SSD 5207 – Netball Central : Site 107 Sydney Olympic Park
Response to Issues raised in Submissions

Issue	Response
Sydney Olympic Park Authority – Submission dated 24 August 2012	
Forecourt Design	It is understood that the issues around the forecourt design are largely resolved (refer Scott Carver drawing package attached), with the exception of the final lighting design (see comments below) and other relatively minor issues (balustrade detail for ramp). It is understood that resolution of these matters will be discussed at a further workshop session with the Project Team and SOPA officers (which may achieve further resolution) but will ultimately be addressed via conditions of consent (to be recommended by SOPA).
Signage Venue identification and way finding signage has not been shown as part of this application and it is recommended that venue and wayfinding signage be considered under a separate application.	The provision of way finding signage is a matter for SOPA and it is understood that it will ultimately serve the Sports Centre, Netball Central and any future development on the adjacent Site 13. Provision has been made for location of way finding signage within the forecourt design (see Scott Carver drawing package). Building identification signage has not been resolved at this stage and will therefore be addressed via a condition of consent (to be provided to the Department of Planning and Infrastructure by SOPA). It is anticipated that signage will be the subject of a separate application to SOPA.
Forecourt and Pedestrian Lighting Specialist lighting designers have only recently been appoints to the project team and external lighting is not adequately addressed in the application (page 22 of the EIS). External areas that should be lit, eg. The colonnade area on the Boulevard and the pedestrian pathways from P7 car park to the Netball Centre entry which have not been mentioned in the EIS. The Preferred Project Report should address the following: • A lighting design is to be repared for all external areas including the forecourt, colonnade, pedestrian paths from P7 car park and Olympic Boulevard that complies with performance standards in the Authority's UEDM and the relevant Australian Standard.	The applicant acknowledges the need to provide appropriate lighting of external areas including the colonnade, the forecourt and the pedestrian pathways from the P7 car park to the Netball facility. It is understood that this will be addressed via a condition of consent to be provided to the Department by SOPA. From the Project Team's perspective it is a matter of timing for provision of the detail of the lighting design – the Project Team has indicated that "prior to Occupation Certificate" is the preferred trigger. In relation to affixing the lighting to the building, the Project Team expressed at its meeting with SOPA on 27 September 2012 that this was not desirable as it will necessitate a separate power supply, it is a liability issue for Netball NSW, safety

Issue	Response
• Lighting and CCTV is to be mounted on the State Sports Centre and Netball buldings, with provision for separate metering for lighting fixed to the Netball Central building.	concerns and maintenance. It is understood that SOPA will make a recommendation to the Department of Planning and Infrastructure for the inclusion of a condition of consent which will require lighting and CCTV to be provided "to the satisfaction of SOPA". This will provide sufficient flexibility for an acceptable design solution to be achieved.
Vehicle Access and Parking Vehicular access is still unresolved in the submitted application. • The relocated driveway which provides access to P7 car park is too close to Netball Central and awkwardly positions in relation to the roundabout and adjacent Shirley Strickland Ave intersection, resulting in potentially dangerous approach angles. • The proposal for larger vehicles exiting from P7 car park to manoeuvre around the roundabout before travelling north along the Boulevard is not supported. • The use and arrangement of the kerbsides along Olympic Boulevard to respond to the relocated entry (including accessible parking, bus drop off and merchandising vehicle parking) is not addressed in the submission. The development will result in the loss of 97 + car parking spaces from P7. The EIS and the Appendix 12 Traffic report does not address what impact this will have in terms of the operation of the Sports Centre or the Netball Central development especially during peak events modes when both facilities may be operating at capacity at the same time. It does provide an estimate of the potential additional traffic movements ie. vehicle movements and pedestrian but does not translate this into demand for car parking spaces. The Preferred Project Report should address the following: • The driveway alignment is to be tested by a swept path analysis to determine optimal location and alignment of the driveway. • The Olympic Boulevard kerbside area is to be included on drawings together with the revised forecourt design, and is to show the relocated bus set down, merchandising vehicle parking and accessible parking bays. • The application is to demonstrate that the proposed P7 car park design will allow large scale vehicles into / out of the loading docks at the Sports Centre without affecting routine traffic movements in the remainder of the P7 car park.	ARUP has provided the following information: The proposed driveway alignment has been designed to Australian Standards 2890.2 for an access to an off-street commercial vehicle facility. This process involved swept path analysis (refer **Attachment 1**) of the entry for the largest vehicle expected to utilise this driveway, which in this case constituted a 19m Articulated Vehicle. Consideration was given to the awkward position of the access in relation to Shirley Strickland Avenue, with the approach to the roundabout angled to provide the most amount of sight distance possible in that location. The existing square aspect of the intersection of Olympic Boulevard and Shirley Strickland Avenue does not allow long vehicles to turn left out of the development. Modifications to this kerb were investigated, however modification of the kerb line will result in unsafe conditions for pedestrians crossing Olympic Boulevard and it would also result in a non-standard roundabout configuration – affecting general roundabout use. Sports Centre operations requested a review of the possibility of rejection of vehicles at the entry to P7. The current design allows for rejection of cars on entry to P7, providing similar amenity to the existing arrangements. Discussions have been undertaken with SOPA regarding the most appropriate kerbside parking treatment. It was agreed to retain the current short term public parking at the far north (including accessible spaces) and extend the bus set down south between this point and the roundabout. It is further understood that details of the kerbside parking can be documented as part of the Public Domain Plan which SOPA will require and which will be recommended for inclusion as condition of consent. The loading dock of the Sports Centre is able to maintain its existing operations. Articulated vehicles were required to perform entry and exit manoeuvres when the car park is clear. However, heavy rigid vehicles are able to perform loading operations without affecting the car park. The development of Netball Central does not impact in these operations.

Issue	Response
Stormwater The proposed stormwater drain / detention channel on the southern side of the Netball Centre is both dangerous and unsightly and is not supported by SOPA. In addition, the submission does not demonstrate that thi channel has the capacity to provide adequate on-site SW detention. Roof drainage is not well resolved, with an excessive number of downpipes dominating the southern face of the building. Harvesting / reuse of this stormwater (eg. for toilet flushing, irrigation) is not currently proposed, with all rainwater collected from the substantial new roof area ultimately intended to flow to Boundary Creek (EIS p73). Under this scenario, upgrade of drainage outlets in BoundaryCreek is liekly to be required to provide for peak flows; the need and responsibility for such works is not identified in the EIS. The EIS identifies that on-site detention of stormwater is required to comply with SOPA's Draft Development Control Policy: Water Sensitive Urban Design, and that ARUP is undertaking further modelling and quantative asessment, with the size and location of the storage to be determined during detailed design (EIS p73). Stormwater management and reuse plans are integral to project design and impact assessment; the EIS is incomplete and potential impacts not able to be properly assessed without such information being provided. The Preferred Project Report should address the following: • A detailed Stormwater Management Plan is to be prepared and is to include calculations to demonstrate that the system can manage expected flows; • Further design refinements are to be made to integrate roof drainage into the overall design of the building. Any required open channels are to be screened, covered or integrated into a coordinated landscape solution; • Harvested stormwater should be reused (eg. for toilet flushing) rather than discharged, to minimise flow impacts to Boundary Creek from the proposed development.	Attached for SOPA's information is the following information: • Details of proposed on-site detention prepared by ARUP (refer **Attachment 2**); • An alternate solution for the integration of roof drainage and the treatment of the southern elevation of the building is illustrated at **Attachment 3** prepared by Scott Carver Architects; and • Advice from ARUP regarding water quality (refer **Attachment 4**).
Egress The EIS has not addressed egress from the existing State Sports Centre venue, which will be substantially affected by Netball Central. "Deemed to comply" egress solutions with operational, cost and management impacts for the Sports Centre management are unacceptable to SOPA.	Attached for SOPA's information is the following information: • Revised Fire Engineering advice prepared by ARUP (refer **Attachment 5**); and

<table>
<tr><th>Issue</th><th>Response</th></tr>
<tr><td>The proposed egress stair from Court 5 into the P7 Car Park is poorly positioned, leading directly onto the footpath and the car park. Reorienting the stair to be parallel to the footpath would provide some milling space at the base of the stair with less pedestrian and vehicle conflicts in an emergency situation.

The Preferred Project Report should address the following:

• The Fire Engineering Report in Appendix 9 of the EIS is to be amended to consider the impact on the Sports Centre.
• The application is to state that the development shall have no operational, cost or management impact on existing egress arrangements at the Sports Centre.
• Review the orientation of the egress stair from Court 5 as outlined above.
• Discussion is to be provided on the impacts of the loss of 97+ car parking spaces from P7.</td><td>• Drawing No. AD SK458 Issue A prepared by Scott Carver Architects which illustrates the egress route from the Show Court (refer Attachment 6).

In relation to the loss of parking in the P7 Car Park as a result of the proposed development, it is noted that there are several Car Parks in the vicinity of the site, all of which are available for public use and area controlled and managed by SOPA (see table below):

<table><tr><th>Car Park Name / Description</th><th>Number of Spaces</th><th>Number of Accessible Spaces</th></tr><tr><td>P2 – at grade car park for the Aquatic Centre</td><td>495</td><td>9</td></tr><tr><td>P3 – multi-storey car park off Sarah Durack Ave</td><td>1438</td><td>46</td></tr><tr><td>P3a – at grade car park adjacent to the Golf Centre</td><td>55</td><td>4</td></tr><tr><td>P4 – at grade car park for the hockey centre</td><td>980</td><td>32</td></tr><tr><td>P7 – at grade car park for the Sports Centre</td><td>263</td><td>4</td></tr><tr><td>TOTAL</td><td>3231</td><td>95</td></tr></table>
It is reasonable to assume that patrons will utilize those parking areas situated in closest proximity to the entrance to the facility. In order of preference, it is assumed that this would be – P3, P7 and P4.

It is also noted that Netball NSW has entered into a car park licence with SOPA which makes provision for 28 reserved spaces in the P7 Car Park and 80 unreserved spaces in the P4 Car Park (located to the west of the Sports Centre and Hockey pitches).</td></tr>
<tr><td>Electrical Substation

The new freestanding electrical substation is too prominent and impacts negatively on the presentation of this frontage, which has high visibility from the parking area. There is adequate clearance in the void below the seating area for the substation to be incorporated into the building envelope.

The Preferred Project Report should address the following:

• The substation is to be incorporated into the building envelope eg in the void below the Show Court seating area.</td><td>Ausgrid has advised that a chamber substation is required to service the proposed development. The requirements associated with access, clearances and the distance from the switchroom preclude its incorporation within the building envelope (under the Show Court seating area).</td></tr>
</table>

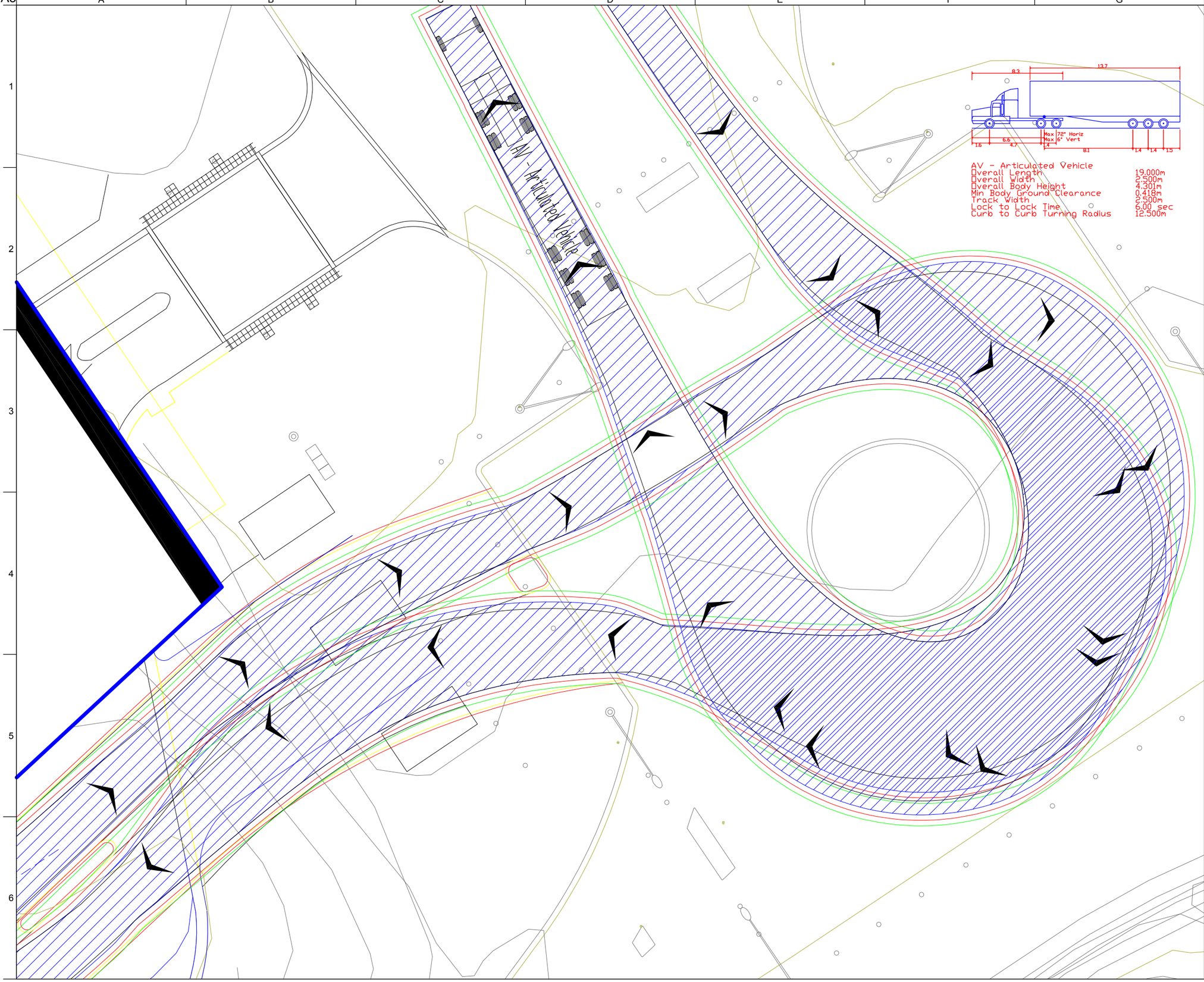
Issue	Response
Remediated Lands A small portion of the proposed development site is located on land subject to Notice 28040 issued under the *Contaminated Lands Management Act 1997,* being part of the Golf Driving Range landfill (which extends under part of the development site). This is recognised in the report (EIS S2.2.3 pp11; Appendix 10 – Remedial Action Plan), but is only addressed in terms of impacts to the proposed development, potential impacts to landfill integrity are not assessed. Treatment of the landfill 'edge' that will be created by the works is a key consideration, and must maintain landfill integrity and avoid water infiltration to the landfill. Notice 28040 requires that development of this nature on a landfill is approved by the EPA (this is a requirement upon SOPA, rather than the proponent).	Coffey Environments has issued a revised Remedial Action Plan (refer **Attachment 7**) which addresses the manner in which the edge of the landfill (in the event it is encountered during the works) will be treated. In summary, the following procedures will apply in the event the Golf Driving Range landfill and / or breach of landfill capping is encountered: • Any potential landfill / soil which already been excavated should be bunded and stockpiled on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25mm thickness, protected from erosion and all seepage retained; • Excavation works at that part of the site where the suspicious material (soil) was encountered should cease until an assessment is carried out by a suitably qualified environmental consultant; • Based on a visual assessment, the environmental consultant will provide interim advice on health and safety of remedial works, soil storage and soil disposal to allow remediation to proceed if possible; • Based on sampling and analysis of the material, the environmental consultant will provide advice as to remedial requirements for the excavated materials; and • Replacement of Landfill Capping, with a low-permeability clay cap and sand drainage layer to maintain landfill integrity, and the implementation of an overlying marker membrane or a barrier of hard pavement. A copy of the revised Remedial Action Plan dated 4 October 2012 is appended to this submission.
The SOPA Act The SOPA Act requires that "*in determining an application for consent to carry out development on land within Sydney Olympic Park, the Minister for Urban Affairs and planning must consider the consistency of the proposed development with the Environmental Guidelines"* (s22(2)). Relevant provisions of the SOPA Environmental Guidelines with regard to stormwater management are are: *4.1(b) requiring all new development to maximise opportunitites for building and infrastructure design to incorporate water collection and recycling systems*	Section 22 of the SOPA Act 2001 requires that any proposal must be considered in terms of its consistency with the Environmental Guidelines. Section 6.1.15 of the EIS included an assessment of the proposal against the key sustainability issues contained in the Environmental Guidelines. In addition to the information presented in that section of the EIS, in relation to section 4.1(b) it should be noted that connection to the WRAMS was duly considered as part of the application however this was deemed to be unachievable as the Netball Central development is lower than the treatment facility. In relation to section 4.1(c) regarding water quality or quantity, water quality devices and on-site detention has been designed to avoid adverse impacts on both quality and quantity of water in Boundary Creek (refer **Attachments 2** and **4**).

Issue	Response
4.1(c) avoiding adverse impacts on water quality or quantity in local streams, wetlands and groundwater from operations, developments, and major event activities at Sydney Olympic Park. The proposal as submitted is not consistent with the SOPA Environmental Guidelines with respect to stormwater management as the proposal does not currently address inclusion of a stormwater collection and recycling system, and impacts on receiving waters and on downstream flooding are not assessed (the EIS states that further modelling and quantitative assessment is yet to be undertaken). The Preferred Project Report should address the following: • The application is to show compliance with the SOPA Act.	Having regard to the above, it is considered that the proposed development has demonstrated due consideration for the provisions of the SOPA Act and the requirements set out in the Environmental Guidelines.
NSW EPA – Submission dated 6 August 2012	
The EPA has reviewed the relevant documents and does not have any regulatory responsibilities in relation to this matter and has no comment to provide on this proposal.	Noted. No further action required.
Office of Environment & Heritage – Submission dated 31 August 2012	
I advise that OEH has reviewed the EIS and has no comments.	Noted. No further action required.
Roads and Maritime Services – Submission dated 29 August 2012	
The RMS has reviewed the EIS and provides the following advisory comments to the Department of Planning and Infrastructure for its consideration in the determination of the application: • To address the transport / traffic and parking management issues during various "event" scenarios, the proponent will be required to prepare a Venue Management Operations Plan which is submitted to SOPA for approval prior to the issue of the Occupation Certificate for the site. This plan must detail how the Netball Central site will operate and how transport / traffic and parking issues will be appropriate managed under the following scenarios: (a) Concurrent usage of Sports Centre and Netball Central with maximum attendance for both sites; and (b) When Sydney Olympic Park is operating in Major Event mode (which includes when the Major Event buses are operating).	Noted. It anticipated that the Department will incorporate the matters raised by RMS as conditions of consent.

Issue	Response
Building Plan Approval The approved plans must be submitted to a Sydney Water Quick Check agent to determine whether the development will affect any Sydney Water sewer or water main, stormwater drains and/or easement, and if further requirements need to be met. Plans will be appropriately stamped. For further assistance please telephone 13 20 92 or refer to Sydney Water's website www.sydneywater.com.au for: • Quick Check agent details - see Building and Developing then Quick Check; and • Guidelines for Building Over/Adjacent to Sydney Water Assets - see Building and Developing then Building and Renovating Contamination The adjacent site is regulated by the Environment Protection Authority (EPA) under the below Maintenance of Remediation Notice http://www.environment.nsw.gov.au/resources/clm/docs/html/n28040.htm. Therefore, the applicant should seek independent advice on any contamination issues regarding the adjacent site. Sydney Water e-planning Sydney Water has created a new email address for planning authorities to use to submit statutory or strategic planning documents for review. This email address is urbangrowth@sydneywater.com.au. The use of this email will help Sydney Water provide advice on planning projects faster, in line with current planning reforms. It will also reduce the amount of printed material being produced. This email should be used for: • Section 62 consultations under the Environmental Planning and Assessment Act 1979 • consultations where Sydney Water is an adjoining land owner to a proposed development • consultations and referrals required under any Environmental Planning Instrument • draft LEPs, SEPPs or other planning controls, such as DCPs • any proposed development or rezoning that will be impacted by the operation of a Sydney Water Wastewater Treatment Plant • any proposed planning reforms or other general planning or development inquiries	

Attachment 1
Swept Paths
ARUP

A3



Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)

Issue	Date	By	Chkd	Appd
B	10/05/12	MAC	EKC	AMH
	Second Draft			
A	09/05/12	MAC	AMH	AMH
	First Draft			

ARUP

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Client
Netball NSW

Job Title
Netball Central

Car Park Entry
19m Articulated Vehicle

Scale at A3
1:200

Discipline
Traffic

Job No
222450

Drawing Status
For Information

Drawing No
SKT003

Issue
B

Do not scale

Attachment 2
Details of On-Site Detention
ARUP

Memorandum

ARUP

To	Josh Malin - Crown Project Services	Date	9 August 2012
Copies	Guy Rossiter - Crown Project Services Karen Seeto - Arup Alex Edwards - Arup Rob Fleury - Arup	Reference number	222450/SAB
From	Samantha Bennett - Arup	File reference	OSD01
Subject	Onsite Detention requirements for Netball Central Development		

The Netball Central development is a new building that is to be built in the forecourt of the existing Sports Centre at the eastern end of Olympic Boulevard.

The existing site is comprised of grass, pavement and car park areas. The existing car park is drained via a pit out-falling into Boundary creek via a headwall. The Sports centre forecourt is grassed with paved footways. Drainage from the paved areas are captured via trench drains which then connect via pipes to the road network in Olympic Boulevard while the grassed area permits ground infiltration with any excess water flowing to the road drainage network in Olympic Boulevard. The road network discharges into boundary creek on the north eastern side of the roundabout at Shirley Strickland Avenue and Olympic Boulevard, approximately 150m downstream of the outfall from the car park.

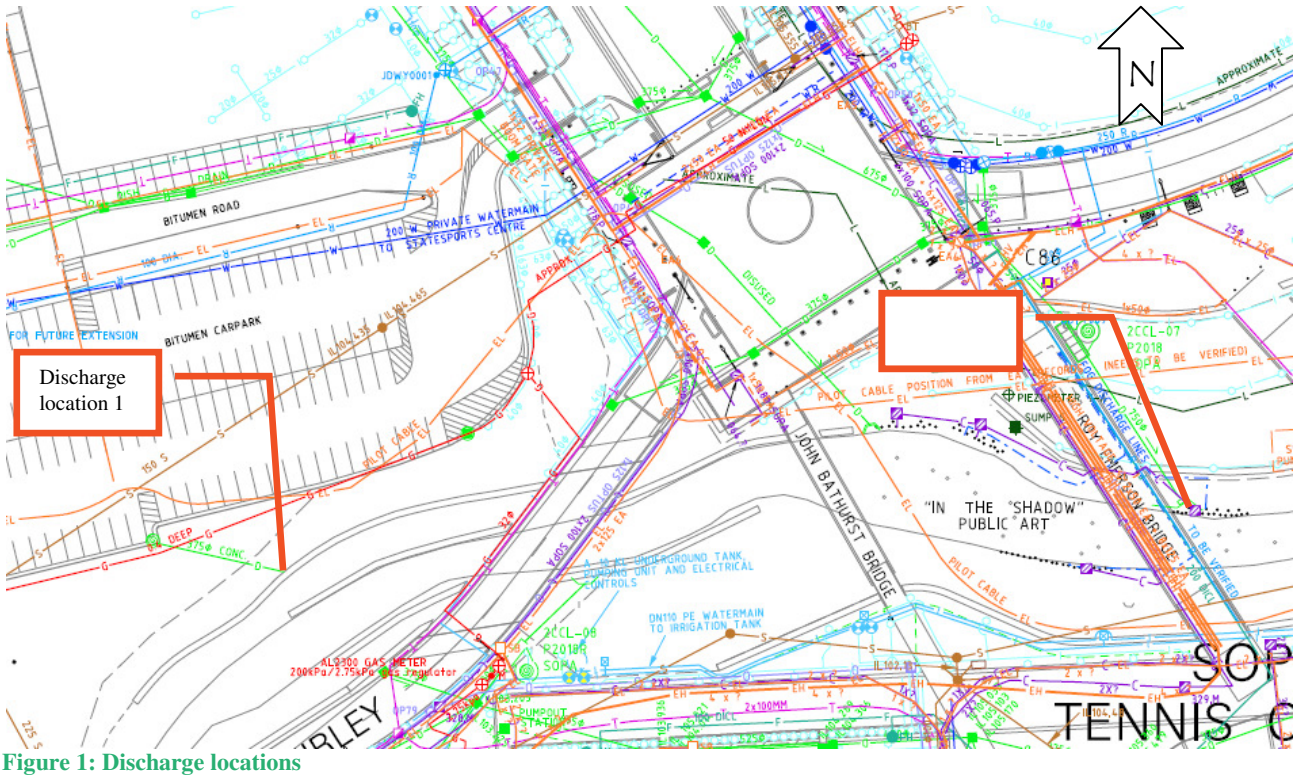

Figure 1: Discharge locations

Memorandum

The effect of the proposed building is that approximately 0.8ha of permeable grassed area is removed and replaced with the roof of the Netball Central building.

In accordance with SOPA's 'Draft Development Control Policy: Water sensitive urban design and construction stormwater management', flow management is required and specified as "Maintain a 1:5 year ARI peak discharge to pre-development magnitude" due to Boundary creek's status as a sensitive receiving water course. Due to the replacement of a pervious surface with an impervious finish, onsite detention is required.

Arup has modelled the existing and proposed sites to determine discharge rates and size the OSD for the 5 year ARI storm event.

Storms of 5 minute duration, 20 minute duration and 90 minute duration were considered for comparison as these three durations produced the highest flows.

The proposed development requires that a portion of the water currently discharging to Olympic Boulevard at discharge point 2, be redirected upstream to discharge at discharge location 1, located at the bottom of the car park as shown in Figure 1. Arup have evaluated the development discharge to the creek as a whole, given that both discharge points are in Boundary Creek and will hence drain to the same location. Refer to Table 1.1 for numerical outputs from the 'Drains' model.

Table 1.1

		Existing Site discharge (m^3/s)	**Proposed Site discharge without OSD (m^3/s)**	**Proposed Site Discharge with 75m^3 (150m^2) OSD (m^3/s)**
5 minute duration	Discharge Location 2 to Boundary Creek	1.423	1.298 (Decrease 0.125)	1.298 (Decrease 0.125)
	Discharge Location 1 to Boundary Creek	0.350	0.635 (Increase 0.285)	0.335 (Increase 0.024)
	Total discharge to boundary creek	**1.774**	**1.933 (Increase 0.159)**	**1.672 (Decrease 0.102)**
20 minute duration	Discharge Location 2 to Boundary Creek	1.889	1.515 (Decrease 0.374)	1.524 (Decrease 0.365)
	Discharge Location 1 to Boundary Creek	0.368	0.679 (Increase 0.311)	0.569 (Increase 0.201)
	Total discharge to boundary creek	**2.257**	**2.194 (Decrease 0.063)**	**2.093 (Decrease 0.164)**
90 minute duration	Discharge Location 2 to Boundary Creek	1.890	1.496 (Decrease 0.394)	1.493 (Decrease 0.397)
	Discharge Location 1 to Boundary Creek	0.354	0.659 (Increase 0.305)	0.682 (Increase 0.328)
	Total discharge to boundary creek	2.244	**2.155 (Decrease 0.089)**	**2.175 (Decrease 0.069)**

Arup originally noted on the civil design development drawings that a preliminary volume of 150m^3 would be required for OSD. We have since refined the model further and now consider 75m^3 to be an adequate volume for restricting the development site discharge to meet the 1 in 5 year ARI discharges. Refer to Table 1.1 for numerical comparison of the original site discharge verses the proposed site with no OSD verses the proposed site with 75m^3 OSD.

In all modelled scenarios, there is a decreased flow at location 2. Therefore no outfall modifications are deemed necessary. However an increase to the outlet size at location 1 is proposed to accommodate additional flows and to check for suitable erosion protection.

Memorandum

Please note Arup will make the 'Drains' model available to SOPA for review if requested. The following figures are screen shots from the Drains model for reference.

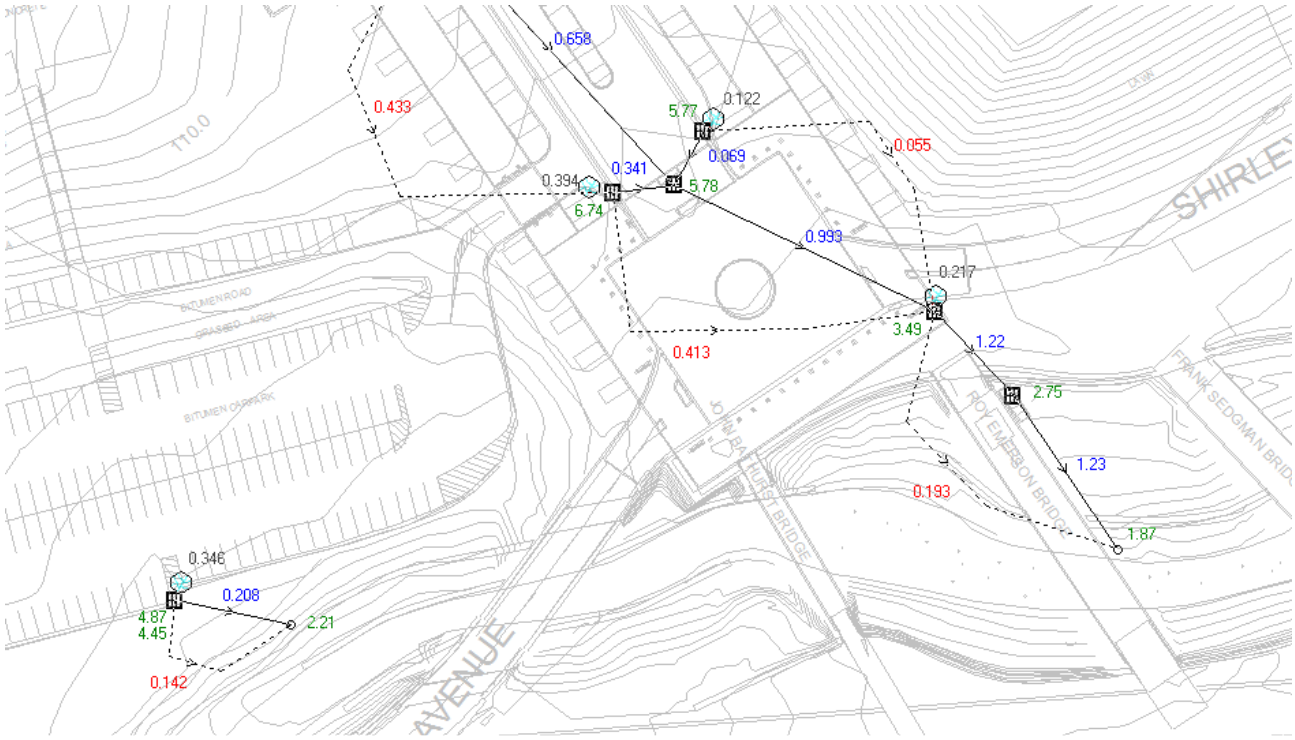

Figure 2: 5 minute duration, existing situation

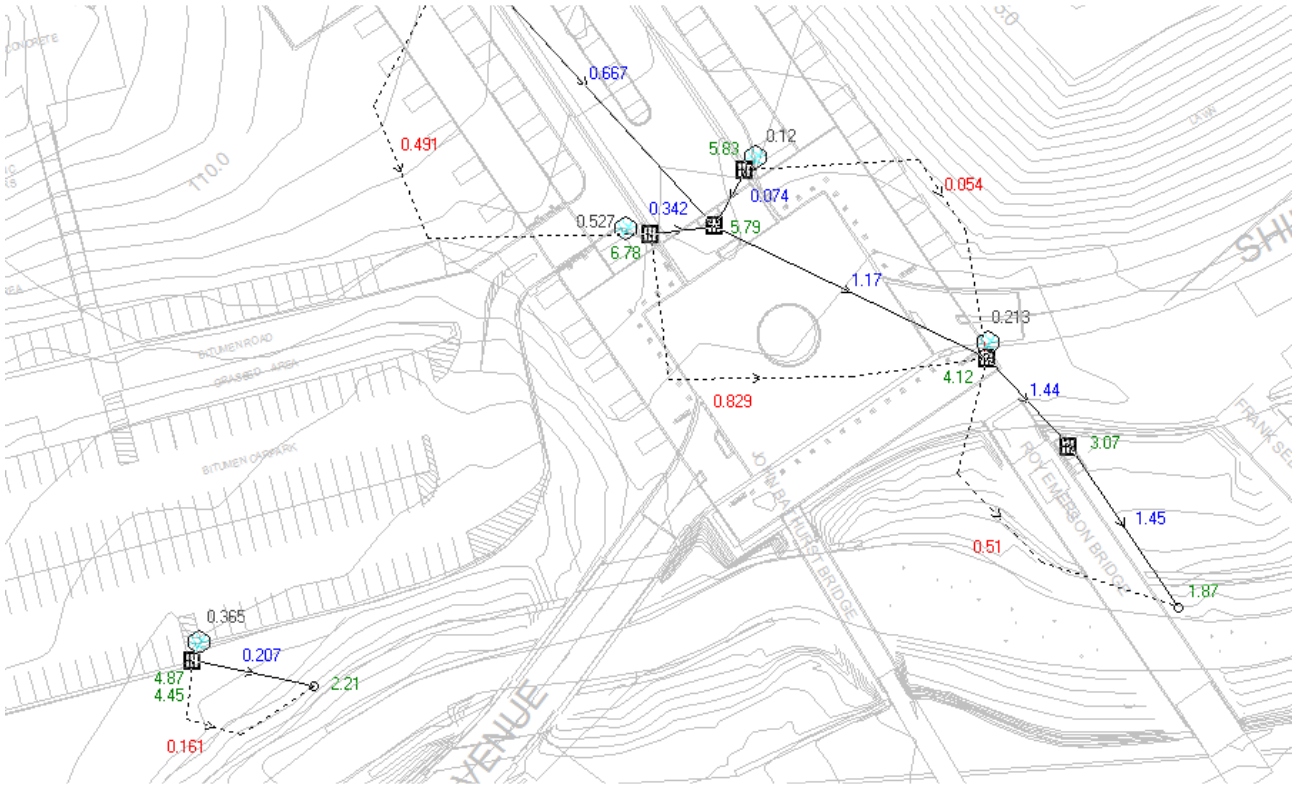

Figure 3: 20 minute duration, existing situation

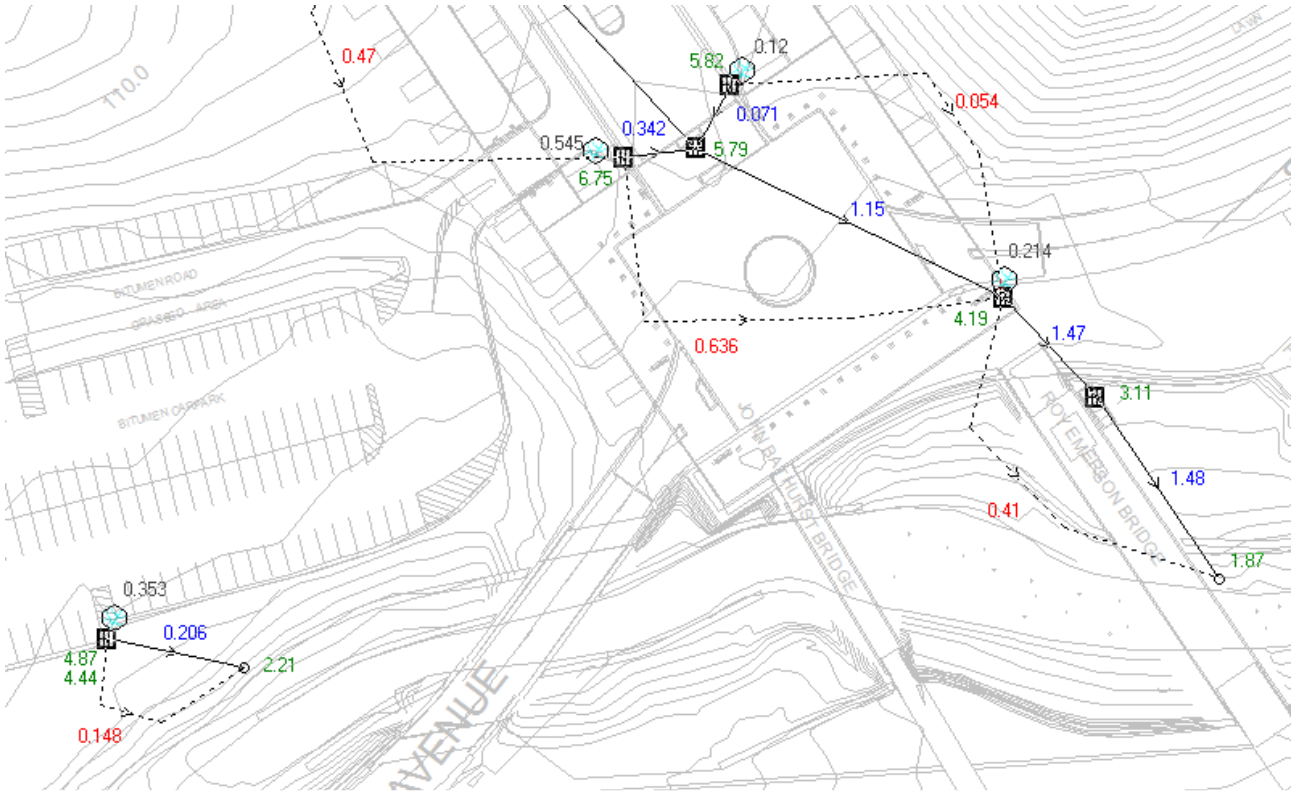

Figure 4: 90 minute duration, existing situation

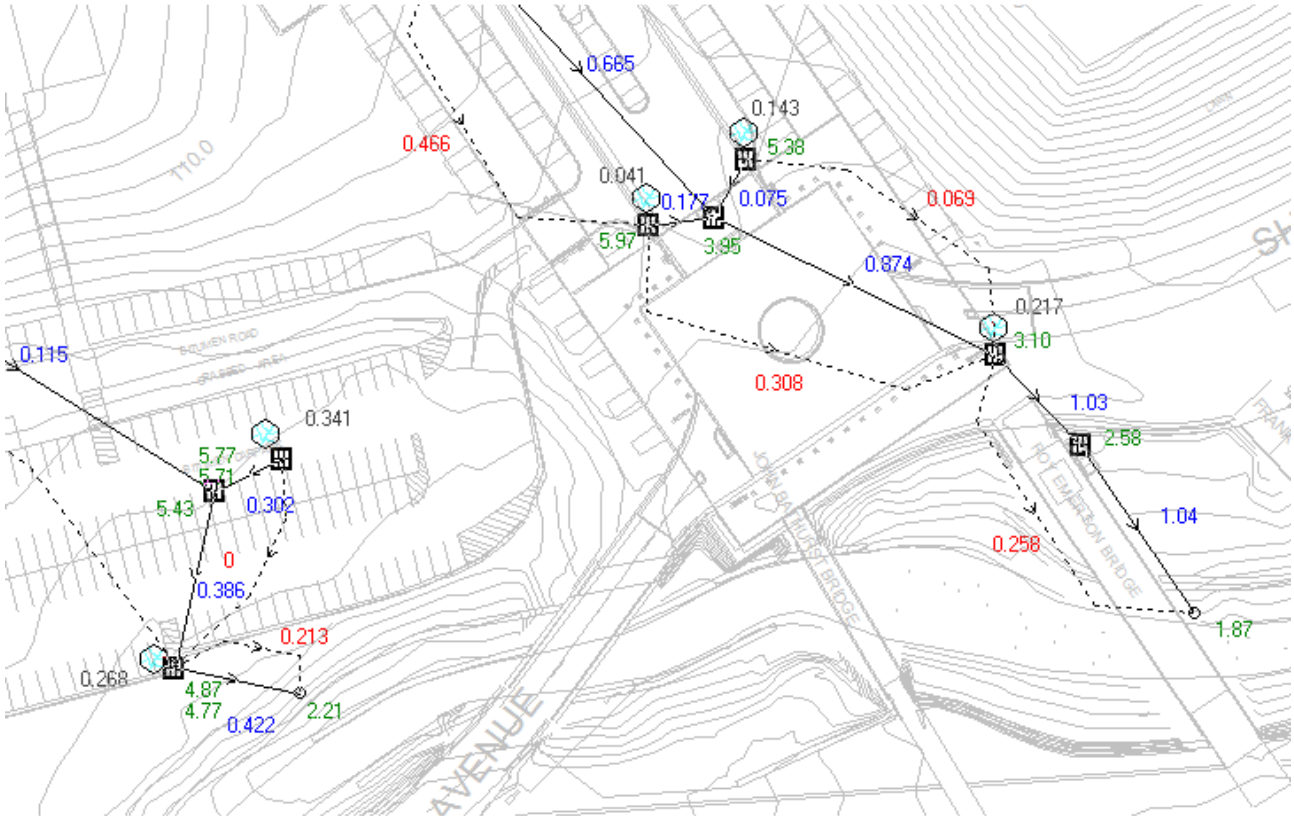

Figure 5: 5 minute duration, no OSD

Memorandum

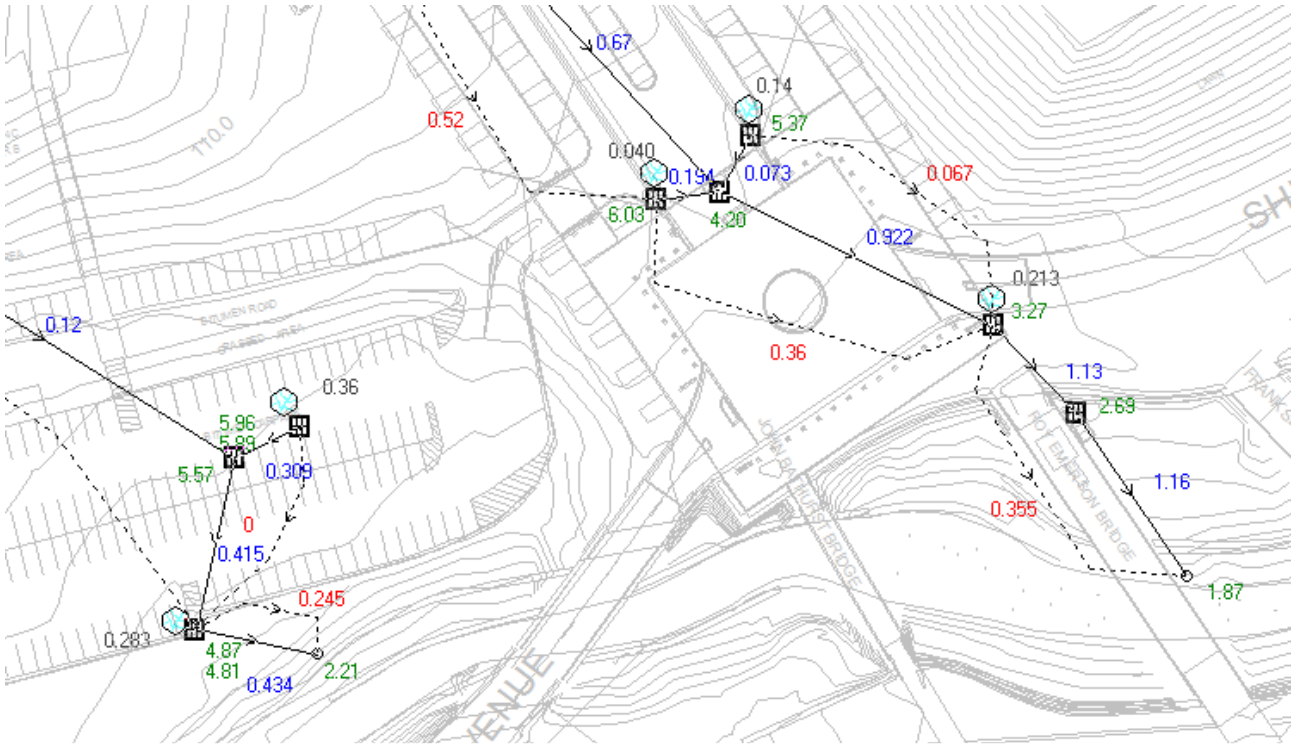

Figure 6: 20 minute duration, no OSD

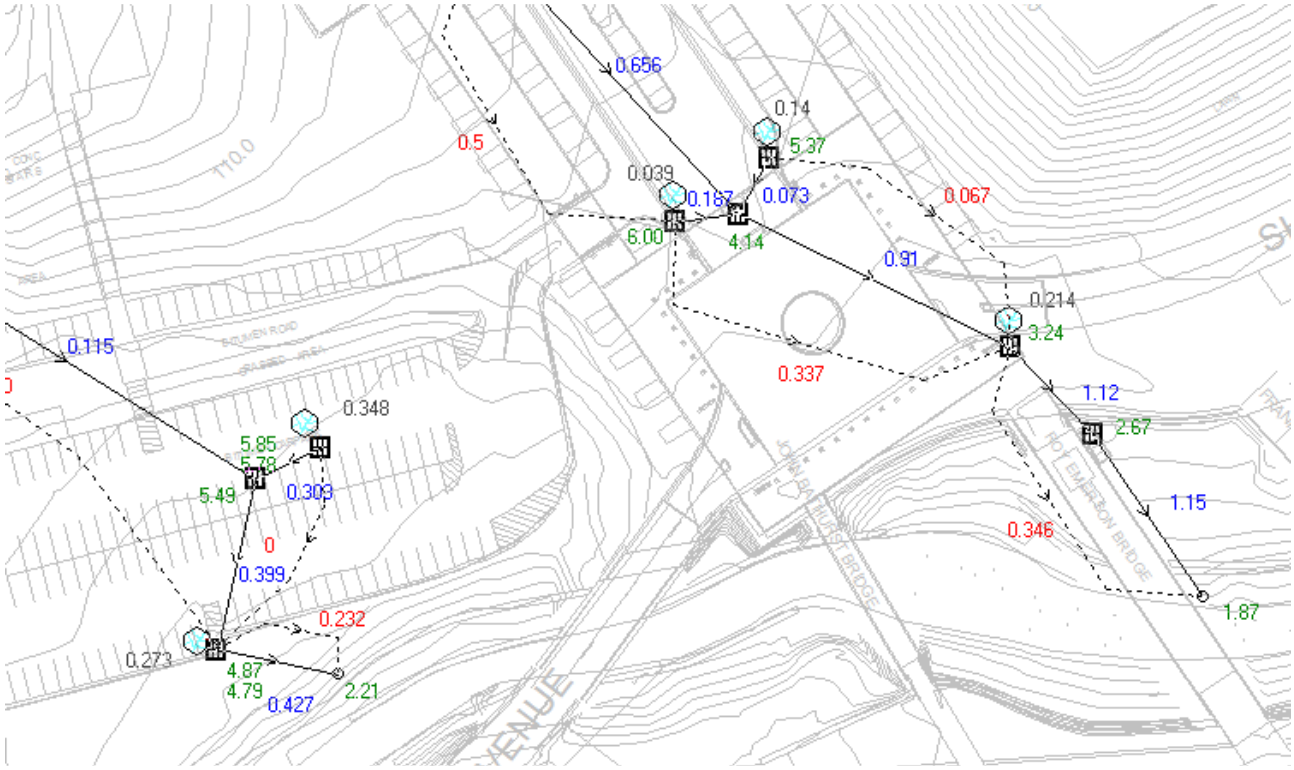

Figure 7: 90 minute duration, no OSD

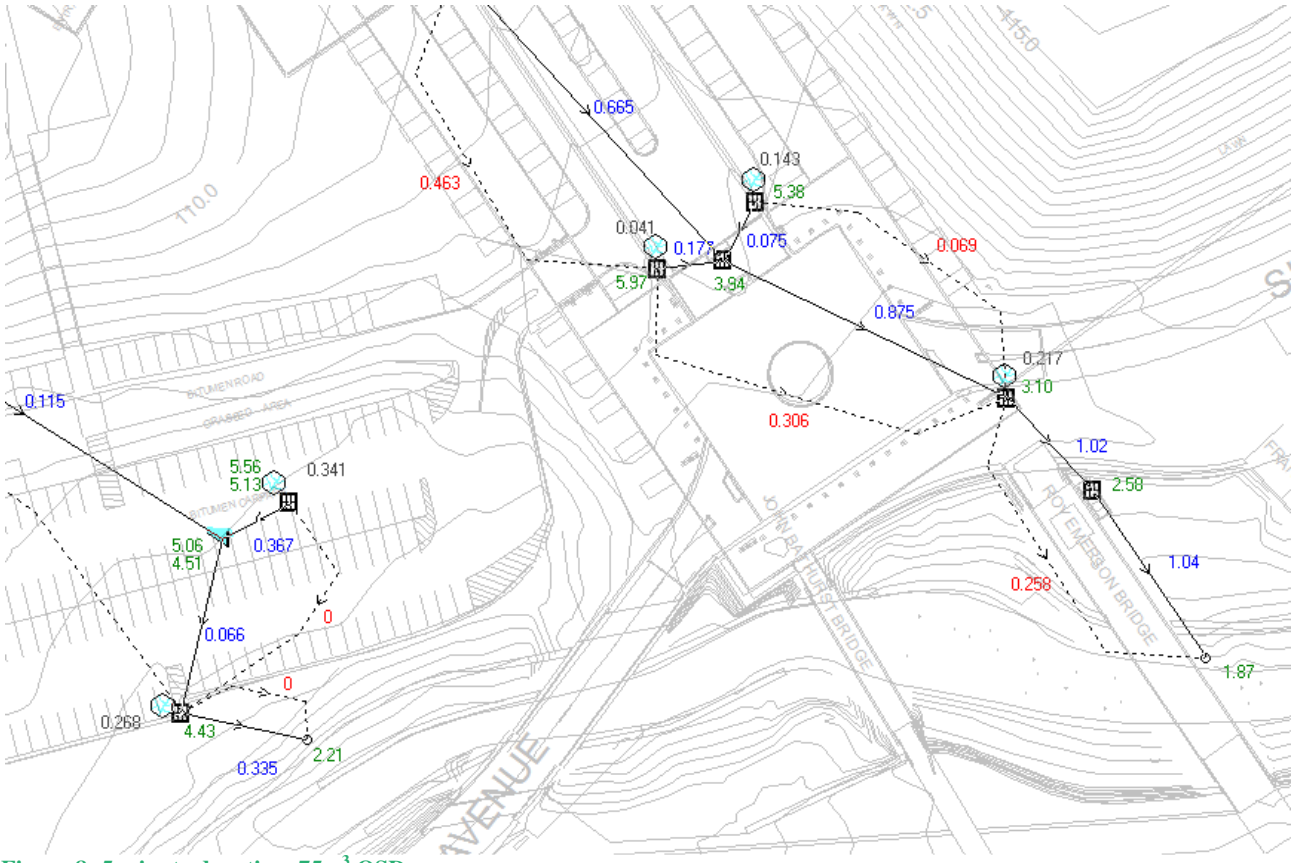

Figure 8: 5 minute duration, 75m^3 OSD

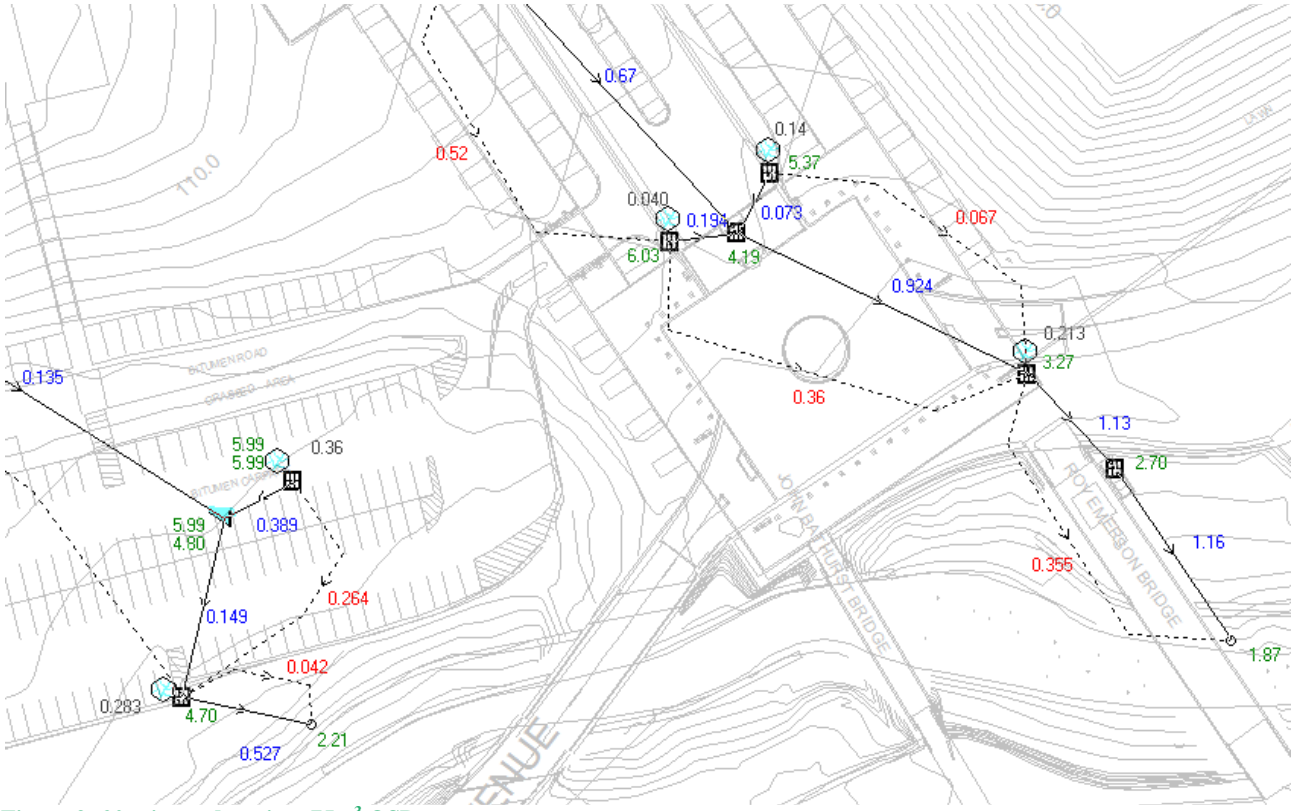

Figure 9: 20 minute duration, 75m^3 OSD

Memorandum

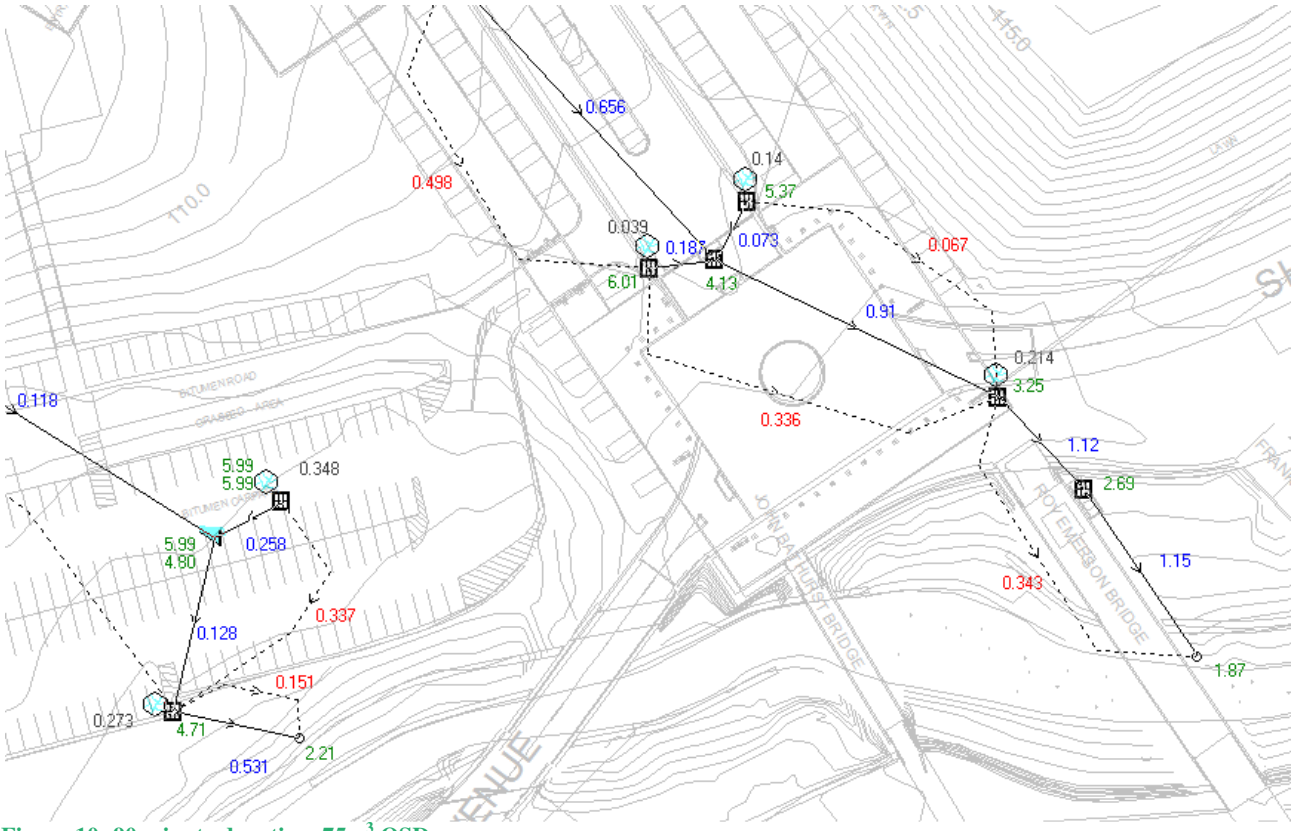

Figure 10: 90 minute duration, 75m^3 OSD

Attachment 3
Southern Elevation
Scott Carver Architects

Southern Elevation of Netball Central Court Halls, with amended catchment detail serving downpipes.

Attachment 4
Water Quality
ARUP

Sydney Olympic Park Authority

Netball Central Development

Water Sensitive Urban Design Strategy

222450/DS

Draft 1 | 11 October 2012

Job number 222450/DS

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Document Verification

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Job title		Netball Central Development			**Job number** 222450/DS
Document title		Water Sensitive Urban Design Strategy			**File reference**
Document ref		222450/DS			
Revision	**Date**	**Filename**	WSUD Report 121011.docx		
Issue 1	11 Oct 2012	**Description**	First issue		
			Prepared by	Checked by	Approved by
		Name	Darren Stewart	Karen Seeto	Louise Millward
		Signature			
		Filename			
		Description			
			Prepared by	**Checked by**	**Approved by**
		Name			
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			Prepared by	**Checked by**	**Approved by**
		Name			
		Signature			

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Contents

Tables

Figures

Appendices

Design details to achieve performance targets

Appendix F

Soil and Water Management Control Plan

1 Introduction

Arup has been commissioned by Netball NSW to provide a drainage design for Netball Central, the new centre of excellence for netball in NSW. The Netball Central development is a new building that is to be built in the forecourt of the existing Sports Centre, at the southern end of Olympic Boulevard, and is intended to replace the Netball NSW current facilities at the Anne Clarke Centre in Lidcombe.

This Water Sensitive Urban Design (WSUD) report has been written in response to the Sydney Olympic Park Authority (SOPA) Draft policy document 'Development Control Policy: Water sensitive urban design and construction stormwater management' (DCP-WSUD&CSM). The DCP document has been published to ensure infrastructure projects within the Sydney Olympic Park adhere to the following core requirements:

- To mitigate the detrimental effects of stormwater runoff from development within the Sydney Olympic Park town centre to downstream waterways and wetlands;
- To promote the use of water sensitive urban design in new developments, and;
- To ensure stormwater runoff and discharge from construction sites does not adversely affect downstream aquatic ecosystems.

To comply with these requirements, it is SOPA policy that developments within Sydney Olympic Park must:

- Comply with best practice water sensitive urban design objectives and performance targets as identified in 'DCP-WSUD&CSM Table 1: Water Sensitive Urban Design Requirements', and;
- Manage stormwater from construction sites in accordance with the requirements of 'DCP-WSUD&CSM Table 2: Stormwater Management Requirements for Construction Sites'.

This document intends to address the requirements and policies above, and to provide advice on the measures employed by Arup to assist in achieving these requirements and, where applicable, mitigate the impacts of detrimental changes to the existing stormwater regime.

Note: the SOPA 'DCP-WSUD&CSM' document referred to above is included in Appendix A.

2 Existing Stormwater Drainage System

The existing Sports Centre site is comprised of grassed, pavement and car park areas. The existing car park is drained via a pit discharging to a headwall outlet to Boundary Creek. This is referred to in this document as Discharge Location 1.

The Sports Centre forecourt is grassed with paved footways. Surface runoff from the paved areas is captured via existing trench drains, which then connect via pipes to the existing road drainage network in Olympic Boulevard. It is assumed that the grassed area permits ground infiltration, with any excess water also flowing to the existing road drainage network in Olympic Boulevard.

The existing road drainage network discharges into Boundary Creek on the north-eastern side of the roundabout at the junction of Shirley Strickland Avenue and Olympic Boulevard, approximately 150m downstream of the outfall from the car park. This is referred to in this document as Discharge Location 2.

Both discharge locations are shown in Figure 1 below.

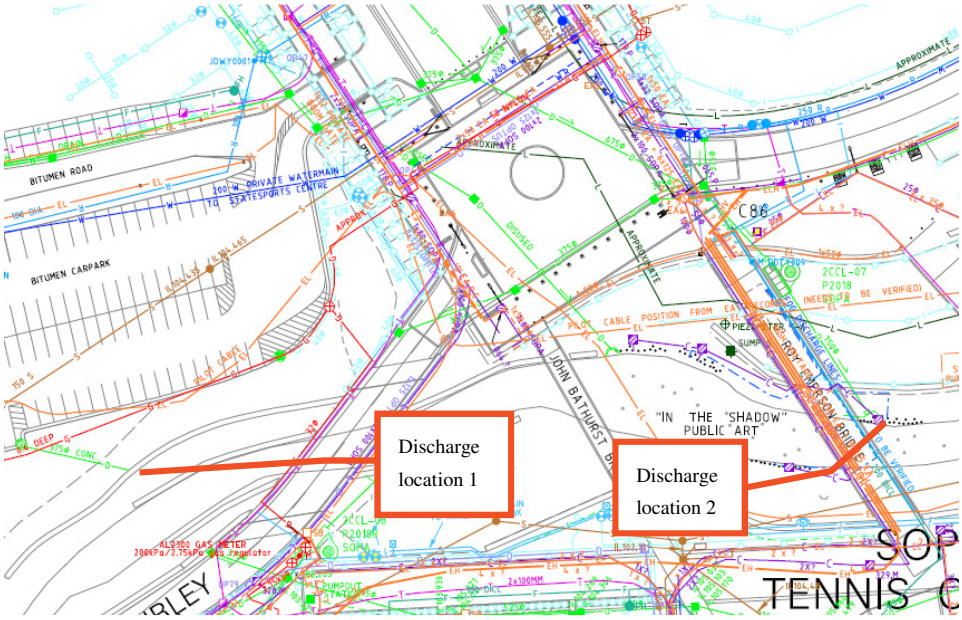


Figure 1: Discharge locations

The impact of the proposed building is that approximately 0.8ha of permeable grassed area is removed and replaced with the roof of the Netball Central building. A sketch depicting the estimated changes in permeable and impermeable areas is provided in Appendix B.

3 WSUD Strategy

The below is an extract from Table 1 'WSUD Requirements' of the SOPA 'DCP-WSUD&CSM' document:

A development application must be accompanied by a Water Sensitive Urban Design Strategy prepared by a suitably qualified engineer with WSUD experience, and include as appropriate:

- A site layout plan showing the location of the proposed stormwater treatment measures;
- A report outlining compliance with the best practice performance targets set out in this policy, using the MUSIC tool or equivalent;
- Design details to assess the technical effectiveness of the proposed stormwater treatment measures, and;
- A site management plan which details how the site will be managed through construction and which sets out future operational and maintenance requirements.

If policy targets are not met, an application must include justification for how the development meets the objectives of this policy.

It is intended that the above parameters are addressed as evidence that WSUD principles are adhered to. The points are addressed in the following sections.

3.1 Site Layout Plan

Arup have produced a draft site drainage layout plan, which shows the preliminary location of stormwater On-Site Detention (OSD) and water quality treatment measures. The drawing also depicts the locations of existing and proposed stormwater discharge structures (headwalls).

The drawing has been provided in Appendix C. It should be noted that this site drainage layout drawing is current at the time of writing. However, it is expected that the drainage layout will evolve as the scheme progresses; hence this plan represents the intent of network rather than the final drainage arrangement.

3.2 Compliance with Best Practice Performance Targets

Arup have developed a strategy to mitigate the anticipated impacts of changes to stormwater flows and quality, emerging as a direct result of the new netball centre construction. A range of proprietary products and current industry innovations have been investigated to produce the most suitable and cost effective method of achieving the performance targets required by SOPA.

3.2.1 Water Quantity – On Site Detention

Targets for flow management are provided in Table 1 'WSUD Requirements' of the SOPA 'DCP-WSUD&CSM' document. Two sets of targets are provided, depending on the sensitivity of the receiving waters. These are outlined in Table 1 below.

Flow Management - Baseline targets ***(EWQCP, NWF, Narawang storage ponds, Haslams Creek, Parramatta River)*** • Not required	**Flow Management - Sensitive receiving waters targets** ***(Badu Mangroves, SWQCP, Boundary Creek, Lake Belvedere, Wharf Pond, Wilson Park Wetland)*** • Maintain a 1:5 year ARI peak discharge to pre-development magnitude • No scouring of outlets during storm events

Table 1 SOPA Flow Management Targets

In accordance with the table above, flow management is required for the Netball Central site and specified as "Maintain a 1:5 year ARI peak discharge to pre-development magnitude", due to Boundary Creek's status as a sensitive receiving water course. Because of the increase in the site's impervious area as a result of the proposed development, it is anticipated that on-site detention will be required to achieve this target.

Using 'Drains' software, Arup has modelled the stormwater drainage networks of both the existing and proposed scenarios to determine peak discharge rates. An indicative OSD volume of $75m^3$ was determined to be required to maintain post-development flows for the 5 year ARI storm event at pre-development levels.

The proposed development requires that a portion of the water currently discharging to Olympic Boulevard at discharge location 2 be redirected upstream to discharge at discharge location 1, located at the bottom of the car park. In matching pre and post development discharges, Arup have considered the sum of the two discharges, rather than matching each individual discharge, given that both discharge points are to Boundary Creek, with an approximate separation distance of 150m.

The design for Netball Central, including forecourt arrangement and roof drainage strategy is currently being finalised which will confirm the OSD volume and outlet constraining device.

It is envisaged that the OSD structure will be a 'StormTrap' system by Humes, or a similar and approved proprietary product. The exact configuration of the OSD modules will be confirmed when the design is finalised, and will be based on the manufacturer's recommendations.

Product information for the 'StormTrap' system is included in Appendix E.

3.2.2 Water Quality

SOPA guidelines state that the quality of stormwater discharging from any new infrastructure within the Sydney Olympic Park must meet pollutant reduction targets, in-line with current best practice guidelines. Where stormwater discharges to areas deemed to be 'sensitive receiving waters', the required targets are even more stringent.

The below targets are extracted from Table 1 'WSUD Requirements' of the SOPA 'DCP-WSUD&CSM' document.

Water Quality - Baseline targets ***(EWQCP, NWF, Narawang storage ponds, Haslams Creek, Parramatta River)***	**Water Quality - Sensitive receiving waters targets** **(*Badu Mangroves, SWQCP, Boundary Creek, Lake Belvedere, Wharf Pond, Wilson Park Wetland)***
• 45% reduction in the mean annual load of Total Nitrogen; • 65% reduction in the mean annual load of Total Phosphorus, and; • 85% reduction in the mean annual load of Total Suspended Solids.	• 65% reduction in the mean annual load of Total Nitrogen; • 85% reduction in the mean annual load of Total Phosphorus, and; • 90% reduction in the mean annual load of Total Suspended Solids.

Table 2 SOPA Water Quality Targets

In order to measure the projected impacts on pollutant loadings for both pre and post-development conditions, the WSUD treatment train can be assessed using a MUSIC model. MUSIC has the capability to simulate discharge loads and concentrations of Total Nitrogen, Total Phosphorus and Total Suspended Solids (TN, TP and TSS), the three water quality objectives currently subject to legislative control.

Arup have undertaken an investigation of the potential impacts on water quality of the new netball centre. A MUSIC model has been produced with the assistance and advice of the proprietary company 'Stormwater 360', to understand the measures required to achieve the reductions set out by SOPA.

Stormwater 360 wrote to Arup on 26th September 2012 to offer their opinion on the achievability of SOPA's targets. They agreed that the baseline targets were generally in line with current industry standard, and could feasibly be accommodated. It was noted though that filtration could be achieved through proprietary devices, in a treatment train with pre-treatment devices.

However, their opinion was that it would not be feasible to achieve the sensitive receiving water targets, due largely to the significant land required to accommodate the necessary bio-retention arrangements to achieve the stated removal rates of TP and TN. An investigation of market leading proprietary products was unable to identify any products capable of reducing nutrient pollutant loadings to the figures stated by SOPA.

The outcome of the MUSIC modelling was the recommendation to use a combination of proprietary water quality devices to target the baseline pollutant removal rates.

It is envisaged that the drainage design will evolve; hence the selection and configuration of proprietary products are yet to be confirmed. Although it is envisioned that the baseline water quality targets can be met 'post-treatment', no MUSIC analysis results have currently been provided. It is Arup's intention to produce detailed MUSIC analysis results when the drainage design is complete.

A copy of the accompanying letter mentioned above, has been included in Appendix D.

Stormwater 360 typical details are included in Appendix E.

4 Design details to achieve performance targets

Typical details of the systems intended to achieve performance targets have been included in Appendix E.

It should be noted that the proprietary systems shown represent the preferred solution for the drainage design at the time of writing. The systems may change as the design evolves.

5 Site Management Plan

The below is an extract from Table 2 'Stormwater Management Requirements for Construction Sites' of the SOPA 'DCP-WSUD&CSM' document:

Construction footprint	**Requirement**
All works involving soil disturbance	Erosion, sediment and dust control measures must be installed and maintained throughout the works in accordance with the provisions of the "Blue Book" Part 1. [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]
Cleared area 250-2500m2 or within the catchment of sensitive receiving waters identified in Table 1, or where soil stockpiles will be in place for more than 10 days	An Erosion and Sediment Control Plan prepared by an appropriately qualified person, must be submitted with an application for development consent, and implemented throughout the works. The Plan must be prepared in accordance with the provisions of the "Blue Book" Part 1. [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]
Cleared area >2500m2	A Soil and Water Management Plan prepared by an appropriately-qualified person must be submitted with an application for development consent, and implemented throughout the works. The Plan must be prepared in accordance with the provisions of the "Blue Book" Part 1. [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]
Discharge standards for temporary sedimentation basins All stormwater water proposed to be discharged into the Sydney Olympic Park stormwater system must demonstrate compliance with the following standards	
Discharge point	As approved by SOPA
Total suspended solids	<50mg/L
pH	pH 6.5-8.5

Table 3 SOPA Stormwater Management Requirements for Construction Sites

It is the contractor's responsibility to put in place an 'Erosion & Sediment Control Plan' to prevent downstream receiving waters from being impacted adversely by the construction works. Arup have provided a 'soil and water management control plan' drawing as a reference, although the contractor will be required to tailor it to suit the specific site characteristics. The drawing is included in Appendix F.

It is also intended that a plan be put in place to prevent adverse impacts during the future operation and maintenance of the new netball centre. It is intended that this be generated by the end-users

Appendix A

Sydney Olympic Park Authority Policy 'Development Control Policy: Water sensitive urban design and construction stormwater management'

Sydney Olympic Park Authority Policy

Policy Name	Development Control Policy: Water sensitive urban design and construction stormwater management
Policy No.	POL
Department File No.	F
Business Unit	
Office Responsible	
Approving Officer	
Date of Approval	

Version	Date

DEVELOPMENT CONTROL POLICY: WATER SENSITIVE URBAN DESIGN & CONSTRUCTION STORMWATER MANAGEMENT

Purpose

- To mitigate the detrimental effects of stormwater runoff from development within the Sydney Olympic Park town centre to downstream waterways and wetlands
- To promote the use of water sensitive urban design in new developments
- To ensure stormwater runoff and discharge from construction sites does not adversely affect downstream aquatic ecosystems

Applicability

This policy applies to all development within Sydney Olympic Park. Additional provisions apply to the following types of development and are identified in Table 1:

- All new commercial, retail, residential, mixed use and other development with a total site area greater than 1000m2
- All alterations and additions to existing commercial, retail, residential, mixed use and other development with a total site area greater than 100m2 and which results in a building footprint or gross floor area of greater than 50%. WSUD is to be applied on the whole site
- Any development which involves the construction or designation of ten or more additional car parking spaces, whether covered or uncovered

Policy

Development within Sydney Olympic Park must

- Comply with best practice water sensitive urban design objectives and performance targets as identified in Table 1: Water Sensitive Urban Design Requirements
- Manage stormwater from construction sites in accordance with the requirements of Table 2: Stormwater Management Requirements for Construction Sites

Policy basis

Urban development can significantly impact the natural environment by altering the quantity and quality of stormwater runoff flowing into wetlands and waterways:

- Impervious surfaces such as roofs, roads, driveways and footpaths, eliminate rainwater infiltration to soil and thereby increase the volume and velocity of stormwater runoff generated. This causes physical and ecological impacts to receiving waters. Changed Number of storm events generating runoff
- Urbanisation generates pollutants such as rubbish, cigarette butts, leaf litter, mulch, sediment, nutrients, toxic organics, surfactants and heavy metals. Stormwater runoff carries these pollutants into waterways and wetlands during rain events, where they negatively impact aquatic ecosystems.
- During construction works, rainfall can wash exposed soil into waterways, causing high sediment loads. Water discharged from temporary on-site

sedimentation basins can contain high levels of suspended sediment, have variable pH, and contain chemical pollutants such as from concrete washings

An integrated approach to water cycle management underpinned redevelopment of Sydney Olympic Park in the late 1990s, resulting in the construction of:

- A Water Reclamation and Management Scheme (WRAMS) that recycles water from sewage and stormwater. WRAMS was Australia's first large-scale urban water treatment system, and supplies recycled water for non-potable uses such as toilet flushing, water cooling and irrigation. All development sites within the Town Centre of Sydney Olympic Park are required to connect to WRAMS.
- Two water quality control ponds (Northern Water Feature and Eastern Water Quality Control Pond, which collect stormwater runoff from the northern half of the Town Centre and discharge to Haslams Creek. These provide a water treatment function, threatened species habitat, and supply harvested stormwater for reuse in Park irrigation and the WRAMS recycled water scheme
- A further water quality control pond, the Southern Water Quality Control Pond, that collects stormwater from part of the southern end of the Town Centre and discharges to Bennelong Pond in the Badu Mangroves wetland. Stormwater is not harvested from this pond.
- Three irrigation storage ponds within the Narawang Wetland, which collect stormwater from P5 carpark, parts of Hill Road and the suburb of Newington. These supply harvested stormwater for reuse in Park irrigation and aquatic habitats.
- Roadside swales, gross pollutant traps and other pollution control devices, installed as components of the road network.

This infrastructure was designed to ensure stormwater discharged to adjacent waterways from development under the ?1998? Masterplan met design criteria of 70-90% retention of phosphorus and suspended solids. It provides a strong foundation for protection of local streams and wetlands to the north of the Town Centre, however receiving waters to the east and south of the Town Centre, which are those most impacted by the higher-intensity Masterplan 2030 redevelopment, do not have such a high level of protection:

- A recent hydrological study[1] identified that the Southern Water Quality Control Pond (SWQCP) is too small to effectively manage stormwater generated within its catchment at current levels of development, and that Bennelong Pond within Badu Mangroves is being adversely affected as a result. Further development in the catchment of the Southern Water Quality Control Pond will add to these impacts.
- A large proportion of the Town Centre drains directly to Bennelong Pond and to Boundary Creek, without first passing through any water quality control pond.

Insert indicative catchment map

[1] Cardno 2011. Review of Stormwater Impacts Bennelong Pond. Prepared for Sydney Olympic Park Authority September 2011

Sydney Olympic Park's wetlands and waterways have high ecological values. Badu Mangroves is listed on the Directory of Important Wetlands in Australia, and the Park's freshwater wetlands including the constructed stormwater ponds are now inhabited by the endangered green and Golden Bell Frog as well as a wealth of other native species. These wetlands need protection from the impacts of development.

Masterplan 2030 requires that all development embodies a best practice approach to environmental sustainability principles, ensuring that the town is nationally and internationally recognised for excellence and innovation in urban design, building design and sustainability. Water sensitive urban design is an approach that aims to integrate water cycle management with broader planning and design approaches, thereby achieving more sustainable forms of urban development.

The performance targets contained in this policy represent best practice management consistent with legal obligations to implement ecologically sustainable development as required by the SOPA Act 2001, and as warranted by the high ecological values of the Park's receiving waters. They are consistent with the development control standards applied by other local authorities [Landcom, Sydney, Parramatta and Strathfield Councils].

This policy requires stormwater management at its source, to supplement the functioning of the Park's existing stormwater infrastructure. Different water quality and water quality standards are applied to different catchments as follows:

- Baseline performance standards apply to all sites above the specified size. These reflect the additional water treatment that occurs in those catchments served by the EWQCP and NWF
- Higher performance standards apply where runoff flows direct to wetlands or to freshwater creeks, or to the SWQCP which has been identified as inefficient at existing levels of development
- Water flow standards do not apply in water harvesting catchments or in estuaries or rivers subject to strong tidal flows

Table 1: Water Sensitive Urban Design Requirements

	Objective	Performance target	
Applicability: All scales of development	**1.** Comply with the Environmental Guidelines for Sydney Olympic Park 2008	○ Minimise overall public domain water use (potable and non-potable) using best practice environmental design principles, innovative technology, water sensitive urban design, water efficient landscaping and other demand management practices ○ All new developments required to maximise opportunities in building and infrastructure design to incorporate water collection and recycling systems ○ Avoid adverse impacts on water quality or quantity in local streams, wetlands and groundwater from operations, development and major event activities	
	2. Comply with Masterplan 2030	Ensure there is sufficient deep soil on each site and throughout the township to retain stormwater, manage the water table and water quality, and support the growth of medium and large trees: ○ A minimum of 20 per cent of the site's open space area is to be deep soil. Areas included as deep soil are to have a minimum dimension of 2 m. Consolidate areas of deep soil within sites and between adjacent sites to increase the benefits. Minimise the impact of stormwater from communal open space on the health and amenity of nearby waterways: ○ Retain stormwater on site by: collecting and storing water from roofs and hard surfaces; maximising porous surfaces and deep soil; draining paved surfaces to adjacent vegetation. ○ Protect stormwater quality by providing for: sediment filters, traps or basins for hard surfaces; treatment of stormwater collected in sediment traps on soils; containing dispersive clays.	
	3. Water conservation	All development to connect to WRAMS where available, for suitable non-potable uses All outdoor use to use non-potable water where WRAMS/irrigation connections available, or 80% where not available	
Applicability: Development above specified criteria	4. WSUD strategy	A development application must be accompanied by a Water Sensitive Urban Design Strategy prepared by a suitably qualified engineer with WSUD experience, and include as appropriate: ○ A site layout plan showing the location of the proposed stormwater treatment measures ○ A report outlining compliance with the best practice performance targets set out in this policy, using the MUSIC tool or equivalent ○ Design details to assess the technical effectiveness of the proposed stormwater treatment measures ○ A site management plan which details how the site will be managed through construction and which sets out future operational and maintenance requirements If policy targets are not met, an application must include justification for how the development meets the objectives of this policy	
	5. Water quality	Baseline targets *(EWQCP, NWF, Narawang storage ponds, Haslams Creek, Parramatta River)* 45% reduction in the mean annual load of Total Nitrogen 65% reduction in the mean annual load of Total Phosphorus 85% reduction in the mean annual load of Total Suspended Solids	Sensitive receiving waters targets *(Badu Mangroves, SWQCP, Boundary Creek, Lake Belvedere, Wharf Pond, Wilson Park Wetland)* 65% reduction in the mean annual load of Total Nitrogen 85% reduction in the mean annual load of Total Phosphorus 90% reduction in the mean annual load of Total Suspended Solids
	6. Flow management	Not required	Maintain a 1:5 year ARI peak discharge to pre-development magnitude No scouring of outlets during storm events
10+ new spaces	7. Oil and grease from carparks	no visible flows up to 50% of ari 1 year peak flows from carparks	no visible flows up to 50% of ari 1 year peak flows from carparks

Table 2: Stormwater management requirements for construction sites

Construction footprint	Requirement
1. All works involving soil disturbance	Erosion, sediment and dust control measures must be installed and maintained throughout the works in accordance with the provisions of the "Blue Book" Part 1. [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]
2. Cleared area 250-2500m^2 **or** within the catchment of sensitive receiving waters identified in Table 1, **or** where soil stockpiles will be in place for more than 10 days	An Erosion and Sediment Control Plan prepared by an appropriately qualified person, must be submitted with an application for development consent, and implemented throughout the works. The Plan must be prepared in accordance with the provisions of the "Blue Book" Part 1. [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]
3. Cleared area >2500m^2	A Soil and Water Management Plan prepared by an appropriately-qualified person must be submitted with an application for development consent, and implemented throughout the works. The Plan must be prepared in accordance with the provisions of the "Blue Book" Part 1. [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]
Discharge standards for temporary sedimentation basins All stormwater water proposed to be discharged into the Sydney Olympic Park stormwater system must demonstrate compliance with the following standards	
Discharge point	As approved by SOPA
Total suspended solids	<50mg/L
pH	pH 6.5-8.5
Oil & Grease	xx
Flow rate	xx

Contact Officer

Nominate the contact officer responsible for implementing the policy and achieving the purpose outlined therein. Include their name, title, telephone number and Business Unit.

POLICY CHECKLIST

Registered corporate file created

Policy number obtained from Information & Records & Services (new policy)

The latest version of an existing policy has been obtained from the Office Manager prior to commencing revision (existing policy to be amended)

Contact Officer identified and details included in the policy

Policy layout is in accordance with the 'Guidelines for Preparation of Policies & Procedures'

Policy cover sheet completed and inserted at the front of the policy

Appropriate approval obtained and a copy forwarded to the Office Manager

A soft copy of the policy forwarded in Word version to the Office Manager

Commercial sensitivity of any policy contents and/or distribution restrictions identified and the Office Manager advised

Suitability for publishing on the Authority's website determined and actioned

Staff notified via email once the policy is published on the Corporate Information Icon and a copy of the email attached to the registered corporate file

Policy Checklist signed off and attached to the registered corporate file

Policy review date identified and diarised

_____ _____

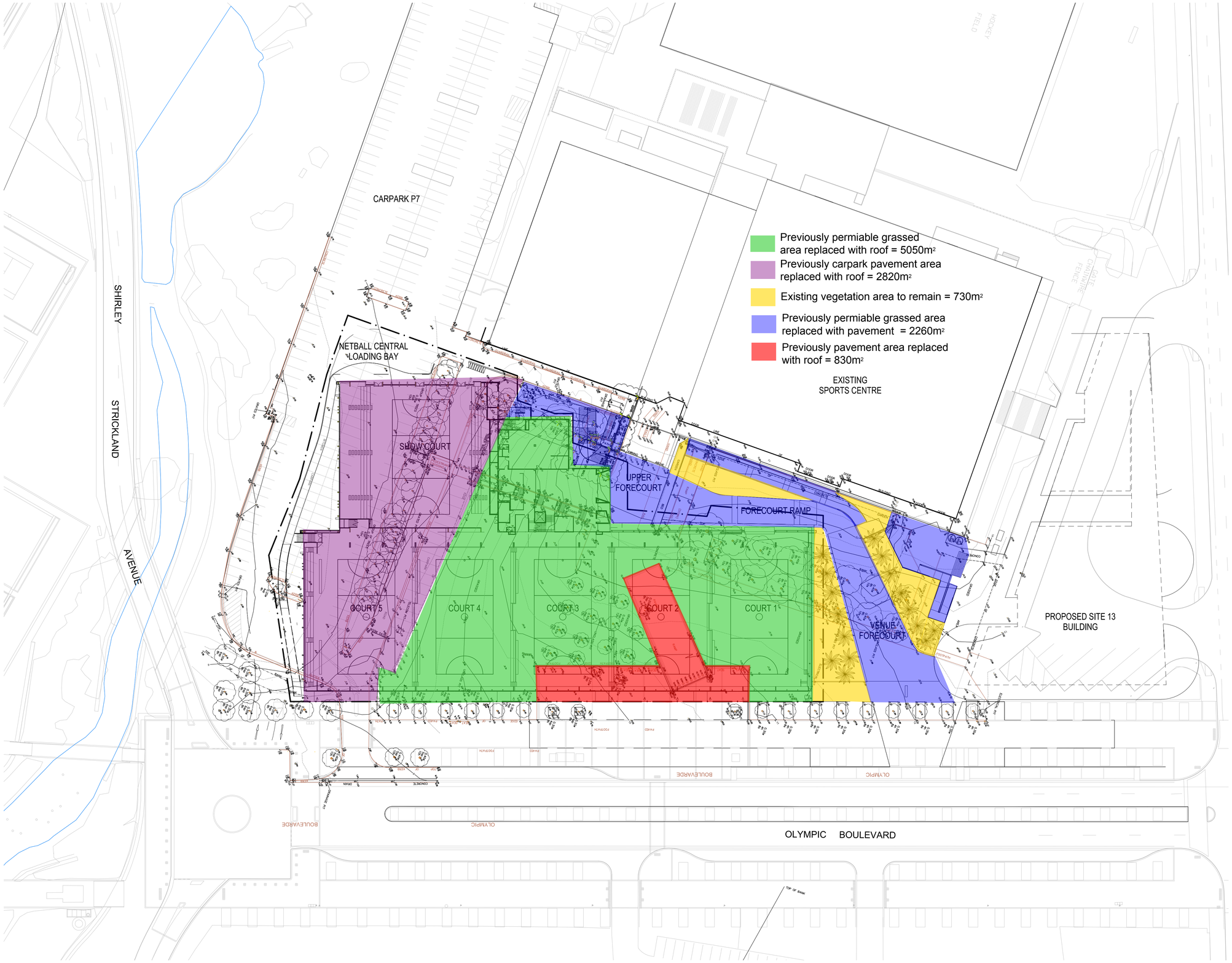
Contact Officer Date

Appendix B

Post-Development changes to permeable & impermeable areas

SKETCH

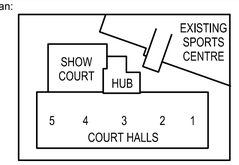
02/07/12



LEGEND:

Architect / Landscape Architect:	Scott Carver Pty. Ltd. Level 8, 71 Macquarie Street Sydney NSW 2000 Australia 02 9957 3988
Project Manager:	Crown Project Services Pty Ltd Level 15, 3 Spring Street Sydney NSW 2000 Australia 02 92524420
Structural/ESD-Mechanical/Electrical/Civil/ Fire and Safety Engineer:	Arup Pty. Ltd. Level 10, 201 Kent Street Sydney NSW 2000 Australia 02 9320 9320
Hydraulic Engineer:	LHO Group Level 1, 25 Atchinson Street St Leonards NSW 1590 Australia 02 9439 1422
PCA Consultant:	Davis Langdon Level 21, 420 George Street Sydney NSW 2001 Australia 02 8934 2222
Quantity Surveyor:	Rider Levett Bucknall Level 5, 34 Charles St Parramatta NSW 2150 Australia 02 9822 2277

Key Plan:



SKETCH

ARUP

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Sydney, NSW, 2000
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www.arup.com

Project
Netball Central

Client
Netball NSW

Supported by the NSW GOVERNMENT

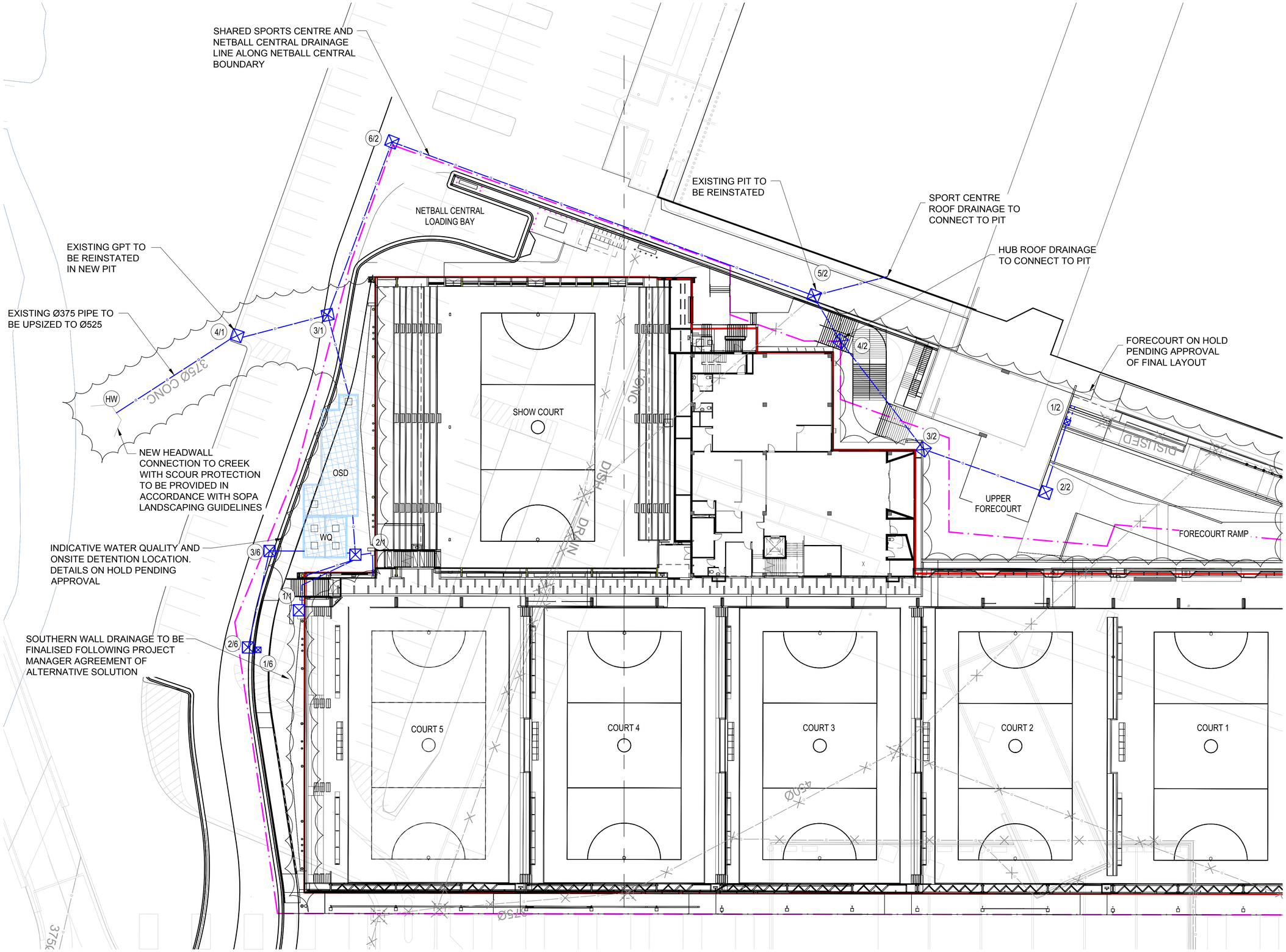
Funded by Communities NSW - Sport and Recreation
The views expressed herein do not necessarily reflect the views of Comunities NSW - Sport and Recreation

Title

Project	Discipline	Dwg. No.	Issue
222450	SK	001	-

Appendix C

Draft site drainage layout drawing



FOR CONTINUATION REFER TO DRAWING 222450-CD-0031

Status: **PRELIMINARY**

Discipline: CIVIL DESIGN

Print Date:

Issue	Date	By	Chkd	Appd
A	11/05/12	AS		
	PRELIMINARY ISSUE - FOR DISCUSSION			
B	26/06/12	SAB	SAB	KS
	REVISED PRELIMINARY ISSUE - FOR DISCUSSION			
C	30/07/12	MJ	SAB	KS
	100% DESIGN DEVELOPMENT			
D	03/09/12	AG		
	FOR CO-ORDINATION			
E	10/09/12	MJ	SAB	KS
	95% TENDER DESIGN			

LEGEND:

- PROJECT BOUNDARY
- BUILDING BOUNDARY
- EXISTING STORMWATER PIT AND PIPE
- EXISTING STORMWATER PIT AND PIPE TO BE REMOVED
- PROPOSED STORMWATER PIT AND PIPE
- PROPOSED GRATED TRENCH WITH SUMP
- ONSITE DETENTION AND WATER QUALITY TREATMENT DEVICE

NOTE:

1. LOCATION OF BUILDING STORMWATER CONNECTIONS TO BE CONFIRMED WITH HYDRAULIC ENGINEER PRIOR TO ISSUE OF CONSTRUCTION DOCUMENTATION.
2. FOR PIT SCHEDULE REFER TO DRAWING 222450-CD-031.

Architect / Landscape Architect:	Scott Carver Pty. Ltd. Level 8, 71 Macquarie Street Sydney NSW 2000 Australia 02 9957 3988
Project Manager:	Crown Project Services Pty Ltd Level 15, 3 Spring Street Sydney NSW 2000 Australia 02 92524420
Structural/ESD-Mechanical/Electrical/Civil/ Fire and Safety Engineer:	Arup Pty. Ltd. Level 10, 201 Kent Street Sydney NSW 2000 Australia 02 9320 9320
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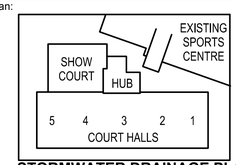
Key Plan:



STORMWATER DRAINAGE PLAN SHEET 1 OF 2

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NETBALL CENTRAL
Project
Client
NETBALL NSW

Supported by the NSW GOVERNMENT
Funded by Communities NSW - Sport and Recreation
The views expressed herein do not necessarily reflect the views of Comunities NSW - Sport and Recreation

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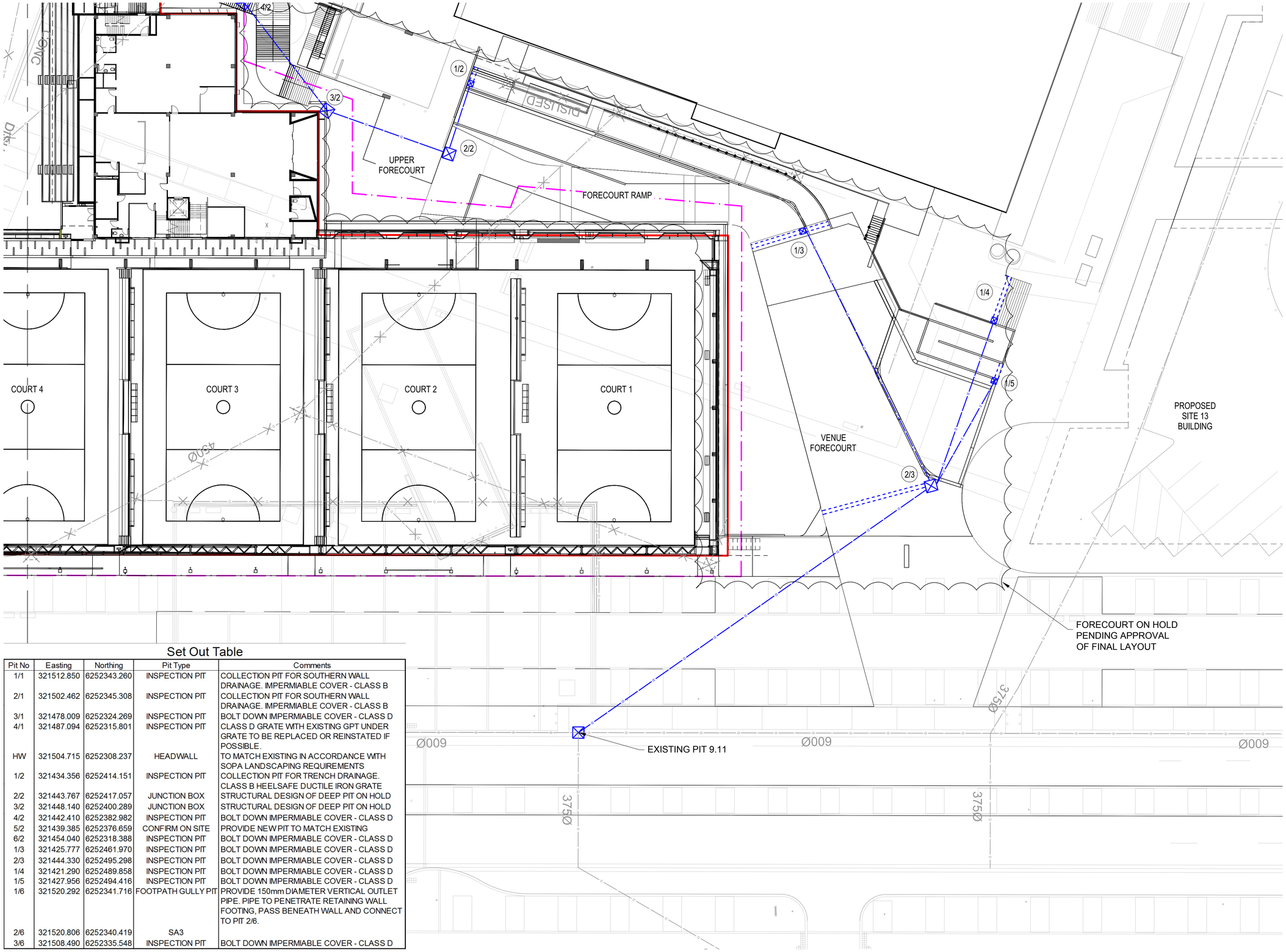
Title
Project 222450 | Discipline CD | Dwg. No. 030 | Issue E

FOR CONTINUATION REFER TO DRAWING 222450-CD-0030



Set Out Table

Pit No	Easting	Northing	Pit Type	Comments
1/1	321512.850	6252343.260	INSPECTION PIT	COLLECTION PIT FOR SOUTHERN WALL DRAINAGE. IMPERMIABLE COVER - CLASS B
2/1	321502.462	6252345.308	INSPECTION PIT	COLLECTION PIT FOR SOUTHERN WALL DRAINAGE. IMPERMIABLE COVER - CLASS B
3/1	321478.009	6252324.269	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
4/1	321487.094	6252315.801	INSPECTION PIT	CLASS D GRATE WITH EXISTING GPT UNDER GRATE TO BE REPLACED OR REINSTATED IF POSSIBLE.
HW	321504.715	6252308.237	HEADWALL	TO MATCH EXISTING IN ACCORDANCE WITH SOPA LANDSCAPING REQUIREMENTS
1/2	321434.356	6252414.151	INSPECTION PIT	COLLECTION PIT FOR TRENCH DRAINAGE. CLASS B HEELSAFE DUCTILE IRON GRATE
2/2	321443.767	6252417.057	JUNCTION BOX	STRUCTURAL DESIGN OF DEEP PIT ON HOLD
3/2	321448.140	6252400.289	JUNCTION BOX	STRUCTURAL DESIGN OF DEEP PIT ON HOLD
4/2	321442.410	6252382.982	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
5/2	321439.385	6252376.659	CONFIRM ON SITE	PROVIDE NEW PIT TO MATCH EXISTING
6/2	321454.040	6252318.388	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
1/3	321425.777	6252461.970	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
2/3	321444.330	6252495.298	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
1/4	321421.290	6252489.858	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
1/5	321427.956	6252494.416	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D
1/6	321520.292	6252341.716	FOOTPATH GULLY PIT	PROVIDE 150mm DIAMETER VERTICAL OUTLET PIPE. PIPE TO PENETRATE RETAINING WALL FOOTING, PASS BENEATH WALL AND CONNECT TO PIT 2/6.
2/6	321520.806	6252340.419	SA3	
3/6	321508.490	6252335.548	INSPECTION PIT	BOLT DOWN IMPERMIABLE COVER - CLASS D

Status: **PRELIMINARY**

Discipline: CIVIL DESIGN

Print Date:

Issue	Date	By	Chkd	Appd
A	10/09/12	AG		
	95% TENDER DESIGN			

LEGEND:

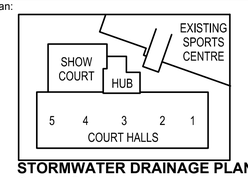
- PROJECT BOUNDARY
- BUILDING BOUNDARY
- EXISTING STORMWATER PIT AND PIPE
- EXISTING STORMWATER PIT AND PIPE TO BE REMOVED
- PROPOSED STORMWATER PIT AND PIPE
- PROPOSED GRATED TRENCH WITH SUMP ACO OR SIMILAR APPROVED.

NOTES:

1. GATIC COVER TREATMENT TO BE SELECTED IN ACCORDANCE WITH SOPA LANDSCAPING REQUIREMENTS
2. PITS TO BE CONSTRUCTED IN ACCORDANCE WITH RMS MODEL DRAWINGS:
   MD.R11.B40.A.1
   MD.R11.B36.A.1
   MD.R11.B29.A.1

Architect / Landscape Architect:	Scott Carver Pty. Ltd. Level 8, 71 Macquarie Street Sydney NSW 2000 Australia 02 9957 3988
Project Manager:	Crown Project Services Pty Ltd Level 15, 3 Spring Street Sydney NSW 2000 Australia 02 92524420
Structural/ESD-Mechanical/Electrical/Civil/ Fire and Safety Engineer:	Arup Pty. Ltd. Level 10, 201 Kent Street Sydney NSW 2000 Australia 02 9320 9320
Hydraulic Engineer:	LHO Group Level 1, 25 Atchinson Street St Leonards NSW 1590 Australia 02 9439 1422
PCA Consultant:	Davis Langdon Level 21, 420 George Street Sydney NSW 2001 Australia 02 8934 2222
Quantity Surveyor:	Rider Levett Bucknall Level 5, 34 Charles St Parramatta NSW 2150 Australia 02 9922 2277

Key Plan:



STORMWATER DRAINAGE PLAN SHEET 2 OF 2

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www.arup.com

NETBALL CENTRAL
Project
Client
NETBALL NSW

Supported by the NSW GOVERNMENT
Funded by Communities NSW - Sport and Recreation
The views expressed herein do not necessarily reflect the views of Comunities NSW - Sport and Recreation

1:250 @ A1
0 1 2 3 4 5 10 15 20 25m

Title
Project 222450 | Discipline CD | Dwg. No. 031 | Issue A

Appendix D

Stormwater 360 - MUSIC model advice letter

Stormwater360
AUSTRALIA

26th September, 2012.

Arup,
Level 10, 201 Kent Street,
Sydney
NSW 2000

Attention: Miss Samantha Bennett

Re: Proposed SOPA targets.

Dear Samantha,

I have reviewed the Sydney Olympic Park Authority DCP for water sensitive urban design and construction stormwater management policy. An extract of the targets are provided below.

4. WSUD strategy	A development application must be accompanied by a Water Sensitive Urban Design Strategy prepared by a suitably qualified engineer with WSUD experience, and include as appropriate: o A site layout plan showing the location of the proposed stormwater treatment measures o A report outlining compliance with the best practice performance targets set out in this policy, using the MUSIC tool or equivalent o Design details to assess the technical effectiveness of the proposed stormwater treatment measures o A site management plan which details how the site will be managed through construction and which sets out future operational and maintenance requirements If policy targets are not met, an application must include justification for how the development meets the objectives of this policy	
5. Water quality	Baseline targets *(EWQCP, NWF, Narawang storage ponds, Haslams Creek, Parramatta River)*	Sensitive receiving waters targets *(Badu Mangroves, SWQCP, Boundary Creek, Lake Belvedere, Wharf Pond, Wilson Park Wetland)*
	45% reduction in the mean annual load of Total Nitrogen	65% reduction in the mean annual load of Total Nitrogen
	65% reduction in the mean annual load of Total Phosphorus	85% reduction in the mean annual load of Total Phosphorus
	85% reduction in the mean annual load of Total Suspended Solids	90% reduction in the mean annual load of Total Suspended Solids

The Baseline targets specified above are in general accordance with other locally recognized load based reduction targets as set-out by Parramatta & Blacktown City Councils. Part of the formulation of these targets, namely nitrogen and phosphorus, was that these targets are based upon the achievable performance expectation for the best performing technologies at the time (bio-retention/filtration). Recent increases on these targets have been provided in Queensland for phosphorus (only) to 70%.

We have setup a model to illustrate this point. Using a 1Ha lumped commercial source node in MUSIC the following bio-retention sizes are required.

Category	Targets for TSS, TP , TN Reductions respectively (%)	Bio-retention size (m^2) to achieve targets	Bio-retention size as % of catchment
Baseline	85, 65, 45	400	4
Sensitive	90, 85, 65	5,000	50

Given the typical bio-retention size for most land-uses is 1.5 to 4%, the Sensitive water quality targets appear neither achievable or practical within this context.

If you therefore also consider that bioretention is not practical on many industrial or commercial sites, an alternative method of treatment needs to be adopted. To design a system that can meet these baseline targets is possible, however filtration is still required through proprietary devices and often in treatment train with pre-treatment devices. No Proprietary system will be able to demonstrate compliance with the sensitive targets.

I trust this meets your approval, however, should you have any further queries please do not hesitate in contacting the undersigned.

Yours faithfully,
STORMWATER360

Michael Wicks BE
Technical Manager
ph: 1300 354 722
fx: 1300 971 566
m: 0409 361 589

Appendix E

Design details to achieve performance targets

Humes
Water Solutions

Strength. Performance. Passion.

StormTrap® system Installation guide

SingleTrap™ model

Contents

The StormTrap® system

The StormTrap® system is a purpose-built stormwater detention and infiltration solution which provides a fully trafficable, below ground on-site detention system (OSD).

The system takes a unique design approach by connecting individual precast concrete modules into a single layer configuration that meets each project's requirements. This delivers a simple and flexible design solution without compromising above ground land use.

The growing popularity of the StormTrap® system is not only driven by its unique design and performance benefits, but by the significant installation economies it can provide. The modular design of the system means large detention volumes are delivered with the installation of each module. And because installers are able to use traditional construction processes, the installation can be completed in minimal time. Generally, it is expected that an individual StormTrap® module can be set in position in less than 10 minutes.

The StormTrap® system is available in two configurations to provide conventional detention, high early discharge or infiltration to ground water. The SingleTrap™ system and DoubleTrap™ system provide design solutions to meet volume requirements. This guide refers to the installation of the SingleTrap™ system.

The SingleTrap™ system is either founded on a strip footing to create a large infiltrative surface area, or founded on a conventional concrete slab for use as either a traditional detention basin or a basin with high early discharge.

The installation of the StormTrap® system is very simple:

1. Establish a suitable foundation.
2. Place modules row-by-row.
3. Apply StormWrap™ mastic tape across the top of the module joins.
4. Backfill.

There are a number of time-lapse videos available from humeswatersolutions.com.au which demonstrate the construction sequence and methodologies undertaken during the installation of a StormTrap® system. The library of videos includes a variety of project sizes and configurations.

As the system is made from precast concrete it is extremely strong and trafficable to AS 5100 traffic loadings (light duty designs are also available). Once the system has been installed there is no requirement for any further structural work in the trafficable pavement. The system will not deflect during construction loading, which allows rapid backfilling, and it won't suffer creep, as can be experienced with some lightweight systems.

Design and installation standards

The StormTrap® system is designed and installed in accordance with the requirements of the following Australian standards:

- AS 3600-2001 – Concrete Structures Code
- AS 5100-2004 – Bridge Design Code
- AS 5100.2-2004 – Bridge Design – Design Loads
- AS 1597.2-1996 – Precast Reinforced Concrete Box Culverts - Large Culverts
- AS/NZS 1170.1-2002 – Structural Design Actions – Part 1: Permanent, Imposed and other Actions.

Specifications

Module details

There are a number of different StormTrap® modules available and their use and placement will depend on design requirements and site layout (refer to Figure 1).

While the length and width of the modules remains constant, the height, and subsequently the mass, will vary according to the leg height for the system. The leg height varies from 600 mm to 1,500 mm, and is adjustable at 25 mm increments within this range.

Some modules will contain openings to allow for stormwater pipes or culverts and maintenance access points. Inlets and outlets may be placed at varying inverts and positions around the perimeter of the structure.

Depending on the overall size, each StormTrap® system will generally be designed with either 600 mm or 1,050 mm diameter openings for access through the roof at either end of the system. However, access openings may be in any location to fit in with specific site requirements. Designs can be modified to accommodate 900 mm x 900 mm grates.

Figure 1 – A sample layout of a SingleTrap™ system

V	III	III	IV
II	I	I	II
II	I	I	II
IV	III	III	V

Masses and dimensions

SingleTrap™ modules have a maximum internal leg height of 1,500 mm. The maximum mass of each module is shown in Table 1.

Table 1 – Masses and dimensions (1,500 mm height)

Module type	Mass (kg)	Length x width (mm)
I	6,730	4,000 x 2,350
II	4,320	2,000 x 2,350
III	7,660	4,000 x 2,350
IV	4,810	2,000 x 2,350
V	4,810	2,000 x 2,350
VI	8,590	4,000 x 2,350
VII	5,280	2,000 x 2,350
Light duty I	4,400	4,000 x 2,350

Standard type I

Standard type II

Standard type III

Standard type IV

Standard type V

Standard type VI

Standard type VII

Light duty type I

Handling and installation

Safety

Safety is a priority for Humes. It is important for all parties to observe safety requirements and regulations during transportation, handling, storage and installation, including wearing appropriate personal safety protection equipment.

It is the responsibility of the main contractor or installation contractor to produce a Safe work method statement; we recommend that this statement complies with both the National Code of Practice for Precast Tilt-up and Concrete Elements in Building Construction, and local and state codes (where they exist). Personnel should follow any safety advice provided by the main contractor/installation contractor.

The precast concrete component should only be lifted using the appropriate lifting clutches which are fitted into the designated lift points via the cast-in anchors. All lifting equipment must be certified to lift the specific mass and approved for lifting heavy components. The mass of the StormTrap® modules will vary depending on its geometry; weights will be clearly marked on the precast units and in the relevant project drawings.

All lifting and placement must proceed with caution and strictly in accordance with all relevant occupational health and safety standards. Bumping or impact of modules can cause damage and should be avoided.

The advice in this publication is of a general nature only. Where any doubt exists as to the safety of a particular lift or installation procedure, seek the guidance of a professional engineer or contact Humes for advice.

Pre-delivery

To ensure the safe and efficient installation of the StormTrap® system it is important to undertake sufficient planning prior to its arrival on site.

Equipment requirements

The following list of equipment is required for a safe and efficient installation:

- tape measure
- a can of marking spray
- chalk line/masonry string
- pinch/crowbar
- stanley knife
- two ladders
- broom
- level
- four chains
- four five-tonne Swiftlift® clutches
- Swiftlift® clutches for manhole covers or risers
- swivel for chains
- 20 mm spacers or gap gauge (available from Humes)
- safety harness for working at height
- StormMastic™ sealant
- StormWrap™ mastic tape.

Left:
Gap gauge

Site preparation

Before the StormTrap® system is installed, the concrete foundation must be poured (refer to the approval drawings supplied by Humes). The foundation details will depend on whether the system is required to provide stormwater detention or infiltration (refer to Figure 2 and Table 2 for an example).

Once the foundation is cured mark the outside edges of the system on the slab (as per the layout dimensions of the approval drawings).

Figure 2 – Example of a foundation plan

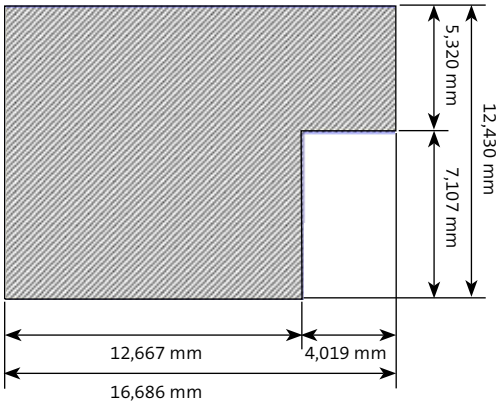
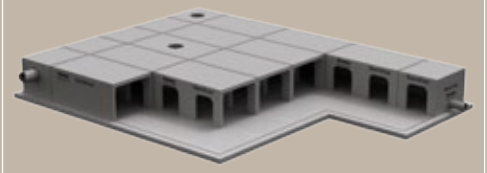
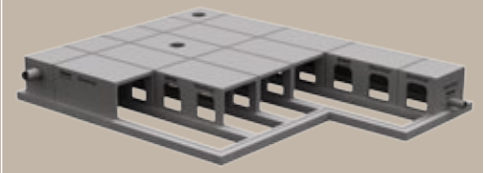
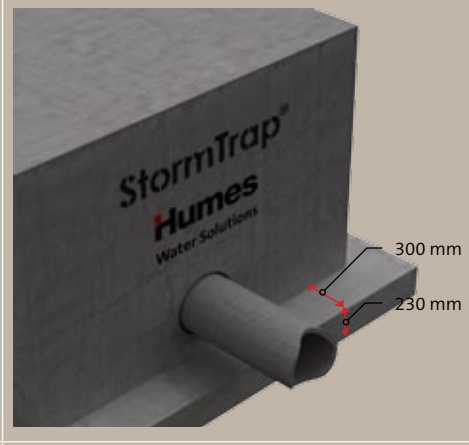
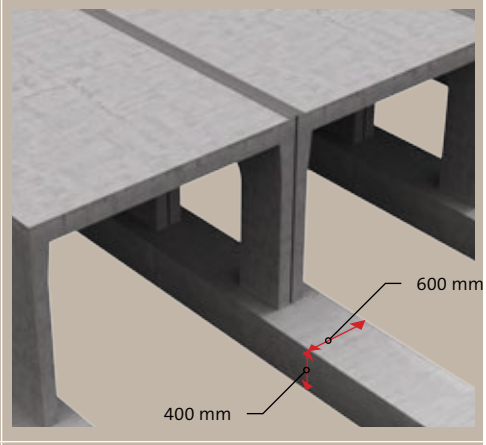


Table 2 – Foundation details

System type	Detention	Infiltration
		
Foundation	Continuous concrete slab	Strip footing
Dimensions	Slab is 230 mm thick* and extends 300 mm past outer edge of the system. 	Slab 'strips' are 400 mm thick and 600 mm wide running underneath the line of StormTrap® feet. 
Recommended cure period	7 days	7 days

Note:
*Slab design is based on in-situ material having a bearing capacity of 150 KPa; this may differ according to engineer's specifications.

Delivery

Prior to deliveries commencing, a pre-installation site meeting will occur with the contractor to finalise shipping plans including the sequencing of deliveries and the order of unloading and installing each of the modules.

The shipping plan will help to alleviate the double-handling of modules; save time and effort, make more efficient use of the crane, and reduce site congestion. The shipping plan will be provided to both the specifying engineer and contractor for sign off prior to commencing the delivery of modules to site (refer to Figure 3).

The StormTrap® modules will be delivered to site either on a semi-trailer or B-double depending on site access and the number of modules to be delivered. Each truck will typically contain 3-6 modules depending on the particular module type and mass. The first truck will typically take about 45 minutes to unload, the second truck about 30-45 minutes, and then each subsequent truck about 20-30 minutes.

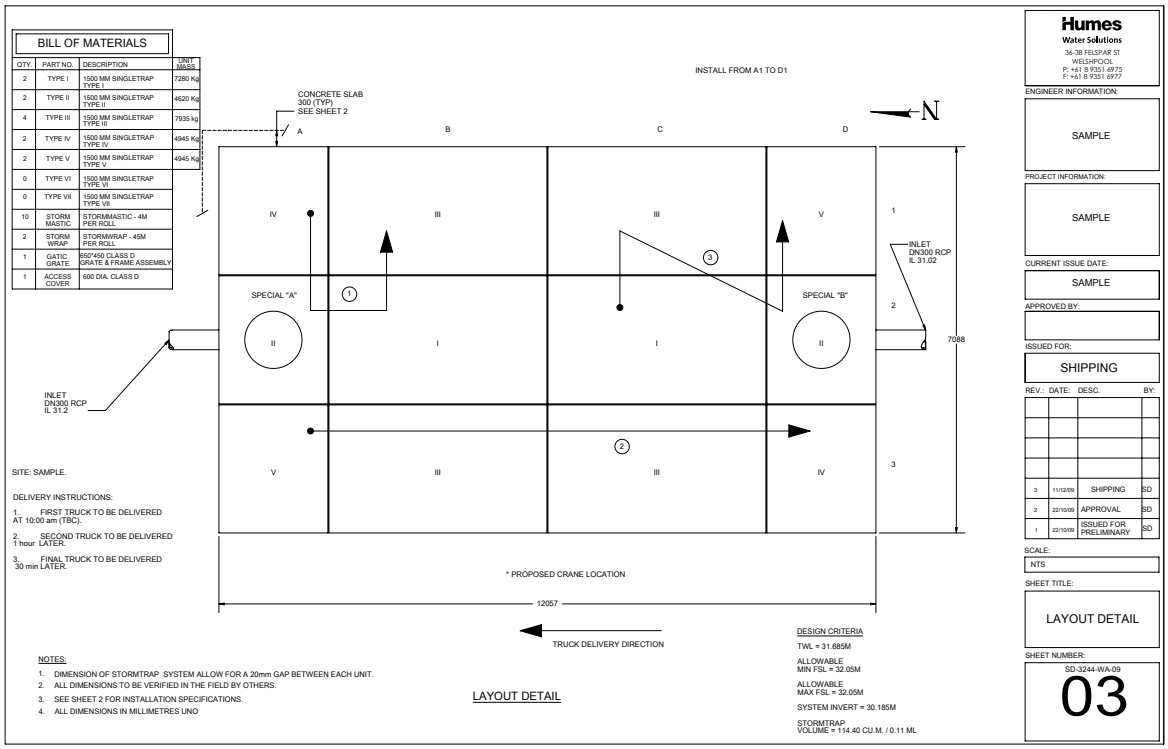
Lifting

All the precast units are supplied with cast-in lifting anchors to enable safe handling. To prevent stress and possible concrete cracking, all units must be handled using the cast-in lifting anchors and associated lifting clutches (lifting clutches can be obtained from the crane contractor or Humes). Installers should use tagged lifting equipment only. It is the installation contractor's responsibility to ensure the lifting clutches are available on site. The lifting points of anchors are clearly shown on the Humes drawings.

Wherever possible, all modular components should be lifted from the delivery truck and set directly onto the prepared substructure. Each module will take approximately 5-10 minutes to unload and set into position.

If for some reason temporary storage of the modules is required on site, they should be placed carefully on level, even ground, free of rocks and uniformly supported across the entire leg surface by using timbers. Modules should not be stacked on top of each other.

Figure 3 – Example of a shipping plan



Module installation

Top:
Step one

Middle:
Step two

Bottom:
Step three

A representative of Humes Water Solutions will be present on site at the commencement of the installation (as required) to provide support to the contractor and observe deliveries and installation.

The StormTrap® system is typically installed as follows:

1. Sweep the concrete slab/footings clean of dirt and debris.

2. Lay a bead of StormMastic™ sealant on the slab approximately 60 mm inside the perimeter line marking.

3. Secure the first module with four Swiftlift® anchors. Take care not to strike the modules together when you are unloading and lowering them. Be aware of pinch hazard at all times and don't walk or work under suspended loads.

4. When lowering the first module into position, pause 50 mm above the concrete slab, then gradually lower it into position once it is aligned with the perimeter markings. Ensure the unit is square and the bottom of the module is on the foundation before you remove the lifters.

Top:
Step four

Middle:
Step five

Bottom:
Step six

5. Align the next module with the edge markings and position it adjacent to, but no more than 20 mm from the first block (check with a gap gauge). Use a pinch or crowbar to assist with the finer adjustment of the modules.

6. Continue to install the modules row-by-row, in the order shown on the shipping plan.

Top:
Step seven

Bottom:
Step eight

7. Once two rows of modules have been laid and checked, apply StormWrap™ tape across the joins.

8. When four rows of modules have been laid, checked and sealed, backfilling can then occur (refer per note F. on page 2 of the approval drawings).

Note: During the installation check the overall dimensions of the system to make sure creep is not occurring. Adjust the laying gap when necessary to recover any discrepancies.

Contact information

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info@humeswatersolutions.com.au

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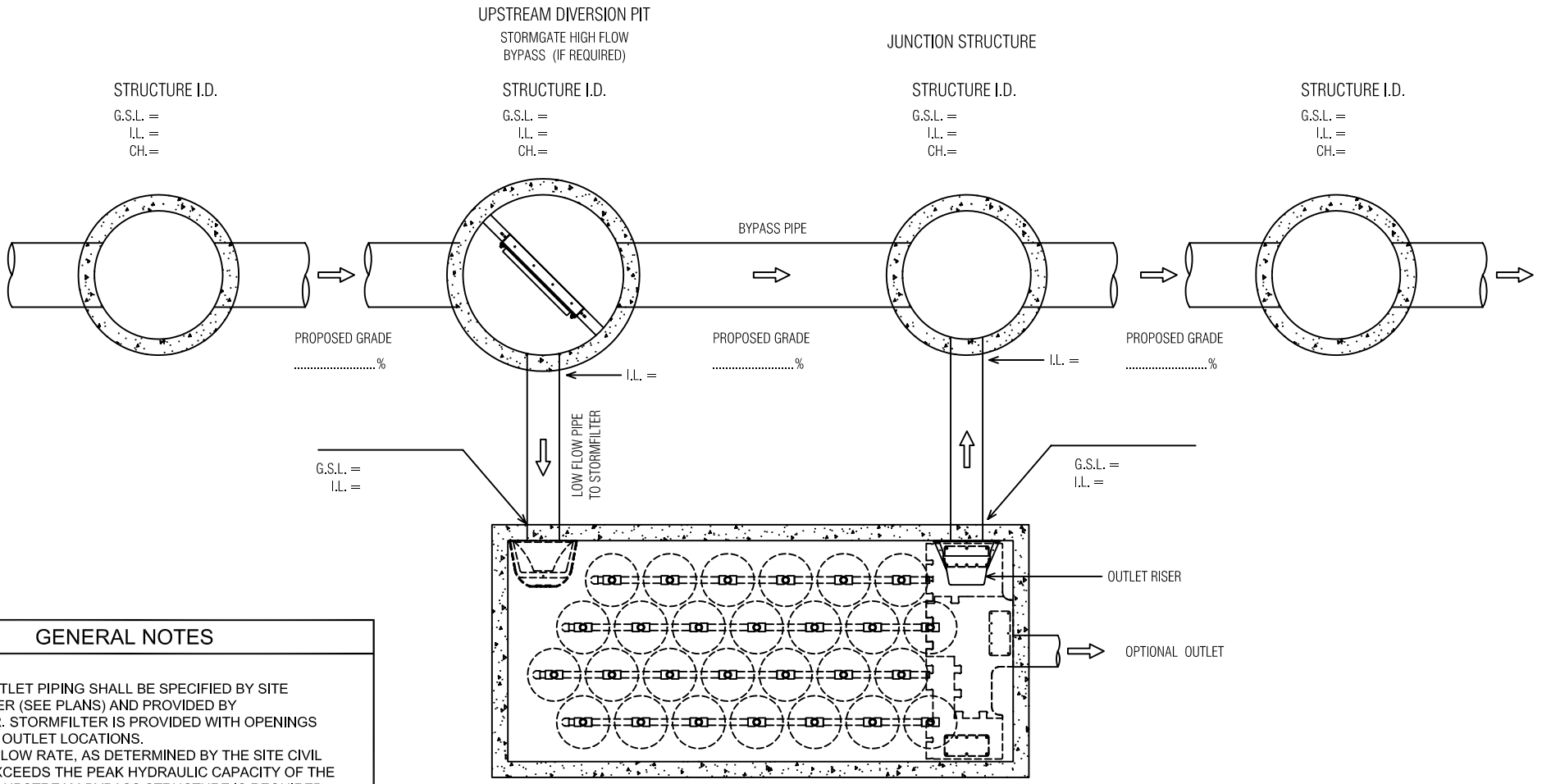
A Division on Holcim Australia



STRUCTURE I.D.

STORMFILTER CHAMBER
BY STORMWATER 360

REFER TO PRODUCT DRAWING .....
FOR SYSTEM DETAILS

PLAN OF TYPICAL OFFLINE LAYOUT

GENERAL NOTES

1. INLET AND OUTLET PIPING SHALL BE SPECIFIED BY SITE CIVIL ENGINEER (SEE PLANS) AND PROVIDED BY CONTRACTOR. STORMFILTER IS PROVIDED WITH OPENINGS AT INLET AND OUTLET LOCATIONS.
2. IF THE PEAK FLOW RATE, AS DETERMINED BY THE SITE CIVIL ENGINEER, EXCEEDS THE PEAK HYDRAULIC CAPACITY OF THE PRODUCT, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED. PLEASE CONTACT STORMWATER360 FOR OPTIONS.
3. THE FILTER CARTRIDGE(S) ARE SIPHON-ACTUATED AND SELF-CLEANING. THE STANDARD DETAIL DRAWING SHOWS THE MAXIMUM NUMBER OF CARTRIDGES. THE ACTUAL NUMBER SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER ON SITE PLANS OR IN DATA TABLE BELOW. PRECAST STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH AS3600.
4. FOR SHALLOW, LOW DROP OR SPECIAL DESIGN CONSTRAINTS, CONTACT STORMWATER360 FOR DESIGN OPTIONS.
5. ALL WATER QUALITY PRODUCTS REQUIRE PERIODIC MAINTENANCE AS OUTLINED IN THE O&M GUIDELINES. PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS.
6. STRUCTURE AND ACCESS COVERS DESIGNED TO MEET AUSTROADS T44 LOAD RATING WITH 0-2m FILL MAXIMUM.
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES AND VARY REGIONALLY.
8. ANY BACKFILL DEPTH, SUB-BASE, AND OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY SITE CIVIL ENGINEER.
9.. STORMFILTER BY STORMWATER360:
SYDNEY (AU) PHONE: (02) 9525 5833,
BRISBANE (AU) PHONE: (07) 3272 1872.

Stormwater360

STORMWATER360

TYPICAL OFFLINE LAYOUT
STORMGATE HIGH FLOW BYPASS (OPTIONAL)
WITH PRECAST VAULT STORMFILTER

DRAWING 1 A

DATE: 09.03.08	SCALE: N.T.S.	FILE NAME: SFV_OFFLINE_TYP	DRN: R.P.	CHK: M.W.

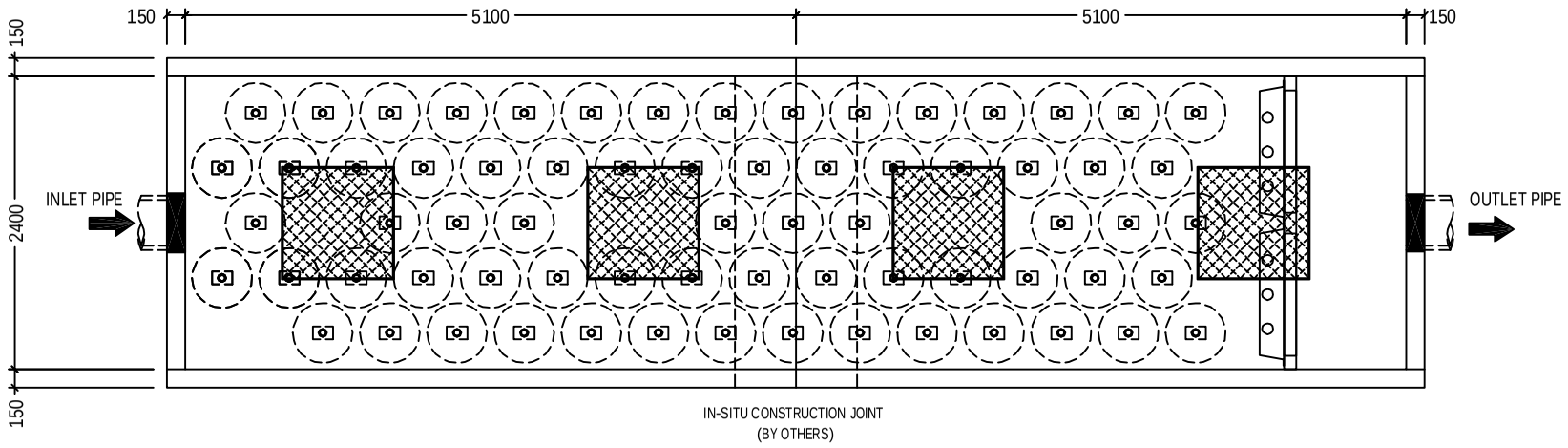
STORMFILTER DESIGN TABLE

- STORMFILTER TREATMENT CAPACITY VARIES BY NUMBER OF FILTER CARTRIDGES INSTALLED AND BY REGION SPECIFIC INTERNAL FLOW CONTROLS. CONVEYANCE CAPACITY IS RATED AT 50L/S.
- THE STANDARD CONFIGURATION IS SHOWN. ACTUAL CONFIGURATION OF THE SPECIFIED STRUCTURE(S) PER CIVIL ENGINEER WILL BE SHOWN ON SUBMITTAL DRAWING(S).
- ALL PARTS PROVIDED AND INTERNAL ASSEMBLY BY STORMWATER360 UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	690		460		310	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	930		700		550	
TREATMENT BY MEDIA SURFACE AREA L/S/m2	1.4	0.7	1.4	0.7	1.4	0.7
CARTRIDGE FLOW RATE (L/s)	1.42	0.71	0.95	0.47	0.63	0.32

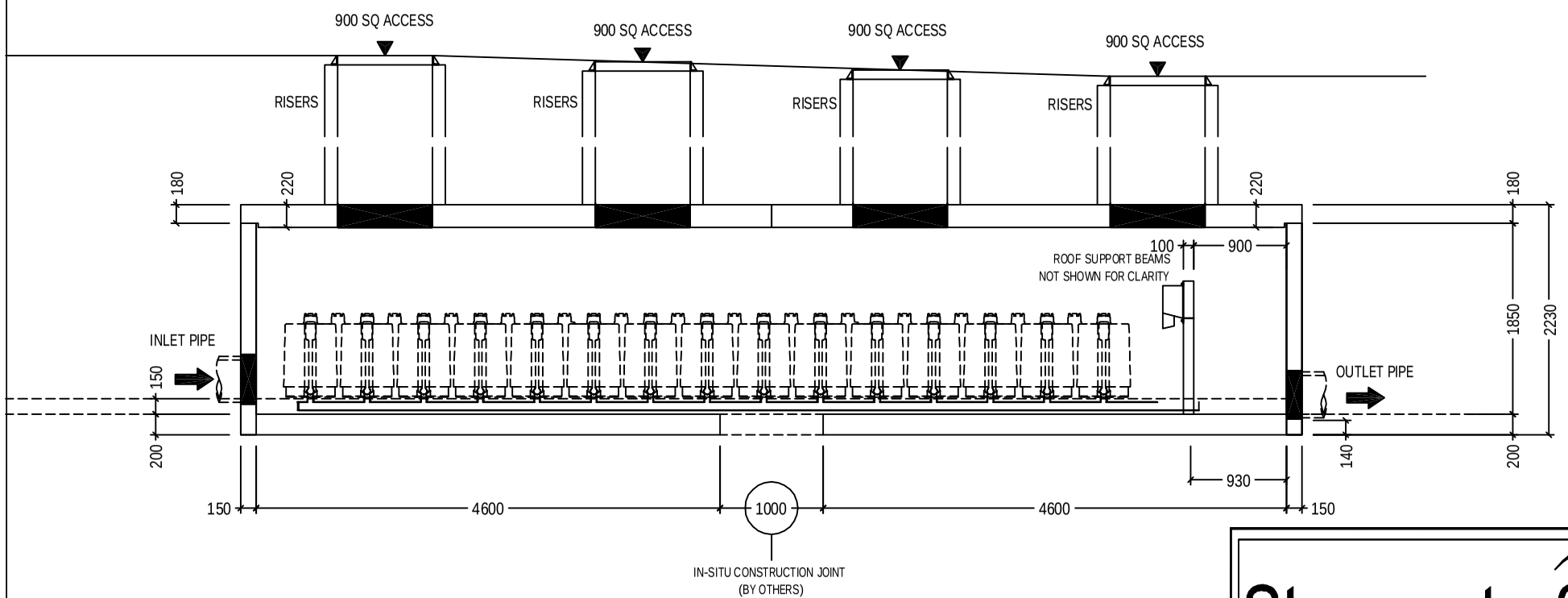
GENERAL NOTES

1. INLET AND OUTLET PIPING SHALL BE SPECIFIED BY SITE CIVIL ENGINEER (SEE PLANS) AND PROVIDED BY CONTRACTOR. STORMFILTER IS PROVIDED WITH OPENINGS AT INLET AND OUTLET LOCATIONS.
2. IF THE PEAK FLOW RATE, AS DETERMINED BY THE SITE CIVIL ENGINEER, EXCEEDS THE PEAK HYDRAULIC CAPACITY OF THE PRODUCT, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED. PLEASE CONTACT STORMWATER360 FOR OPTIONS.
3. THE FILTER CARTRIDGE(S) ARE SIPHON-ACTUATED AND SELF-CLEANING. THE STANDARD DETAIL DRAWING SHOWS THE MAXIMUM NUMBER OF CARTRIDGES. THE ACTUAL NUMBER SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER ON SITE PLANS OR IN DATA TABLE BELOW. PRECAST STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH AS3600.
4. SEE STORMFILTER DESIGN TABLE FOR REQUIRED HYDRAULIC DROP. FOR SHALLOW, LOW DROP OR SPECIAL DESIGN CONSTRAINTS, CONTACT STORMWATER360 FOR DESIGN OPTIONS.
5. ALL WATER QUALITY PRODUCTS REQUIRE PERIODIC MAINTENANCE AS OUTLINED IN THE O&M GUIDELINES. PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS.
6. STRUCTURE AND ACCESS COVERS DESIGNED TO MEET AUSTROADS T44 LOAD RATING WITH 0.0m TO 2.0m FILL MAXIMUM.
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES AND VARY REGIONALLY.
8. ANY BACKFILL DEPTH, SUB-BASE, AND OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY SITE CIVIL ENGINEER.
9. CARTRIDGE HEIGHT IS 690mm (SHOWN). CARTRIDGE HEIGHT AND ASSOCIATED DESIGN PARAMETERS PER STORMFILTER DESIGN TABLE.
10. STORMFILTER BY STORMWATER360: SYDNEY (AU) PHONE: (02) 9525 5833, BRISBANE (AU) PHONE: (07) 3272 1872.



PLAN LAYOUT

VAULT MASS = 14.5 TONNES
LID MASS = 6.8 TONNES

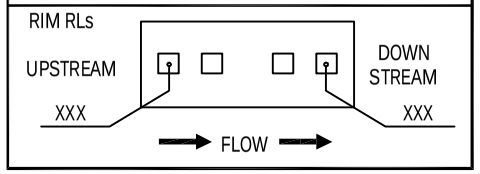


SECTION

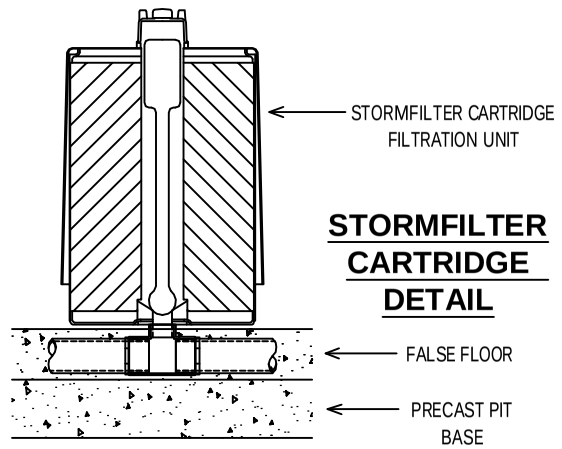
SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	XXX
WATER QUALITY FLOW RATE (L/S)	-
PEAK FLOW RATE (L/S)	-
RETURN PERIOD OF PEAK FLOW (yrs)	XXX
# OF CARTRIDGES REQUIRED	XXX
CARTRIDGE HEIGHT (310, 460 or 690mm)	XXX
MEDIA TYPE (PERLITE, PERLITE/ZEOLITE OR ZPG)	ZPG
PRECAST MAX. LIFT WEIGHT	REF PLAN
PRECAST LID WEIGHT	REF PLAN

PIPE DATA:	I.L.	MATERIAL	DIAMETER
INLET PIPE #1	XXX	R.C.P.	XXX
INLET PIPE #2	XXX	MATERIAL	XXX
OUTLET PIPE	XXX	R.C.P.	XXX



LADDER		YES/NO
ANTI-FLOTATION BALLAST	XXX	XXX
	XXX	XXX
NOTES/SPECIAL REQUIREMENTS:		



STORMFILTER CARTRIDGE DETAIL

Stormwater360

STORMWATER360

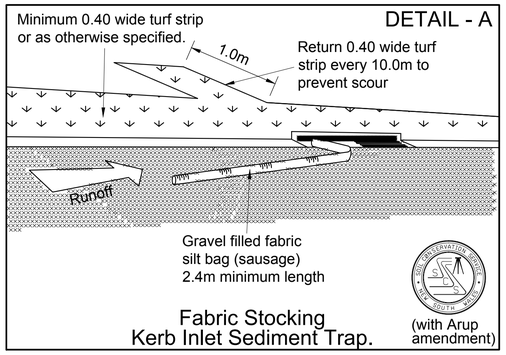
42-70 CARTRIDGE STORMFILTER SYSTEM
10.2m x 2.4m x 2.0m HIGH VAULT
STANDARD PRODUCT DRAWING

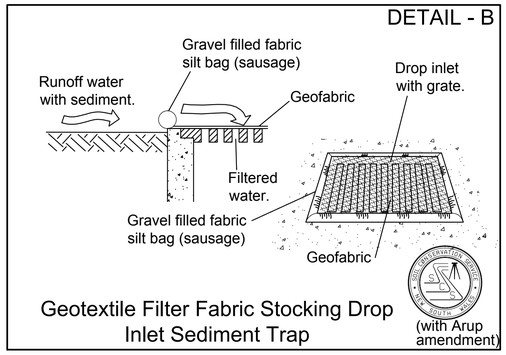
DRAWING 1 A

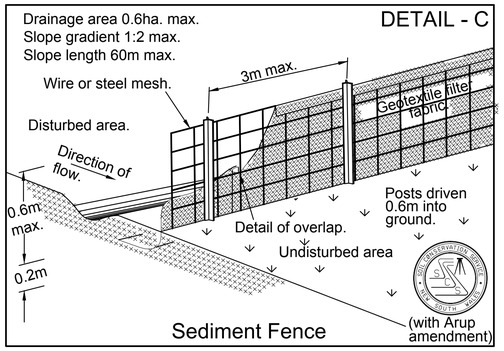
DATE: 23-05-11 | FILE NAME: 42-70CSFV_1A | DRN: R.P. | CHK: M.W.

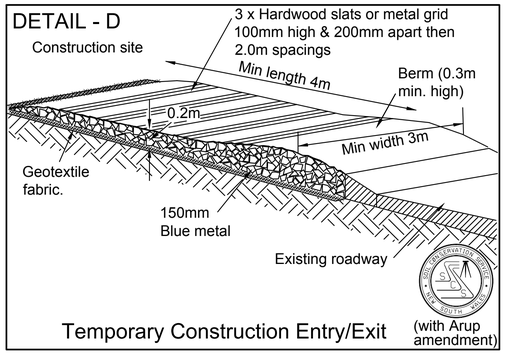
Appendix F

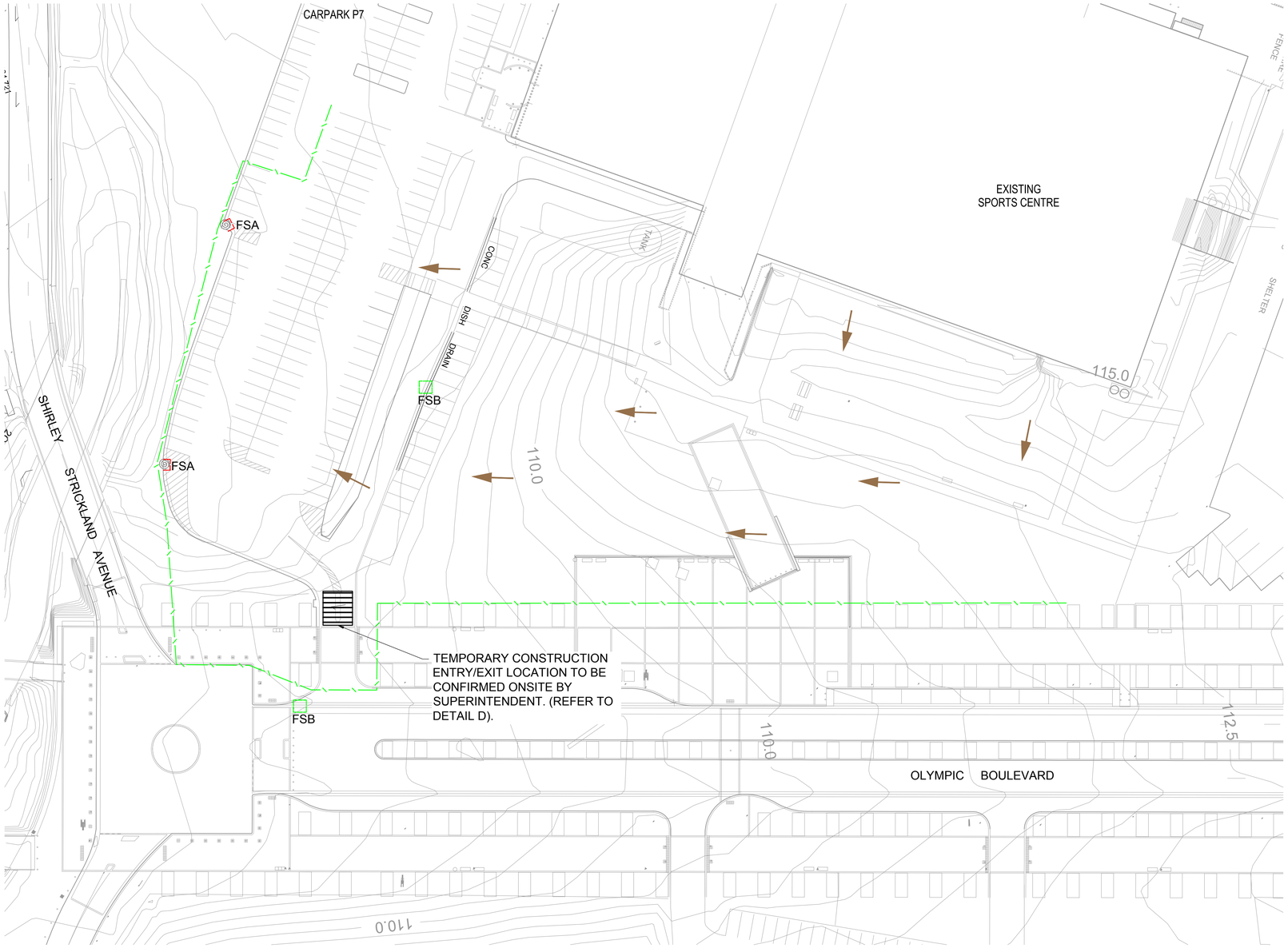
Soil and Water Management Control Plan











SOIL AND WATER MANAGEMENT PLAN NOTES:

1. THE CONTRACTOR IS TO IDENTIFY AND LOCATE ALL SERVICES PRIOR TO THE INSTALLATION OF THE SOIL AND WATER MANAGEMENT WORKS.
2. THIS SOIL AND WATER MANAGEMENT PLAN IS TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, SURVEY DRAWINGS AND THE CONTRACT REQUIREMENTS.
3. THIS SOIL AND WATER MANAGEMENT PLAN IS CONCEPT ONLY. SITE CONDITIONS AND PHASING OF WORKS ARE LIKELY TO INFLUENCE CONTROL MEASURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AMENDING THE SCHEME TO SUIT CONDITIONS AT THE TIME OF WORKS, PHASING AND CONSTRUCTION PROGRAM.
4. WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS SEDIMENT FREE, THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND ANY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE
5. WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE;
   (A) INSTALL SOIL AND WATER MANAGEMENT WORKS.
   (B) STRIP TOPSOIL.
   (C) CARRY OUT BULK EARTHWORKS.
   (D) UNDERTAKE REMAINING SITE WORKS IN ACCORDANCE WITH ENGINEERING DESIGN
   (E) REMOVE SOIL AND WATER MANAGEMENT WORKS NOT REQUIRED FOR OTHER STAGES OF CONSTRUCTION ONCE UPSTREAM SURFACES ARE STABILISED TO THE SATISFACTION OF THE SUPERINTENDENT.
6. DUST CONTROL MEASURES SHALL BE IMPLEMENTED CONTINUOUSLY DURING CONSTRUCTION WORKS TO THE SATISFACTION OF THE SUPERINTENDENT AND SOPA.
7. STOCKPILE LOCATIONS WILL BE DEPENDENT ON THE LOAD OUT LOCATION AND THE POINT OF EXCAVATION. STOCKPILE LOCATIONS TO BE MARKED ON THE SITE PLAN AT THE SITE OFFICE AS THE PROJECT PROGRESSES.
8. A WASHING/CLEANING AREA WITH APPROPRIATE SEDIMENT CONTROL MEASURES IS TO BE SET UP ON A FLAT AREA OF THE SITE.
9. ALL CONTROL MEASURES ARE TO BE CLEANED AND MAINTAINED AT LEAST WEEKLY OR AFTER EVERY DELUGE EVENT.
10. ALL DISTURBED AREAS ARE TO BE PROGRESSIVELY STABILISED WITH PERMANENT VEGETATION AS EACH STAGE OF THE DEVELOPMENT IS COMPLETED.
11. FOLLOWING THE COMPLETION AND RESTORATION OF SITE, THE CONTRACTOR IS TO REMOVE ALL CONTROL MEASURES.
12. PERMANENT DRAINAGE STRUCTURES INCLUDING PIPES AND PITS ARE TO BE HANDED OVER IN A CLEAN CONDITION AT THE COMPLETION OF THE WORKS.
13. ALL STORMWATER PITS ARE TO BE COVERED OR A DROP INLET SEDIMENT TRAP SHALL BE PROVIDED. KERB INLET TRAPS ARE TO BE INSTALLED AFTER COMPLETION OF PAVING.

Status: **PRELIMINARY**

Discipline: CIVIL DESIGN

Print Date:

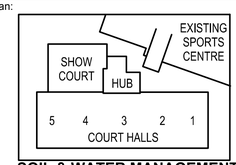
Issue	Date	By	Chkd	Appd
A	11/05/12	AS		
	Preliminary Issue - For Discussion			
B	26/06/12	SAB	SAB	KS
	Revised Preliminary Issue - For Discussion			
C	30/07/12	MJ	SAB	KS
	100% DESIGN DEVELOPMENT			
D	03/09/12	AG		
	FOR CO-ORDINATION			
E	10/09/12	MJ	SAB	KS
	95% TENDER DESIGN			

LEGEND:

- FSA — FABRIC TRAP - REFER TO DETAIL A
- FSB — FABRIC STOCKING - REFER TO DETAIL B
- SEDIMENT FENCE - REFER TO DETAIL C
- OVERLAND FLOW PATH

Architect / Landscape Architect:	Scott Carver Pty. Ltd. Level 8, 71 Macquarie Street Sydney NSW 2000 Australia 02 9957 3988
Project Manager:	Crown Project Services Pty Ltd Level 15, 3 Spring Street Sydney NSW 2000 Australia 02 92524420
Structural/ESD-Mechanical/Electrical/Civil/ Fire and Safety Engineer:	Arup Pty. Ltd. Level 10, 201 Kent Street Sydney NSW 2000 Australia 02 9320 9320
Hydraulic Engineer:	LHO Group Level 1, 25 Atchinson Street St Leonards NSW 1590 Australia 02 9439 1422
PCA Consultant:	Davis Langdon Level 21, 420 George Street Sydney NSW 2001 Australia 02 8934 2222
Quantity Surveyor:	Rider Levett Bucknall Level 5, 34 Charles St Parramatta NSW 2150 Australia 02 9922 2277

Key Plan:



SOIL & WATER MANAGEMENT CONTROL PLAN

ARUP
Arup, Level 10, 201 Kent Street
Sydney, NSW, 2000
Tel +61 (02) 9320 9320
Fax +61 (02) 9320 9321
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NETBALL CENTRAL
Project
Client
NETBALL NSW

Supported by the NSW GOVERNMENT

Funded by Communities NSW - Sport and Recreation
The views expressed herein do not necessarily reflect the views of Comunities NSW - Sport and Recreation

1:500 @ A1

0 1 2 3 4 5 10 15 20 25m

Title
Project **222450**
Discipline **CD**
Dwg. No. **005**
Issue **E**

Attachment 5
Revised Fire Engineering Advice
ARUP

Your ref
Our ref 222450-30
File ref

ARUP

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d +61 2 9320 9474
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rob.fleury@arup.com
www.arup.com

Director General
Department of Infrastructure and Planning
GPO Box 39
Sydney NSW 2000

7 September 2012

Dear Sir/Madam,

Netball Central – Site 107 Sydney Olympic Park
Fire Engineering Design - Planning Application (Rev B)

This letter considers the fire safety design of the proposed Netball Central facility at Sydney Olympic Park, and specifically those aspects of the fire safety design that impact upon planning and hence Planning Application issues for the building.

The proposed building will be a high performance netball venue and also the office for Netball NSW. Five netball courts (single storey) will sit side-by-side, alongside Olympic Boulevard, and are known as the 'standard courts', with limited spectator seating. An additional single storey 'show court' located in the south western corner of the building will allow for more extensive spectator viewing of games and training. The courts are arranged around a four storey amenities/administration 'hub'. An external forecourt will be used for shared access to Netball Central and the adjacent Sports Centre (existing). The proposed building layout is fully described in the architectural plans by Scott Carver forming part of the Planning Application submission.

The fire safety design of the building will generally satisfy the Performance Requirements of the Building Code of Australia (BCA) 2012 by complying with the Deemed-to-Satisfy (DTS) Provisions. However, there are some aspects of the design that are developed using performance based fire engineering to achieve compliance with the Performance Requirements of the BCA. The main aspects that affect the building layout are highlighted below.

The presence of six netball courts and the hub building results in a fire compartment that exceeds the area and volume limitations of the DTS Provisions and the requirements for large isolated buildings are not met (no sprinklers or perimeter vehicular access). However, the use of the facility for netball corresponds to a very low fuel load and therefore large fires spreading throughout the compartment would not be expected. Note that Netball NSW has confirmed its acceptance of the limitations regarding the types of

activities allowed within the facility and a description of this is to be provided on the Fire Safety Schedule.

The standard courts and show courts are proposed to have LVL (Laminated Veneered Lumbar) portal frames, whilst the hub will be an independent concrete structure. A fire engineering Alternative Solution is proposed to justify the use of the LVL portal frames with nil Fire Resistance Level (FRL). This structure is considered to be similar to a number of theoretical DTS compliant buildings, which may have significantly greater fuel loads within.

A polycarbonate cladding is proposed for the façade of the courts, which does not strictly comply with the DTS Provisions for external wall linings. However, the proposed Lexan product performed very well under the AS1530.3 test, receiving the lowest possible score of 0 for the ignitability index, spread of flame index and heat evolved index. This corresponds to a very low risk of fire spread along the façade via the polycarbonate.

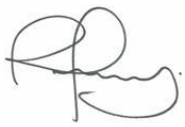
Egress from the building is provided by numerous exits located around the perimeter, with overall egress width meeting or exceeding the DTS Provisions. Some localised instances of extended travel distances occur from areas of the hub.

A circulation stair connects the four levels of the hub, however the DTS Provisions do allow this for an indoor sports stadium. As part of the fire engineering strategy, this stair is to be fire separated at Level 1 and smoke separated at Level 4.

Due to physical restrictions between the proposed Netball Central building and the existing Sports Centre, maintaining the aggregate exit width from the Sports Centre to a road or open space is difficult to achieve. In discussions with SOPA, we understand that an egress stair from the forecourt down to the Sports Centre loading dock road is undesirable, therefore egress between the Sports Centre and Netball Central will be to the north. Arup has assessed the proposed forecourt design in terms of egress from the Sports Centre and considers that the proposed design meets the relevant Performance Requirements of the BCA. Furthermore, our fire engineering design does not require additional management provisions for the Sports Centre.

At this stage of the design, other fire safety aspects of the building appear to be DTS compliant. It is anticipated that other non-compliances with the DTS Provisions of the BCA may arise as the design develops, however it is considered that there are no issues that would affect the building layout arising from compliance with the fire safety Performance Requirements of BCA 2012 and therefore no impediment to the approval of the Planning Application.

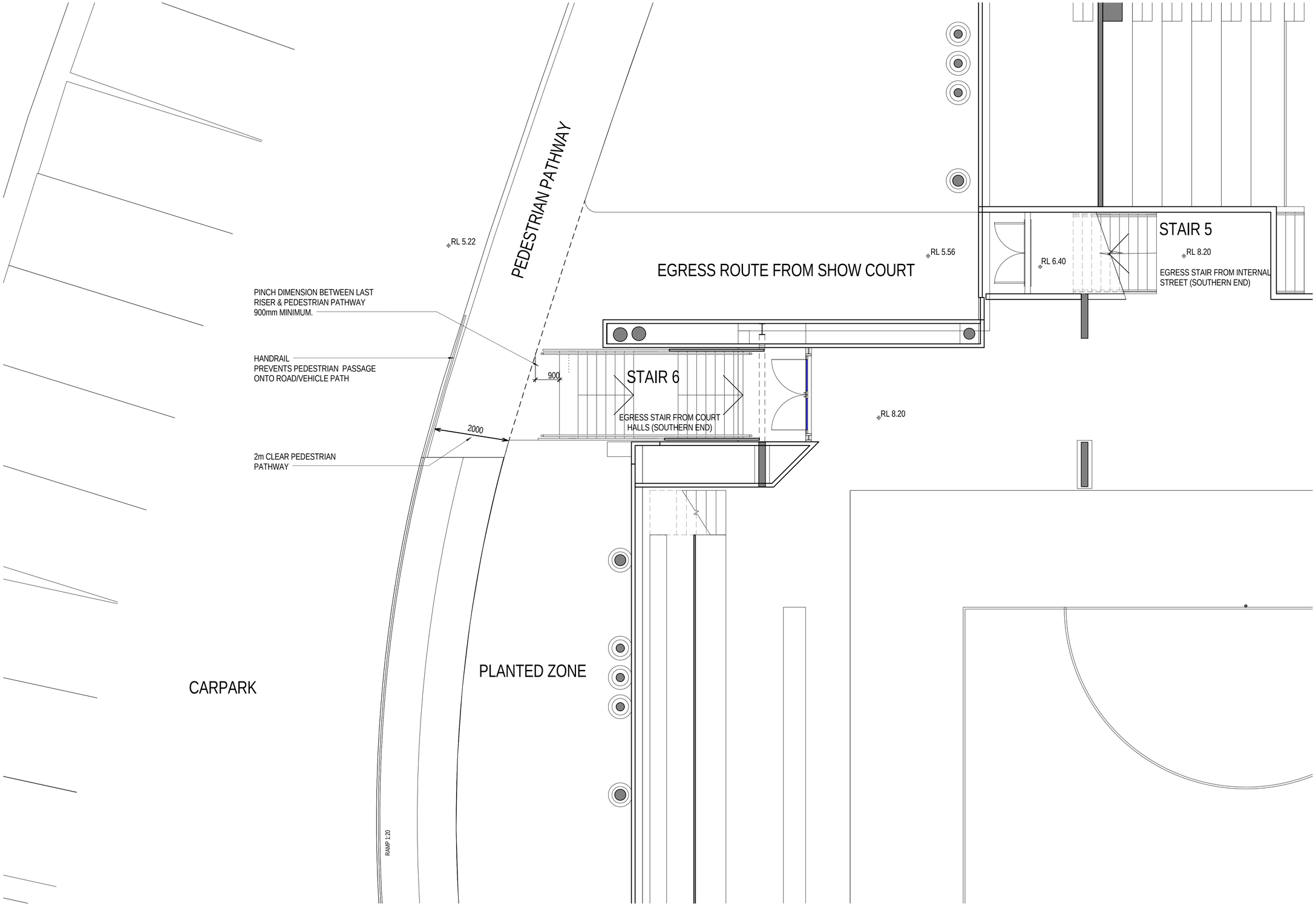
Yours sincerely



Rob Fleury
Fire Engineer

cc Claire Matheson - Scott Carver
Josh Malin - Crown Projects
Felix Gamon - Arup

Attachment 6
Egress Route
Scott Carver Architects



Status: PROJECT APPLICATION ISSUE

Nominated Architect: Bob Perry 3935

File:

Print Date: 28/09/2012 5:34:14 PM

Rev.	Description	Date
A	Project Application Resubmission	28.09.2012

Scott Carver Pty. Ltd.
Level 8, 71 Macquarie Street
Sydney NSW 2000 Australia

Telephone +61 2 9957 3988
hello@scottcarver.com.au
www.scottcarver.com.au

Project: Netball Central

Client: Netball NSW

Supported by the NSW GOVERNMENT

Funded by Communities NSW - Sport and Recreation
The views expressed herein do not necessarily reflect the views of Comunities NSW - Sport and Recreation

Title: Planning Clarification - Egress Route

Project	Discipline	Dwg. No.	Issue
20100036	AD	SK458	A

Attachment 7
Revised RAP
Coffey Environments

REVISED REMEDIATION ACTION PLAN FOR PROPOSED DEVELOPMENT NETBALL CENTRAL, SYDNEY OLYMPIC PARK, NSW

Prepared for:

Crown Project Services Pty Ltd
Level 15
3 Spring Street
Sydney
NSW 2000

Report Date: 4 October 2012
Project Ref: ENAURHOD04232AB

Written/Submitted by:	Reviewed/Approved by:
	
Julia Gaitan	Tot Le
Environmental Scientist	Principal

Coffey Environments Australia Pty Ltd ABN 65 140 765 902
Level 1, 3 Rider Boulevard Rhodes NSW 2138 Australia
T +61 2 8083 1600 F +61 2 8765 0762 coffey.com

4 October 2012

Crown Project Services Pty Ltd
Level 15
3 Spring Street
Sydney
NSW 2000

Attention: Guy Rossiter

Dear Guy

RE: Revised Remediation Action Plan for Proposed Development
Netball Central, Sydney Olympic Park, NSW

Coffey Environments Australia Pty Ltd (Coffey) is pleased to present a Revised Remediation Action Plan (RAP) addressing comments from Department of Planning for the proposed Netball Central development at Sydney Olympic Park, NSW.

We draw your attention to the enclosed sheet entitled “Important Information about Your Coffey Environmental Report” which should be read in conjunction with the report.

We trust that this document meets your requirements. If you require any further information regarding this document, please do not hesitate to contact the undersigned.

For and on behalf of Coffey Environments Australia Pty Ltd

Tot Le
Principal

RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1	ENAURHOD04234AB-R01	Final	1 June 2012	Crown Project Services Pty Ltd	IP
1	ENAURHOD04234AB-R01	Final	1 June 2012	Coffey Environments Australia Pty Ltd	IP
1	ENAURHOD0423AB-R01	Revised	4 October 2012	Crown Project Services Pty Ltd	JDG
1	ENAURHOD0423AB-R01	Revised	4 October 2012	Coffey Environments Australia Pty Ltd	JDG

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LIST OF ATTACHMENTS

Tables

Figures

ABBREVIATIONS

AEC	Areas of Environmental Concern
C6-C36	Hydrocarbon chain length fraction
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
COPC	Contaminants of Potential Concern
CMP	Contaminant Management Plan
DQO	Data Quality Objectives
EIL	Ecological Investigation Level
HIL	Health-based Investigation Level
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW DEC	New South Wales Department of Environment and Conservation
NSW DECC	New South Wales Department of Environment and Climate Change (formerly DEC)
NSW DECCW	New South Wales Department of Environment, Climate Change and Water (formerly DECC)
NSW EPA	Environment Protection Authority of New South Wales (formerly OEH)
NSW OEH	New South Wales Office of Environment and Heritage (formerly DECCW)
OCP	Organochlorine Pesticide
OHS	Occupational Health and Safety
OPP	Organophosphorous Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector

ppmv	parts per million volume
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SRC	Site Remediation Criteria
SEPP	State Environmental Planning Policy
SMP	Site Management Plan
SOPA	Sydney Olympic Park Authority
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbon
UCL	Upper Confidence Limit
VOC	Volatile Organic Compounds

1 INTRODUCTION

1.1 Background

Crown Project Service Pty Ltd (CPS) commissioned Coffey Environments Australia Pty Ltd (Coffey) to prepare a Remediation Action Plan (RAP) for the proposed development of the Netball Central, Olympic Boulevard, Sydney Olympic Park (SOP), NSW (the site).

It is understood that the development project will comprise the construction of a four storey building to house the following:

- Five indoor netball courts of international standard;
- One 'Show Court' with provision for approximately 800 spectators; and
- Provision of amenities for players, officials and the public including a cafe and merchandise area, medical rooms, storage and equipment areas and office space.

This RAP was prepared based on Coffey's Phase 1 Preliminary Site Investigation (P1 PSI) conducted at the site in December 2011.

The site location is presented in Figure 1.

1.2 Objectives

The RAP was prepared in order to:

- Provide a cost effective risk-based strategy for the implementation remediation measures that will reduce or eliminate the risk of any identified soil contamination impacting on identified potential receptors;
- Ensure that the site is remediated to a level consistent with the proposed park, recreational open space and playing field land use; and
- Outline the procedures for remediation, validation, and site control and management, as required.

In addition, the RAP includes the following:

- Provide validation requirements for importation of material for use as a capping layer;
- Requirements for off-site disposal of excavated soils and demolition materials, as required;
- A brief summary of likely site management controls; and
- Attachments detailing Unexpected Finds Protocols and Worker Safety Requirements.

1.3 Scope of Works

The scope of works undertaken in preparation of this RAP included the following:

- Reviewing the site condition, history and surrounding environment;
- Reviewing previous contamination assessment reports pertaining to the site;
- Establishing remediation goals;
- Establishing site remediation criteria (SRC) for the contaminants of concern;
- Identifying and assessing remediation options;
- Recommending a preferred remediation option/s;
- Outlining procedures and activities required for the implementation of the preferred remediation option;
- Outlining requirements for a contingency plan for the remediation;
- Outlining procedures and activities required for validating the remediation;
- Outlining requirements for a site management plan for implementation during remediation;
- Outlining the regulatory compliance requirements for the remedial works; and
- Defining roles and responsibilities for remediation works and validation activities.

2 SITE DESCRIPTION

2.1 Site Identification

A site locality map is presented in Figure 1 and site features showing borehole and test pit locations are presented in Figure 2.

Table 2.1 - Site Identification

Site Address:	Sydney Olympic Park, NSW
Site Identification:	Lot 201 of DP1041756
Site Area:	Approximately 9,000 sqm
Current Land use:	The carpark and landscaped garden areas of the current SOP Sports Centre.
Current Zoning:	The land is excluded land under Auburn Local Environmental Plan 2010. The land zoning and land use provisions of State Environmental Planning Policy (Major Development) 2005 apply to the land.
Adjoining Site Uses:	The site is surrounded by the following: North: Car park of the SOP Aquatic Centre. East: Olympic Boulevard with the SOP Golf Centre and driving range beyond. South: The SOP Tennis Centre. West: Two hockey fields with a car park beyond.
Site co-ordinates	151°4'14.27"E 33°51'11.49"S (based on the eastern car park entrance)

2.2 Site Condition

The site comprises a carpark and landscaped garden area of the current SOP Sports Centre and covers an area of approximately 9,000m^2.

A site walkover undertaken on 1 December 2011 during Coffey's P1 PSI and identified the following site features:

- The site is bound by Olympic Boulevard to the east, Shirley Strickland Avenue to the south, Sarah Durack Avenue to the north and the Sports Centre to the west.
- The area surrounding the site exhibits a topographic crossfall down towards the south. The carpark in the southern portion of the site is lower than the northerly portion with elevation stepping down from north to south.

- The northern portion of the site was observed to be generally covered by grass with asphalt pavements and some established and landscaped trees. The southern portion of the site was mainly asphalt car park. Obvious evidence of distressed vegetation phytotoxic impact (e.g. stress or dieback) was not observed.
- A small pond was observed approximately 55m south and down gradient of the site.
- There were no direct indicators observed of fill material being present across the site, however, the building area is elevated by approximately 4m in relation to the car park area. The car park area is located down an embankment which may have been formed by filling or reworking of natural material.
- No evidence of potential hydrocarbon storage or historic releases were identified.
- Minor evidence of staining was observed at ground surface in the southern car park area of the site.
- No evidence of underground storage tanks was observed.
- No obvious evidence of contamination or potentially contaminating activities was observed.

A site layout plan is presented as Figure 2.

2.3 Hydrology

No creeks or rivers surround or dissect the site. The closest waterways to the site are Powells Creek, located approximately 1.1km to the east, Haslams Creek, located approximately 1.5km north and the Parramatta River, located 1.7km northeast of the site at its closest point.

2.4 Geology

Review of the 1:100,000 Sydney Geological Series Sheet 9130 indicates that the foreshores of Homebush Bay and Parramatta River in the vicinity of Sydney Olympic Park are underlain by man-made fill overlying Quaternary-aged stream sediments.

The man-made fill is expected to comprise dredged estuarine sand and mud, demolition rubble, and industrial and household wastes.

The sediments are expected to comprise silty to peaty quartz sand, silt and clay that exhibits ferruginous (i.e. iron rich) and humic (i.e. organic) sedimentation in places. Shell layers are also common.

The fill is underlain by the Triassic Bringelly Shale, Minchinbury Sandstone and Ashfield Shale of the Wianamatta Group comprising shale with some sandstone beds.

Bringelly Shale is the uppermost unit and is described as carbonaceous claystone and laminite with fine to medium grained lithic sandstone. The Ashfield Shale is described as black to dark grey. An intermediate unit, Minchinbury Sandstone, described as fine to medium grained sandstone is situated between the Bringelly and Ashfield Shale units.

The previous P1 PSI undertaken at the site by Coffey in December 2011 (Coffey, 2011) encountered fill to a depth of 2.6m to 6.3m bgs overlying weathered shale bedrock. Silty clay alluvium over silty clay residual soil was reported in the northern portion of the site in the vicinity of the eastern site boundary

only. Site specific geology in the lower southern portion of the site comprised fill to approximately 1.2m bgs overlying alluvium comprising sandy silty clay and residual soil comprising silty clay to approximately 2.7m bgs, over extremely to moderately weathered shale bedrock.

The site is located within the SOP which has been used for uncontrolled landfilling for many years prior to remediation and redevelopment in 2000 and this has resulted in widespread contamination. The landfill waste was excavated during remediation and re-contained within several landfill areas, one of which is the Golf Driving Range Landfill which encroaches on the southeast corner of the site.

2.5 Hydrogeology

Based on the hydrology of the surrounding area, it is expected that groundwater beneath the site would flow in a broadly northerly direction towards surface water feature of the Parramatta River.

2.6 Acid Sulphate Soil

The State Environmental Planning Policy (Major Development) 2005 Sydney Olympic Park Acid Sulfate Soils (ASS) Map (Sheet ASS 001) indicates that the site does not lie in an area with high probability of ASS.

2.7 Registered Groundwater Bores

A search for registered groundwater bores within a 500 m radius of the site was undertaken using the NSW Natural Resources Atlas (NSW-NRA, http://nratlas.nsw.gov.au) on 22 May 2012. No records were reported for bores in this radius. The search was expanded to a 1 km radius and records for 10 registered groundwater bores were found located to the northeast and east of the site and used for monitoring purposes.

The registered bore data indicated that the depth to groundwater ranged between approximately 1.80m and 1.83m below ground surface (bgs), and, where indicated, the groundwater bearing zone is within shale.

3 SUMMARY OF SITE HISTORY

A summary of the site history review undertaken by Coffey (2011) is presented below:

Historical aerial photographs indicate that the site was undeveloped until 1986 when the SOP Sports Centre building was constructed and the site land was developed into a carpark and landscaped area. The site has remained unchanged since this time, however, the surrounding land has undergone extensive development with filling to the west of the site in approximately 1970, construction of the M4 Western Motorway to the south of the site, development of residential properties to the south and west, development of the SOP Golf Centre to the east, tennis courts to the south and southeast and Bicentennial Park to the east of the site.

A search of the NSW Office of Environment and Heritage (OEH, formerly Department of Environment, Climate Change and Water) online contaminated land record indicates that there is a maintenance of remediation for waste containment areas (Notice Number: 28040) within Sydney Olympic Park, those areas being the Aquatic Centre Car Park Landfill, Bicentennial Park Landfill, Blaxland Common Landfill, Golf Driving Range Landfill, Kronos Hill Landfill, Woo-La-Ra Landfill and Wilson Park Bioremediation. The site is located immediately to the west of the Golf Driving Range Landfill which also encroaches slightly on to the site in the southeast corner of the site.

The notice states that SOP was used for uncontrolled landfilling for many years before it was redeveloped as the major Olympic Games venue in 2000. This resulted in wide spread contamination of the area. Assessment of the contamination in the areas began in the late 1980s and site remediation began in the early 1990s.

The remediation strategy was to consolidate and re-contain the waste into several areas within the SOP and consequently the majority of the SOP area had the buried waste removed before it was redeveloped for the Games. The excavated waste was transferred to the designated waste containment areas named above. These areas were capped, landscaped and turned into parkland. Leachate collection and transfer systems were also built to prevent leachate from escaping.

Wilson Park was a former Gasworks site and the waste was not removed from this particular site as it was for the remainder of the SOP. The nature of the contamination here is waste liquid tar rather than uncontrolled landfilling. However, the remediation strategy adopted was also “cap-and-contain” similar to the remediation of the landfilling areas within the SOP.

A land title search indicates that the land was owned by The Metropolitan Meat Industry Board until 1983, followed by the Minister for Public Works until 1986 and the Sydney Olympic Park Authority (SOPA) until the present day.

A search of the NSW OEH Heritage Branch online database (http://www.heritage.nsw.gov.au) reported that there are no heritage-listed structures listed as registered for the site, however, the Sydney Olympic Games Cauldron, used during the Sydney 2000 Olympic Games is located approximately 900m north northwest of the site.

A search of the Stored Chemical Information Database (SCID) by NSW WorkCover Authority was conducted on 9 December 2011. The search indicated that WorkCover NSW identified no records of licences pertaining to the storage of dangerous goods on the site.

Coffey reviewed one land use planning certificates issued by Auburn City Council on 29 November 2011 (under Section 149(2) of the Amended Environmental Planning and Assessment Act 1979) which

identified the site as excluded land under the Auburn Local Environment Plan 2010. The land zoning and land use provisions of State Environmental planning Policy (SEPP) (Major Development) apply to the land. The planning certificate notes that the site is located within an Environmental Conservation Area under the provision of SEPP (Major Development) 2005.

The land is significantly contaminated land (or part of the land), within the meaning of the Contaminated Lands Management Act 1997, at the date when the certificate is issued.

4 PREVIOUS INVESTIGATIONS

The following provides a summary of the previous contamination assessments carried out on-site.

Phase 1 Preliminary Site Investigation (Coffey, 2011)

The objectives of the P1 PSI were to:

- Identify past and present potentially contaminating activities;
- Identify potential contamination types;
- Discuss the site condition;
- Provide a preliminary assessment of site contamination; and
- Assess the need for further investigations.

The P1 PSI focussed on potential contamination risks for the proposed redevelopment at the site.

The scope of works undertaken for this assessment included a desktop review, site walkover, data assessment, preliminary site sampling and reporting.

Based on the scope of work undertaken, Coffey made the following conclusions:

- The concentrations of TPH, BTEX, PAHs, OCP, OPP and metals in soil samples analysed were reported either below the laboratory limits of reporting (LORs) or below the adopted assessment criteria.
- The Golf Driving Range landfill site, is located immediately to the east of the site, and it encroaches into the southeastern corner of the site.
- Asbestos fibres in soil were detected in the southeastern corner and northern portion of the site, which are located on the southern and northern edges of the proposed development footprint.

Based on the findings, Coffey considered that the site is suitable for the proposed development of the Netball Central subject to:

The asbestos containing soil material in the shallow soil in the vicinity of TP7 be delineated by collection of additional soil samples surrounding the test pit location and asbestos containing material be removed and the site validated. Asbestos containing soil in the deeper soil samples in TP1 be delineated by additional soil sample collection surrounding the test pit and asbestos containing soil can be managed on site. Management of asbestos contaminated soils may include capping of soils under a suitable barrier, consisting of either:

- Hard pavement (concrete or bitumen); or
- A marker layer of geo-fabric or mesh, covered by a minimum thickness of clean landscape materials (topsoil). The landscape materials will need to be stabilised with suitable vegetation to minimise erosion of the cap.

Removal or disturbance (during construction) of the asbestos containing soil material should be carried out under an Asbestos Removal Plan with supervision by a NSW WorkCover licensed (AS1) contractor. The potential for any dusts generated during construction works will need to be managed with periodic

spraying of water etc. during works, along with suitable erosion and sediment controls. Analytical results from the P1 PSI are presented in Tables 1 and 2.

5 SITE CHARACTERISATION

5.1 Area of Environmental Concern and Contaminants of Potential Concern

Based on the results from previous assessment carried out on-site, the Areas of Environmental Concern (AECs) and Contaminants of Potential Concern (COPCs) are summarised in Table 5.1.

Table 5.1: Areas of Environmental Concern and Contaminants of Potential Concern

Area of Environmental Concern	Contaminants of Potential Concern
TP1 (2.8-3.0m bgs) (located in the southeastern corner of the site)	Asbestos
TP7 (0.5-0.6m bgs) (located in the northwest corner of the site)	Asbestos

5.2 Potential Sensitive Receptors

The following potential sensitive receptors have been considered in this assessment:

People visiting and working on the site.

6 ASSESSMENT CRITERIA

6.1 Remediation Criteria

The site assessment criteria presented in the following references are generally the primary references used in NSW when setting investigation and remediation (acceptance) criteria for chemical concentrations in soil:

- NSW DEC (2006) Contaminated Sites: Guidelines for the NSW Auditor Scheme (Second Edition);
- NSW EPA (1994) Contaminated Sites: Guidelines for Assessing Service Station Sites; and
- NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).

Other references were used to supplement the above references where appropriate.

For assessing contamination levels in soil in urban settings, the NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* and the NEPC (1999) present health based investigation levels (HILs) for different land uses (e.g. industrial/commercial, residential, recreational etc.) as well as provisional phytotoxicity based investigation levels or ecology based investigation levels (EILs).

Given that the site is to be redeveloped for indoor and outdoor recreation facilities with minimal landscaping, the investigation levels for parks, recreational open spaces, playing fields land use (HIL E) are considered the most applicable for validation purposes.

In addition, the NEPC (1999) EILs have also been adopted for the site given that landscaped areas are to be included as part of the proposed development.

NSW DEC (2006) Guidelines do not provide levels for volatile petroleum hydrocarbon compounds. NSW EPA (1994) *Guidelines for Assessing Service Station Sites* provide an indication of acceptable levels for sensitive land use for petroleum hydrocarbons compounds. The NSW OEH has advised that these guidelines should also be used for less sensitive land uses. For semi-volatile petroleum hydrocarbons (C_{16}–C_{35} and $>C_{35}$) investigation levels are provided in the NSW DEC (2006) Guidelines, however, these are based on the NEPC (1999) health-based investigation levels, which require the laboratory analysis to unequivocally differentiate between aromatic and aliphatic compounds. The relevant values in NSW EPA service station guidelines will be applied in the first instance as broad criteria to assess TPH concentrations. If TPH impacts are identified in soil, then aromatic/aliphatic investigation levels from NSW DEC (2006) may be utilised to assess the aromatic/aliphatic speciation of TPH.

NSW DEC (2006) states that there are currently no national or NSW EPA endorsed guidelines relating to human health or environmental investigation of material containing asbestos on sites. Site auditors must exercise their judgement when assessing if a site is suitable for a specific use in the light of evidence that asbestos may be a chemical of concern. NSW Health will provide advice to auditors on a case by case basis where appropriate. Enhealth (2005) *Guidelines for Asbestos in the Non-Occupational Environment*, provides some guidance on assessing and managing asbestos in soil although does not provide a threshold concentration or investigation level for asbestos. For this site, Coffey adopted a conservative criterion for asbestos of no detectable asbestos present in the near surface soils.

A summary of site remediation criteria is presented in Table 6.1.

Table 6.1: Summary of Site Soil Remediation Criteria

Analyte	Health-based Investigation Levels (HILs) (mg/kg)[1]	Ecological Investigation Levels (EILs) (mg/kg)[1]	Guidelines for Assessing Service Station Sites (mg/kg)
	HIL E	Interim Urban	
METALS / METALLOIDS			
Arsenic	200	20	-
Cadmium	40	3	-
Chromium (III)	240,000	400	-
Copper	2,000	100	-
Lead	600	600	-
Mercury (inorganic)	30	1	-
Nickel	600	60	-
Zinc	14,000	200	-
ORGANICS			
Total PAH	40	-	-
Benzo(a)pyrene	2	-	-
TPH C_6-C_9	-	-	65
TPH C_{10}-C_{40}	-	-	1000
Benzene	-	-	1
Toluene	-	-	130
Ethylbenzene	-	-	50
Xylenes	-	-	25
OTHER			
Asbestos	ND[2]	-	-

Note:

1. NSW DEC (2006)
2. Not detected in near surface soil, based on NSW EPA Interim Policy.

6.2 Waste Classification Criteria

Waste classification will be conducted in general accordance with the procedures for classifying waste as detailed in the *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW DECC, 2009).

7 REMEDIATION ACTION PLAN

7.1 Remediation Goal

The remediation goal is to render the site suitable for its proposed netball court and associated amenities land use based on a setting of park, recreational open space, playing field land use with minimal landscaping.

7.2 Location of Remediation and Sampling Required

Based on the available data for the site, the location of the soil requiring remediation is summarised in Table 7.2 and the estimated extent of the asbestos impacted soils are presented on Figure 2.

The horizontal and vertical extent of contamination will be defined following delineation investigation works around the identified contaminated soil locations.

Table 7.2: Location of Remediation and Sampling Required

Contamination Source	Location	Sampling Requirement
Asbestos impacted soils	TP7 (0.5-0.6m bgs)	Vertical sampling: fill (sandy clay) to depths of at least 1.5m bgs in the location of TP7. Lateral sampling: delineate the asbestos impact by collecting samples from a 5m radius from the sampling locations.
	TP1 (2.8-3.0m bgs)	Given that no excavation or intrusive works are proposed in the south-eastern corner of the site the delineation of asbestos at the depth of impact surrounding TP1 is not required.

It should be noted that the estimated lateral extent of the remediation may change based on the outcomes of the delineation works.

7.3 Remediation Option Assessment

Remediation of soils on the site are required under the Department of Urban Affairs and Planning's State Environment Protection Policy (SEPP) 55 to address soil contamination on the site and reduce potential risk to human health and the environment.

Based on the data presented in the contamination assessments and the estimated extent of remediation presented in Section 7.2 of this RAP, five remediation options were considered for implementation at the site. These are discussed in Table 7.3.

Table 7.3: Remediation Options

No.	Option	Assessment
1.	Leave the contamination undisturbed.	Asbestos containing material would remain undisturbed and no excavation within the vicinity of the impacted area/s permitted. This option is generally considered to be unacceptable in areas where access to soil is likely as it poses an unacceptable level of human health risk and compromises the proposed land use. In areas where access to soil is unlikely to occur the advantages of this option include the minimal and/or elimination of significant costs associated with the removal, waste disposal and on-going management of the land and the potential of medium to large areas of the site to be undisturbed.
2.	Excavation and off-site disposal of material that does not comply with the adopted assessment criteria.	Asbestos contaminated material would be removed and disposed to an appropriately licensed facility following classification in accordance with NSW DECC (2009). The advantages of this option include the potential for minimising ongoing management of the land, as well as minimising restrictions on future land use following remediation and validation. The disadvantages of utilising this option include significant costs associated with waste transport and disposal, and the potential for medium to large areas of the site to be disturbed.
3.	On-site ex-situ containment of material that does not comply with the adopted assessment criteria.	Contaminated materials would be excavated and buried in purpose-built containment cell on the site. The advantage of this option is reduced waste transport and disposal costs. The disadvantages of this option include the on-going management of land for containment of contaminated soil, the construction costs of containing the material and potentially restricted land use in its vicinity. A long term contamination management plan (CMP) would be required to manage risks associated with potential future disturbance of the contained contamination. The CMP would need to be legally enforceable. The contained contaminant requirement for maintenance of the CMP would need to appear on any Section 149 Planning Certificate issued for the site (which may affect future value and use of the site).

No.	Option	Assessment
4.	On-site in-situ containment of material that does not comply with the adopted assessment criteria.	Contaminated materials could be capped in in-situ. That is, the material would not be excavated. The advantage of this option is to eliminate waste transport and disposal costs, as well as eliminating costs associated with excavating material for containment in another location. The disadvantages of this option include the on-going management of the capped material, the construction costs of containing the material and potentially restricted land use in its vicinity. The placement of a cap on the site may also impact future use of the site. A long term CMP would be required to manage risks associated with potential future disturbance of the contained contamination. The CMP would need to be legally enforceable. The requirement for maintenance of the CMP would need to appear on any Section 149 Planning Certificate issued for the Site (which may affect future value and use of the site).
5.	Excavation and on-site treatment of impacted soils	This option would involve excavation of impacted soil and treatment on site for re-use. The advantage of this option is minimisation of waste transport and disposal costs and potential creation of re-usable fill material (on the site). The disadvantages of this option are that there is currently there is no proven on-site treatment technology to treat/destruct asbestos.

7.4 Preferred Remediation Option and Rationale

Factors considered in assessment of the remediation option included:

- Reliability;
- Regulatory Approvals;
- Relative Cost;
- Time-frame; and
- Ongoing monitoring and future liability.

Based on these factors, Option 2 was selected as the most appropriate and cost-effective method of remediation of the site in the vicinity of TP7 and Option 1 was selected as the most appropriate and cost-effective method of remediation of the site in the vicinity of TP1.

7.5 Overview of Adopted Remediation and Management Activities

The following sub-sections present procedures for management, remediation and validation of the site to render the site suitable for the on-going park and recreational land use, with respect to the identified contamination.

The normal environmental and engineering control measures required for general earthworks would need to be in place. Unless otherwise identified, all activities discussed below will be the responsibility of the contractor and its representative.

An overview of the adopted remediation and management activities is presented in Table 7.5.

Table 7.5: Overview of Adopted Remediation and Management Activities

Areas of Concern to be Addressed	Proposed Remediation and Management Activities
Localised soil impacted with asbestos in the vicinity of TP7	• Delineate the extent of asbestos containing soils in a 10m radius surrounding TP7 by additional sampling and testing (Section 8.2) • Based on the delineation results, excavate the asbestos containing soil to 1.5m bgs (Section 8.3) • Dispose of the excavated material to a licensed landfill as per a waste classification (Section 8.5) • If unexpected contamination is found on site, stop works immediately and follow the unexpected finds protocol (Section 8.6) • If required, backfill the excavation with clean imported VENM (Section 8.7) • If unexpected events arise during remediation and earthworks, follow the remediation contingency plan (Section 8.8)

Deep soil impacted with asbestos in the vicinity of TP1	Based on the current development plans and foundation designs the proposed end relative level (RL) of test pit TP1 is 108.20. The current RL of TP1 is 105.80, which indicates that the site in this area is to be filled, eliminating the risk posed to human health through expose to asbestos containing soils at depth. Therefore, based on the proposed development plans Coffey proposes: • Prohibition of all excavation activities in the vicinity of TP1. • Cover the area in the vicinity of TP1 with a marker layer of geo-fabric or mesh prior to filling the area/site to the required level (RL) for foundation construction design. • Complete a long-term CMP for on-going management of these deep impacted soils (a long-term CMP is outlined in Section 8.4) • If unexpected contamination is found on site, stop works immediately and follow the unexpected finds protocol (Section 8.6) • If unexpected events arise during construction and earthworks in the vicinity of TP1, follow the remediation contingency plan (Section 8.8).

8 REMEDIAL STRATEGY

8.1 Site Preparation and Environment Controls

Site preparation and environmental controls are presented in Section 13.

8.2 Delineation of Asbestos Impacted Soils

Asbestos impacted soils will be laterally and vertically delineated by collecting soil samples in a 10m radius surrounding TP7.

Laboratory results will take approximately one week to be delivered and, therefore, delineation should take place before the site is redeveloped in order to avoid stand-down time while waiting for laboratory results.

8.3 Validation of Excavation

Area of TP7

Once the extent of the asbestos containing soil in TP7 has been delineated, the asbestos containing soil will be excavated and disposed of off-site as *Asbestos Waste.* Preliminary waste classification undertaken in Coffey, 2011 indicated that soil in the vicinity of TP7 could be disposed of off-site as *General Solid Waste to be managed as asbestos waste.*

The excavation works will be undertaken by an AS1 contractor and guided by a suitably qualified environmental consultant. The excavated material will be:

1. Stockpiled on-site for further sampling for waste classification, if required, to facilitate appropriate off-site disposal (refer to Section 8.5);
2. Loaded onto trucks and transported for off-site disposal at a licensed landfill following the waste classification.

Following removal of the soil, the resulting excavations will be validated in accordance with the directions summarised in Section 11.

8.4 Long Term Contamination Management Plan

The objectives of the CMP are to:

- Implement a monitoring program to check the integrity and performance of the remedial and management measures;
- Provide a framework for appropriate health and safety and environmental controls and/or requirements to be implemented in relation to general site users and workers undertaking activities at the site.

The CMP will include and/or discuss:

- A summary of site characteristics;

- A drawing identifying the presence of contaminated soil;
- The assumptions on which exposure settings and risk management are based;

Outline of a long term maintenance and monitoring/inspection program for topsoil layer and grass cover (in capping area).

- Outline of general administrative controls, site rules and restrictions for general site users;
- Outline of administrative, health and safety and environmental controls/requirements if disturbance of the capping area is required;
- Details of monitoring/validation program for the topsoil or capping layer;
- Contingency plans.

8.5 Waste Classification and Off-site Disposal

Excavated soil requiring off-site disposal will be classified in accordance with NSW DECC (2009) Waste Classification Guidelines Part 1: Classifying Waste by a suitably qualified environmental consultant, prior to disposal.

All soil for off-site disposal will be analysed at an adequate frequency. The frequency will depend on the volume and variability of the material. As a minimum, soil for off-site disposal will be sampled at a rate of one sample per 25m3 bulk soil volume or by sufficient samples to enable classification based on comparison of the 95% upper confidence limit (UCL) of the mean. A reduced sampling frequency may be acceptable for larger volumes.

Samples will be analysed for the following analytes, as a minimum: TPH, PAH, heavy metals and asbestos, which were the contaminants of potential concern identified during previous assessments. Leachability tests based on the toxicity characteristics leaching procedures (TCLP) will likely be required. Previous laboratory analysis data may be utilised, where appropriate. Preliminary waste classification undertaken in Coffey, 2011, indicated that the soil excavate from the site could be classified, in accordance with the NSW DECCW (2009) Waste Classification Guidelines: Part 1 Classifying Waste, as General solid waste with the exception of in the vicinity of TP7 which would be classified as General Solid Waste to be managed as asbestos waste and in the vicinity of BH1 to be classified as Restricted Solid Waste. However, TCLP tests are recommended to be undertaken for nickel for samples in the vicinity of BH1 in order to be able to reclassify the soil as general solid waste prior to be disposed off site.

The classified waste soil will be transported in NSW EPA permitted vehicles, according to the classification, to an appropriately licensed landfill for disposal.

The contractor undertaking the works should maintain appropriate records of waste classification, transportation and off-site disposal (landfill dockets etc). These records will be included in the final validation report.

8.6 Unexpected Finds Protocol

Should unexpected potential contamination be found on-site, works should stop immediately. The affected area should be isolated with a minimum five metre radius barrier to minimise potential for disturbance to the affected soils.

Unexpected potential contamination could include, but not be limited to:

Unexpected staining or odours;

Potential asbestos containing materials; or

Unexpected underground storage tanks, buried drums or machinery, etc.

The following general approach for managing unexpected finds should be adopted:

Immediately notify sub-contractors on-site and the Coffey Project Manager of the identified or suspected contamination;

An appropriately qualified environmental consultant should carry out an assessment of the nature and extent of the unexpected contamination, which may include sampling, laboratory analysis and reporting;

Additional remediation work (including an amendment to this RAP) may be required; and

Validation of the remediation should be carried out to assess the success of the remediation works.

8.7 Importation of Fill

If required, excavations created on-site should be backfilled with clean imported virgin excavated natural material (VENM).

The contractor will be responsible for providing geotechnical specifications for the backfilling of the excavation and for undertaking the backfilling in accordance with these specifications. The backfilled material will be compacted by the use of the machine track rolling over the top.

If material is required to be imported for backfilling of excavations it should classify as VENM in accordance with the NSW DECC (2009) *Waste Classification Guidelines – Part 1: Classifying Waste*.

The Contractor must advise Coffey of the proposed source site. Coffey will then assess each proposed source site to assess whether material sourced from that site is likely to classify as VENM. This would generally include a site visit, review of existing reports (if any) and potentially a site history review as well as limited sampling and analysis.

8.8 Remediation Contingency Plan

A contingency plan is outlined in Table 8.8, listing some potential events that may arise during the remediation and earthwork activities that will be undertaken if unexpected conditions occur.

The Remediation Contractors is to assess other potential events that could occur (if any) and identify contingency measures prior to commencement of remediation.

Table 8.8: Contingency Plan

Unexpected Event	Action
Encounter of Golf Driving Range landfill (near TP1) and/or Breach of Landfill Capping	In the event that soil material considered to be landfill of the Golf Driving Range is encountered during development; particularly in the southern eastern corner of the site (near TP1) between depths of 0.2m to 3.0mbgs, the following procedures should apply: • Any potential landfill material/soil which has already been excavated should be bunded and stockpiled on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25mm thickness, protected from erosion and all seepage retained. • Excavation works at that part of the site where the suspicious material (soil) was encountered should cease until an assessment is carried out by a suitably qualified environmental consultant. • Based on a visual assessment, the environmental consultant will provide interim advice on health and safety of remedial works, soil storage and soil disposal to allow remediation to proceed if possible. • Based on sampling and analysis of the material, the environmental consultant will provide advice as to remedial requirements for the excavated material. • Replacement of the Landfill Capping, with a low-permeability clay cap and sand drainage layer to maintain landfill integrity, and the implementation of an overlying marker membrane or a barrier of hard pavement.
Identification of unexpected contaminated materials during the remediation/ excavation works	If during the remediation/excavation work, material is encountered which appears to be potentially contaminated and appears to be different from the soils described in our previous assessment reports, the following procedures should apply: • Any suspicious material/soil which has already been excavated should be bunded and stockpiled on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25mm thickness, protected from erosion and all seepage retained. • Excavation works at that part of the site where the suspicious material (soil) was encountered should cease until an assessment is carried out by a suitably qualified environmental consultant. • Based on a visual assessment, the environmental consultant

Unexpected Event	Action
	will provide interim advice on health and safety of remedial works, soil storage and soil disposal to allow remediation to proceed if possible. • Based on sampling and analysis of the material, the environmental consultant will provide advice as to remedial requirements for the material. In the context of the above, “suspicious” material would include concentrated fibrous bundles, oily or odorous material, drums, metal or plastic chemical containers or brightly coloured material etc.
Environmental or health and safety controls fail or environmental or OHS monitoring indicates potential hazards	Environmental and health and safety contingencies would be presented in the site management plan (remediation phase) to be prepared by the responsible contractor.
Other	Any other unexpected events which may affect the outcome of the remediation would be notified to the environmental consultant. Potential actions to address the unexpected event will be assessed and presented.

9 REMEDIATION SCHEDULE AND HOURS OF OPERATION

The hours of operation will be consistent with the requirements imposed by SOPA.

It is understood the remediation is to commence following approval of the development application (DA) which is to be submitted on 4 June 2012. It is anticipated that the works will be undertaken over the duration of a few weeks although this program could potentially be extended depending on weather and other site specific constraints.

10 SAMPLING, ANALYSIS AND QUALITY PLAN

Data Quality Objectives (DQOs) for validation activities have been developed generally in accordance with the seven step process outlined in the *Guidelines for the NSW Site Auditor Scheme (2nd edition)* (NSW DEC, 2006).

Table 10.1: Data Quality Objectives

State the problem	The primary objective is to assess whether, following the site remediation and validation, the site is suitable for parks, recreational open space land use with minimal landscaping. The main problems are: If and what additional soil assessment works are required? What is the waste classification of soils to be disposed off-site? How should soils be validated? What validation sampling layout should be used? What contaminants should be analysed for?
Identify the decision	The decisions that are required to be made in this project include: Is the number of samples to be collected sufficient to identified the extent of the contamination hot spots? Does the validation data indicate that the site is suitable for the proposed land use or is further remediation required?
Identify inputs to the decision	The primary inputs to assessing the above include: The results from previous assessments carried out at the site. Site Remediation Criteria (SRC). Additional data collected by Coffey during remediation and validation works including field measurements/observations and laboratory analytical results. Outcome of quality assurance assessment from relevant data. Applicable regulatory guidelines.
Define the boundaries of the study	Horizontally, the study boundaries are defined by Olympic Boulevard to the east, the SOP Sports Centre to the west, the grass verge abutting the carpark to the south and the extent of the landscaped area to the north. Vertically the study boundary is defined by the vertical extent of soil contamination.
Develop a decision rule	The decision rules for the project will be as follows:

	If the results of the analytical data quality control assessment (also referred to as a data useability assessment) are acceptable, then the data will be deemed suitable for the purposes of the project. In this regard, data will be assessed against completeness, comparability, representativeness, precision and accuracy; and If the reported assessment and validation results are within the SRC, then the site will be considered suitable for the proposed land use; and If the reported assessment and validation results exceed the SRC, then the potential impact of such contamination will be assessed with a view to further assessment or remediation/management of contamination.
Acceptable limits on decision error	There are two types of error: deciding that the site is suitable for the proposed land use when it is not; and deciding that the site is not suitable for the proposed land use when it is. The assessment will aim to conclude with 95% confidence that the site soils are suitable for the proposed land use. Consequently, the 95% UCL will be used to assess the mean concentrations of contaminants of potential concern (where appropriate).
Optimise the design for obtaining data.	Assessment and validation methods and sampling will target COPCs based on information from previous contamination assessments. Sampling/observations will focus on: The bases and walls of remediation excavations; The bases and walls of additional assessment sampling locations; and Stockpiles for off-site disposal.

10.1 Fieldwork Quality Assurance / Quality Control (QA/QC)

10.1.1 Preparation

Sampling equipment required for fieldwork should include the following (where appropriate):

- Notebook/indelible marker pens;
- Decontamination buckets;
- Deionised or distilled water and Decon 90 detergent;
- Laboratory prepared sample jars;
- Eskies and ice;
- Disposable nitrile gloves;

- Personal protective equipment (PPE); and
- Camera.

10.1.2 Decontamination Procedures

Non-disposable sampling equipment coming into in contact with soil will be decontaminated before and between sampling events to minimise the possibility of cross contamination between samples and minimise the risk of impacting sample integrity. The decontamination process will include the following procedure:

- Washing of the equipment in a solution of phosphate free detergent (e.g. Decon 90) and potable water; and
- Rinsing with distilled water.

10.1.3 Soil Sampling Procedures

Once the extent of the asbestos containing soil has been identified and removed in TP7, samples of soil from the walls and floor of the excavation will be obtained by the excavator/backhoe bucket, in order to avoid the need for personnel to enter the excavation. It should be noted that no personnel is allowed to enter into a Confined Space without having proper training, entry certificates and other required documentation and most excavation pits will fall into the confined space category.

A sample is to be taken from at least 0.15 m below the surface of the soil in the bucket. Personnel will change gloves between each sample and collect soils for analysis that have not come in direct contact with the bucket to minimise potential cross contamination.

Samples of soil from stockpiles (i.e. both the excavated and stockpiled soil) will be obtained by using a hand auger, shovel or the excavator bucket. Personnel will change gloves between each sample to minimise potential cross contamination.

Sampling equipment will be decontaminated as described in Section 10.1.2.

The samples collected for laboratory analysis will be placed in laboratory prepared and supplied glass jars, and sealed with a Teflon-lined lid and a clean “zip-lock” plastic bag.

Soil samples will be placed directly into clean “zip-lock” plastic bags and soil samples screened for volatile organic compounds (VOCs) using a photoionisation detector (PID) calibrated to a known concentration of isobutylene in air. The detection limit of the PID is generally considered to be between 0.5 to 1 parts per million per volume of air (ppmv). The headspace in the soil sample will be allowed to equilibrate for five minutes before the PID suction tube is used to puncture the airtight plastic bag. The readings obtained during the headspace screening will be used as relative indicators of the presence of VOCs and do not represent actual concentrations. Details of the VOC concentrations, sample type, and location will be recorded on standard field forms.

10.1.4 Storage and Transport Procedures

Samples will be placed in laboratory prepared containers. The sample containers will then be placed directly into a chilled cooler for transportation to the NATA accredited analytical laboratory with the Chain of Custody form.

Samples will be transported to the laboratory with sufficient time to perform analysis within the applicable holding period.

10.1.5 Intra-laboratory Duplicates

Intra-laboratory field duplicates will be collected on an average frequency of one sample per ten samples collected (10%). The analytical results of the two spilt samples will be compared to assess the precision of the sampling protocol and to provide an indication of variation in the sample source.

10.1.6 Inter-Laboratory Duplicates

Inter-laboratory field duplicates will be collected on an average frequency of one sample per twenty samples collected (5%). The analytical results of the two split samples will be compared to assess the precision of the sampling protocol, provide an indication of variation in the sample source and to assess the accuracy of the primary laboratory.

10.1.7 Rinsate Samples

Rinsate samples will be prepared in the field using empty bottles and the distilled water/potable water used for the cleaning of non-disposable sampling equipment. These samples will be a check on field decontamination procedures and sample device cleanliness.

A rinsate sample will be collected and analysed for each day of field work carried out, where non-disposable sampling equipment has been used.

10.1.8 Trip Blanks

Trip blanks are a check on sample contamination originating from sample transport, shipping and site conditions. The blank will remain with the sample containers during sampling and during the return trip to the lab. At no time during these procedures will the blanks be opened. Upon return to the lab the blank will be analysed, if needed, as any other field sample. A trip blank will be used and analysed for a batch of samples released to the laboratory, where the contaminants being assessed are volatile in nature (e.g. BTEX or TPH C6-C9).

10.2 Laboratory QA/QC

10.2.1 Laboratory Selection

The primary laboratory proposed for this project is mgt-Labmark Pty Ltd, Lane Cove West, which is NATA-accredited for the analyses to be undertaken. The secondary laboratory proposed for this project is SGS Australia Pty Ltd, Alexandria, which is NATA-accredited for the analyses to be undertaken.

Laboratory Quality Control would include the following:

- The laboratory analysis of samples will be undertaken by a NATA accredited environmental testing laboratory;
- The NATA accredited environmental testing laboratory will implement a quality control plan; and
- The laboratory will include reagent blanks, spike samples, duplicate spikes, matrix spikes, and surrogates spikes and duplicates to assess the laboratory quality control.

Should an alternative laboratory be required during the project, then the above selection criteria will still apply.

10.2.2 Data Assessment

The laboratory quality control data shall be assessed as follows:

- Checking that the reporting limits and procedures are satisfactory;
- Checking that the samples are analysed within holding times;
- Checking that laboratory blanks / reagent blanks are less than the laboratory reporting limits;
- Checking the reproducibility of samples by calculating the Relative Percentage Differences (RPDs) between primary and duplicate laboratory samples; and
- Checking that spikes, surrogate spikes, matrix spikes and duplicate matrix spike recoveries are within acceptable control limits.

Data Quality Indicators that will be adopted for quality control samples are presented in Table 10.2.

Table 10.2: Data Quality Indicators for Quality Control Samples

Type of Quality Control Sample	Control Limit
Duplicate Samples	RPDs within 50% for soil (higher RPDs are acceptable for low concentrations)
Spikes	Recoveries within the following ranges 70% - 130% for inorganics / metals 60% - 140% for organics
Blanks and Rinsate Samples	Analytes not detected.

11 VALIDATION STRATEGY AND WASTE CLASSIFICATION

In order to obtain agreement that the site has undergone appropriate and effective remediation works, a validation of the remedial works in the vicinity of TP7 will be undertaken. This section summarises the scope of works required to achieve validation suitable for the proposed commercial/industrial land use.

There are currently no national or NSW EPA endorsed guidelines relating to human health or environmental investigation of material containing asbestos on sites. For this site, Coffey adopted a conservative criterion for asbestos of no detectable asbestos present in the near surface soils.

11.1 Validation of Excavations

At the completion of soil removal works, field visual observation for asbestos or asbestos containing material (ACM) will be undertaken on the excavation pit. Should field screening indicate that there is a low likelihood of contamination in the residual soils, then soil validation samples will be collected from the walls and base of the excavation.

The following sampling density will be adopted for excavation validation purposes:

Collection of soil samples from the walls of each excavation at a rate of approximately one sample per 10 lineal metres with a minimum of one sample from each excavation wall. Where significant changes in lithology are noted within the excavation, soil validation samples should be collected from each soil horizon; and

Collection of soil samples from the base of each excavation at a rate of approximately one sample per 25m^2 with a minimum of one sample per excavation base.

Selected soil samples will be analysed for asbestos.

11.2 Validation of Imported Fill

Where fill material is to be imported to the site to facilitate backfilling of excavations, the material will comply with the following criteria:

- the definition of Virgin Excavated Natural Material (VENM) as defined in NSW DECC (2009) *Waste Classification Guidelines*;
- sample analysis results below laboratory limits of reporting (LOR) for organic contaminants; and
- sample analysis results within expected metal concentration background ranges (as nominated in Table 5-A of NEPC (1999).

The material shall be assessed by a suitably qualified environmental consultant prior to importation. This assessment shall include:

- a visual inspection of the source site and the proposed fill material (if exposed); and
- collection and laboratory analysis of spatially representative samples of the proposed fill material.

- Samples shall be collected at a rate of one sample per 100m^3 of imported fill, with a minimum of two samples per source site.

The samples shall be submitted to a NATA accredited laboratory for analysis for TPH, PAH, BTEX, OCP, PCB, heavy metals and asbestos. The range of contaminants requiring analysis may need to be revised, depending on the environmental consultant's understanding of historical source site usage and the visual assessment of the material.

Observations will be made by Coffey of the material from each source as it is delivered to site, to check that the material appears consistent with the source and that there is no visual or olfactory evidence of potential contamination such as staining, anthropogenic materials or odours.

Copies of dockets pertaining to imported fill soils will be provided by the remediation contractor to confirm the source, type and quantities of materials.

11.3 Waste Classification

Soil samples will generally be collected at a rate of one sample per 25m3 for each stockpile. A reduced sampling frequency may be acceptable for larger volume.

The soil samples will generally be analysed for TPH, BTEX, heavy metals, and PAH. Soil samples may also require analysis for TCLP.

The procedures for classifying waste are detailed in the Waste Classification Guidelines Part 1: Classifying Waste (NSW DECC, 2009).

12 REPORTING

At the completion of remediation and validation works, a validation report will be prepared in general accordance with NSW OEH (2011) and other relevant guidance documentation.

The validation report will include:

- Executive Summary;
- Scope of work;
- Site identification and description;
- Summary of site history;
- Summary of site condition and surrounding environment;
- Summary of topography, geology and hydrogeology;
- Remediation activities undertaken;
- Validation sampling and analysis plan (including Methodology);
- Field and laboratory QA/QC and data evaluation;
- Basis for soil acceptance criteria;
- Validation sampling results;
- Site characterisation;
- Ongoing site monitoring requirements (if any); and
- Conclusions and recommendations.

13 SITE MANAGEMENT PLAN

13.1 General

The Contractor must implement a Site Management Plan (SMP) that addresses environmental, occupational health and safety hazards and risks during the remediation.

13.1.1 Occupational Health and Safety

The Remediation Contractor will ensure that a project specific occupational health and safety plan has been prepared. This RAP does not relieve the Remediation Contractor of their responsibility for the health and safety of their employees, sub-contractors and visitors to the site, nor their responsibility for preventing contamination of areas outside remediation work areas.

Specific safe work method procedure details for the remediation of contamination on the site shall be the responsibility of the Remediation Contractor and will depend upon the equipment used and the overall sequence of removal.

The Environmental Consultant will prepare a project specific occupational health and safety plan to address health and safety risks associated with the activities they will be carrying out on the site during remediation works.

For the purposes of health and safety during remediation, Coffey recommends that potential asbestos impacted materials are removed under an Asbestos Removal Plan (ARP) prepared by a qualified occupational hygienist. The ARP outlines the occupational hygiene measures (such as air monitoring) to be implemented during asbestos removal works, provide mitigation strategies if the criteria described in the above measures are exceeded and provide direction regarding the handling and removal of asbestos impacted materials to be conducted by an AS1 licensed contractor. A clearance certificate must be provided at the completion of the final topsoil layer by the qualified occupational hygienist.

13.1.2 Dust and Material Handling

The remedial works will involve excavation of the subsurface, stockpiling, transportation and placement of soil, and general movement of vehicles across the site. As such, dust generation is considered a potential impact to the surrounding environment and the public.

The following management measures should be implemented to prevent dust impacts.

General Site Area

High density weave shadecloth shall be placed around the site boundaries.

Excavation Areas

If dust migration from excavation areas is considered excessive due to high winds, exposed soils shall be wetted down or the works should be delayed or limited during these periods.

Stockpile Areas

Temporary stockpiling of excavated materials may result in dust generation. If excessive dust is generated, the material will be covered by high density polyethylene (HDPE) sheeting.

Stockpiles should be positioned where erosion of the stockpile will be minimised and/or securely covered with a tarpaulin or HDPE sheeting where this is not possible.

Regular dampening of stockpiles with water mist may be carried out to minimise dust generation. Note that the amount of water used for dust suppression needs to be minimal in order to prevent runoff.

Stockpiles should not exceed the height of the fencing in order to reduce potential for dust spreading to the surrounding environment.

Whenever possible the temporary stockpiling of soils should be established on sealed concrete.

HDPE sheeting should be placed under the soil stockpiles to mitigate contaminants from seeping into uncontaminated soils.

Haulage of Soils

Trucks transporting contaminated soil from the site or imported fill to the site should be covered in order to minimise dust generation.

The following procedures should be followed on-site to limit the potential for transport of soil/dust off-site via vehicular movement:

- Vehicles on-site should remain on paved areas where possible;
- Minimal vehicular traffic will be entering and exiting the site;
- The excavator will be taken to and from the site on a float; and
- Vehicles, plant and equipment will be washed/brushed down before leaving the site.

13.1.3 Noise

Noise producing machinery and equipment will only be operated during working hours as approved by SOP Authority (SOPA) and/or NSW EPA.

Australian Standard *AS2436-1981 Guide to noise control on construction, maintenance and demolition sites* outlines guidelines for the minimisation of noise on construction and demolition sites and these should be followed at all times.

No “offensive noise” as defined under the *Protection of the Environment Operations Act 1997* shall be created during remediation works/activities.

All associated mechanical plant, equipment and the like used during remediation works/activities shall use all practical and reasonable noise attenuating devices and measures to minimise noise being transmitted from the site.

All equipment and machinery shall be operated in an efficient manner to minimise the emission of noise.

13.1.4 Soil Management

Stockpiles should be labelled to ensure that the stockpiles are properly tracked and classified according to contaminant concentrations and to ensure that mixing of differently classified soils does not occur.

The soil removed during the excavation works should be stockpiled on paved areas or impervious polyethylene sheeting (if required), and will be bunded with silt barriers to mitigate runoff from the stockpile to surrounding areas.

Stockpiles shall not be placed near drainage lines, gutters or stormwater pits. Additional drainage control works will be constructed on-site should the need arise.

If wet weather conditions are encountered, excavation works will cease and stockpiles covered with HDPE lining to mitigate runoff (if required).

Stockpiles will be positioned to minimise potential for stockpile erosion where possible.

The excavation and stockpile areas will be isolated from the surrounding site areas through the use of temporary barricades and fencing.

13.1.5 Water Management

It is possible that excavations may remain open, during which surface water ingress may occur. In order to minimise the need for treatment/disposal of potentially contaminated surface water from excavations, the Remediation Contractor shall implement controls to divert surface water away from open excavations.

It is possible that during excavation works, groundwater ingress may occur. The Remediation Contractor shall pump groundwater ingress from the excavations, transport and dispose of it at an appropriately licensed liquid waste facility.

13.1.6 Traffic

No major traffic disruptions are expected as a result of the on-site works. Excavation and other equipment will be transported to the site in accordance with regulatory requirements.

13.1.7 Working Hours

Remediation work shall only be conducted during hours approved by SOPA.

13.1.8 Access Restriction

Access to the site will be restricted to authorised staff and contractors who have been inducted and appropriately trained for the works being undertaken.

A chain wire fence shall be installed around the perimeter of the site.

Signage, including contractor details and contact numbers, will be erected near the gate at the site. The signage will remain displayed on the site entrance throughout the duration of the remediation works.

The site supervisor shall control site access and shall authorise visitors on an “as needed” basis.

13.1.9 Communication and Complaints

Communication and complaints received for the site must be reported to the principal contractor.

All communications and complaints shall be assessed and an appropriate response, corrective and/or preventative action implemented (as necessary).

A communication and complaints register will be operated on site to ensure that concerns of local residences and businesses are recorded and addressed.

14 REGULATORY COMPLIANCE REQUIREMENTS

In general, the remedial work should therefore be carried out in accordance with SEPP55 and appropriate NSW EPA requirements.

Pre-approval from a licensed disposal facility will be required prior to removal of contaminated soil or liquid from the site.

Handling (including excavation) of any asbestos containing materials and removal of any asbestos from the site will need to be undertaken by an AS1 licensed contractor in accordance with NSW WorkCover regulations.

Other legislative requirements which may be applicable include but not limited to:

- Contaminated Land Management Act 1997 (DECCW);
- Environmental Planning and Assessment Act 1979 (DIPNR);
- Protection of the Environment Operations Act 1997 (DECCW);
- Waste Avoidance and Resource Recovery Act 2001 (DECCW); and
- OHS Act 2000 and OHS Regulations 2001.

It is understood that the remediation does not required to comply with the auditing scheme in NSW, although voluntary compliance with the relevant principles of the auditing scheme is recommended.

15 ROLES AND RESPONSIBILITES

The following provisional roles and responsibilities have been allocated for the duration of the project. In the event that project personnel change, relevant parties will be notified.

Table15.1: Project Personnel

Personnel	Contact Number
Site Owner SOPA	Phone: TBC
Environmental Consultant / Project Manager Julia Gaitan (Coffey Environments Australia Pty Ltd)	Phone: (02) 9406 1000 Mobile: 0427 183 404 Fax: (02) 9406 1002
Remediation Contractor Crown Project Services Pty Ltd	Phone: (02) 9252 4420 Mobile: 0426 210 215 Fax: (02) 9252 4430

16 REFERENCES

Contaminated Land Management Act 1997 (amended July 2009).

Environmental Planning and Assessment Act 1979.

Protection of the Environment Operations Act 1997.

Waste Avoidance and Resource Recovery Act 2001.

OHS Act 2000 and OHS Regulations 2001.

Australian Standard AS4482.1 (1997). *Guide to the sampling and investigation of potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds*.

Australian Standard AS2436 (1981). *Guide to noise control on construction, maintenance and demolition sites.*

Coffey Environments (2011). *Phase 1 Preliminary Site Investigation Proposed Development Netball Central Olympic Park NSW,* (ref: GEOTLCOV24420AA-AE).

Enhealth (2005). *Guidelines for Asbestos in the Non-Occupational Environment*.

NEPC (1999). *National Environmental Protection (Assessment of Site Contamination) Measure,* National Environment Protection Council.

NSW DEC (2006). *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition),* Department of Environment and Conservation NSW.

NSW DECC (2009). *Waste Classification Guidelines, Part 1: Classifying Waste*, NSW Department of Environment and Climate Change.

NSW EPA. (1994). *Contaminated Sites: Guidelines for Assessing Service Station Sites,* NSW Environment Protection Authority.

NSW OEH (2011). *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites,* NSW Office of Environment and Heritage.

NSW EPA (1995). *Contaminated Sites: Sampling Design Guidelines for Contaminated Sites,* NSW Environment Protection Authority.

17 LIMITATIONS

The findings contained within this report are the result of discrete/specific sampling methodologies used in accordance with normal industry practices. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

We draw your attention to “Important Information About Your Coffey Environmental Report” which outline or discuss limitations associated with interpreting contamination site assessment and validation data and drawing conclusions based on the data.

Tables

Revised Remediation Action Plan for Proposed Development
Netball Central, Sydney Olympic Park NSW

Figures

Revised Remediation Action Plan for Proposed Development
Netball Central, Sydney Olympic Park NSW