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28 October 2011

Dear Murray

Royal Randwick Racecourse
 Spectator Precinct - DGR Report- 0002Integrated Water Management_Issue 2

As part of the Spectator Precinct 75w planning process Arup have been asked to review the current architectural documents listed below and advise the impacts to the recommendations made within the above DGR report.

The buildings form essentially remains the same although it has shortened a little.

Title	Number	Rev
Existing Roof Plan	DA-05	B
Proposed Roof Plan	DA-06	B
Proposed Site Plan	DA-07	B
Proposed Site Elevations	DA-08	B
Previous DOP Scheme Overlay	DA-09	B
Grandstand Basement 1	DA-10	B
Grandstand Ground	DA-11	B
Grandstand Level 1	DA-12	B
Grandstand Level 2	DA-13	B
Grandstand Level 3	DA-14	B
Grandstand Level 4	DA-15	B
Grandstand Level 5	DA-16	B
Grandstand Level 6	DA-17	B
Grandstand Level Plant	DA-18	B
Grandstand Level Roof	DA-19	B
QEII Section A-A (Existing)	DA-20	B
QEII Section A-A (Demolition)	DA-21	B
QEII Section A-A (Proposed)	DA-22	B
Paddock Sect B-B & Link Sect C-C	DA-23	B
Elevation NW-SE	DA-24	B
Elevation SW-NE	DA-25	B

Parade Ring Ground	DA-30	B
Parade Ring Level 1	DA-31	B
Section A-A & B-B	DA-32	B
Section C-C & D-D & E-E	DA-33	B
View Analysis – V2	DA-52	B
View Analysis – V3	DA-53	B
View Analysis – V4	DA-54	B
View Analysis – V6	DA-56	B
View Analysis – V7	DA-57	B
View Analysis – V8	DA-58	B
Cut & Fill Plan	DA-60	B

Having reviewed the above documents we confirm that the new building configuration does not alter the recommendations made within the original DGR report and no amendments are required to the report.

Yours sincerely



Nicholas Howard
Senior Associate

Australian Jockey Club
Spectator Precinct
Integrated Water Management Plan

220759

Issue 2 | September 2010

Arup
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This report takes into account the particular instructions and requirements of our client.




It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Job number 220759

ARUP

Document Verification

Job title		Spectator Precinct		Job number		220759	
Document title		Integrated Water Management		File reference			
Document ref		220759					
Revision	Date	Filename	0001Water Management.docx				
Draft 1	27/08/10	Description	First draft				
			Prepared by	Checked by	Approved by		
		Name	NH	NL	NH		
		Signature					
Issue 1	17/09/10	Filename	0002Integrated Water Management_Issue 1.docx				
		Description	Issue 1				
			Prepared by	Checked by	Approved by		
		Name	NL	NH	NH		
		Signature					
Issue 2	22/09/10	Filename	0002Integrated Water Management_Issue 2.docx				
		Description	Issue 1				
			Prepared by	Checked by	Approved by		
		Name	NL	NH	NH		
		Signature					
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
		Name					
		Signature					

Issue Document Verification with Document



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1 Executive Summary

This report has been produced in response to the Director Generals Part 3A Planning requirements MP 10-0097 for the refurbishment of the Spectator Precinct on the Western side of the Royal Randwick Racecourse property.

It addresses water management and use across the Spectator Precinct and specifically responds to the Following DGR's:

DGR-9 – Flooding, Drainage and Surface Water Management

The EA shall address drainage/flooding issues associated with the development/site, including stormwater, drainage infrastructure and incorporation of water sensitive urban design measures. The EA shall:

- *Provide an assessment of any flood risk on site in consideration of any relevant provisions of the NSW floodplain development manual (2005).*
- *Provide a detailed analysis of overland flow paths within the development site and measures proposed to minimise any potential adverse impact of the development on properties / infrastructure upstream and downstream of the development site and adjacent to the development site.*
- *Identify any proposed water management structures including any swales or detention basins and provide information regarding size, location, capacity and purpose of any water management structures*

DGR-10 – Ground Water Management

- *Identify ground water issues and potential degradation to ground water sources and identify mitigation measure to remediate, reduce or manage any potential impacts to the ground water resource and any dependent ground water users*
- *Provide details of the presence and distribution of groundwater dependent ecosystems in the vicinity of the site and identify any potential impacts as a result of the proposal, and any mitigation measures required it address identified impacts.*

DGR-Appendix B – Item 13. Integrated Water Management Plan

- *Including any proposed alternate water supply, proposed end users of potable and non-potable water, demonstration of water sensitive urban design and any water conservation measures.*

Whilst the responsibility for different aspects of water use and conservation fall within the remit of different parties involved with the design, this report aims to focus on the broad principles adopted within the precinct including:

- Reduction in Potable water use
- Rainwater harvesting and reuse
- On Site Detention
- Infiltration and aquifer recharge
- Overland Flow Provisions

- Sedimentation and Erosion Control

Conclusion

In conclusion the following issues have been analysed:

- Reduction in Potable water use
- Rainwater harvesting and reuse
- On Site Detention
- Infiltration and aquifer recharge
- Overland Flow Provisions
- Sedimentation and Erosion Control

This Integrated Water Management Report makes the following recommendations:

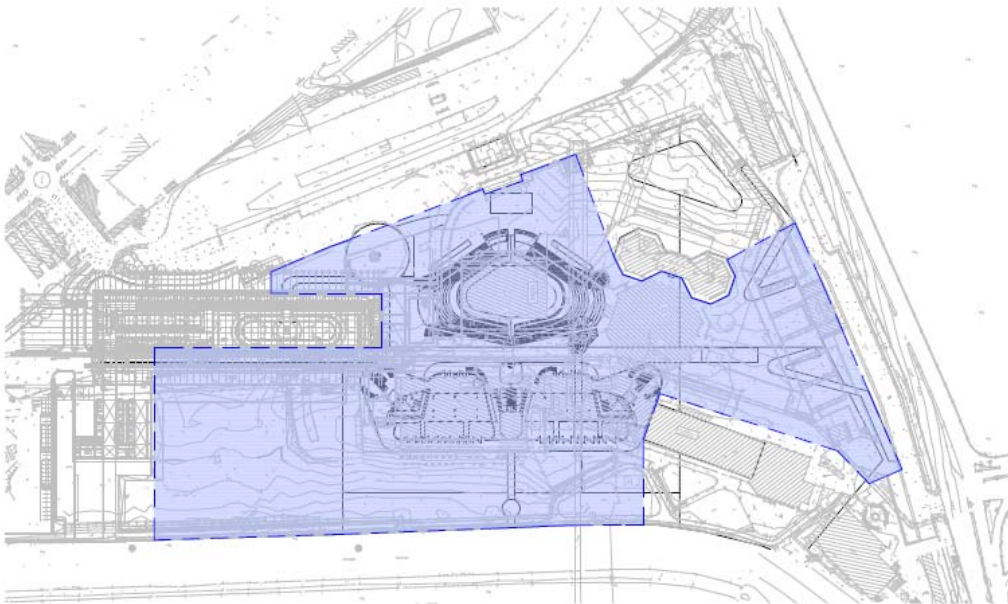
- Rainwater Harvesting be implemented in accordance with the recommendations within this report (0002Integrated Water Management_Issue 2.docx)
- Low Water Use WELS rated taps and fittings be used in accordance with section 3.1 of this report (0002Integrated Water Management_Issue 2.docx)
- No Additional On site Detention be incorporated to maintain current infiltration rates
- Existing infiltration systems remain as currently configured
- A detailed stormwater overland flow plan be prepared as part of the detailed engineering design phase configured to direct surface flows away from the buildings
- A Sedimentation and Erosion control plan is to be prepared and implemented in accordance with the proposed sedimentation and erosion control measures contained within section 8 of this report (0002Integrated Water Management_Issue 2.docx)

2 Introduction

The redevelopment of the existing Spectator Precinct will see the existing Queen Elizabeth II Grandstand refurbished and construction of a new Paddock Grandstand including basement levels, a new parade ring and spectator amenities such as Kiosks and landscaped areas.

This report assesses the impacts of the latest development planning layout on the water management issues within the proposed site precinct boundaries.

The site overlay below shows the Spectator Precinct's location on the site adjacent to the intersection of Alison Road and Doncaster Avenue.



3 Reduction in Potable Water Use

The first principle of water conservation is the reduction in use. This generally focuses on the reduction of the potable uses within buildings and encompasses;

- The incorporation of low water use fittings and fixtures
- Reduction in potable water for cooling tower use through recycled use
- Rainwater harvesting to offset potable water use

The spectator precinct buildings are designed to operate as mixed mode buildings with natural cross ventilation being used for the proportion of the year where external conditions are favourable. This mode of operation will reduce the mechanical cooling required and also the volumes of water used in evaporative cooling towers.

Coupled with the use of low water use fittings the maximisation of Bore Water and Rainwater reuse will be promoted across the precinct.

The following sections discuss each of these potable water reduction measures.

3.1 Water Fittings

The tapware and sanitary ware throughout the facility will be selected to minimise overall water consumption, all fixtures shall bear the following Water Efficiency Labelling System (WELS) Star rating or higher:

Fixture	WELS Star rating
Basins	5*
Sinks	4*
Dual Flush WC (4.5/3L)	4*
Wash down/hose taps	N/A (< 0.2 L/s)

Domestic hot water will be provided with a circulation / return loop to minimise water waste and to ensure hot water is quickly available at the required points of use. Taps in public areas will be self closing and be provided with blended water at 43° Celsius. Return loops will be provided within one (1) meter of each TMV to limit dead legs and reduce waste water due to waiting time.

This provision of blended water to each fitting also serves to reduce waste as personnel only have to operate the tap to have water at a useable temperature, mixing and blending in basins can lead to greater volumes of water use as basins first have to be filled to a level where the water can be mixed and used to wash hands.

Waterless urinals are not proposed. The urinals will be configured as sensor type and configured to operate on the basis of a janitorial flush rather than at each use. The frequency of janitorial flush will be adjusted to match the event demands being placed on the buildings. For small event days where populations are low, flushing frequency will be reduced compared to busy race days where a more frequent flush is appropriate.

4 Rainwater Harvesting

Randwick City Council Policy on Rainwater tanks “Folder Number F 2005/00282 XR F2004/06495” notes the following,

POLICY STATEMENT

That Council will:

1. require all new developments (including residential, commercial, and industrial) to install a rainwater tank for the collection and re-use of roof water.
2. require the connection of the rainwater tank for the internal purposes of toilet flushing and clothes washing (cold water only), and then allow for other authorised uses such as landscape watering.
3.
 - (a) require all new dwelling houses to install a rainwater tank with a preferred size of 5,000 Litres, but not less than 2,000 Litres.
 - (b) require all new townhouse and multi-unit dwellings and all new commercial and industrial premises to provide a site-specific analysis identifying optimum tank size, in order to meet the external and internal demands.
 - (c) where it can be demonstrated, to the satisfaction of Council, that the installation of the tank is not possible due to site constraints or where rainwater supply will not meet the demand requirements of each and every dwelling, such as may be the case for a large multi-unit development, then an alternative off-set provision promoting sustainability and innovation within the development may be put forward for consideration. This sustainable development provision must be provided in addition to Council’s standard sustainability requirements for developments and may include measures such as, greywater utilisation, renewable (solar) energy utilisation, larger communal and/or private landscaped areas, or other innovative features of the development promoting ecologically sustainable development.
4. encourage the use of harvested roof water for car washing, topping up swimming pools, rooftop gardens, and external water features.

2

5. require the installation of rainwater tanks in accordance with the relevant Council Guidelines, Australian Standards, and conditions of authorities – such as Sydney Water and NSW Health.
6. provide guidance and information, including the availability of rebates, to the community and Council staff, which will support the successful implementation of this policy.
7. encourage the installation of rainwater tanks in circumstances where it is not mandatory (i.e. alterations and additions), in conjunction with other water conserving aspects.
8. review this policy as changes to relevant State guidelines occur, and as more information becomes available (i.e. On Site Detention off-set data).

Whilst this policy primarily provides guidance for domestic premises it is noted as including developments of an industrial and commercial nature. It notes in paragraph 3c that where it can be demonstrated that rainwater supply is not able to meet demand requirements due to site constraints, then alternative offset provisions promoting sustainability and innovation within the development shall be put forward.

This report proposes to adopt a hybrid approach to water sustainability due to the infrequency of facilities use. The impracticalities and costs associated with storing / treating rainwater for potentially weeks before use during an event has been considered as an unviable option. Arup’s proposal is to utilise bore water extraction in conjunction with rainwater harvesting systems to minimise the amount of required water storage for major events.

The Queen Elizabeth II and Paddock Grandstands have a combined roof area of approximately 5,400m² whilst the Theatre of the Horse roof is approximately 525m². Combined these roofs have a collection potential of approximately 5.5 Mega litres of rainwater per year, however the intermittent use of the facility is the main driving factor with respect to effectiveness and cost.

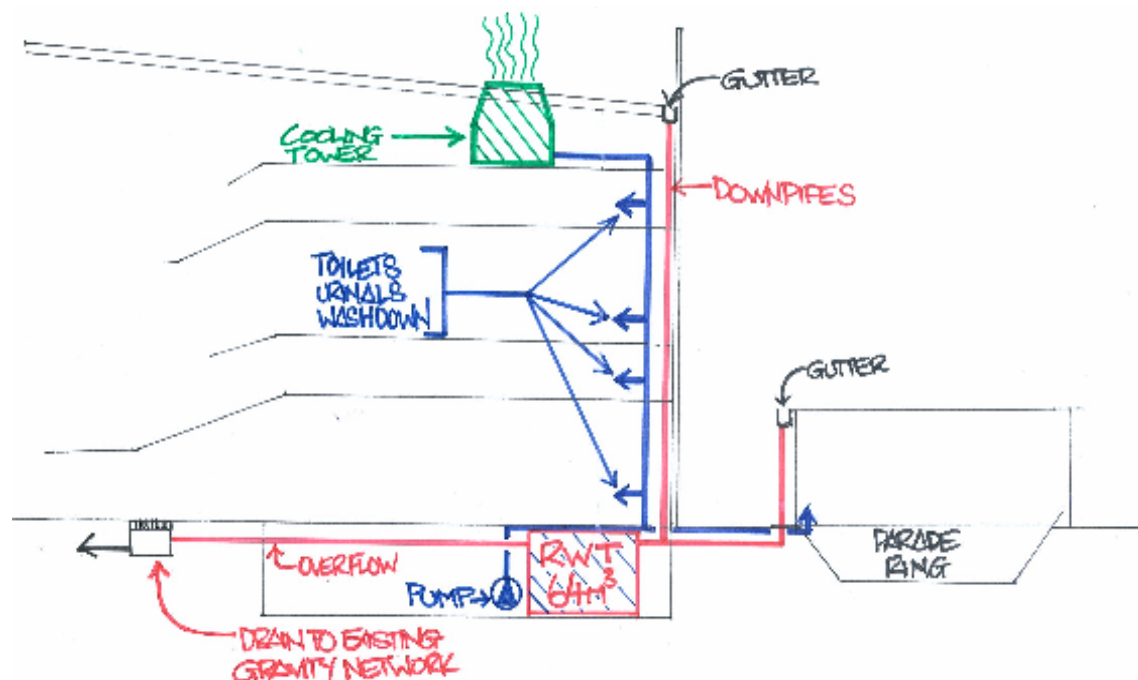
Arup have analysed both the collection potential and the usage patterns based upon the last 50 years of rainfall data to determine an appropriately sized rainwater storage tank. A single 64,000 Litre storage tank is proposed as the optimal volume when considering the intermittent use of the facility, overall roof area and potential for re-use.

The rainwater runoff from the Grandstands and Theatre of the Horse roofed areas will be directed to a single storage tank for reuse by means of a gutter and downpipe system, the water captured within the tank will be reticulated around the precinct to serve the requirements of facility wash down, irrigation, cooling towers and ablution flushing.

The analysis has indicated that one (1) 64,000 litre tank will provide the following offsets and savings of potable water consumption:

- Approximately **20%** of low grade water use is met by rainwater re-use
- Three (3) Mega litres of Potable water saved each year by rainwater re-use

The 64,000 litre tank will be located beneath the Grandstand and the roof water collected will be directed to this tank and reticulated throughout the facility, indicatively shown within the diagram below.



5 On Site Detention

Randwick City Councils “Private Stormwater Code” notes the requirements for OSD in new properties.

ON-SITE DETENTION

Council requires that most areas in the City of Randwick provide on-site stormwater detention. The map in Appendix A shows the areas that require on-site detention and the appropriate Rainfall Intensity that is to be used in each area to determine the relevant Permissible Site Discharge.

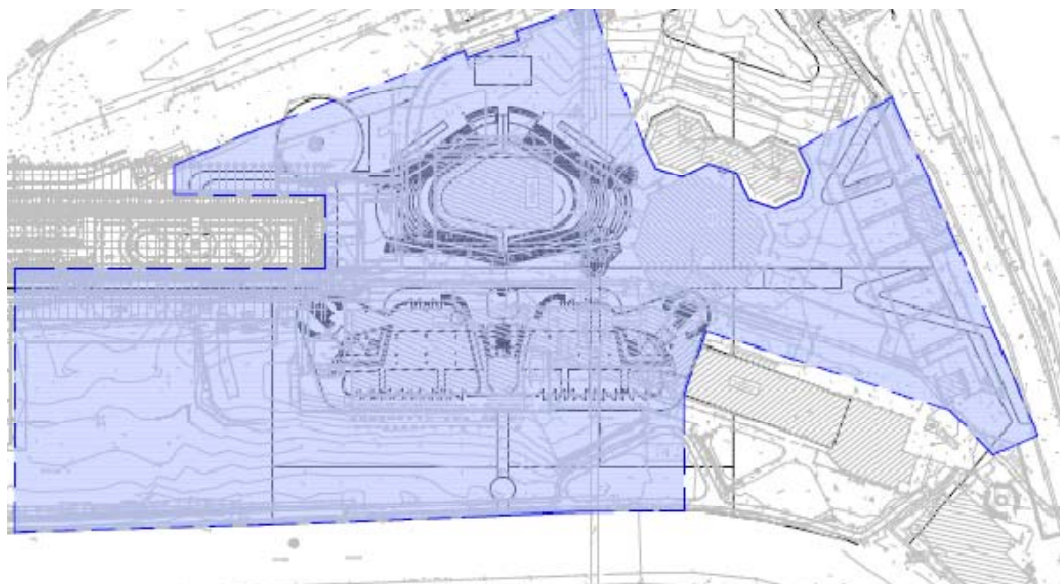
The code notes that where the development can demonstrate adequacy of the downstream systems then OSD may be omitted.

Should the existing downstream drainage be adequate for Council's adopted design standards, it may be possible to avoid on-site detention. However, the onus will be on the developer to demonstrate that this situation exists.

The existing Spectator Precinct, indicated within the precinct boundary (depicted by the image below), incorporates soft landscaping, gardens and lawns. The proposed new development involves demolition / removal of some impervious areas including the Tea House incorporating an equal or slightly greater area of soft permeable landscaping and therefore a theoretical reduced peak stormwater runoff. A summation of impermeable areas within the development site shows:

- The existing precinct incorporates approximately 14,143m² of permeable area
- The new precinct incorporates approximately 14,759m² of permeable area

These areas are considered sufficiently close that it can be considered that the Precinct's impermeable area is unchanged



The existing precinct currently collects runoff into below ground drains and directs this storm water to existing site detention / infiltration basins to the south of the precinct adjacent to the racetrack draining through an existing ø600mm piped connection to the Anzac Parade Council drainage assets. The existing basins will remain in operation during and post redevelopment and will attract no additional storm water load than that which currently exists on site.

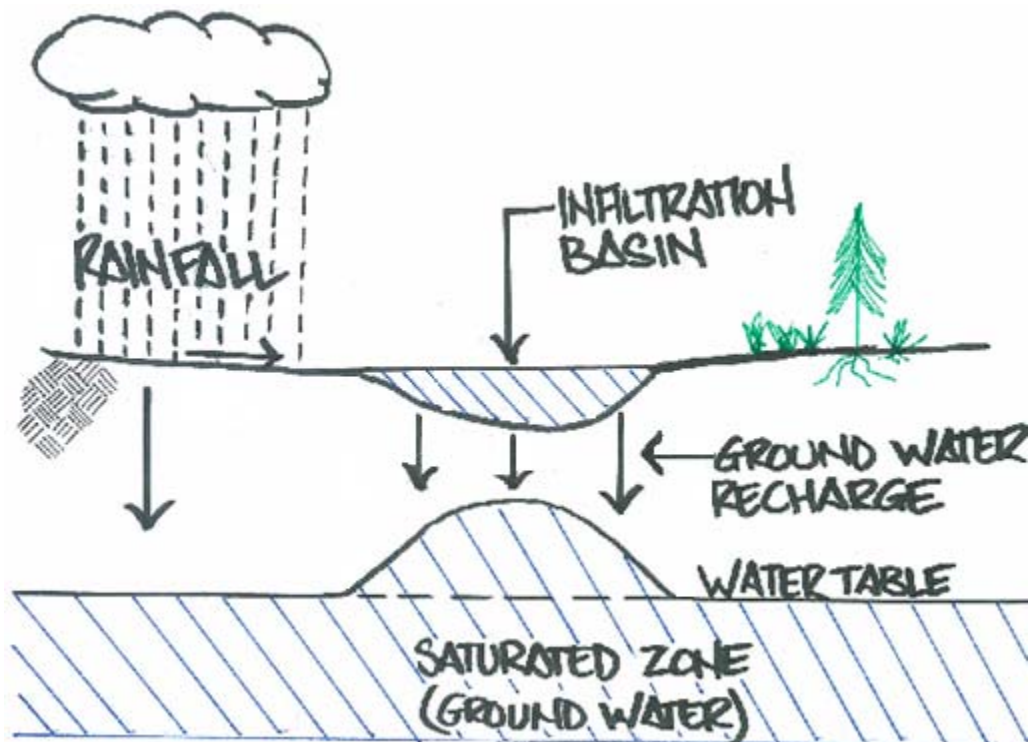
The stormwater systems on site are performing adequately at present and this is taken as also confirming that the downstream drainage is adequate to service the redevelopment without requiring upgrade works.

On this basis no additional On-Site Detention is proposed for this development.

6 Infiltration and Aquifer Recharge

Royal Randwick Racecourse is situated over the Botany aquifer system. An aquifer is the terminology used to describe underground layers of earth that are saturated with groundwater, otherwise known as the water table. To ensure the continuing availability of ground water sources there must be a balance between removal and replacement of water.

The replacement of water into an aquifer is known as 'recharge'. Aquifer recharge occurs naturally when surface water runoff reaches the aquifer by seeping through permeable layers of earth to the Water table. Natural recharge is a slower process relative to surface runoff therefore alternative methods to assist recharge such as infiltration basins are more effective.



The existing Spectator Precinct stormwater drains by gravity through a series of surface inlet pits, piped below the race track level draining to the existing inner and outer detention / infiltration basins located in the south western corner of the property.

The redeveloped Spectator Precinct permeable areas have been only slightly increased in size. It is envisaged this slight increase will have an insignificant impact on the continued operation of the existing basins.

It is proposed the existing inner and outer detention / infiltration basin configurations remain unchanged and the remodelling of the spectator precinct presents an insignificant change to the current infiltration on site given the total area of the precinct.

No additional swales or detention basins are envisaged to be required.

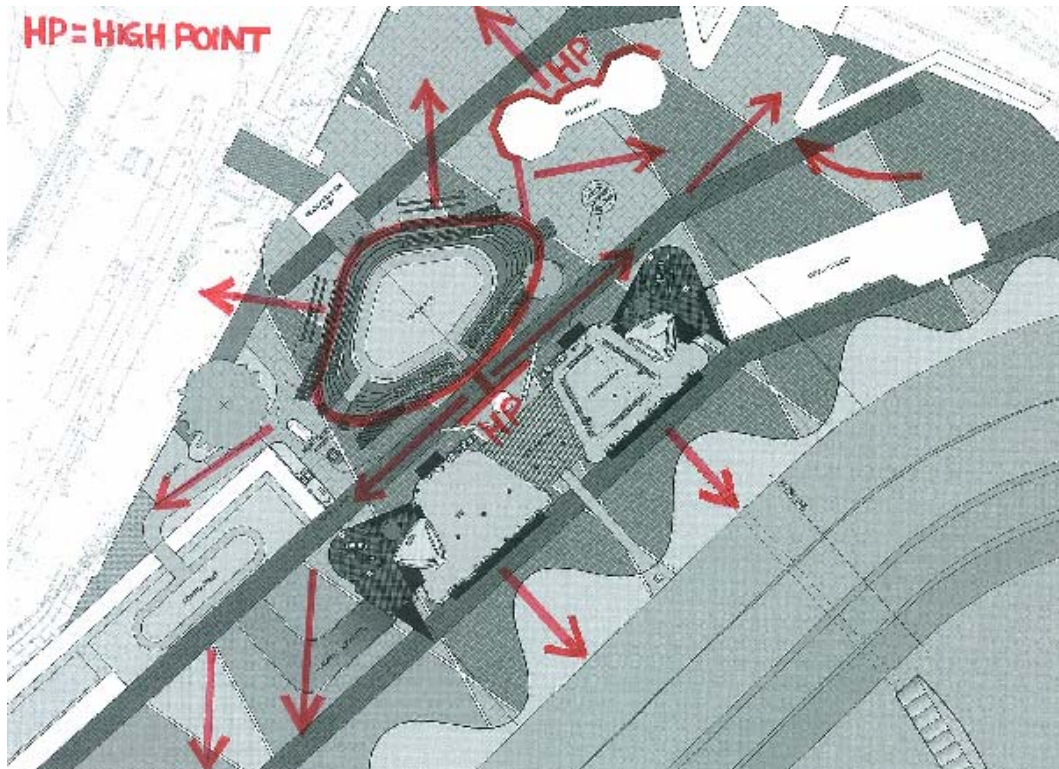
7 Overland Flow Provisions

Overland flow paths relate to the surface water flows created during a peak storm event where drainage systems (blocked or of insufficient capacity) have an alternate method to disperse excess or nuisance surface water without causing damage to property in accordance with Randwick City Council stormwater management requirements.

The existing Spectator Precinct Grandstands and building floor levels are currently situated above the 100 year storm flood level. The basement levels and Theatre of the Horse are below this level and measures will need to be introduced so that they are not susceptible to flooding.

Overland flow paths will therefore be provided to ensure flows generated by local impermeable surfaces and excess surface runoff will be directed away from these buildings. The overland flow paths as depicted within Figure 2 (refer Appendix A) of the Stormwater management plan produced by Webb McKeown and Associates (WMA) shall remain unchanged and locally adjusted within the Spectator Precinct so water is directed away from the buildings.

The following diagram is a preliminary stormwater overland flow plan derived from existing site survey levels and contours. (Indicative layout subject to detailed design)



These overland flow paths will be collected within grated drains and pits and directed into the existing precinct gravity drainage system.

8 Sedimentation and Erosion Control

Sediment controls during redevelopment will be adopted for the site as referenced in the following documents: “Managing Urban Stormwater: Soils and Construction” and must comply with Department of Earth and Climate Change (DECC) regulations.

An erosion plan will be formulated by the building contractor after detail design, staging and construction proposals have been completed.

8.1 Works Description

The contractor will be responsible for implementing the erosion and sediment controls as appropriate, the contractor will:

- Have responsibility for the installation and maintenance of erosion and sediment management controls. These controls shall be modified on site when required by construction schedules to ensure compliance with environmental legislation.
- Submit details of erosion and sediment management procedures for approval to Council at the same time as engineering drawings for each stage of the development. The site Erosion and Sediment Control Management Plan will include a schedule detailing the stages at which various management techniques will be in place.
- Stockpiled material will be protected to prevent them becoming a source of dust or sediment. Earth diversion banks upslope, cover crops of fast growing annual grass species or cereals, mulching and/or sediment containment measures shall be undertaken where stockpiles are to be located for more than 14 days. For periods of less than 14 days, the use of temporary perimeter banks and sediment fences is appropriate for daily protection.
- The contractor will be responsible for the restoration of the site and any adjoining affected lands where sediment deposition has occurred as a consequence of construction activity associated with the development.

8.1.1 Temporary Site Drainage

Stormwater runoff will be directed around or through the site in a non-erosive manner, using sandbags as appropriate.

As works progress, clean water from external catchments will be diverted around any disturbed areas of the site via catch drains. Runoff velocities and volumes will be controlled to prevent scour by the following methods:

- In the event of an imminent storm, sand bag barriers will be strategically placed at exposed areas, to eliminate the opportunity for scour.
- The reconfigured stormwater system will remain offline until the system is complete and the site is sufficiently stabilised. Swale sand / aggregate pillows in geotextile fabric will cover any existing stormwater inlets and gully inlets to prevent runoff entering the system prematurely.

8.1.2 Erosion Control (ESC)

A selection of the following measures is proposed to control erosion on the site:

- Straw bales wrapped in geo-textile woven fabric and fixed to the ground to withstand the erosive forces from a peak storm event (1:100yr 270mm/Hr) and shall be maintained by a cleaning program.
- Sub-surface material will be covered as soon as practical during the works process. This could be primarily in the form of the placement of turf and seeding. Turf will be placed for full verge width behind all concrete kerb and channel, finishing flush with kerbs. All other disturbed areas will be top-soiled to a thickness of 100mm and grass seeded.
- Gully protection in the form of geotextile sand / blue metal filled fabric or filter socks across the grates of all gully inlets located directly downstream of the proposed construction works shall also be provided.
- 0.9m wide turf strips around stormwater field inlets in grassed areas will be provided, where necessary.

8.1.3 Sediment Control

It is proposed that site controls will be implemented within the property boundaries to control sedimentation as much as possible during construction, these controls generally include:

- Stockpiles will be set aside in protected areas of reduced grade
- Filter rolls at kerb-side inlets to include either crushed aggregate or coarse sand filtration and maintained by a cleaning program
- Water wetting of dust areas during dry weather
- Staged stripping of the site and staged vegetation removal
- Sediment filters to retain solids coarser than .02mm
- The need for retention of runoff in sediment traps will be ascertained for each area of runoff depending upon the work methods and staging. Transport to and from site will be required to have covered loads.
- Water wetting of dust areas during dry weather
- Topsoil stockpiles and fill locations are to be banded on the high side and runoff diverted to minimise the opportunity for scour and entrainment of sediment.
- The need for a Shaker Pad to remove excess spillage collected on construction vehicles is to be reviewed.

8.1.4 Pre-Construction Works

Before the commencement of construction activities, the following measures will be implemented to ensure minimal disturbance to the site:

- A Single site entry/ exit point to be established, sign posted, and agreed with Council's Designated Representative for the site;
- The need for a Shaker Pad to remove excess spillage collected on construction vehicles is to be reviewed.
- Define the location of any construction vehicle compound, site office and vehicle servicing area.
- Traffic routes to be established across the site;
- Establish diversion drain devices to divert runoff around potentially exposed areas and control site discharges.
- Sediment fencing to be erected.
- Sandbags to be placed along catch drains to slow flow, reduce scour and capture some course sediment from runoff in appropriate locations; and
- Educate site personnel to the importance of erosion and sediment control (ESC) measures and their maintenance.

8.1.5 During Construction

The Contractor is required to undertake a visual ESC monitoring and maintenance program for the site, to check that the ESC measures:

- Reflect this ESC Program (as approved by Council);
- Are maintained and fully operational at all times; and
- Are modified and/or supplemented as required to suit site conditions.

The nominated personnel should also obtain Bureau of Meteorology weather forecasts for the site and take appropriate action based on such forecasts.

A checklist for the monitoring and maintenance of the ESC program controls onsite is to be kept updated for the duration of works. The site supervisor, or a staff member chosen by the site supervisor, should undertake ESC inspections with the checklist on the following occasions during the works:

- At least weekly
- Prior to forecast rain
- At regular intervals not exceeding 14 hours during prolonged rainfall events
- Immediately after each rain event resulting in runoff from the site.

Should Randwick City Council request additional erosion and sediment control measures be implemented during construction, these measures will be implemented in a timely fashion.

8.1.6 Post Construction

Following the completion of construction works, exposed areas are to be turfed and landscaped in accordance with an Erosion and Sediment Control Plan for the site.

Permanent stormwater mitigation devices will be brought online as early as possible.

8.1.7 Typical sedimentation and erosion control measures

The final responsibility for erosion and sediment control measure will remain with the contractor, the following are a selection of examples that may be incorporated within the controls.

Final submissions will be made as the contractor develops the construction strategies.

