWING No.	ISSUE
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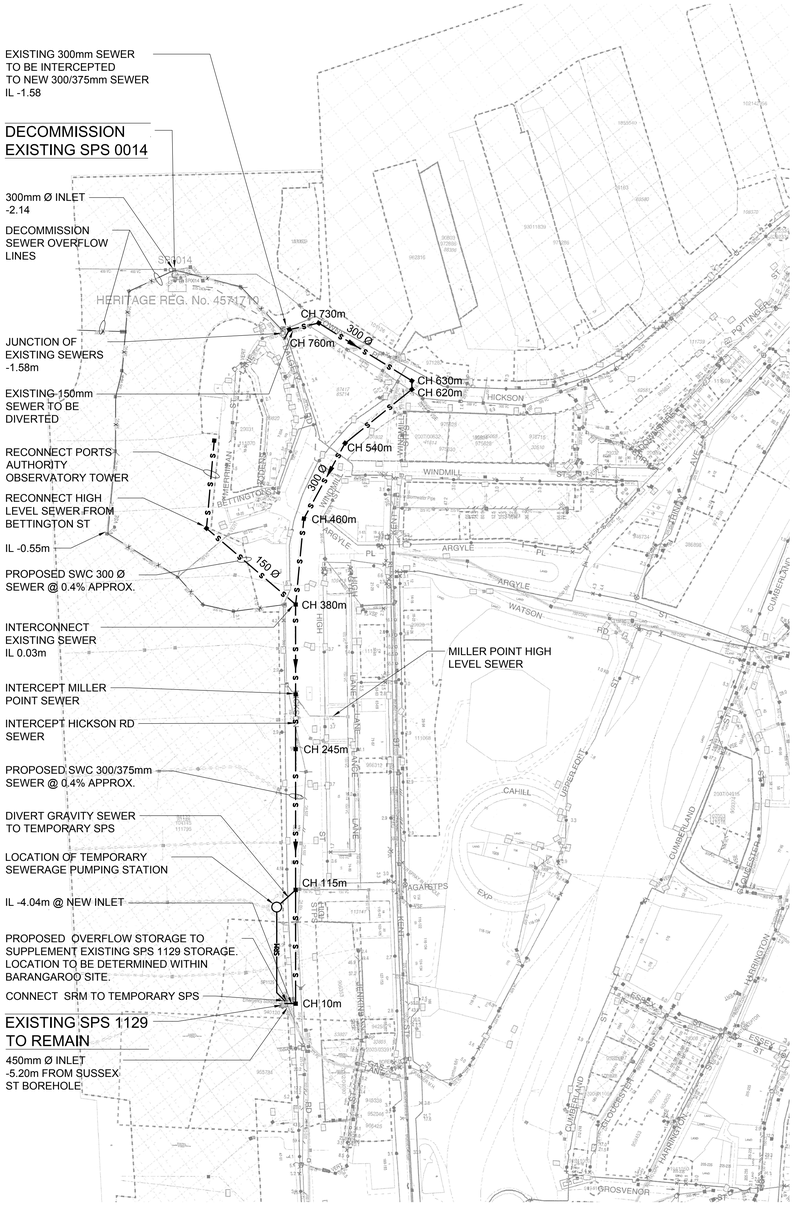
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SHEET 1 OF 1

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Last Plotted: 13/10/2010 12:43:13 - User Name: jmajka



LEGEND

- PROPOSED CHAMBER
- S — SWC SEWER
- SRM — SWC SEWER RISING MAIN
- FLOW DIRECTION
- X — EXISTING SEWER TO BE ABANDONED

ABBREVIATIONS

SWC	SYDNEY WATER CORPORATION
SPS	SEWERAGE PUMPING STATION
Ø	DIAMETER
IL	REDUCED INVERT LEVEL

AUSTRALIAN HEIGHT DATUM

20 0 40 80 120m
SCALE 1:2000

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TITLE
INTEGRATED WATER MANAGEMENT PLAN
SYDNEY WATER CORPORATION GRAVITY SEWER DEVIATION TO SPS1129 AND DECOMMISSIONING OF SPS0014

SCALE	DRAWN	DESIGNED	CHECKED	APPROVED
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DATE	DRAWING No.	ISSUE
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Login Name: mcpeka

APPENDIX B - BARANGAROO HEADLAND PARK MAIN WORKS APPLICATION INFRASTRUCTURE REPORT – LIGHTING, ELECTRICAL AND TELECOMMUNICATIONS

BARANGAROO HEADLAND PARK

MAIN WORKS APPLICATION

INFRASTRUCTURE REPORT

LIGHTING, ELECTRICAL and TELECOMMUNICATIONS

MW-WAG-E-S3-9101

PREPARED BY:

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20 OCTOBER 2010 I139CREP001E.DOCX ISSUE E

BARANGAROO HEADLAND PARK

INFRASTRUCTURE & SERVICE PROVISIONS

ELECTRICAL, LIGHTING, TELECOMMUNICATIONS, SECURITY & MECHANICAL

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	TENDER	
	CONSTRUCTION	

Authorised By:	FRED PENTECOST
Date:	20 OCTOBER 2010

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APPENDIX A – CARPARK VENTILATION
APPENDIX B – CARPARK LIGHTING
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APPENDIX D – SEA WATER COOLING FOR CULTURAL CENTRE
APPENDIX E – LANDSCAPE LIGHTING

BARANGAROO HEADLAND PARK
INFRASTRUCTURE & SERVICE PROVISIONS

1. GENERAL

This report describes the infrastructure and services provision for the Barangaroo Headland Park including:

- 300 car carpark.
- Cultural Centre space of approximately 100,000 cubic meters.
- Landscape lighting.
- Public Amenities.
- Sewerage Bypass.
- Temporary Sewerage Pumping Station.
- Power Supply Infrastructure.
- Communications.
- Security.

Services chosen for these works will be in line with the ESD report submitted by Built Ecology including:

- Efficient Lighting.
- Low energy ventilation and air-conditioning systems.
- BMS control of services.
- Provision of submetering.

2. CARPARK

2.1 Mechanical Ventilation

The underground carpark with need to have both a Supply and Exhaust ventilation system which will be designed to minimize fan power.

The system will include 4 plantrooms providing separate supply and exhaust fans for each carpark level.

2.2 Lighting

The carpark lighting will be by high efficiency twin 28W T5 diffused fittings. Twin T5 is selected for the following reasons:

- Average of 56 Lux is obtainable with 2 twin 28W fittings per 17m bay.
- Twin fittings maintain reasonable lighting uniformity even when 1 lamp fails in a fitting.

2.3 ESD Proposals for Carpark

2.3.1 Mechanical

- CO monitoring on each level of the carpark will be used to adjust the level of ventilation to that required to maintain sate conditions via variable speed drives on fans. Patrons will be encouraged to use the top carpark in times of low demand which will allow L2 carpark ventilation to be minimized.

2.3.2 Lighting

- Recommend painting roof and walls a light colour to improve lighting efficiency.

- The light fittings will be fitted with dimmable ballasts which will be controlled by photocells to maintain required light level over life of lamp, saving energy and extending the life of the lamps. Target light level will be adjusted to provide comfortable conditions down to a minimum of 40 Lux as required by the standard.

- Carpark lighting will be controlled by time clock and occupancy sensors allowing separate control of each carpark level. Patrons will be encouraged to use the top carpark in times of low demand which will allow L2 carpark lighting to be minimized.

2.3.3 Electric Car Charging

- To encourage low emission transport, at least 20% of the car park spaces will be provided with Electric Vehicle Charging spots.

3. CULTURAL FACILITY

3.1 Air-conditioning

A space of approximately 75,000 to 100,000 cubic meters is to be provided for a future cultural space. Provision will be made for air-conditioning of this space to allow maximum flexibility of use up to the standard required of an Art Gallery or Museum with a maximum population of 3,000.

Ultimately this system will require the following plantrooms:

- 2 air handling plant rooms per floor.
- 1 chiller plant room at basement level.
- 1 seawater pump chamber below sea level to be located under the foreshore path for sea water heat exchangers and pumps.

The initial construction phase will provide an empty shell and plant rooms to be fitted out at a later stage plus other essential facilities which would be difficult to construct later including:

- Chiller plant room
- Seawater pump chamber
- Cooling water pipework between the chiller plant room and seawater pump chamber.

Mechanical ventilation will be provided to allow use of the space in the interim for events for up to 2,000 people.

3.2 Lighting

Provisional allowance in the electrical infrastructure for the following lighting concept:

- Supplement natural light from the atrium with background lighting to allow safe use of the space. The lighting scheme will include extensive switching and dimming to provide the flexibility required for multiple uses of this space.
- Provision for display and event lighting will be via power outlets in strategic locations.

The initial construction phase will provide an empty shell with sufficient lighting to allow flexible use of the space in the interim for events for up to 2,000 people.

3.3 ESD Proposals for Cultural Centre

3.3.1 Mechanical

- An advanced Air-conditioning design such as active mass cooling will be incorporated in the future fitout.
- Heat rejection will be to the harbour.
- CO2 monitoring will be used to control outside air supply when occupancy is less than full capacity.
- Variable speed drives on supply air fans and chilled water pumps.
- The opportunity for mixed mode ventilation (Natural with supplementary Mechanical) will be investigated during detail design.

3.3.2 Lighting

- High efficiency lighting will be provided.

4. LANDSCAPE LIGHTING

The objective is to provide efficient, glare free lighting which is aesthetically pleasing, blends in with the landscape and requires minimal maintenance. The scheme is to provide sufficient lighting to attract people to Barangaroo Headland Park at night, breathing life and vitality into the space in an innovative manner to reveal the character and quality of the park and all of its component parts. Pedestrian lighting will be designed to minimise light pollution.

Australian Standards are as follows:

Pedestrian / cycle activity	**Risk of crime**	**Need to enhance prestige**	**Applicable lighting subcategory**	**Average Horizontal / Minimum Vertical Illuminance**
N/A	HIGH	N/A	P1	7 / 2
HIGH	MEDIUM	HIGH	P2	3.5 / 0.7
MEDIUM	LOW	MEDIUM	P3	1.75 / 0.3
LOW	LOW	N/A	P4	0.85 / na

City of Sydney Standards are as follows:

Category	**Default Lighting Level**
Parks – Med/High Crime: Selected Areas	P1
Parks – Med/High Crime: Pathways	P2

Parks – Low Crime: Pathways	P3
Walkways, Tunnels, Steps, Connecting Elements	P3

For a satisfactory video camera performance, a minimum vertical level of illumination back to the camera of 4 lux at a height of 1.5m is required.

Proposed levels are as follows:

- Foreshore walk and bike path lights P1 reducing to P2 in times of low occupancy.
- Major park paths P3 at intersections, stairs and selected locations to allow operation of security cameras reducing to P4 for the rest of the path
- No lighting is to be provided for the bush paths to discourage use at night.

4.1 Foreshore Walk

A single row of multipurpose poles will be installed on the park side of the paths. The path light fittings will be designed to provide good colour rendering and low glare. Other fittings will be used to accentuate the different colours and textures of the landscape including shoreline where accessible and built elements along the promenade such as "The Crescent".

4.2 Park

Pathways will be lit via pole mounted light fittings.
Inground fittings and up-down bollards will be used to light trees and rock features around the lawns.
Safety lighting will be provided at stairs and lighting levels will be subtly raised in selected areas to allow operation of Security Cameras.

4.3 ESD Proposal for Landscape Lighting

- Selection of High efficiency light fittings.
- All park lighting to be controlled to suit ambient lighting conditions and general occupancy levels.
- Foreshore walk lighting to be stepped down for periods of low occupancy.

5. PUBLIC AMENITIES

Natural lighting to be used where possible, supplemented by long life LED fittings controlled by light sensors.

Park amenities to be ventilated naturally.

6. SEWERAGE BYPASS

Sewer bypass pumps to be connected to the nearest landscape lighting DB.

7. TEMPORARY SEWERAGE PUMPING STATION

The temporary sewerage pumping station will require:

- 50kVA of power.

- Controls and telemetry.
- Mechanical ventilation.
- Light and power.
- Connection to communications.

8. POWER SUPPLY INFRASTRUCTURE

8.1 Services to be Retained and Protected during early works

- The maritime control tower has 2 supplies; the main supply is from Merriman Street which is run down the face of the rock face behind the tower and the secondary supply is from Towns Place reticulating along the base of the sandstone rock-face to the base of the tower.

- The Sewer pump station SPS14 receives supply from Towns Place and is reticulated via the existing underground conduit and pit system. Existing underground route to be coordinated with water and sewerage works to ensure it is protected.

- Navigation lights and existing public amenities demountable to have replacement underground supply provided by Lend Lease.

8.2 Services to be Demolished

- The 5 existing light towers in the Headland Park zone are to be demolished and electrical supply's disconnected.

8.3 New Services

The development will be constructed in multiple stages:

- Early Works / Site Establishment: November 2010 – June 2011
- Main Works: June 2011 – December 2014
- Future Works: To be determined

Early Works will comprise:

- Site establishment including establishment of temporary kiosk substation.
- Demolition works including removal/disconnection of existing electrical services supplied from existing 5kV system via substation S.2124.
- Retention of existing electrical supplies to the Sewer Pump Station SPS0014 and Maritime Control Tower.
- Modification to existing services including electrical supply re-establishment to Gate 3 and navigation lighting to the north and Gates 4 and 5 in the central zone.
- Establishment of electrical supply to the International Passenger Cruise Terminal located in Stage 2.
- Receipt of fill from the Lend Lease Stage 1 site.
- Sandstone extraction.
- Heritage protection of the existing Sewer Pump Station SPS0014.

Main Works Stage 1 will comprise:

- Demolition works including decommissioning of Sewer Pump Station SPS0014.

- Establishment of the Underground Carpark and Cultural Facility shell-only, including establishment of chamber substation for permanent supply.
- Establishment of new sewer pump station.
- Establishment of on-site renewable energy generation in the form of photovoltaics required to offset public domain energy consumption.
- Foreshore Promenade and Cafe.
- Parkland and Upper Bluff interconnections to Merriman Street.
- Re-configuration of electrical supply to the Maritime Control Tower.

Future works will comprise:

- Cultural Facility fitout.
- Establishment of sea-water cooling system for the cultural facility.

8.4 Maximum Demand

Based on preliminary designs, and using AS3000, we estimate the electrical demand for the Early Works and Main Works stages to be as follows:

Load	Early Works	Main Works	Future Works
Temporary Construction Supply	300	300	
Gate 3 and Navigation Lights	35	35	35
Gates 4 & 5	40	40	
International Cruise Terminal	400	400	
Carpark Lighting		10	10
Carpark Ventilation		90	90
Electrical Vehicle Charging		210	210
Cultural Facility Light & Power		100	500
Cultural Facility Air-Conditioning			700
Cafe		50	50
Sewerage Pumping Station	Existing	50	50
Maritime Control Tower	Existing	45	45
Landscape Lighting		25	25
Total	**775kVA**	**1355kVA**	**1715kVA**

8.5 Proposed Augmentation To Existing Energy Australia Infrastructure

The following augmentation to the existing Energy Australia infrastructure is proposed to meet the Early Works and Main Works programs and their associated electrical supply demands.

On decommissioning of the existing 5kV substation S.2124 in October 2010, the existing electrical supplies to Gates 3, 4 & 5 and the Sydney Port harbour navigation lighting will require re-supply from an alternate source.

Temporary Headland Park Construction Supply
The Headland Park Early Works will require a 400Amp 3ph electrical supply from a new kiosk substation for temporary construction supply. Locate the new kiosk substation adjacent to Gate 4 Hickson Road.

Existing International Passenger Terminal

The Interim Cruise Terminal is currently running on generators and is planned to continue operations until 2012. BDA are investigating the feasibility to provide a mains supply from the temporary kiosk substation for the Headland Park.

Headland Park Permanent Supply
The Headland Park Main Works has an ultimate estimate maximum demand of 1725kVA. It is proposed to establish a two transformer chamber substation to service the permanent electrical supply for the Headland Park. As a mandate of the Barangaroo Planning Approval, kiosk substations are not permitted in the public domain and only concealed chamber substations are permitted. Therefore plant space for a permanent future chamber substation is to be provided in the Cultural Centre.

Underground Chamber Substation requirements:

- 2 x 1,500kVA transformer Chamber Substation.
- 100sqm with 4m clear height.
- Large vehicle access over with trapdoor access into chamber.
- Mechanical ventilation.

8.6 Main Switchroom

The Headland Park will require a main switch room of 4m x 6m to be located next to the Chamber Substation.

The switchroom will contain:

- Main Switchboard 6m.
- Metering
- Power Factor Correction Panels
- Carpark DB.
- 1 Electric Vehicle charging DB.

9. COMMUNICATIONS

The Communications Infrastructure shall support the following services:

- Site wide distribution of Closed Circuit Television (CCTV) signals to provide Public Domain Security and Safety.
- Site wide distribution of communications carrier and service providers communication media.
- Site wide distribution of Mobile Telephony/data signals from the Campus Distributor.
- Site wide distribution of terrestrial networks such as G-PON plus high speed bandwidth for the National Broadband Network technologies.
- Localized Barangaroo website to increase community awareness of environmental and sustainability issues.
- Interactive display for public transport timetable.

The Communications provisions include:

- A Building Distribution room to accommodate the main distribution frames (MDF) and provider head end equipment.
- Communications Room requirements:

Area: 4m x 4m
Base Option: Located in the carpark
Otherwise: Located in the Cultural Centre

- Provision of incoming lines to the building for three (3) carriers/service providers.
- The building shall incorporate antennas and amplification equipment to ensure mobile phone reception.

The Communications infrastructure to be provided in the Barangaroo Precinct shall support the goals of the City of Sydney Sustainable Sydney 2030 policy initiatives. This shall be achieved through the provision of real-time reporting on energy and water consumption, being an enabling technology for the reduction of energy and water consumption, as well as the provision of environmental, sustainability, landscape and ecology initiatives information through a Barangaroo specific web site.

The ICT infrastructure shall:

- Include site wide pit and pipe system with optical fibre, a Management Control System complete with interfaces to sustainable and energy infrastructure and localized displays for the monitoring and reporting of sustainable initiatives impacts.
- Be based on open systems – Internet protocol TCP/IP.
- Be site wide – common data base.
- Operate as a local intranet.
- Have an internet portal.
- Operate in real-time.

The pit and pipe network shall provide independent routes from a common Campus Distributor (CD). Conduits shall be 100mm diameter communications conduits compliant with ACIF standards.

Optical fibre cables shall run in "star" configuration from the Campus Distributor. The Optical fibre cables shall be multi-core OM3 Multimode and multi-core Single Mode cables. The OM3 multimode cables shall support 10Gb per second data rate and the single mode optical fibre shall be capable of exceeding 10Gb per second data rate.

A Management Control System (MCS) shall be installed to gather data from and control plant situated throughout the precinct. The MCS hardware components shall be open systems based as shall the applications software.

10. SECURITY

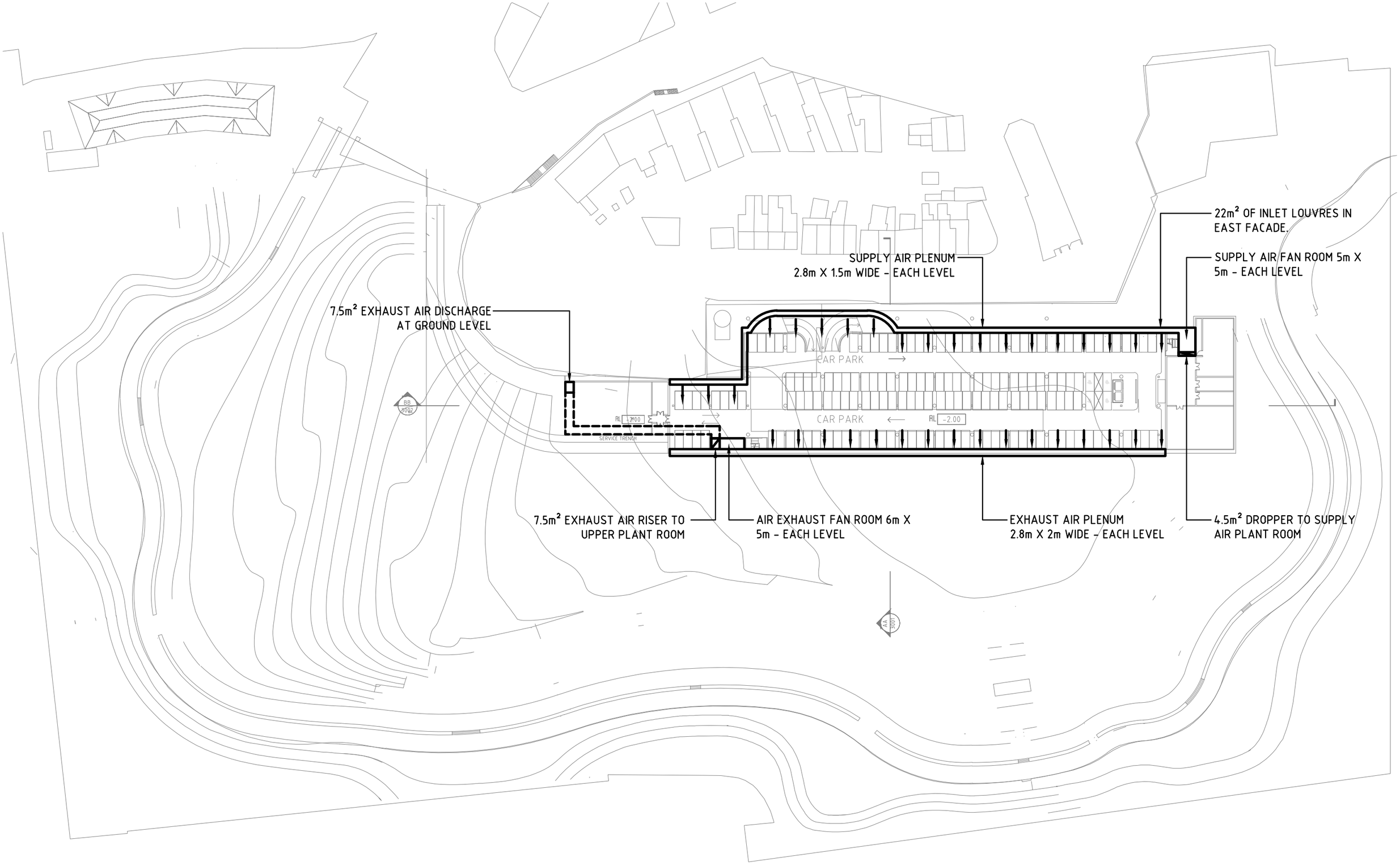
A security / intercom / access control / CCTV system shall be provided for the public domain/carpark and incorporates the following elements:

- Access control/carpark ticketing system to carpark vehicular entry and CCTV monitoring of all entries and exits.
- CCTV monitoring of lifts.
- CCTV monitoring of external public domain areas. External lighting to be adjusted to meet the minimum level required for effective CCTV operation.
- Communications links for off-site remote CCTV monitoring.
- External passive security, consisting of bounding perimeter landscape features and lighting.

CCTV cameras will be linked back to a central security monitoring centre. Monitoring and vehicle identification facilities are to be nominated by the BDA if necessary.

A public area duress system may be considered, and if provided shall be linked to the monitoring facility with speaker annunciation.

APPENDIX A – CARPARK VENTILATION



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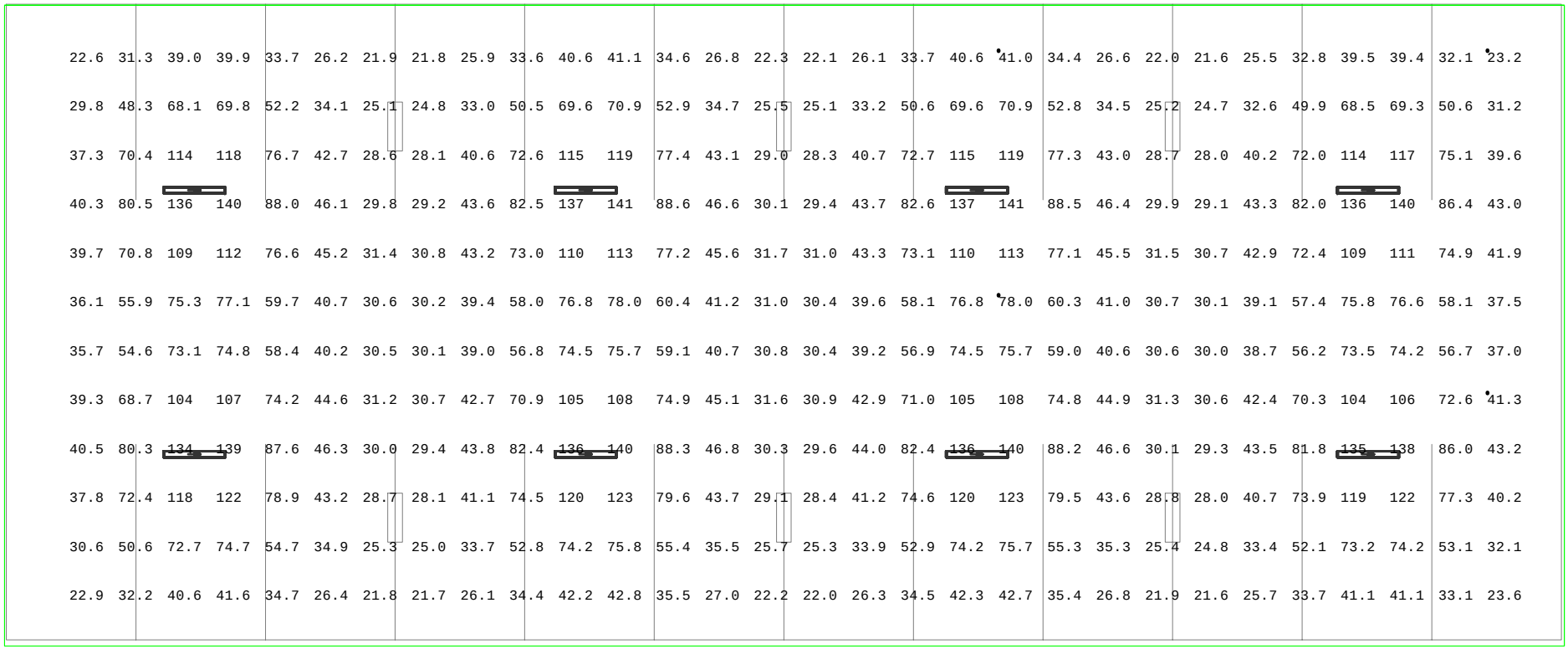
BARANGAROO HEADLAND

PWP Landscape Architecture
739 Allston Way, Berkeley, California 94710
Johnson Pilton Walker
Level 10, Plaza Building Australia Square, 95 Pitt Street, Sydney NSW 2000

MAIN WORKS APPLICATION
CARPARK & FUTURE CULTURAL FACILITY
CARPARK VENTILATION

MW-WAG-E-S3-1002 REV. 00 11th October 2010

APPENDIX B – CARPARK LIGHTING



Luminaire Schedule						
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	8	EL-DEN-228-100-000	SINGLE	2600	0.700	2x28W T5 REEDED LONG DIFFUSED BATTEN

Calculation Summary							
Label	**CalcType**	**Units**	**Avg**	**Max**	**Min**	**Min/Avg**	**Min/Max**
CARPARK	Illuminance	Lux	56.99	141	21.6	0.38	0.15

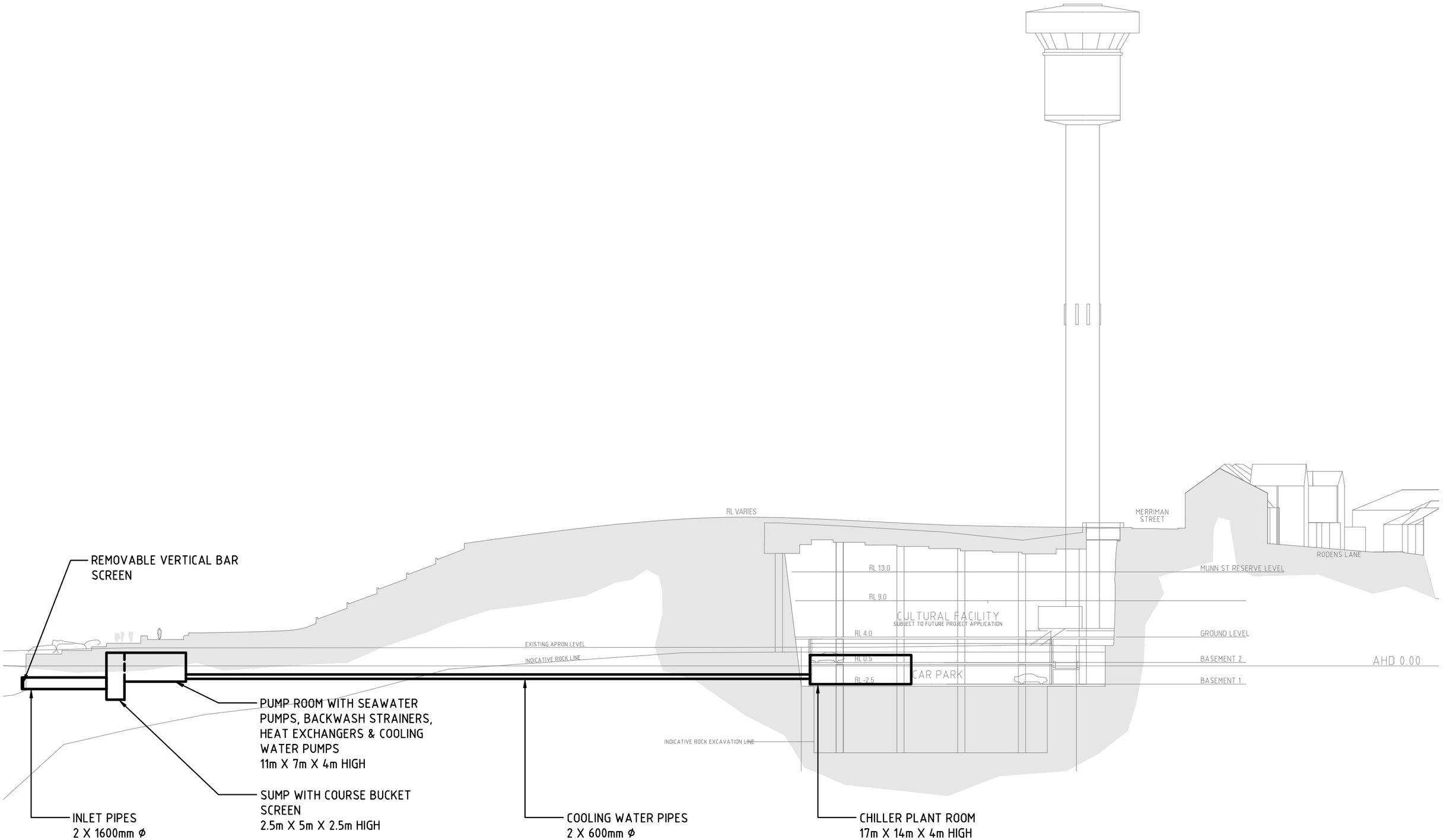
APPENDIX C – ELECTRIC VEHICLE CHARGING

Renault Megane charging at Better Place Standard Charge Spot



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APPENDIX D – SEA WATER COOLING FOR CULTURAL CENTRE



1:500 @ A3

0 5 10 15 25m

BARANGAROO HEADLAND

PWP Landscape Architecture
739 Allston Way, Berkeley, California 94710
Johnson Pilton Walker
Level 10, Plaza Building Australia Square, 95 Pitt Street, Sydney NSW 2000

MAIN WORKS APPLICATION
CARPARK & FUTURE CULTURAL FACILITY
SEAWATER COOLING DETAILS

MW-WAG-E-S3-3001 REV. 00 11th October 2010

APPENDIX E – LANDSCAPE LIGHTING



CHARACTER IMAGES





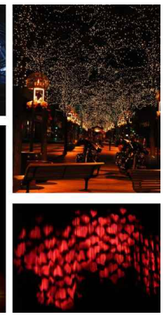


UP/DOWN POLES







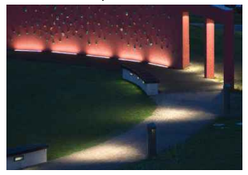


CATENARY SYSTEMS & PROJECTIONS









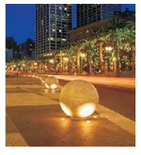
UNDER STEP LIGHTING / FLOOR / WALL WASHING



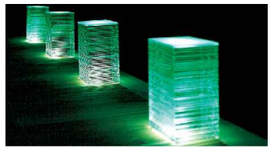




POLE LIGHTING



LIT OBJECTS











UNDERBENCH LIGHTING

LEGEND

	4 - 8 OFF LED SPOTLIGHTS WITH MEDIUM BEAM SPREAD ON CUSTOM CURVED POLES WITH RANGE OF ACCESSORIES. IP65. 4000K	8m HIGH. SPOTS @ 5m, 6m & 7m
	2 - 3 OFF LED SPOTLIGHTS WITH MEDIUM BEAM SPREADS FOR PATH & ADJUSTABLE NARROW BEAM SPOTLIGHT FOR TREE FOLIAGE. IP65. 4000K	4m HIGH.
	RECESSED LED WALL LIGHT WITH ASYMMETRIC FLOOR WASH DISTRIBUTION. IP65. 4000K	WALL RECESSED.
	RECESSED LED INGROUND CONTINUOUS STRIP LIGHT WITH ASYMMETRIC WALL WASH DISTRIBUTION. IP68. 3000K	INGROUND.

1:1000 @ A3

0 10 20 30 50m

BARANGAROO HEADLAND

PWP Landscape Architecture
739 Allston Way, Berkeley, California 94710
Johnson Pilton Walker
Level 10, Plaza Building Australia Square, 95 Pitt Street, Sydney NSW 2000

MAIN WORKS APPLICATION
CARPARK & FUTURE CULTURAL FACILITY
HEADLAND PARK - LIGHTING CONCEPT PLAN

MW-WAG-E-S3-1001 REV. 01 18th October 2010

APPENDIX C - INFRASTRUCTURE AND SERVICES PROVISIONS – CIVIL WORKS

RobertBirdGroup

Infrastructure and Services Provisions – Civil Works

Barangaroo Headland Park

Issue: D

Prepared For: Barangaroo Delivery Authority

Project No.: 10400C

12 October 2010

ISO 9001:2008
FS 520893

Report Amendment Register

Issue	Section & Page No.	Issue/Amendment	Author/ Initials		Project Engineer	Reviewer/ Initials		Date
A	Entire Document				PD			02/09/10
B	Title	Revise Report Title	AS	PD	PD	BG		10/09/10
B	Entire Document	Revise to A4 Format	AS	PD	PD	BG		10/09/10
B	Limitations Pg7	Relocation limitations	AS	PD	PD	BG		10/09/10
B	Information Relied Upon Pg1	Revised list of reports from other consultants	AS	PD	PD	BG		10/09/10
C	1.1 / Pg 1	Revised heading and paragraph information	AS	BG	PD	BG		08/10/10
C	2.1 / Pg 2	Revise heading and entire paragraph content	AS	BG	PD	BG		08/10/10
C	2.2 / Pg 2	Revise heading and delete partial amount of content	AS	BG	PD	BG		08/10/10
C	2.3 / Pg 2	Delete entire section	AS	BG	PD	BG		08/10/10
C	2.4 / Pg 2	Revise part of content	AS	BG	PD	BG		08/10/10
C	2.5 / Pg3	Delete partial sentence	AS	BG	PD	BG		08/10/10
C	3.1 / Pg 4 & 5	Rename section and revise / delete large amount of table information	AS	BG	PD	BG		08/10/10
C	3.2 / Pg 6	Revise partial information / update table	AS	BG	PD	BG		08/10/10
C	3.3 / Pg 6	Revise partial information	AS	BG	PD	BG		08/10/10
C	4.1 / Pg 8	Add information to content	AS	BG	PD	BG		08/10/10
C	4.2 / Pg 8	Add information to content	AS	BG	PD	BG		08/10/10
C	4.3 / Pg 8	Delete partial content and replace with new content.	AS	BG	PD	BG		08/10/10
C	5.0 / Pg 9	Delete entire section	AS	BG	PD	BG		08/10/10
D	3.2 / Pg 6	Table amended	AS	BG	PD	BG		12/10/10
D	Pg 9	Drawing reference deleted	AS	BG	PD	BG		12/10/10

ISSUE ACCEPTED BY:

AUTHOR:

……..
PAUL DA ENCARNACAO
Signing for and on behalf of
Robert Bird Group Pty Ltd
Date:

REVIEWER:

……..
BRUCE GUNN
Signing for and on behalf of
Robert Bird Group Pty Ltd
Date:

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1.0 Scope of Report

1.1 Extent of Headland Park and Northern Cove Area

The extent of the Headland Park and Northern Cove area is shown on the landscape drawings.

1.2 Information Relied Upon

Please refer to the list of assumptions below. The following information has been relied upon in the preparation of this Report:

- Barangaroo South – Concept Plan Amendment (MP06_0162 MOD 4) Geotechnical Report by Arup Pty Ltd
- Architectural drawings received from Johnson Pilton Walker Pty Ltd.
- Landscape Architectural drawings received from Peter Walker Partners Landscape Architecture Pty Ltd.
- Verbal and written advice received from geotechnical and geohydrological engineers, Douglas Partners Pty Ltd.
- Verbal and written advice received from project managers, InfraSol Group.
- Costing information received from quantity surveyors, Altus Page Kirkland.
- General information in regard to the site and the Headland Park received from the client, Barangaroo Delivery Authority.
- WSP Environment & Energy Draft Report – Soil & Water Report to Support the Environmental Assessment (September 2010).
- AgEnviro Solutions Report on Water Balance (September 2010).

2.0 MATERIAL PROPERTIES

2.1 Materials from Barangaroo South

Fill material will be sourced from Stage 1 that meets the HHERA and RAP requirements.

2.2 Materials from Headland Park and Northern Cove

In general, these materials are to be taken from the excavations for:

- Foreshore construction
- Northern Cove excavation
- The sandstone extraction area.

2.3 Compaction of Filled Materials

It is proposed that the compaction of fill materials at 98% Maximum Standard Dry Density (MSDD).

It is considered that 98% MSDD will provide a cost-effective and attainable density index, while reducing short and long term consolidation and settlement to acceptable levels.

2.4 Consolidation and Settlement

Despite placement and compaction of filling materials as above, it is expected that further consolidation and settlement will occur in the Headland Park.

Initial volume decrease on filling materials due to dewatering and compaction of filling materials during construction will occur. These effects will be accounted for in the construction methodology and are not expected to affect the ongoing performance of the Headland Park.

Initial compaction of materials will be carried out in accordance with the Civil Engineering and Geotechnical Specifications to be produced. It is anticipated that the thickness of filling layers will be restricted to 500mm and that fill material compaction will be specified at generally 98% of Maximum Standard Dry Density.

Ongoing consolidation and settlement is generally vertical in direction only and can usually occur due to:

- Further compaction of materials due to self weight and applied loading to the surface, and
- Further changes to the moisture content of filled materials in-situ or by migration of moisture and small soil particles.

The timing and amount of ongoing consolidation will be affected by the properties of the filling materials and should be confirmed by geotechnical investigation and further testing.

Most of the expected settlement generally occurs within 3 to 5 years for earth structures such as this, with settlement usually slowing in rate but continuing for many years, to the 100 year design life. The practical limit of long-term settlement of filling is generally taken as 100 years.

From initial Geotechnical advice, it is expected that initial settlement during the construction phase will be in the order of 285 to 300mm for the total maximum thickness of fill zone.

For a total depth of filling of up to 21m, Geotechnical review suggests that the anticipated long-term settlement may be approx 0.25% to 2.0% of the total fill depth (up to 0.42m).

Expected settlement will need to be considered for:

- Design of structural elements,
- Design and functioning of infrastructure,
- Long-term stability of steep batter slopes and earth retaining structures,
- Control of cracking and waterproofing, and
- Determination of site survey and planning control on height of the fill.

3.0 CIVIL ENGINEERING

3.1 Basis of Design – Headland Park and Northern Cove

The following basis of design in regard to Civil Engineering issues have been made.

Issue	Assumption
Headland Park shape	The layout has been prepared by JWP and PWPLA and has been adopted for the Design. Allowance to be made for future high-level built space adjacent to the Cultural Facility. Contours are to finished surface – no fill etc to be above contour level, except as noted for fill batter options below.
Sequence of construction	The general fill and cut sequence to be: 1. Site establishment and preparation. It is noted that, in general, the existing surface and infrastructure will not be removed. Where necessary, existing services will be blocked and capped as part of the preparation stage. 2. Drainage layer and levelling layer. 3. Material won from Barangaroo South to be delivered to Headland Park and Northern Cove site, placed and compacted. Dewatering, screening and any other treatment of the material from Barangaroo South will be undertaken as necessary to allow placement and compaction in accordance with Civil and Geotechnical Specifications. Refer as well to Materials Properties, in the Concept Design report. 4. Retaining walls (concurrent) and 5. Sandstone excavation and re-use(concurrent) 6. Cut from Headland Park and Northern Cove (foreshore, Northern Cove etc) and fill to Headland Park and Northern Cove.
Topsoil	Minimum 500mm topsoil thickness as nominated by Sydney Environmental Soil Laboratories. Topsoil will be blended and mixed from fill materials
Fill Batters/Slopes	Fill batters are shown on Landscape Architecture drawings up to 1 (vertical) to 1.5 (horizontal). Fill slopes of 1:3 and steeper require retaining required, using precast concrete walls.
Foreshore Treatment	Rock protection / retaining required, using sandstone material extracted from Headland Park and Northern Cove.
Sandstone Extraction	Sandstone extraction volume to be minimised, but to include allowance for: o Wastage, which includes fine material, broken and out-of-specification rock, preparation works, such as establishment of a working face of solid stone, etc. o Provision of sufficient solid and durable stone for use on foreshore, batter protection works only. o Crushed sandstone or other sandstone material as required for Headland Park and Northern Cove o Excess sandstone material for other Barangaroo sites or off-site. Location of the sandstone extraction area is subject to detailed geotechnical and geological investigation and is expected to be within the footprint of the carpark and Cultural Facility on Headland Park and Northern Cove.
Sandstone Re-use	Up to 30% wastage assumed from the extraction. This material is to be used on site as topsoil conditioning and select material and may require crushing or treatment for its end use.

Issue	Assumption
Retaining Walls	Permanent retaining walls are to be reinforced concrete. A combination of reinforced earth technology, tensile reinforcement or backfill materials will be used to provide stability behind retaining walls, subject to final Geotechnical Engineering design.
Seepage Drain Layer and Seepage Water Reuse	Seepage drain layer is to be provided under the Headland Park filling zone. Seepage drain layer is to be provided by a drainage cell capable of performing underneath fill materials up to 20m thickness. Minimum grade of the drainage layer is 1 in 100 (1%) adopted for Concept Design. A graded and prepared base is to be provided under the seepage drain layer using site material. Seepage drainage is to be directed to a system of perimeter drains, which will in turn convey water to a collection sump. Seepage water is to be pumped from the sump to a holding tank, treated as required, and reticulated for irrigation and landscape use.
Site materials	Allowance has been made to re-use all site materials, as above. It is assumed that no materials are to be removed from the Headland Park and Northern Cove site, unless it does not comply with HHERN and RAP. It is assumed that all concrete and other materials will be re-used on site and any crushing, blending, dewatering or other treatment will be carried out to allow these materials to conform to the requirements of the Civil and Geotechnical Specifications, where relevant.
Pavements	Public area pavements assumed from existing site level to nominated levels. Pavements assumed as imported materials and not included within contour / filling analysis.

3.2 Material Properties

The materials required for construction of the Headland Park will be obtained from the following sources:

1. Soil and other material from excavation of the Barangaroo South basement and other site excavations, and
2. Material obtained from excavation of the foreshore profile and other locations on Headland Park and Northern Cove.

The engineering properties of materials to be used for various purposes in the filling are outlined below.

Filling Type	Maximum particle size (mm)	Grading (mm)	CBR (%)	PI (%)	Friction Angle (degrees)
General filling	150	N/A	2	N/A	N/A
Select filling	75	50% max passing 0.075mm sieve	15	2 to 14	Min 28
Sandstone fines for topsoil and subsoil generation	15	20% max passing 0.075mm sieve		N/A	N/A

3.3 Fill Batter Slopes

As stated in the Assumptions above, fill batter slopes have been set at up to 1:1.5 by the Landscape Architect. This batter slope is not a common naturally-occurring slope in this environment and may present a number of difficulties in design, construction and service. In particular, the following issues are paramount:

- Slope stability
- Consideration of potential failure modes,
- Public safety and access,
- Aesthetics,
- Landscape treatment,
- Plant selection,
- Soil retention, erosion control, and
- Maintenance considerations

Detailed assessment of the proposed tensile reinforcement for the above options will be provided by Douglas Partners as part of the Geotechnical concept design, but in brief, tensile reinforcement is proposed to provide security against slip circle failure of the fill batter, and to provide anchorage to precast concrete retaining walls and sandstone blocks where applicable and any other facing units.

The length, vertical spacing and grade of tensile reinforcement is determined by the following factors

1. Height of the fill and size of the potential slip circle, and
2. Angle of slope for the filled surface, and
3. Type of fill materials, their mass and internal angle of friction, and
4. Weight and mobility of facing units.

The concept design of tensile reinforcement and batter protection systems typically is a ‘trade-off’ between the relative costs of:

- Importing high quality backfill material to substitute for site material, with the associated cost for disposal of site material not required,
- Modification of site fill materials to improve the internal angle of friction,
- The length and area of tensile reinforcement,
- The aesthetics and function of an 'engineered' batter face,
- Suitability for solid anchorage of tensile reinforcement within the fill zone, using 'dead man' points or similar.

Modification of site materials as above is primarily a geotechnical engineering issue and will be identified by Douglas Partners as part of their assessment of the design.

4.0 EROSION AND SEDIMENT CONTROL

The control of erosion and sediments on the site will be achieved by a combination of the following systems:

- Preliminary works, and
- Temporary measures implemented during the earthworks phase, and
- Permanent treatment and control of runoff.

4.1 Preliminary Works

Preliminary works are detailed by InfraSol Group in the Preliminary Environmental and Construction Management Plan. (ECMP)

4.2 Temporary Measures

Temporary erosion and sediment control measures for the earthworks construction phase will be designed by Robert Bird Group as part of the detailed design. A soil and water management plan will be prepared in accordance with the InfraSol Group Preliminary ECMP. These measures will be generally in accordance with *Managing Urban Stormwater* by Landcom, NSW. Temporary measures will likely include the following:

- Construction access controls
- Temporary basins
- Silt control fencing
- Contour drainage measures

4.3 Permanent Treatment

Permanent treatment of potential erosion and sediment controls will be in accordance with the Integrated Water Management Plan.



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