

DCM-S2F

**Hunter Medical
Research Institute**

Development Application
Report

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Report

Civil Engineering and
Stormwater Drainage

August 2009

Arup
Arup Pty Ltd ABN 18 000 966 165



Arup
Level 17 1 Nicholson Street, Melbourne VIC 3000
Tel +61 3 9668 5500 Fax +61 3 9663 1546
www.arup.com

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		Name	Peter Gillespie	Paul Janssen	Paul Janssen
		Signature			
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		Name			
		Signature			
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Executive Summary

A Schematic Stormwater Management plan has been prepared which complies with legislative requirements of local Council. This plan indicates Stormwater drainage can be adequately and appropriately managed and incorporates a number of Water Sensitive Urban Design philosophies, some of which are over and above legislative requirements

The site, being the land required for the proposed new building, is not flood prone.

The potential impact of climate change has been considered and where appropriate the design enhanced to cater for such an occurrence.

1 Introduction

This report has been prepared in response to the Director General's Environmental Assessment Requirements (ref: MP 08_0250 dated 29th January 2009) for a proposed new building, the Hunter Medical Research Institute (HMRI) at 2 Lookout Rd (Lot 132 DP 1053492) New Lambton Heights. This report addresses aspects of the proposal relating to stormwater drainage and general civil engineering.

In addition, this report addresses the issues and advice raised by:

- The City of Newcastle Council (ref: 09/X002 dated 23rd January 2009)
- NSW Department of Water and Energy (ref: ER20464 dated 16th of January 2009)

This report has been structured in so far as it responds to each Director General Requirement (DGR) identified within the Department of Planning Director General's Part 3A Project Application correspondence which is related to stormwater drainage or civil engineering.

2 Scope

Elements relating to civil engineering and stormwater drainage covered in this report include:

- A thorough site analysis and description of the existing environment
- Construction and operational drainage, stormwater and groundwater management issues, including impact on riparian areas, topography, on-site stormwater detention, overland flow paths and drainage infrastructure
- Details of cut and fill earthworks outside the building footprint, including dust and erosion control management issues

Building roof drainage and associated water harvesting and reuse strategies are not covered within this report and are located in the Hydraulic & Wet Fire Services Report.

3 Existing Site Conditions

The existing site consists of medical officers amenities buildings, tennis court, bitumen carpark servicing the hospital and a large area densely populated with heavy timber and a thick underscrub.

The topography of the site consists of steeply sloping hillside with a minor gully to the South which feeds into a detention basin perched on the sloping hillside to the South-East.

Primary access for vehicles is by the Kookaburra Circuit roadway which runs to the South-West of the site. The roadway is elevated adjacent to the rear of the existing hospital and has a retaining wall.

There is minimal control of surface water run-off across the site. Runoff from the bitumen carpark, medical officer's amenities building and tennis court is allowed to flow freely down the hillside where it is captured within the detention basin or allowed to continue on down the slope.

The detention basin is one of the primary discharge points for the hospital complex and consists of a surcharge pit with an energy dissipation structure, an outlet riser for basin discharge and a spillway with an open channel to control overflow during major rainfall events. A number of surface water collection pits are placed along the Kookaburra circuit road and are connected to the detention basin.

4 Project Description

The proposed site development includes:

- Substantial new buildings to the East of Kookaburra Circuit, consisting of two multi-story wings and an elevated 'pod'
- New vehicle access road to the proposed new building, located at the East of the existing hospital off Kookaburra Circuit
- Three substantial car parking areas to the South East of the proposed building

For further description of the site refer to the architect's DA report.

5 Drainage, Stormwater and Groundwater Management

5.1 Codes and Standards

The philosophy for stormwater management of the proposed building has been developed in accordance with:

1. Newcastle City Council's 'DCP 2005, Element 4.5 Water Management'
2. Australian Rainfall and Runoff
3. AS3500 Plumbing and drainage
4. Water Sensitive Urban Design (WSUD) initiatives
5. NSW DWE's Guidelines for Controlled Activities (2009)
6. Best industry practice

5.2 Drainage and Stormwater Management

The proposal includes:

1. Roof water collection and reuse as per the Hydraulic & Wet Fire Services Report
2. Collection and treatment of runoff from paved surfaces to remove waterborne pollutants. The proposal incorporates vegetated swales in accordance with Newcastle City Council's DCP 2005, 'Element 4.5 Water Management'. There is potential to fit the swales with additional bioretention treatment to further enhance the treatment of runoff as required.
3. Surface water infiltrating into the ground will be managed using conventional techniques (water proofing membranes, subsoil drainage pipes, etc) to maintain slope stability and pavement integrity. The geotechnical investigation report, undertaken by Coffey (ref. GEOTWARA20576AB-AC) indicates that ground water profiles are relatively low and should not result in any significant effects.
4. Collection of surface runoff derived from upstream catchments from a small area to the North West. This runoff will be collected and conveyed to prevent impact upon the new building and discharged to maintain the status quo (i.e. utilising the same discharge point as currently occurs).
5. Onsite detention of an initial volume of rainfall in 'site discharge controls' emulating the runoff characteristics of more natural site conditions. The proposal incorporates detention in vegetated swales fitted with check dams, a roof water storage tank and enhancement of the existing detention basin.
6. Erosion and scour control at the site outlet

7. Surface levels have been graded to ensure the site is free draining and excess surface waters do not enter buildings when the underground drainage systems are operating above their design capacity.

Appendix A contains the Stormwater Management Plan for the proposed development. These plans show the key aspects of the stormwater management system, as outlined above.

5.3 Flood Management

The site is located very near the top of a hill with ground falling away steeply to the South and North. The site:

- Is not traversed by a significant overland flow path
- Does not receive significant overland flow from upstream
- Is not affected by peak flood water from any water courses

In accordance with the requirements and definitions outlined within the Newcastle City Council's DCP2005, 'Section 4.3 Flood Management', or the NSW Government Floodplain Management Manual, the proposed building site would not be classified as flood prone land and hence is free from flood risk.

5.4 Impact of Climate Change

The potential impact of climate change on both flooding and general stormwater management has been considered within this proposal. The policy document published by the NSW Government Department of Environment and Climate Change (DECC) titled "Practical Consideration of Climate Change", suggests climate change could potentially increase the severity and frequency of storm events within the Hunter Region by up to 12% by the year 2030.

The site is not currently flood prone, and even considering a 12% increase in flood severity and frequency, would not result in change to this status.

The stormwater management system proposed for this development has also considered the impact of climate change. The drainage system incorporates spare capacity, in the order of that recommended by the NSW DECC within their publication "Practical Consideration of Climate Change". Section 5.2 above outlines the proposed stormwater drainage system and Appendix A includes the stormwater management plan with calculations to this effect.

6 Earthworks Management

The proposal includes:

- Minimisation of cut and fill earthworks to limit impacts to the existing site and reduce the need for exportation or disposal of excess cut and the importation of fill
- An endeavour to achieve a cut and fill balance across the site, reusing cut material as fill where possible and reducing the requirement for exportation or importation of bulk earthworks
- Revegetation of batter slopes to reinforce slope stability and minimise sediment movement from the site

Appendix B and C contain the Site Grading Plan and Site Earthworks Plan for the proposed development. The plans show key aspects of the cut fill earthworks management systems, as outlined above.

The site earthworks plan includes an estimation of the cut and fill levels for the building pad but excludes any specific earthworks required for the formation of building foundations.

7 Construction Impacts

The construction methodologies and activities which are likely to be implemented during construction are very typical of standard building construction practices. As such, methodologies to mitigate construction impacts such as: sediment and erosion control; dust generation; and management of stormwater runoff are very routine and commonly undertaken. Specific requirements and methodologies would be developed, documented and implemented by the Contractor during construction. Such information would be documented within the site specific Construction Management Plan (CMP), which would be prepared at the Construction Certificate stage.

Furthermore, earthworks operations and retaining structures will also be characterised by routine construction methods. Earthworks are required to achieve the required levels for the three carparks areas and also to establish a platform for the building footprint.

7.1 Stormwater and Sediment Management

In general, the Contractor shall be responsible for adequately managing/controlling site stormwater runoff with the aim of preventing erosion and deposition, specifically within water ways or stormwater drains.

The contractor shall be responsible for adequately implementing the requirements of the 'Sediment and Erosion Control Plan' which will be specifically prepared for this site and proposed development as part of the Construction Certificate Phase.

The Sediment and Erosion Control Plan shall include but not be limited to specific requirements such as:

- All work is to be carried out in accordance with relevant ordinances and regulations; note in particular the requirements of Landcom's 'Managing Urban Stormwater, Soils and Construction' (the 'blue book')
- Install sediment protection filters on all new and existing stormwater inlet pits in accordance with the typical details contained within the 'Bluebook'
- All stormwater devices being upgraded are in full working order at the end of each days work
- All stormwater devices in the designated route of vehicular access shall be protected from damage. All damage to stormwater devices during the works shall be repaired or replaced prior to the completion of works.
- Sediment and Erosion Control measures shall be installed prior to the commencement of construction and regularly maintained in accordance with the Engineering drawings and specifications
- Stage the earthworks operations where appropriate to reduce the extent of the site that is 'open' and susceptible to erosion processes
- Install a 'rumble strip' or 'shakedown' at all vehicle entrances/exits to reduce the likelihood of sediment being trafficked offsite. Manually remove (by means other than washing into stormwater drains) sediment tracked offsite on the adjacent roads.
- Use silt fences and staked hay bales to control runoff in individual building zones across the site
- All trenches shall be side-cast to the high side and closed at the end of each days work
- Construct and maintain all material stockpiles in accordance with detail SD4-1 of the 'Bluebook'
- Once cut and fill operation have been finalised all disturbed areas that are not being worked on shall be re-vegetated or sealed as soon as is practical

- The Contractor shall be responsible for keeping a detailed written record of all erosion and sediment controls on site during the construction period. The record shall be maintained and shall contain details on the condition of controls and any/all maintenance, cleaning and breaches. This record shall be kept on site at all times and shall be made available for inspection by the principal certifying authority during normal working hours.
- To reduce the likelihood of suspended solids entering downstream stormwater drains; flocculate, settle and discharge stored water from the temporary sediment basin in accordance with the methodology outlined in the blue book.

7.2 Dust Management

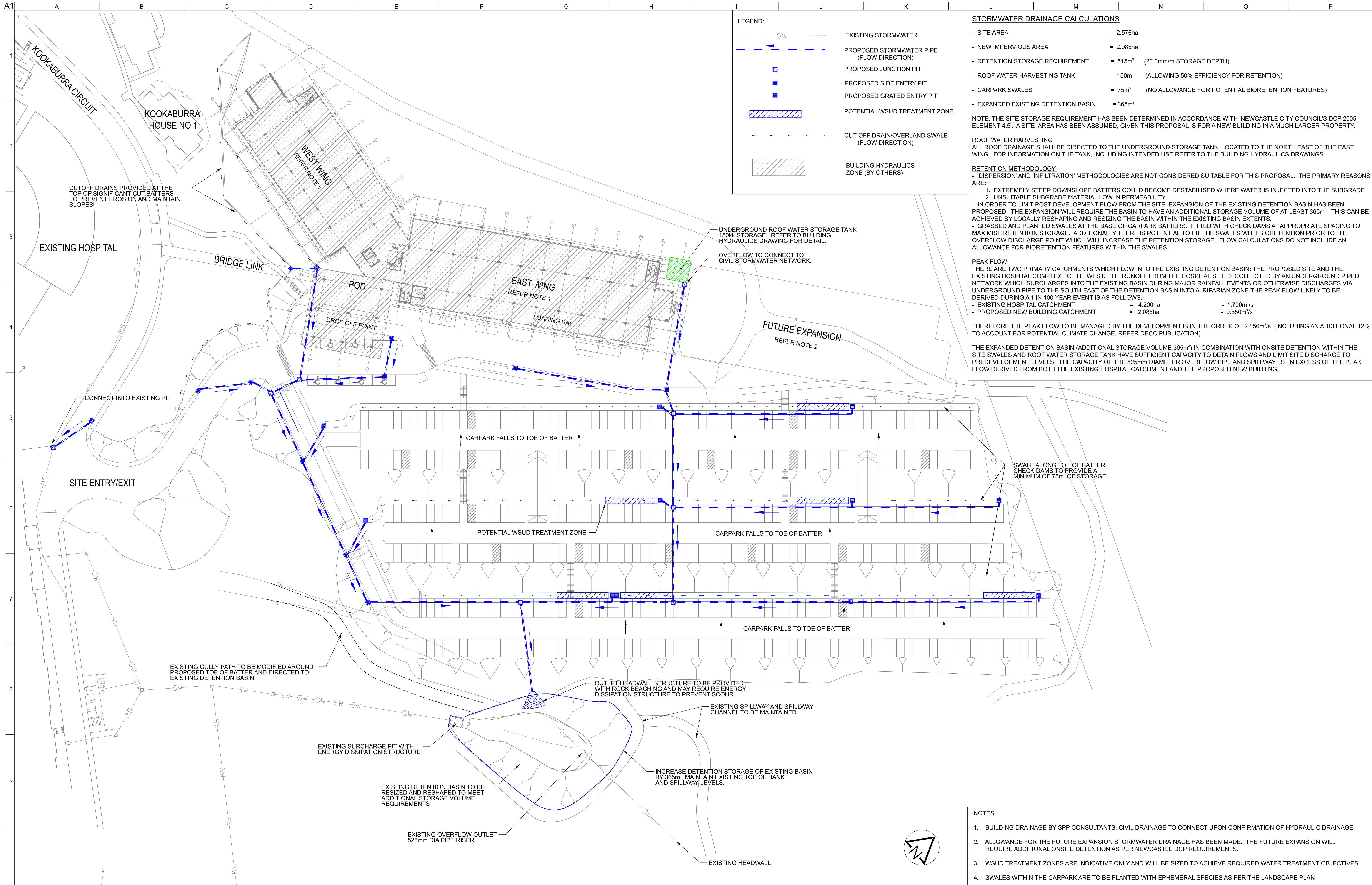
To ensure that dust generation is eliminated or reduced where possible and practical, all site operations shall be undertaken with consideration given to their potential to produce dust.

The Contractor shall instigate measures to minimise and control generation of dust from the site. The measures shall include but not be limited to:

- Program works around periods of significant and adverse meteorological conditions
- Install wind fences around stockpiles in accordance with detail SD6-15
- Maintain vegetation across the site where possible, otherwise establish vegetation or seal disturbed site areas as soon as practical
- Provide water trucks or sprinkling devices during construction as required to suppress dust
- Install and maintain protective cloth to perimeter fence to assist with dust suppression

Appendix A

**Stormwater
Management Plan**



STORMWATER DRAINAGE CALCULATIONS

- SITE AREA	= 2.576ha
- NEW IMPERVIOUS AREA	= 2.085ha
- RETENTION STORAGE REQUIREMENT	= 515m ³ (20.0mm/m STORAGE DEPTH)
- ROOF WATER HARVESTING TANK	= 150m ³ (ALLOWING 50% EFFICIENCY FOR RETENTION)
- CARPARK SWALES	= 75m ³ (NO ALLOWANCE FOR POTENTIAL BIORETENTION FEATURES)
- EXPANDED EXISTING DETENTION BASIN	= 365m ³

NOTE, THE SITE STORAGE REQUIREMENT HAS BEEN DETERMINED IN ACCORDANCE WITH 'NEWCASTLE CITY COUNCIL'S DCP 2005, ELEMENT 4.5'. A SITE AREA HAS BEEN ASSUMED, GIVEN THIS PROPOSAL IS FOR A NEW BUILDING IN A MUCH LARGER PROPERTY.

ROOF WATER HARVESTING
ALL ROOF DRAINAGE SHALL BE DIRECTED TO THE UNDERGROUND STORAGE TANK, LOCATED TO THE NORTH EAST OF THE EAST WING. FOR INFORMATION ON THE TANK, INCLUDING INTENDED USE REFER TO THE BUILDING HYDRAULICS DRAWINGS.

RETENTION METHODOLOGY
- 'DISPERSION' AND 'INFILTRATION' METHODOLOGIES ARE NOT CONSIDERED SUITABLE FOR THIS PROPOSAL. THE PRIMARY REASONS ARE:
1. EXTREMELY STEEP DOWNSLOPE BATTERS COULD BECOME DESTABILISED WHERE WATER IS INJECTED INTO THE SUBGRADE
2. UNSUITABLE SUBGRADE MATERIAL LOW IN PERMEABILITY
- IN ORDER TO LIMIT POST DEVELOPMENT FLOW FROM THE SITE, EXPANSION OF THE EXISTING DETENTION BASIN HAS BEEN PROPOSED. THE EXPANSION WILL REQUIRE THE BASIN TO HAVE AN ADDITIONAL STORAGE VOLUME OF AT LEAST 365m³. THIS CAN BE ACHIEVED BY LOCALLY RESHAPING AND RESIZING THE BASIN WITHIN THE EXISTING BASIN EXTENTS.
- GRASSED AND PLANTED SWALES AT THE BASE OF CARPARK BATTERS. FITTED WITH CHECK DAMS AT APPROPRIATE SPACING TO MAXIMISE RETENTION STORAGE. ADDITIONALLY THERE IS POTENTIAL TO FIT THE SWALES WITH BIORETENTION PRIOR TO THE OVERFLOW DISCHARGE POINT WHICH WILL INCREASE THE RETENTION STORAGE. FLOW CALCULATIONS DO NOT INCLUDE AN ALLOWANCE FOR BIORETENTION FEATURES WITHIN THE SWALES.

PEAK FLOW
THERE ARE TWO PRIMARY CATCHMENTS WHICH FLOW INTO THE EXISTING DETENTION BASIN: THE PROPOSED SITE AND THE EXISTING HOSPITAL COMPLEX TO THE WEST. THE RUNOFF FROM THE HOSPITAL SITE IS COLLECTED BY AN UNDERGROUND PIPED NETWORK WHICH SURCHARGES INTO THE EXISTING BASIN DURING MAJOR RAINFALL EVENTS OR OTHERWISE DISCHARGES VIA UNDERGROUND PIPE TO THE SOUTH EAST OF THE DETENTION BASIN INTO A RIPARIAN ZONE. THE PEAK FLOW LIKELY TO BE DERIVED DURING A 1 IN 100 YEAR EVENT IS AS FOLLOWS:
- EXISTING HOSPITAL CATCHMENT = 4.200ha - 1.700m³/s
- PROPOSED NEW BUILDING CATCHMENT = 2.085ha - 0.850m³/s

THEREFORE THE PEAK FLOW TO BE MANAGED BY THE DEVELOPMENT IS IN THE ORDER OF 2.856m³/s (INCLUDING AN ADDITIONAL 12% TO ACCOUNT FOR POTENTIAL CLIMATE CHANGE, REFER DECC PUBLICATION)

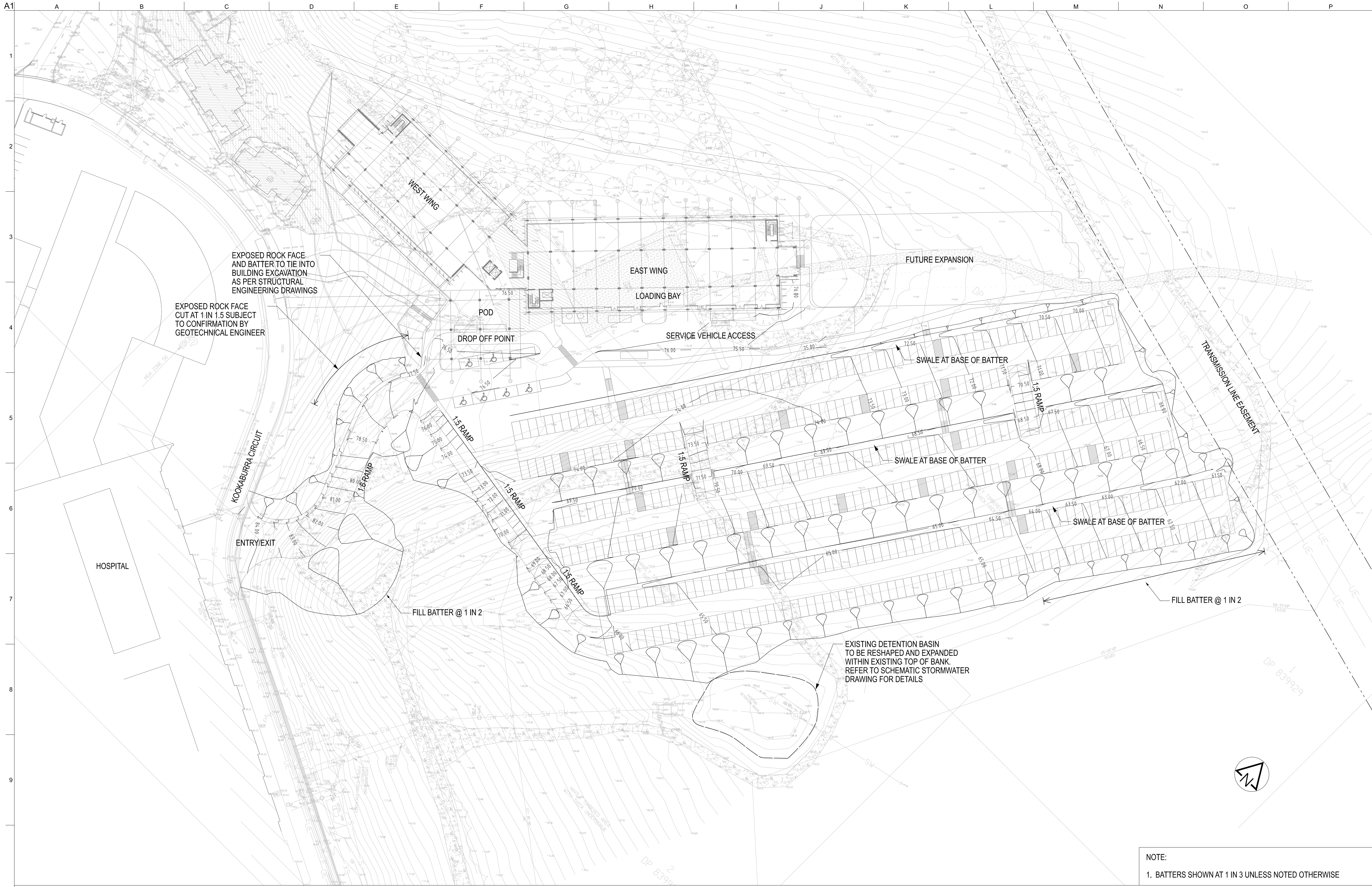
THE EXPANDED DETENTION BASIN (ADDITIONAL STORAGE VOLUME 365m³) IN COMBINATION WITH ONSITE DETENTION WITHIN THE SITE SWALES AND ROOF WATER STORAGE TANK HAVE SUFFICIENT CAPACITY TO DETAIN FLOWS AND LIMIT SITE DISCHARGE TO PREDEVELOPMENT LEVELS. THE CAPACITY OF THE 525mm DIAMETER OVERFLOW PIPE AND SPILLWAY IS IN EXCESS OF THE PEAK FLOW DERIVED FROM BOTH THE EXISTING HOSPITAL CATCHMENT AND THE PROPOSED NEW BUILDING.

- NOTES**
- BUILDING DRAINAGE BY SPP CONSULTANTS, CIVIL DRAINAGE TO CONNECT UPON CONFIRMATION OF HYDRAULIC DRAINAGE
 - ALLOWANCE FOR THE FUTURE EXPANSION STORMWATER DRAINAGE HAS BEEN MADE. THE FUTURE EXPANSION WILL REQUIRE ADDITIONAL ONSITE DETENTION AS PER NEWCASTLE DCP REQUIREMENTS.
 - WSUD TREATMENT ZONES ARE INDICATIVE ONLY AND WILL BE SIZED TO ACHIEVE REQUIRED WATER TREATMENT OBJECTIVES
 - SWALES WITHIN THE CARPARK ARE TO BE PLANTED WITH EPHEMERAL SPECIES AS PER THE LANDSCAPE PLAN

P1 18/08/09 PJG PJG PAJ Schematic Design for DA Issue Date By Chkd Appd					Client HUNTER MEDICAL RESEARCH INSTITUTE 	Job Title HMRI - JOHN HUNTER HOSPITAL RANKIN PARK CAMPUS NEWCASTLE Scale at A1 1:500 Plot ID	ARUP Level 17, 1 Nicholson Street Melbourne, Victoria 3000 Tel +61 (03) 9668 5500 Fax +61 (03) 9663 1546 www.arup.com  Arup Pty Ltd ABN 19 000 966 165	Drawing Title STORMWATER MANAGEMENT LAYOUT PLAN Drawing Status Preliminary - For Development Application Job No 206014 Drawing No CS11 Issue P1
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Appendix B

Site Grading Plan



NOTE:
1. BATTERS SHOWN AT 1 IN 3 UNLESS NOTED OTHERWISE

P1	06/08/09	PJG	PJG	PAJ
Schematic Design for DA				
Issue	Date	By	Chkd	Appd

Client
HUNTER MEDICAL RESEARCH INSTITUTE



Hunter Medical Research Institute

Job Title
HMRI - JOHN HUNTER HOSPITAL

RANKIN PARK CAMPUS NEWCASTLE

Scale at A1 1:500

Plot ID

ARUP

Level 17, 1 Nicholson Street
Melbourne, Victoria 3000
Tel +61 (03) 9668 5500 Fax +61 (03) 9663 1546
www.arup.com

Arup Pty Ltd
ABN 19 000 966 185

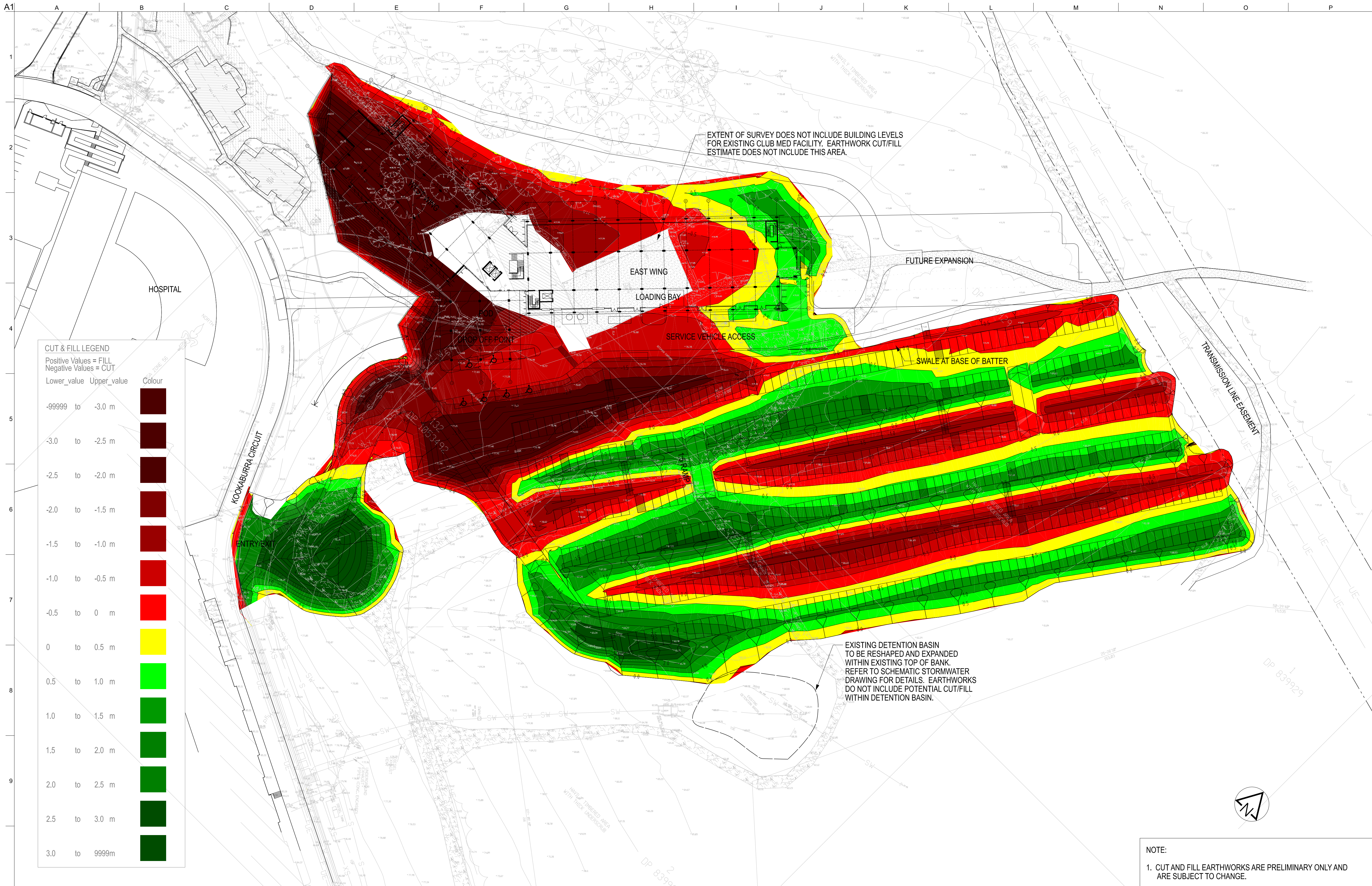
Drawing Title
SITE GRADING LAYOUT PLAN

Drawing Status
Preliminary - For Development Application

Job No 206014	Drawing No CS12	Issue P1
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Appendix C

Site Earthworks Plan



CUT & FILL LEGEND		
Positive Values = FILL		
Negative Values = CUT		
Lower_value	Upper_value	Colour
-99999	to -3.0 m	
-3.0	to -2.5 m	
-2.5	to -2.0 m	
-2.0	to -1.5 m	
-1.5	to -1.0 m	
-1.0	to -0.5 m	
-0.5	to 0 m	
0	to 0.5 m	
0.5	to 1.0 m	
1.0	to 1.5 m	
1.5	to 2.0 m	
2.0	to 2.5 m	
2.5	to 3.0 m	
3.0	to 9999m	

NOTE:
1. CUT AND FILL EARTHWORKS ARE PRELIMINARY ONLY AND ARE SUBJECT TO CHANGE.

P1	06/08/09	PJG	PJG	PAJ
Schematic Design for DA				
Issue	Date	By	Chkd	Appd

Client
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INSTITUTE


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Job Title
HMRI - JOHN HUNTER HOSPITAL
RANKIN PARK CAMPUS
NEWCASTLE

Scale at A1
1:500

Plot ID

ARUP

Level 17, 1 Nicholson Street
Melbourne, Victoria 3000
Tel +61 (03) 9668 5500 Fax +61 (03) 9663 1546
www.arup.com

Arup Pty Ltd
ABN 19 000 996 165

Drawing Title
SITE EARTHWORKS
LAYOUT PLAN

Drawing Status
Preliminary - For Development Application

Job No
206014

Drawing No
CS13

Issue
P1