

Grimshaw Architects Pty Ltd
**ARTHUR PHILLIP HIGH
SCHOOL & PARRAMATTA
PUBLIC SCHOOL**

**Flooding and Stormwater
Management Report**

Civil Report

Issue 1 | 21 March 2016

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.

Job number 247436-03

Arup
Arup Pty Ltd ABN 18 000 966 165



Arup
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

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		Name	A. Sasha Kovacina	Louise Millward	James O'Reilly
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			Prepared by	Checked by	Approved by
		Name	A. Sasha Kovacina	Louise Millward	James O'Reilly
		Signature			
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1 Introduction

Arup has been engaged by Grimshaw Architects on behalf of the Department of Education to prepare a flooding and stormwater management strategy for the proposed redevelopment of the existing Arthur Phillip High School & Parramatta Public School located along Macquarie Street between Smith and Charles Street.

This report has been prepared as supporting documentation to accompany a development application for the site with regards to the State Significant Development (SSD) assessment criteria. This report will address the following Secretary's Environmental Assessment Requirements (Application Number - SSD 7237):

Key Issue	Requirements
12. Utilities	Preparation of an Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design. <i>Note: Alternative water supplies, potable and non-potable water has been addressed in the Development Application ESD Report.</i>
14. Drainage	Detail drainage associated with the proposal, including stormwater and drainage infrastructure.

The Civil plans including the Stormwater Concept Plan and Sediment and Erosion Control Plan have been developed to accompany this report (refer **Appendix A**).

This engineering report has been developed in consultation with Parramatta City Council. Council's performance criteria has been adopted for the stormwater and water quality design.

2 Relevant Guidelines

2.1 Parramatta Local Environmental Plan

Redevelopment of Arthur Philip High School and Parramatta Public School is considered to be a state significant development, consequently, certain requirements outlined in the Parramatta Local Environmental Plan (LEP) 2011 Parts 6.2 and 6.3 pertain to the flooding and stormwater management strategy for the site.

Part 6.2 of the LEP relates to proposed Earthworks, and requires that the following be considered prior to consent:

- (a) the likely disruption of, or any detrimental effect on, existing drainage patterns and soil stability in the locality;
- (g) the proximity to and potential for adverse impacts on any watercourse, drinking water catchment or environmentally sensitive.

Part 6.3 of the LEP relates to Flood Planning, this clause applies to land at or below the flood planning level. The flood planning level is defined as the level of a 1:100 ARI (average recurrence interval) flood event plus a 0.5 metre freeboard.

2.2 Parramatta Development Control Plan

In accordance with planning advice received during the concept design process, stormwater quantity and quality management will be designed in accordance with Council Development Control Plan 2011 Part 3.

The stormwater measures applicable to the site include:

- The provision of stormwater quality measures during construction and once the gravity pit and pipe stormwater system is operational;
- A gravity pit and pipe system connection to Council's stormwater system in Smith Street, Macquarie Street, Charles Street and Barrack Lane;
- The gravity pit and pipe system is to be designed and installed and maintained in accordance with the AS/NZS3500:2015 National Plumbing;
- The provision of on-site detention (OSD) in accordance with Upper Parramatta River Catchment Trust requirements as outlined in the On-site Stormwater Detention Handbook Fourth Edition December 2005;
- The integration of roof water harvesting to provide a non-potable water source;
- The provision of stormwater quality treatment to meet reduction criteria outlined below:

Pollutant	Pollutant Performance Target reduction loads
Gross Pollutants	90% reduction in the post development mean annual load of total gross pollutant load (greater than 5mm)
Total Suspended Solids	85% reduction in the post development mean annual load of Total Suspended Solids (TSS)
Total Phosphorus	60% reduction in the post development mean annual load of Total Phosphorus (TP)
Total Nitrogen	45% reduction in the post development mean annual load of Total Nitrogen (TN)
Hydrocarbons, motor oils, oil and grease	No visible oils for flows up to 50% of the one-year ARI peak flow specific for service stations, depots, vehicle body repair workshops, vehicle repair stations, vehicle sales or hire premises, car parks associated with retail premises, places of public worship, tourist and visitor accommodation, registered clubs and pubs

Stormwater quality modelling will be undertaken in accordance with the Sydney Metropolitan Catchment Management Authority Draft MUSIC Modelling Guidelines for New South Wales 2010. The design of the stormwater drainage system is to be in accordance with Australian Rainfall & Runoff 2001, AS/NZS3500:2015 National Plumbing.

3 Existing Site

The project site is located within Parramatta City central business district approximately 300m from Parramatta River. The site is currently occupied by the existing Parramatta Public School and Arthur Phillip High School. The Site is split into two parcels by Macquarie Street. The High School occupies the entire northern parcel and shares the southern parcel with the Public School located to the east.

The northern parcel shares a common boundary with commercial developments to the north and east, Macquarie Street to the south and Barker Lane to the west.

The southern parcel is bound by Macquarie Street to the north, Charles Street to the east, Little Street and 1st Australian Armoured Regiment Lancers Memorial to the south and Smith Street to the west. Refer Figure 1 below.



Figure 1 Existing Site location (Source: SIX maps, Land and Property Information)

The entire site is made up of fifteen lots identified as Lots 65, 64, 63A, 63 and 62 Section 17, DP758829, Lots 1, 2 and 3 DP115296, Lots 23, 24, 25 and 26 DP7809, Lot 413 DP820541, Lot 414 DP820542 and Lot 27A DP449406. With easements for substation (AF945909) and restricted use AF945910 in the eastern corner of the site.

A natural crest (at approx. 11.5mAHD) exists at approximately the boundary of Parramatta Public School and Arthur Phillip High School, with the site falling to the north at approximately 4~5% and north-east at grades over 10%. Earthwork batters from the crest and along Macquarie Street have been constructed to

accommodate a level grass playing field (approx. 7.5mAHD) in the eastern corner of the northern parcel.

The existing site predominately consists of impervious surfaces, varying from concrete footpaths, asphalt paving, roofs and softfall areas. The northern parcel has a dedicated pervious area of 4800sq.m.



Figure 2 Existing Site Aerial

The survey drawing prepared by Rygate & West Plan Ref. 76957 Sheet 1 to 7 23/06/2015 does not show these properties as being affected by existing drainage easements. There is evidence of a substantial pit and pipe system draining through the site to Charles Street.

4 Proposed Development

It is proposed that the existing primary and high schools be demolished and replaced with two multi-storey buildings. The northern parcel would be developed for the high school and the southern parcel for the primary school, refer below.

The proposed high school will be set back from the existing eastern boundary to accommodate a service lane and a drop off area. Additional setback areas will be utilised as open play areas.

It is proposed to construct the primary school at the eastern end of the southern parcel. Little Street will be upgraded to accommodate a dropoff area. Significant trees located throughout the site will be maintained with play areas designed around them. The proposed building will have a grassed roof that will be accessible to students.

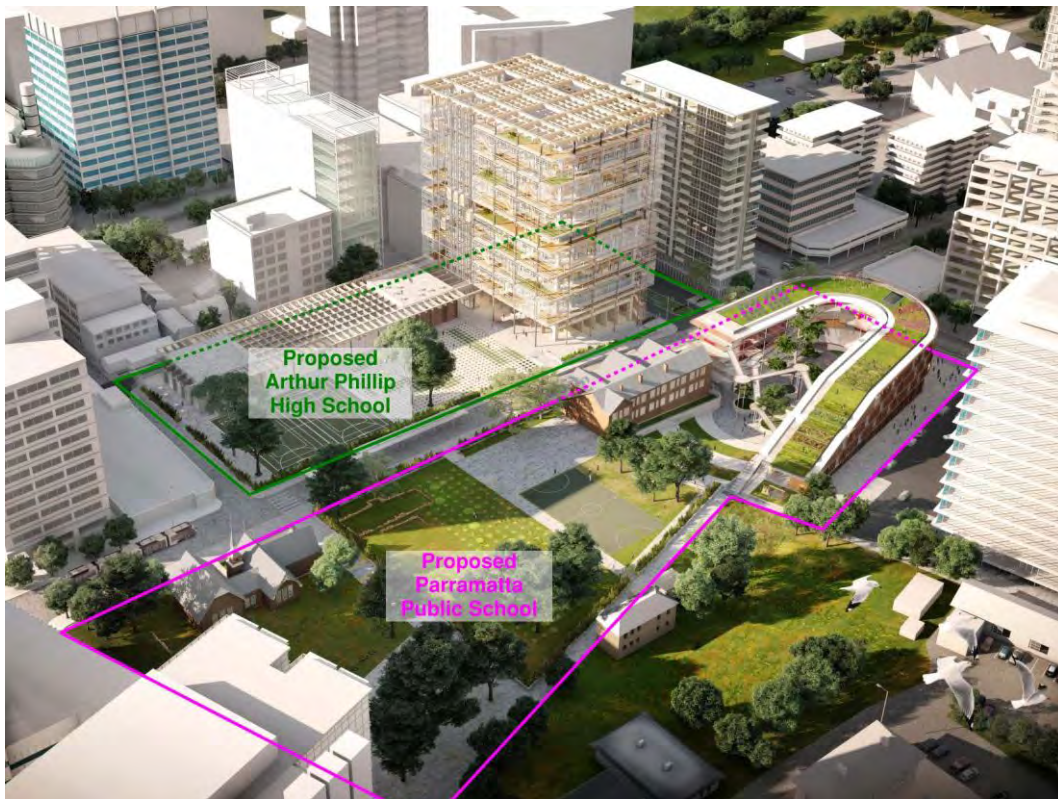


Figure 3 Proposed Development (source: Grimshaw)

5 Flooding

5.1 Existing/baseline flooding

Most of the site is located in the Lower Parramatta River Catchment, defined as “lands downstream of the Charles Street weir”, refer Figure 1. Results of a flood enquiry from Council are shown in Figure 4, below (full results attached in **Appendix B**).

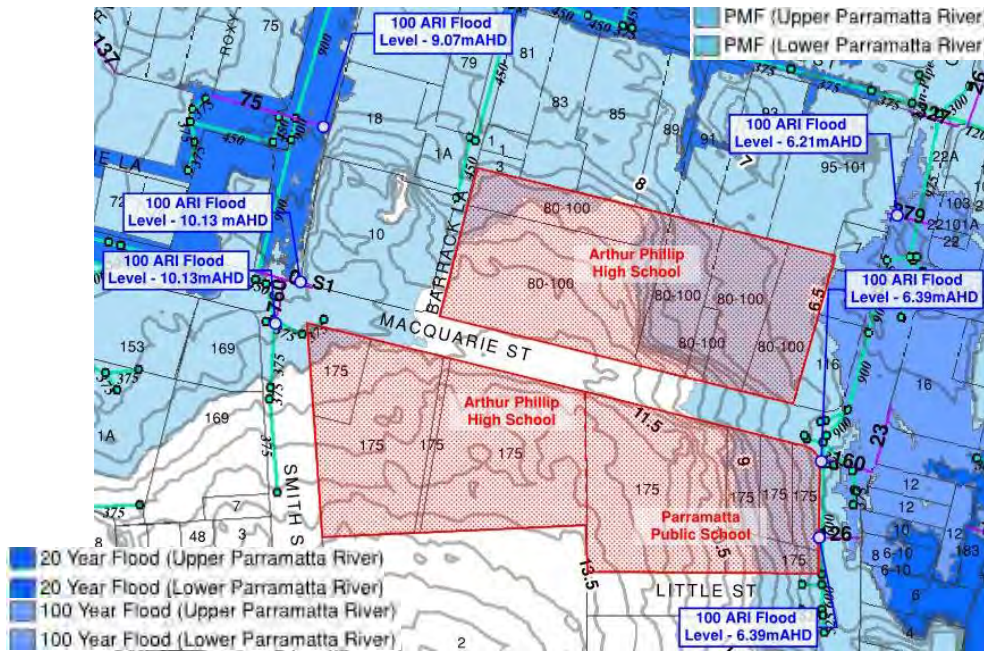


Figure 4 Flood Map (source: Parramatta Council Flood Enquiry)

The 100 year ARI flood level along Charles Street varies from 6.39m AHD to 6.21m AHD most of the existing site is above the flood planning level **6.89m AHD** (100 ARI + 500mm).

5.2 Flood Planning Level – Proposed Development

The currently proposed finished floor level of the Parramatta Primary school will be **7.38m AHD**. Arthur Philip High School is proposed to have a finished floor level of **8.20m AHD**. Both schools will have more that 500mm freeboard to the 100 year level. In the event of a larger storm the schools can be evacuated across the playing fields to Smith Street.

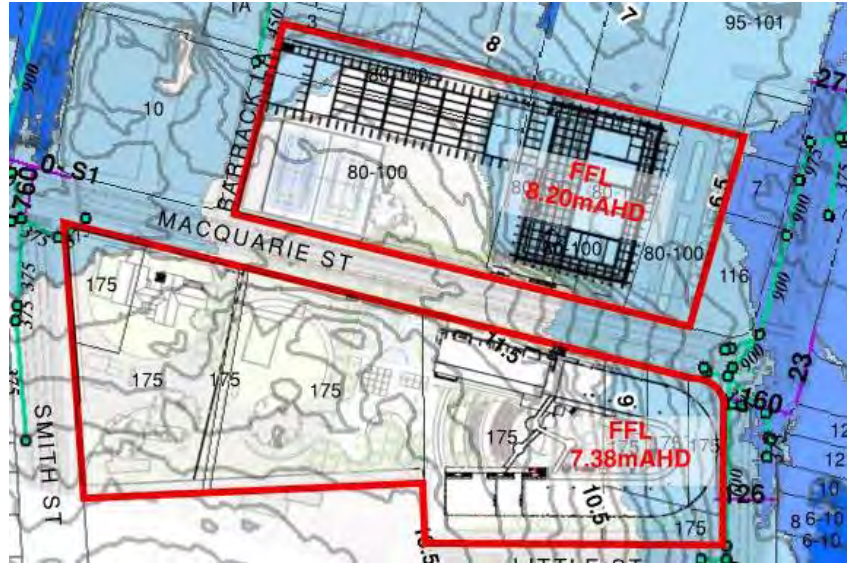


Figure 5 Proposed Development with Flood Map (source: adapted from Parramatta Council)

5.3 Flood Impact

No filling is proposed within the 100 year ARI flood extent, however filling will occur within the PMF extent. Existing catchments will be maintained in the proposed scenario.

6 Stormwater management, Hydrology and Hydraulics

6.1 Proposed Stormwater Management Strategy

The proposed Stormwater Management strategy will make use of the existing fall on the site and drain the majority of the site through a pit and pipe system, rainwater tank and OSD systems before being connected to Council's stormwater drainage pits located on Smith Street, Macquarie Street, Charles Street and Barrack Lane.

The on-site drainage system will be designed to accommodate the 1 in 20 year ARI with the provision of overland flow paths to cater for surcharges from the on-site gravity drainage system.

6.2 Rainwater Harvesting

Rainwater harvesting is proposed for the site. Two rainwater tanks will be provided, the first tank will service the High School with a volume of **25m³** and a roof catchment of **2,750sq.m**, the second tank will have a volume of **15m³** servicing the Primary School with a roof catchment of **2,500sq.m**. The tanks will be used for non-potable means including toilet flushing and irrigation.

In accordance with Parramatta City Council Stormwater Disposal Policy, the rainwater tank volume may be offset from the required onsite detention volume. The offset will be in accordance with the Upper Parramatta River On-Site Detention Handbook guidelines. Based on the on-site detention calculation spreadsheet the offsets are as follows:

North Two – offset - 0.29m^3

South Two – offset - 0.1m^3

6.3 On-site Stormwater Detention

The site has been subdivided in to 4 sub-catchments along the natural contours of the existing site. The proposed development will maintain the discharge locations of the existing sub-catchments, refer below.

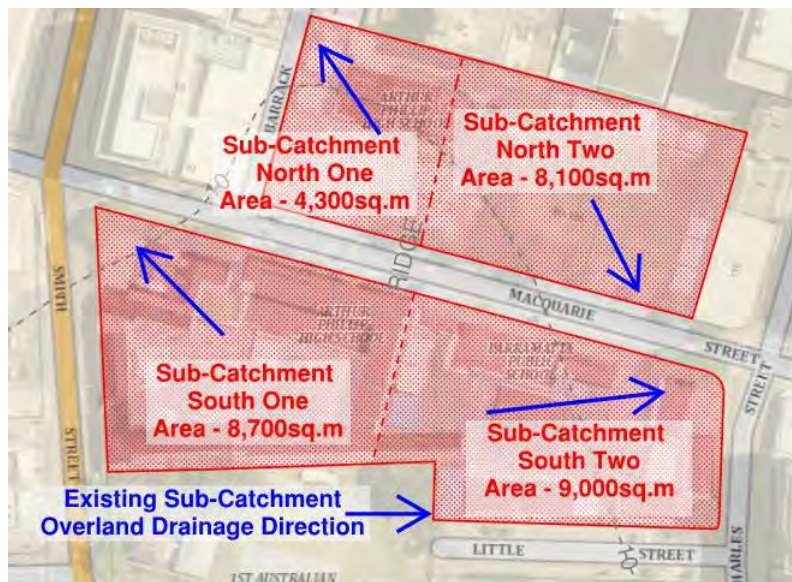


Figure 6 Existing Catchment Overland Flow Path/Drainage Direction

The Upper Parramatta River Catchment Trust spreadsheet version 9 with high early discharge has been used to size the on-site detention required for each sub-catchment. A summary of the detention volume is provided in Table 1, with calculations provided in **Appendix C**.

Sub-Catchment	Sub-Catchment Area (sq.m)	On-Site Detention Volume (cu.m)
North One	4,300	200
North Two	8,100	370
South One	8,700	400
South Two	9,000	410

Table 1 On-Site Detention Required

Storages have been located outside the 1 in 100 year ARI flood extents.

Locations, volumes and configuration of the detention storage will be subject to refinement during subsequent design stages, following receipt of detailed survey identifying invert levels for the downstream Council networks at each discharge location.

6.4 Stormwater Quality

A water quality assessment of the site was undertaken using the Model for Urban Stormwater Improvement Conceptualization (MUSIC) software program. Parramatta Council Music Link was used to develop the model. Source nodes have been constructed with reference to the Draft Music Modelling Guidelines for New South Wales, Table 3.2 for land type adopted parameters and Tables 3.9 and 3.10 for pollutant generation, refer below.

Table 3-2 Translation of Land Use/Zoning and Surface Types into MUSIC Source Nodes

Land use/zoning and surface type	Adopt parameters for...
Land use/zoning	
All urban residential zones	Residential
All commercial zones	Commercial
All industrial zones	Industrial
Schools	Residential
Urban parks	Residential
National Park	Forest
Protected land	Forest
Rural residential	Rural residential
Rural grazing (horse paddocks)	Rural residential
Rural grazing (other stocked areas)	Agricultural
Nurseries	Agricultural
Surface type	
Roofs	Roofs
Unsealed/partially sealed roads	Unsealed roads
Sealed roads	Sealed roads
Private residential landscaping/gardens	Residential

Table 3-9 Base Flow Concentration Parameters for NSW (Fletcher et al, 2004)

Concentration (mg/L-log ₁₀)						
	TSS		TP		TN	
	mean	std. dev	mean	std. dev	mean	std. dev
Land use/zoning						
Residential	1.20	0.17	-0.85	0.19	0.11	0.12
Commercial	1.20	0.17	-0.85	0.19	0.11	0.12
Industrial	1.20	0.17	-0.85	0.19	0.11	0.12
Rural residential	1.15	0.17	-1.22	0.19	-0.05	0.12
Agricultural	1.30	0.13	-1.05	0.13	0.04	0.13
Forest	0.78	0.13	-1.52	0.13	-0.52	0.13
Surface type						
Roofs	n/a	n/a	n/a	n/a	n/a	n/a
Sealed roads (if contains a pervious fraction e.g. verge)	1.20	0.17	-0.85	0.19	0.11	0.12
Unsealed roads ¹	1.20	0.17	-0.85	0.19	0.11	0.12
Eroding gullies ¹	1.20	0.17	-0.85	0.19	0.11	0.12

Table 3-10 Storm Flow Concentration Parameters for NSW (Fletcher et al, 2004)

Concentration (mg/L-log ₁₀)						
	TSS		TP		TN	
	mean	std. dev	mean	std. dev	mean	std. dev
Land use/zoning						
Residential	2.15	0.32	-0.60	0.25	0.30	0.19
Commercial	2.15	0.32	-0.60	0.25	0.30	0.19
Industrial	2.15	0.32	-0.60	0.25	0.30	0.19
Rural residential	1.95	0.32	-0.66	0.25	0.30	0.19
Agricultural	2.15	0.31	-0.22	0.30	0.48	0.26
Forest	1.60	0.20	-1.10	0.22	-0.05	0.24
Surface type						
Roofs	1.30	0.32	-0.89	0.25	0.30	0.19
Sealed roads	2.43	0.32	-0.30	0.25	0.34	0.19
Unsealed roads ¹	3.00	0.32	-0.30	0.25	0.34	0.19
Eroding gullies ¹	3.00	0.32	-0.30	0.25	0.34	0.19

Maintaining the predevelopment drainage patterns the model has been developed to represent the four sub-catchments, roof areas and their intended uses. Stormwater quality treatment nodes are summarised in Table 2.

Sub-Catchment	Treatment
North One	- 5xSPEL Bay Filters - Detention Tank
North-two	- 5xSPEL Bay Filters - Detention Tank - 25kL Reuse Tank - 2,750sq.m roof catchment - proposed for landscape irrigation and WC flushing
South One	- 5xSPEL Bay Filters - Detention Tank
South Two	- Green Roof (modelled as buffer area) - Detention Tank - 15kL Reuse Tank - 2,500sq.m roof catchment - Proposed for landscape irrigation and WC flushing

Table 2 Water Quality Treatment Structures

A summary of the MUSIC model results is shown in Table 3. The proposed stormwater management strategy reduces the pollutant load to meet Council's requirements.

TOTAL	Source	Residual	Reduction (%)	Council Required Reduction (%)
Total Suspended Solids (kg/yr)	2840	400	85.9	85
Total Phosphorus (kg/yr)	6.23	2.06	66.9	60
Total Nitrogen (kg/yr)	49	25.8	47.3	45
Gross Pollutants (kg/yr)	494	0	100	90

Table 3 MUSIC Model Stormwater Quality Results

The assessment undertaken in MUSIC indicates that the water quality controls incorporated into the proposed stormwater management strategy are likely to achieve the water quality objectives outlined in **Section 2**. Following final development of the landscape plans, planted WSUD installations (e.g. bio-basins/swales) will be explored, whilst maintaining the reductions required to meet Council's criteria.

6.5 Construction Phase Stormwater Quality (Sediment erosion control)

The key issue and potentially most adverse impact for water quality management during the construction phase is the potential erosion from earthworks areas and the capture of sediment.

Care should need to be taken during construction that sediments and other wastes are not washed into the drainage system and carried to downstream water bodies.

A concept erosion and sediment control arrangement for the site has been developed in accordance with the NSW Department of Housing Managing Urban Stormwater – Soils and Construction (Blue Book). These controls will ensure that there are no significant adverse impacts on the receiving waters during the construction phase, refer to civil plans in **Appendix A**.

7 Conclusion

In accordance with the Parramatta City Council LEP the proposed Arthur Philip High School and Parramatta Primary School shall have their finished floor level set at 8.2mAHD and 7.38mAHD respectively. The nominated levels are above the flood planning level for the sites.

Existing drainage patterns will be maintained. Proposed site levels will not require fill within the 100 year ARI flood extent, but will include some filling within the PMF flood extent.

The proposed stormwater management strategy will ensure that the development will not unacceptably increase peak runoff from the site during rainfall events up to the 1 in 100 year ARI event with the provision of on-site detention in accordance with the Parramatta City Council Stormwater Disposal Policy and the Upper Parramatta River Catchment Trust requirements.

The proposed stormwater management strategy incorporates a green roof, rainwater tanks, and piped drainage network draining to on-site detention with stormwater quality filters. The system has been designed in accordance with the requirements of Parramatta City Council DCP and is able to meet the pollutant load reduction requirements.

From a stormwater management perspective, the site is considered to be suitable for the proposed development as impacts of the proposal on the existing water quantity and quality are capable of being ameliorated.

Appendix A

Civil plans

ARTHUR PHILLIP HIGH SCHOOL & PARRAMATTA PUBLIC SCHOOL

PARRAMATTA

Civil

SITE WORKS LEGEND

- 

EXISTING STORMWATER DRAINAGE PIPE
- 

PROPOSED STORMWATER DRAINAGE PIPE
- 

EXISTING DRAINAGE PIT TO BE RETAINED
- 

PROPOSED DRAINAGE PIT
- 

SUBSOIL DRAINAGE
- 

GRATED DRAIN
- 

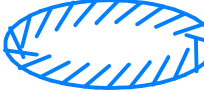
OVERLAND FLOW PATH

EROSION AND SEDIMENT CONTROL LEGEND

- 

SEDIMENT FENCE
- 

SWALE DRAIN
- 

VEHICLE ACCESS
- 

SEDIMENT BASIN
- 

STORAGE AREA
- 

DRAINAGE PIT
- 

GEOTEXTILE FILTER FABRIC DROP
- 

FABRIC STOCKING - KERB INLET SEDIMENT TRAP

DRAWING NUMBER	DRAWING NAME	REVISION
SK-CIV-001	COVER SHEET AND LEGEND	01
SK-CIV-002	GENERAL NOTES	01
SK-CIV-011	LOCALITY PLAN	01
SK-CIV-111	SITE WORKS PLAN SHEET 1 OF 4	01
SK-CIV-112	SITE WORKS PLAN SHEET 2 OF 4	01
SK-CIV-113	SITE WORKS PLAN SHEET 3 OF 4	01
SK-CIV-114	SITE WORKS PLAN SHEET 4 OF 4	01
SK-CIV-201	SEDIMENT AND EROSION CONTROL NOTES AND DETAILS	01
SK-CIV-211	SEDIMENT AND EROSION CONTROL PLAN SHEET 1 OF 2	01
SK-CIV-212	SEDIMENT AND EROSION CONTROL PLAN SHEET 2 OF 2	01

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Issue	Date	By	Chkd	Appd

ARUP

Level 10, 201 Kent Street,
Sydney NSW 2000
ph +61 2 9320 9320
fax +61 2 9320 9321

Member Firm

Arup Pty Ltd
ABN 18 000 966 165

Client
Department of Education

Job Title

Arthur Phillip High School and
Parramatta Public School
Parramatta

DRAWING INDEX AND LEGEND

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Scale at A1				
Discipline Civil				
Job No	Drawing Status			
247436	SCHEME DESIGN			
Drawing No	Issue			
SK-CIV-001	01			

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KERB, FOOTWAYS AND ANCILLARY ITEMS

1.

KERB, GUTTERS, PEDESTRIAN RAMPS AND VEHICLE CROSSINGS TO BE PROVIDED IN ACCORDANCE WITH PARRAMATTA CITY COUNCIL STANDARD DETAILS.

2.

THE SUPPLY, PLACING, FINISHING AND CURING OF IN-SITU CONCRETE FOR PAVEMENTS SHALL COMPLY WITH AS 3600. ALL CONCRETE TO BE MIN N25 AT 28 DAY COMPRESSIVE STRENGTH UNO.

3.

ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 100mm GRANULAR BASE COURSE COMPACTED TO MINIMUM 98% MODIFIED DRY DENSITY (AS 1289 5.2.1), UNO.

4.

CONCRETE FOOTPATHS, RAMPED AND VEHICULAR CROSSINGS SHALL BE BROOM FINISHED, UNO. ALL OTHER KERB OR DISH DRAINS ARE TO BE STEEL FLOAT FINISHED.

5.

AT TIE INS WITH EXISTING KERBS, CONCRETE TO BE SAWCUT AND EJ IS TO BE PROVIDED.

6.

IN THE REPLACEMENT OF KERB AND GUTTER; EXISTING ROAD PAVEMENT IS TO BE SAW CUT 600mm FROM THE UP OF GUTTER, UNO. UPON COMPLETION OF THE NEW KERB AND GUTTER, NEW PAVEMENT TO BE PROVIDED IN ACCORDANCE WITH CoS DRG. 1.1.16..

7.

SAWCUTTING MUST PROCEED WITHIN 24 HOURS OF PLACING CONCRETE.

8.

SUBSOIL DRAINS ARE TO BE PROVIDED BEHIND ALL KERBS. FLUSHING POINTS ARE TO BE PROVIDED AT MAXIMUM 30m SPACING AND END OF PIPES.

DRAINAGE

1.

THE LOCATION AND LEVEL OF ALL SERVICES WHICH CROSS PROPOSED DRAIN LINES MUST BE CONFIRMED PRIOR TO CONSTRUCTION AND BE CHECKED FOR CONFLICT. ANY CONFLICTS TO BE RESOLVED PRIOR TO COMMENCING WORKS.

2.

WHERE A CONNECTION IS TO BE MADE TO AN EXISTING DRAINAGE PIPE OR STRUCTURE, THE LEVEL OF THAT PIPE OR STRUCTURE MUST BE CONFIRMED PRIOR TO THE CONSTRUCTION OF THE NEW DRAIN LINE.

3.

EXISTING STORMWATER DRAINAGE PIPES AND PITS WITHIN THE SITE ARE TO BE RETAINED UNO. A CONDITION SURVEY IS TO BE UNDERTAKEN FOR ALL EXISTING SERVICES TO BE ABANDONED TO CONFIRM IF ANY LIVE CONNECTIONS EXIST. REDESIGN OF EXISTING LIVE CONNECTIONS TO BE UNDERTAKEN.

4.

ALL PIPES 375mm OR GREATER ARE TO BE SRCP, RRJ AND PIPE CLASS 4, UNO. PIPE CLASSES ARE TO BE CHECKED FOR THE PERMANENT DESIGN CASE AND FOR CONSTRUCTION LOADING AND ADJUSTED IF NECESSARY.

5.

ALL PIPES LESS THAN 375mm TO BE UPVC, SEWER GRADE, SOLVENT WELDED UNO.

6.

DRAINAGE LINES ARE TO BE LAID AT A MINIMUM GRADE OF 1.0% OR AS SHOWN ON THE LONGITUDINAL SECTIONS.

7.

INSTALLATION, BEDDING AND BACKFILLING OF ALL DRAINAGE PIPES SHALL BE IN ACCORDANCE WITH ROADS AND MARITIME MD.R11.A01.B HS3 UNO.

8.

PIPES SHALL BE CONNECTED TO PITS SUCH THAT THE PIPE IS CENTRED ON THE PIT FACE.

9.

SURFACE LEVELS FOR PITS AND MANHOLES SHALL BE THE CENTRE OF THE STRUCTURES, UNLESS SHOWN OTHERWISE ON DETAIL PLANS OR ROADS AND MARITIME/ COUNCIL STANDARD DRAWINGS.

10.

ALL EXPOSED EDGES ARE TO HAVE 20mm x 20mm CHAMFER.

11.

GRATE FRAME MUST PROVIDE FIRM SUPPORT TO ALL SIDES ENSURING GRATES ARE SECURE.

12.

ALL GRATES IN ROADWAYS ARE TO BE CLASS D, BICYCLE TYRE PENETRATION RESISTANT IN ACCORDANCE WITH CLAUSE 3.3.6 OF AS 3996:2005, UNO. ALL GRATES IN FOOTWAYS ARE TO BE CLASS D AND HEELSAFE, UNO.

13.

ALL PITS ARE TO BE PRECAST CONCRETE, CONSTRUCTED TO AS 3500.3, BENCHED AND STREAMLINED, UNO. PITS OVER 1.2m IN DEPTH TO BE PROVIDED WITH STEP IRONS IN ACCORDANCE WITH AS 1657. REFER ROADS AND MARITIME DRAWING MD.R11.B47.B FOR DETAILS. INSTALL PIPEWORK WITH MINIMUM 20mm FALL ACROSS PITS. MAXIMUM PIT DEPTH 3500mm.

14.

PIPE JOINT TO BE PROVIDED 600mm FROM EXTERNAL FACE OF STORMWATER PITS FOR PIPES Ø450mm. FOR PIPES > 450mm, PIPE JOINT IS TO BE PROVIDED 1200mm FROM FACE OF STORMWATER PITS.

15.

PROVIDE 150mm DIA. SLOTTED SUBSOIL PIPE CONNECTION TO STORMWATER PITS. THE PIPE IS TO BE 3.0m LONG ENCLOSED IN TUBULAR FILTER FABRIC AND LAID ADJACENT TO INLET PIPE/S.

16.

STORMWATER DRAINAGE CRITERIA:

MINOR STORM = 20y ARI

MAJOR STORM = 100y ARI

17.

ALL GRATED DRAINS, PITS AND PROPRIETARY PRODUCTS ARE TO BE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS. DESIGNATED PRODUCTS CAN BE SUBSTITUTED WITH EQUIVALENT PRODUCTS, BUT MUST FIRST BE SUBMITTED TO THE UNIVERSITY FOR APPROVAL.

18.

DRAINAGE INSTALLATIONS LOCATED IN TREE PROTECTION ZONE ARE TO BE THRUST BORED IN ACCORDANCE WITH THE REQUIREMENTS OF THE ARBORICULTURAL REPORT. THE FINAL POSITION OF PITS LOCATED WITHIN THE TREE PROTECTION ZONE ARE TO BE CONFIRMED ON SITE IN CONJUNCTION WITH THE PROJECT ARBORIST. REFER TO WSA DRG. SEW-1402 FOR DETAILS OF BORED OR JACKED ENCASING PIPE METHOD.

ROADS AND MARITIME SPECIFICATIONS

R11

STORMWATER DRAINAGE

R15

KERBS AND GUTTERS

R23

PLASTIC FLEXIBLE PIPES

R33

TRENCH DRAINS

R37

INTRA-PAVEMENT DRAINS

R41

CLEARING AND GRUBBING

R44

EARTHWORKS

R53

CONCRETE (FOR GENERAL USE), MORTAR AND GROUT

R71

UNBOUND AND MODIFIED PAVEMENT COURSE

R101

COLD MILLING OF ROAD PAVEMENT MATERIALS

R106

SPRAYED BITUMINOUS SURFACING (WITH CUTBACK BITUMEN)

R117

LIGHT DUTY DENSE GRADED ASPHALT

R141

PAVEMENT MARKING

SUSTAINABILITY

1.

THE CIVIL WORKS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE UNIVERSITY OF SYDNEY'S SUSTAINABILITY FRAMEWORK. REFER TO NDY "SUSTAINABILITY FRAMEWORK" REPORT FOR REQUIREMENTS.

ABBREVIATIONS

AC

ASPHALTIC CONCRETE

AHD

AUSTRALIAN HEIGHT DATUM

ARI

AVERAGE RECURRENCE INTERVAL

AR&R

AUSTRALIAN RAINFALL AND RUNOFF

AS

AUSTRALIAN STANDARDS

DRG

DRAWING

EJ

EXPANSION JOINT

FFL

FINISHED FLOOR LEVEL

FSL

FINISHED SURFACE LEVEL

IJ

ISOLATION JOINT

IL

INVERT LEVEL

K&G

KERB AND GUTTER

MAX

MAXIMUM

MIN

MINIMUM

NOM

NOMINAL

NTS

NOT TO SCALE

RL

REDUCED LEVEL

RRJ

RUBBER RING JOINTED

SCJ

SAWN CONTRACTION JOINT

SMDD

STANDARD MAXIMUM DRY DENSITY

SOMC

STANDARD OPTIMUM MOISTURE CONTENT

SRCP

STEEL REINFORCED CONCRETE PIPE

TBC

TO BE CONFIRMED

TYP

TYPICAL

UNO

UNLESS NOTED OTHERWISE

WSA

WATER SERVICE ASSOCIATION

PARRAMATTA CITY COUNCIL STANDARD DRAWINGS

DS1

KERBS AND LAYBACKS

DS3

FOOTPATH

DS4

FOOTPATH

DS5

DISH DRAIN CROSSING DETAIL

DS8

STANDARD VEHICULAR CROSSING

DS21

STANDARD KERB INLET PIT DETAIL

DS25

SURFACE INLET PIT FOR OPEN SPACE AREAS

DS33

SUBSOIL DRAINAGE DETAILS

DS34

CONCRETE SUPPORT CRADLE FOR USE ON PIPELINES IN CLOSE PROXIMITY TO SERVICES

ROADS AND MARITIME MODEL DRAWINGS

MD.R11.A01.B

INSTALLATION OF BURIED CONCRETE PIPES TYPE HS3 SUPPORT

MD.R11.B01.A.1

GULLY PIT TYPE SA

MD.R11.B03.A.1

PRECAST CONCRETE LINTELS FOR TYPE SA GULLY PITS

MD.R11.B04.A.2

SA GRATE AND FRAME (LARGE)

MD.R11.B05.A.2

SA GRATE AND FRAME (SMALL)

MD.R11.B29.A.1

PITS - JUNCTION

MD.R11.B36.A.1

PITS - INSPECTION

MD.R11.B37.A.2

INLET SUMP WITH RAISED STEEL GRATE

MD.R11.B40.A.1

PITS - INSPECTION

MD.R11.B47.B

INDIVIDUAL RUNG LADDER (STEP IRONS) FOR DRAINAGE PITS

GENERAL NOTES

Scale at A1

DisciplineCivil

Job No247436

Drawing StatusSCHEME DESIGN

Drawing NoSK-CIV-002

Issue01

1. THESE DRAWING HAVE BEEN CREATED USING FOLLOWING CONSULTANT'S DRAWINGS

CONSULTANT	DRAWINGS TITLE	DRAWINGS NO.	REV.	DATE
RYGATE AND COMPANY PTY. LTD. P.W. RYGATE AND WEST	PLAN SHOWING DETAIL AND LEVELS PARRAMATTA PUBLIC SCHOOL AND ARTHUR PHILLIP HIGH SCHOOL MACQUARIE STREET	76327-001	A	01.09.2015
GRIMSHAW ARCHITECTS	GENERAL ARRANGEMENT FLOOR PLANS APHS - GA LOWER GROUND	A03_1201	3	15.03.2016
GRIMSHAW ARCHITECTS	GENERAL ARRANGEMENT FLOOR PLANS APHS-GA-GROUND FLOOR	A03-1201	4	16.03.2016
GRIMSHAW ARCHITECTS	GENERAL ARRANGEMENT FLOOR PLANS PPS - A GROUND - CHARLES STREET	A03-1101	4	16.03.2016
GRIMSHAW ARCHITECTS	GENERAL ARRANGEMENT FLOOR PLANS PPS - A LEVEL 01	A03-1102	4	16.03.2016
ASPECT STUDIOS	15052 LANDSCAPE BASE DRAFT 20160308	-	-	08.03.2016

2. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE ABOVE LISTED DRAWINGS AND ANY DIVERGENCE TO THE DRAWINGS MUST BE NOTIFIED TO THE ENGINEER.

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01	21.03.16	SD	SK	LM
SCHEME DESIGN				
00	11.03.16	KH	SK	LM
DRAFT SCHEME DESIGN				
Issue	Date	By	Chkd	Appd

ARUP

Level 10, 201 Kent Street,
Sydney NSW 2000
ph - 02 9320 9320
fax - 02 9320 9321

CONSULT AUSTRALIA

Member Firm
Arup Pty Ltd
ABN 18 000 966 165

Client

Department of Education

Job Title

Arthur Phillip High School and Parramatta Public School Parramatta

GENERAL NOTES

Scale at A1

DisciplineCivil

Job No247436

Drawing StatusSCHEME DESIGN

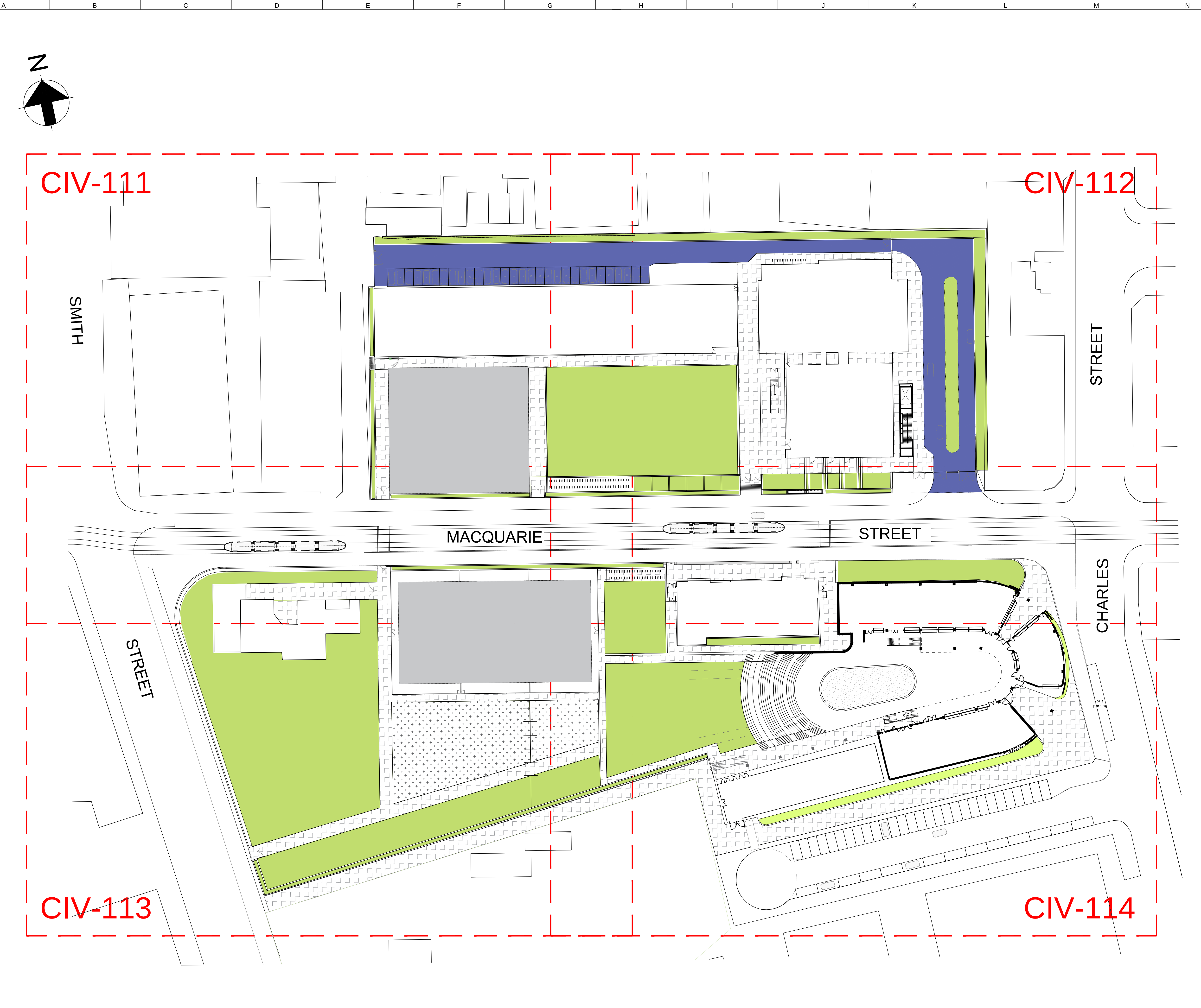
Drawing NoSK-CIV-002

Issue01

Do not scale

E Arup

A1
1
2
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5
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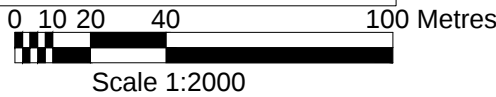


CIV-111

CIV-112

CIV-113

CIV-114



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SCHEME DESIGN				
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DRAFT SCHEME DESIGN				
Issue	Date	By	Chkd	Appd

ARUP

Level 10, 201 Kent Street,
Sydney NSW 2000
ph +61 2 9320 9320
fax +61 2 9320 9321



Client
Department of Education

Job Title
Arthur Phillip High School and
Parramatta Public School
Parramatta

LAYOUT PLAN

Scale at A1 1:1000

Discipline Civil

Job No
247436
Drawing Status
SCHEME DESIGN

Drawing No
SK-CIV-011

Issue
01

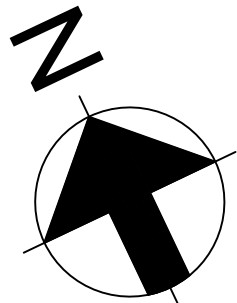
NOTES:

SIGNIFICANT HERITAGE ITEMS ARE CONSIDERED TO BE LOCATED THROUGHOUT THE SITE AREA REFER:

- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL HERITAGE IMPACT STATEMENT, BY GML HERITAGE, MARCH 2016.
- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTAT PUBLIC SCHOOL HISTORICAL ARCHAEOLOGICAL ASSESSMENT, BY GML HERITAGE, MARCH 2016.
- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL INTEGRATED ABORIGINAL CULTURAL HERITAGE AND ARCHAEOLOGICAL ASSESSMENT REPORT, BY GML HERITAGE, MARCH 2016.

CONNECTION TO EXISTING COUNCIL PIT SUBJECT TO CONFIRMATION OF EXISTING PIPE SIZE AND INVERT

TANK VOLUME:
200m³ WITH 5 SPEL BAY
FILTERS (OR EQUIVALENT)



OSD

Ø225

PAVEMENT STRUCTURE AND KERB
ALIGNMENT TO BE CONFIRMED FOLLOWING
FINAL SCHEME DESIGN

FFL 11.2m AHD

Ø375

N375

Ø375

N375

N375

Ø375

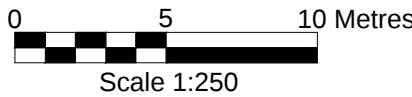
N375

OSD

MACQUARIE STREET

STREET

SMITH



01	21.03.16	SD	SK	LM
SCHEME DESIGN				
00	11.03.16	KH	SK	LM
DRAFT SCHEME DESIGN				
Issue	Date	By	Chkd	Appd

ARUP

Level 10, 201 Kent Street,
Sydney NSW 2000
ph +61 2 9320 9320
fax +61 2 9320 9321



Member Firm
Arup Pty Ltd
ABN 18 000 966 165

Client:
Department of Education

Job Title
Arthur Phillip High School and
Parramatta Public School
Parramatta

SITE WORKS PLAN
SHEET 1 OF 4

Scale at A1 1:250

Discipline Civil

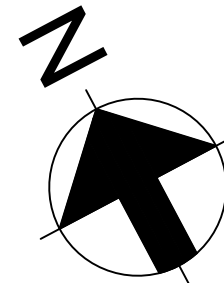
Job No
247436
Drawing Status
SCHEME DESIGN

Drawing No
SK-CIV-111

Issue
01

SIGNIFICANT HERITAGE ITEMS ARE CONSIDERED TO BE LOCATED THROUGHOUT THE SITE AREA REFER:

- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL HERITAGE IMPACT STATEMENT, BY GML HERITAGE, MARCH 2016.
- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTAT PUBLIC SCHOOL HISTORICAL ARCHAEOLOGICAL ASSESSMENT, BY GML HERITAGE, MARCH 2016.
- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL INTEGRATED ABORIGINAL CULTURAL HERITAGE AND ARCHAEOLOGICAL ASSESSMENT REPORT, BY GML HERITAGE, MARCH 2016.



— PAVEMENT STRUCTURE AND KERB ALIGNMENT TO FOLLOWING FINAL SCHEME DESIGN

FFL 8.2m AHD

GRATED DRAIN

OSD

TANK VOLUME:
370m³ WITH 5 SPEL BAY
FILTERS (OR EQUIVALENT)

NEW PIT

CONNECTION TO EXISTING PIT
SUBJECT TO CONFIRMATION OF
EXISTING PIPE SIZE AND INVERT LEVEL

MACQUARIE

STREET

— FINAL KERB ALIGNMENT TO BE
CONFIRMED FOLLOWING FINAL
SCHEME DESIGN

STREET +

CHARLES

01	21.03.16	SD	SK	LM
SCHEME DESIGN				
00	11.03.16	KH	SK	LM
DRAFT SCHEME DESIGN				
Issue	Date	By	Chkd	Appd

ARUP

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Sydney NSW 2000
ph : 02 9320 9320
fax : 02 9320 9321

Client

Department of Education

Job Title

Arthur Phillip High School and
Parramatta Public School
Parramatta

SITE WORKS PLAN
SHEET 2 OF 4

Scale at A1 1:250

Discipline **Civil**

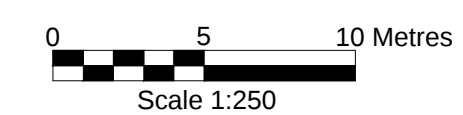
Job No

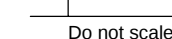
247436

Drawing No
SK-CIV-112

Drawing Status
SCHEME DESIGN

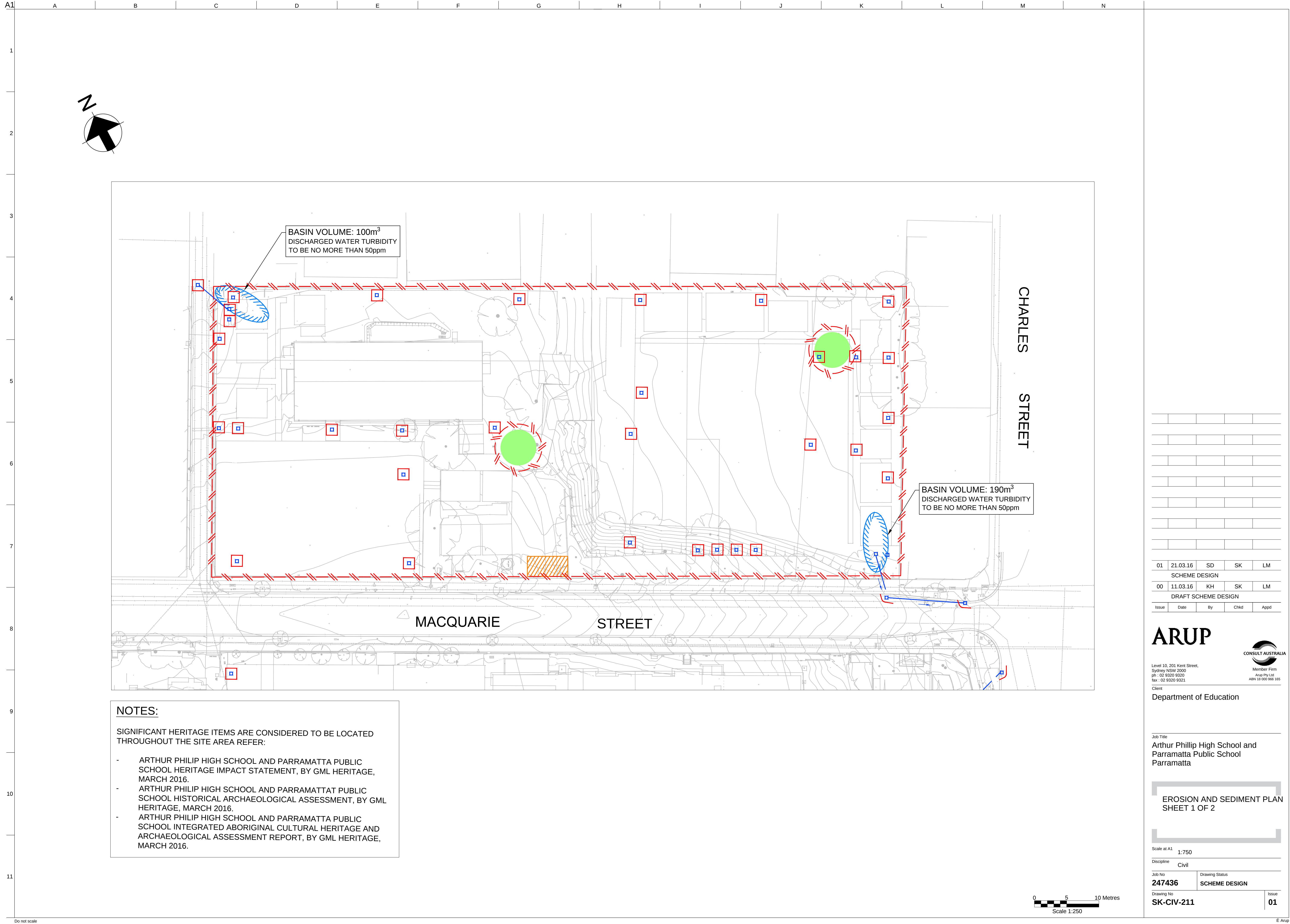
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È Arup

Issue
01



01	21.03.16	SD	SK	LM
SCHEME DESIGN				
00	11.03.16	KH	SK	LM
DRAFT SCHEME DESIGN				
Issue	Date	By	Chkd	Appd

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Sydney NSW 2000
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fax : 02 9320 9321



Job Title
Arthur Phillip High School and
Parramatta Public School
Parramatta

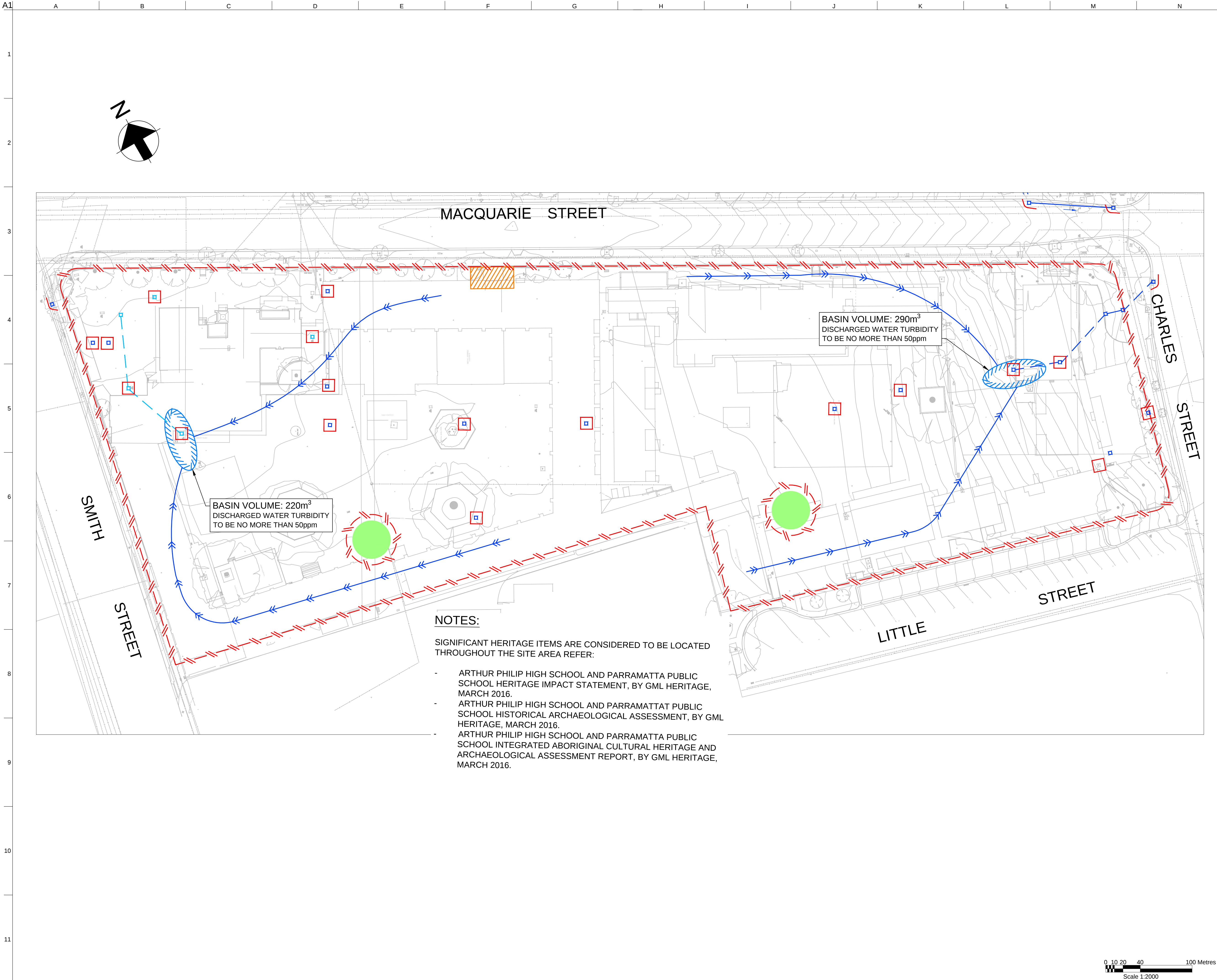
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Discipline	Civil
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Job No 247436	Drawing Status SCHEME DESIGN
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Drawing No
SK-CIV-211

1



NOTES:

SIGNIFICANT HERITAGE ITEMS ARE CONSIDERED TO BE LOCATED THROUGHOUT THE SITE AREA REFER:

- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL HERITAGE IMPACT STATEMENT, BY GML HERITAGE, MARCH 2016.
- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTAT PUBLIC SCHOOL HISTORICAL ARCHAEOLOGICAL ASSESSMENT, BY GML HERITAGE, MARCH 2016.
- ARTHUR PHILIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL INTEGRATED ABORIGINAL CULTURAL HERITAGE AND ARCHAEOLOGICAL ASSESSMENT REPORT, BY GML HERITAGE, MARCH 2016.

01	21.03.16	SD	SK	LM
SCHEME DESIGN				
00	11.03.16	KH	SK	LM
DRAFT SCHEME DESIGN				
Issue	Date	By	Chkd	Appd

ARUP

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Sydney NSW 2000
ph - 02 9320 9320
fax - 02 9320 9321

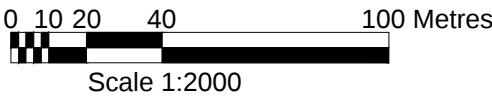


Client:
Department of Education

Job Title
Arthur Phillip High School and
Parramatta Public School
Parramatta

EROSION AND SEDIMENT PLAN
SHEET 2 OF 2

Scale at A1 1:750	
Discipline Civil	
Job No 247436	Drawing Status SCHEME DESIGN
Drawing No SK-CIV-212	Issue 01



Appendix B

Parramatta Council Flood Enquiry

Flood Enquiry Information Issued *(To be completed by Council Officer)*

Mainstream Flooding

Is this property affected by mainstream flooding? Arthur Phillip High School & Parramatta Primary School		☒ Yes ☐ No
Flood Levels	Closest Cross Sections: <i>(Please refer to Flood Study):</i> Refer to Flood Map	
☐ 1:20 year ARI	Varies – RL 6 m AHD at Charles St to RL 10 m AHD at Smith St	Comments: See Note on Flood / Hazard Map
☒ 1:100 Year ARI	Varies – RL 6.4 m AHD at Charles St to RL 10.1 m AHD at Smith St	
☒ PMF	Varies – RL 9.7 m AHD at Charles St to RL 11.8 m AHD at Smith St	
☒ Refer to flood maps provided for detailed flood levels.		
The above flood level information is obtained from the following flood study report:: 1. Upper Parramatta River Flood Study – Draft 8 (UPRCT) 2. Lower Parramatta River Floodplain Risk Management Study – Flood Study Review, 2005 (SKM)		

Note: Flood inundation can be verified by detail survey to AHD undertaken by a Registered Surveyor.

Local Flooding

Is the property located within a Hatched Grey Area? <i>Properties located within a Hatched Grey Area are subjected to flooding from the local catchment.</i>	☐ Yes ☒ No
Is the property located within a Grey Area? <i>Properties located within a Grey Area are subjected to additional site drainage controls to manage flooding in the local catchment.</i>	☐ Yes ☒ No
Is the property likely to be affected by overland stormwater run-off from the local catchment? Note: No site inspection conducted for this assessment. Based solely on the information supplied for this flood enquiry application.	☐ Yes ☒ No
Note: You are required to contact Council's Development Service Engineer for any details and requirements relating to development that is affected by local flooding.	

Additional Recommended Actions

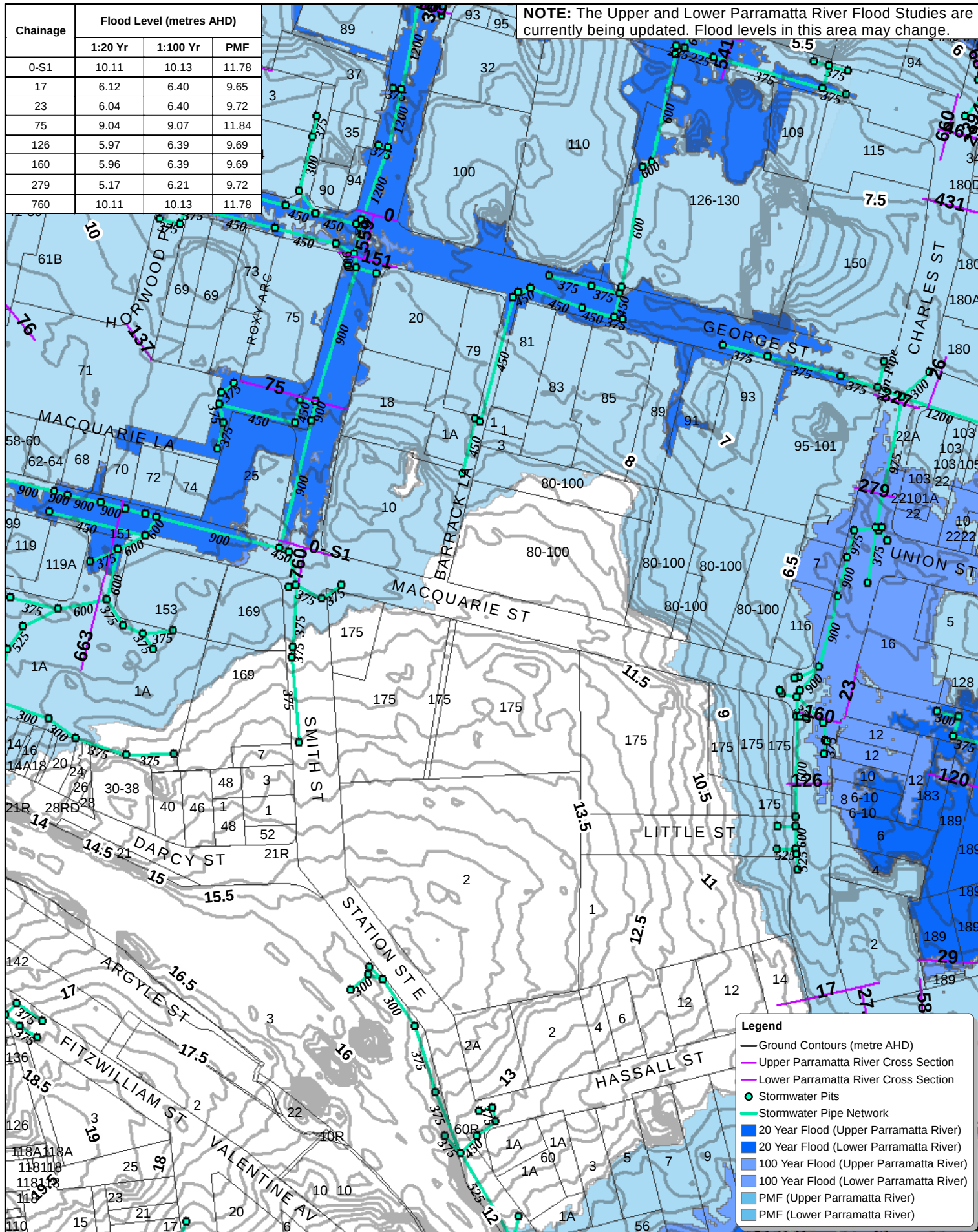
☒	The Applicant needs to discuss the proposal to re-develop this site with Council's Town Planner and Development Services Engineer.
☒	The Applicant needs to contact Council's Town Planner and organise a pre-lodgement meeting to discuss any proposal to redevelop this property.
☒	The Applicant needs to refer to Council's Local Floodplain Risk Management policy for details relating to developing a land affected by flooding.

Definitions: *(As per NSW Floodplain Development Manual dated April 2005)*

- AHD** – a common national surface level datum approximately corresponding to mean sea level.
- ARI** – the long term average number of years between the occurrences of a flood as big as or larger than, the selected event.
- PMF** – is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.
- AEP** – Annual Exceedance Probability is the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage.

Chainage	Flood Level (metres AHD)		
	1:20 Yr	1:100 Yr	PMF
0-S1	10.11	10.13	11.78
17	6.12	6.40	9.65
23	6.04	6.40	9.72
75	9.04	9.07	11.84
126	5.97	6.39	9.69
160	5.96	6.39	9.69
279	5.17	6.21	9.72
760	10.11	10.13	11.78

NOTE: The Upper and Lower Parramatta River Flood Studies are currently being updated. Flood levels in this area may change.



- Legend**
- Ground Contours (metre AHD)
 - Upper Parramatta River Cross Section
 - Lower Parramatta River Cross Section
 - Stormwater Pits
 - Stormwater Pipe Network
 - 20 Year Flood (Upper Parramatta River)
 - 20 Year Flood (Lower Parramatta River)
 - 100 Year Flood (Upper Parramatta River)
 - 100 Year Flood (Lower Parramatta River)
 - PMF (Upper Parramatta River)
 - PMF (Lower Parramatta River)



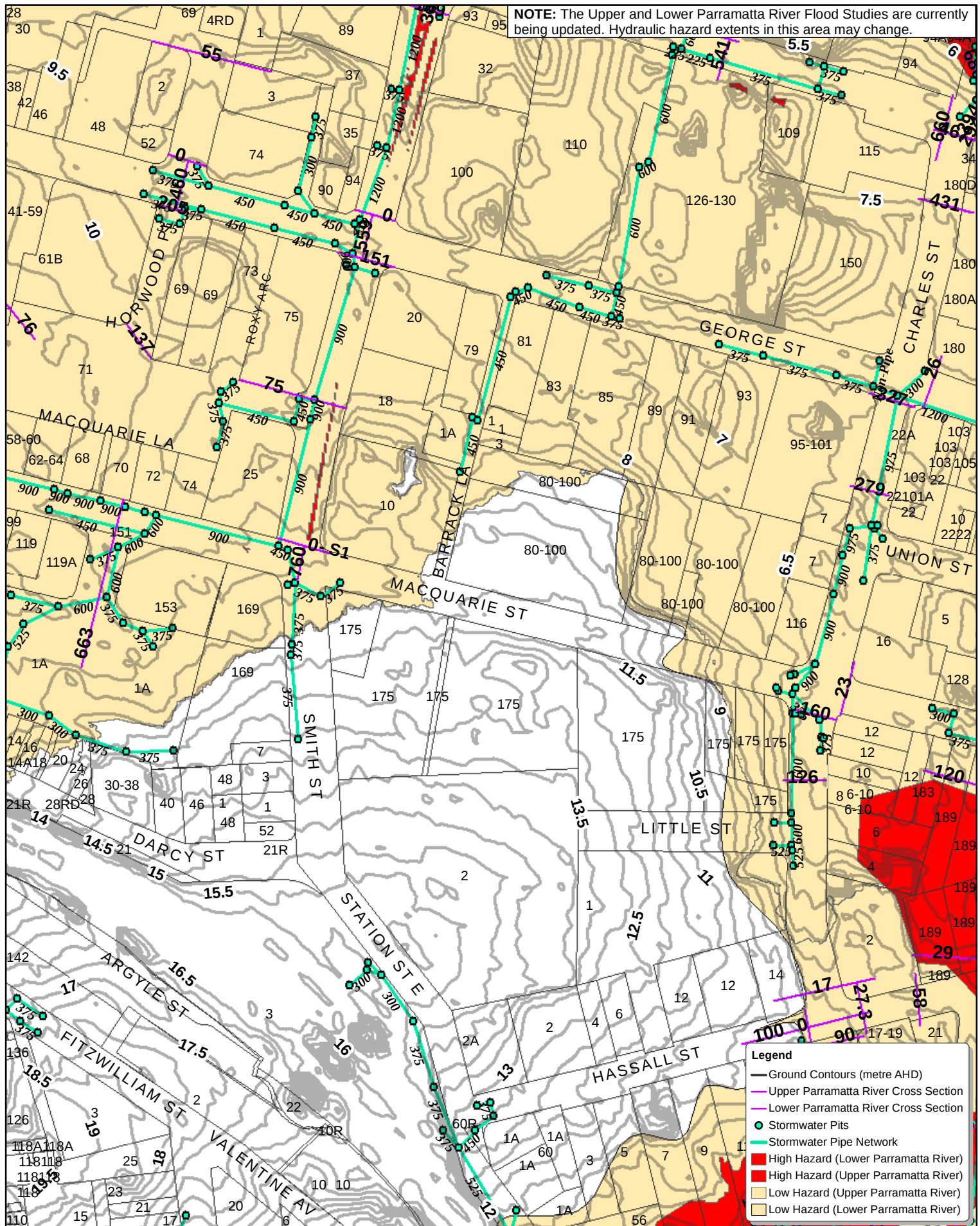
Printed
26/10/2015

Parramatta City Council Flood Map

N
1:2,500

DISCLAIMER: Flood levels and flood extent lines are based on current information held by Council. Council does not accept responsibility for the accuracy of this Information. Any pipe sizes and location of pits and pipe lines should be confirmed by site investigation.
The flood levels provided are only an approximate guide and have been derived using the current computer simulated model.
The information provided on this document is presented in good faith. It is the responsibility of each individual using this information to undertake their own checks and confirm this information prior to its use.
Parramatta City Council, its agents and employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement, or advice referred to above.

NOTE: The Upper and Lower Parramatta River Flood Studies are currently being updated. Hydraulic hazard extents in this area may change.



Printed
26/10/2015

Parramatta City Council Hydraulic Hazard Map

N
1:2,500

DISCLAIMER: Flood levels and flood extent lines are based on current information held by Council. Council does not accept responsibility for the accuracy of this Information. Any pipe sizes and location of pits and pipe lines should be confirmed by site investigation.
The flood levels provided are only an approximate guide and have been derived using the current computer simulated model.
The information provided on this document is presented in good faith. It is the responsibility of each individual using this information to undertake their own checks and confirm this information prior to its use.
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Appendix C

Upper Parramatta River Catchment Trust spreadsheet

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment HED Secondary Outlet

Project:	Arthur Phillip High School and Parramatta Public School - Sub-Catchment North One				
Site Address	Macquarie St, Parramatta NSW 2150				
Job No:	247436				
Designer:	ASK				
Telephone:					

Site Data					
OSD Area:	Lower Parramatta River Catchment				
L.G.A	Parramatta City Council				
Site Area	0.43	ha	4,300	m ²	
Total Roof Area	0.1	ha	1,000	m ²	
Area of Site draining to OSD Storage	0.43	ha	4,300	m ²	Satisfactory
Residual Site Area (Lot Area - Roof Area)	0.330	ha			
Area Bypassing Storage	0	ha			
Area Bypassing / Residual Site Area	0.0%				Satisfactory
No. of Dwellings on Site	1				Satisfactory
Site Area per Dwelling	0.430	ha			
Roof Area per Dwelling	0.100	ha			

Basic OSD Parameters					
		Extended Detention		Detention	
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage	455 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet	150 L/s/ha

OSD Tank Bypass			
Residual Lot Capture in OSD Tank	100%		
Adjusted SRDs	40	L/s/ha	150 L/s/ha

OSD Calculations					
		Extended Detention		Detention	
Basic SSR Volume	Ext Detention Storage	129.00	m ³	Total Storage	195.65 m ³
Total Rainwater Tank Credits		0.00	m ³		0.00 m ³
Storage Volume				Total	195.65 m ³
Storage Volume	Ext Detention Storage	129.00	m ³	Flood Detention Storage	66.65 m ³
OSD Discharges	Primary Outlet	17.20	L/s	Secondary Outlet	64.50 L/s
RL of Top Water Level of Storage		7.200	m		7.200 m
RL of Orifice Centre-line		6.300	m		6.300 m
Number of Orifices		1			1
Estimated Downstream Flood Level		0.00	1.5 yr ARI		6.30 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-6.30	Satisfactory	Satisfactory	0.00 m
Design Head to Orifice Centre		0.900	m	TWL Ext Detn Storage - RL Orifice	0.900 m
Calculated Orifice Diameter		93	mm	Satisfactory	180 mm

Overflow Weir & Freeboard Calculation			
RL of Minimum Habitable Floor Level		8.200	m
RL of Minimum Garage Floor Level		8.200	m
Length of Overflow Weir		3.60	m
Site Runoff Coefficient	Parramatta City Council	0.75	
Storm Intensity (5 min 100 yr ARI)		206	mm/h
Peak Flow over Weir		184.5	L/s
Depth of Flow over Weir		99	mm
Freeboard to Habitable Floor		Satisfactory	901 mm
Freeboard to Garage Floor		Satisfactory	901 mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
			Min	Max
% of Roof draining to Rainwater Tank	100.0%		Satisfactory	0.0% 100%
Total Rainwater Tank Volume	0.00	kL	Minimum 0.0 kL	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol in Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	0.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
	Extended Detention		Detention	
Dedicated Airspace Credit	0.00	kL	0.00	kL
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	0.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	0.00	kL		
	Extended Detention		Detention	
Dynamic Airspace Credit	0.00	kL	0.00	kL
Combined Rainwater Tank Credit	0.00	kL	0.00	kL
Maximum Rainwater Tank Credit	0.00	kL	0.00	kL
Rainwater Tank Credit per Dwelling	0.00	kL	0.00	kL
Rainwater Tank Credit for the Site	0.00	m ³	0.00	m ³

Signature: _____

Date: _____

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment HED Secondary Outlet

Project:	Arthur Phillip High School and Parramatta Public School - Sub-Catchment North Two				
Site Address	Macquarie St, Parramatta NSW 2150				
Job No:	247436				
Designer:	ASK				
Telephone:					

Site Data					
OSD Area:	Lower Parramatta River Catchment				
L.G.A	Parramatta City Council				
Site Area	0.81	ha	8,100	m ²	
Total Roof Area	0.25	ha	2,500	m ²	
Area of Site draining to OSD Storage	0.81	ha	8,100	m ²	Satisfactory
Residual Site Area (Lot Area - Roof Area)	0.560	ha			
Area Bypassing Storage	0	ha			
Area Bypassing / Residual Site Area	0.0%				Satisfactory
No. of Dwellings on Site	1				Satisfactory
Site Area per Dwelling	0.810	ha			
Roof Area per Dwelling	0.250	ha			

Basic OSD Parameters					
		Extended Detention		Detention	
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage	455 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet	150 L/s/ha

OSD Tank Bypass			
Residual Lot Capture in OSD Tank	100%		
Adjusted SRDs	40	L/s/ha	150 L/s/ha

OSD Calculations					
		Extended Detention		Detention	
Basic SSR Volume	Ext Detention Storage	243.00	m ³	Total Storage	368.55 m ³
Total Rainwater Tank Credits		0.29	m ³		0.32 m ³
Storage Volume				Total	368.23 m ³
Storage Volume	Ext Detention Storage	242.71	m ³	Flood Detention Storage	125.51 m ³
OSD Discharges	Primary Outlet	32.40	L/s	Secondary Outlet	121.50 L/s
RL of Top Water Level of Storage		7.200	m		7.200 m
RL of Orifice Centre-line		6.300	m		6.300 m
Number of Orifices		1			1
Estimated Downstream Flood Level		0.00	1.5 yr ARI		6.30 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-6.30	Satisfactory	Satisfactory	0.00 m
Design Head to Orifice Centre		0.900	m	TWL Ext Detn Storage - RL Orifice	0.900 m
Calculated Orifice Diameter		128	mm	Satisfactory	Satisfactory

Overflow Weir & Freeboard Calculation			
RL of Minimum Habitable Floor Level		8.200	m
RL of Minimum Garage Floor Level		8.200	m
Length of Overflow Weir		3.60	m
Site Runoff Coefficient	Parramatta City Council	0.75	
Storm Intensity (5 min 100 yr ARI)		206	mm/h
Peak Flow over Weir		347.6	L/s
Depth of Flow over Weir		152	mm
Freeboard to Habitable Floor	Satisfactory	848	mm
Freeboard to Garage Floor	Satisfactory	848	mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
			Min	Max
% of Roof draining to Rainwater Tank	100.0%		Satisfactory	3.1% 100%
Total Rainwater Tank Volume	25.00	kL	Tank Volume OK	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol in Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	25.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
	Extended Detention		Detention	
Dedicated Airspace Credit	0.00	kL	0.00	kL
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	25.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	4.41	kL		
	Extended Detention		Detention	
Dynamic Airspace Credit	0.29	kL	0.32	kL
Combined Rainwater Tank Credit	0.29	kL	0.32	kL
Maximum Rainwater Tank Credit	25.00	kL	25.00	kL
Rainwater Tank Credit per Dwelling	0.29	kL	0.32	kL
Rainwater Tank Credit for the Site	0.29	m ³	0.32	m ³

Signature: _____

Date: _____

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment HED Secondary Outlet

Project:	Arthur Phillip High School and Parramatta Public School - Sub-Catchment South One			
Site Address	Macquarie St, Parramatta NSW 2150			
Job No:	247436			
Designer:	ASK			
Telephone:				

Site Data				
OSD Area:	Lower Parramatta River Catchment			
L.G.A	Parramatta City Council			
Site Area	0.87	ha	8,700	m ²
Total Roof Area	0.08	ha	800	m ²
Area of Site draining to OSD Storage	0.87	ha	8,700	m ²
Residual Site Area (Lot Area - Roof Area)	0.790	ha		
Area Bypassing Storage	0	ha		
Area Bypassing / Residual Site Area	0.0%			
No. of Dwellings on Site	1			
Site Area per Dwelling	0.870	ha		
Roof Area per Dwelling	0.080	ha		

Basic OSD Parameters				
		Extended Detention		Detention
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage 455 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet 150 L/s/ha

OSD Tank Bypass				
Residual Lot Capture in OSD Tank	100%			
Adjusted SRDs	40	L/s/ha	150	L/s/ha

OSD Calculations				
		Extended Detention		Detention
Basic SSR Volume	Ext Detention Storage	261.00	m ³	Total Storage 395.85 m ³
Total Rainwater Tank Credits		0.00	m ³	0.00 m ³
Storage Volume				Total 395.85 m ³
Storage Volume	Ext Detention Storage	261.00	m ³	Flood Detention Storage 134.85 m ³
OSD Discharges	Primary Outlet	34.80	L/s	Secondary Outlet 130.50 L/s
RL of Top Water Level of Storage		7.200	m	7.200 m
RL of Orifice Centre-line		6.300	m	6.300 m
Number of Orifices		1		1
Estimated Downstream Flood Level		0.00	1.5 yr ARI	6.30 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-6.30	Satisfactory	Satisfactory 0.00 m
Design Head to Orifice Centre		0.900	m	TWL Ext Detn Storage - RL Orifice 0.900 m
Calculated Orifice Diameter		133	mm	Satisfactory Satisfactory 257 mm

Overflow Weir & Freeboard Calculation				
RL of Minimum Habitable Floor Level		8.200	m	
RL of Minimum Garage Floor Level		8.200	m	
Length of Overflow Weir		3.60	m	
Site Runoff Coefficient	Parramatta City Council	0.75		
Storm Intensity (5 min 100 yr ARI)		206	mm/h	
Peak Flow over Weir		373.4	L/s	
Depth of Flow over Weir		159	mm	
Freeboard to Habitable Floor		Satisfactory	841	mm
Freeboard to Garage Floor		Satisfactory	841	mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
			Min	Max
% of Roof draining to Rainwater Tank	100.0%		Satisfactory	0.0% 100%
Total Rainwater Tank Volume	0.00	kL	Minimum 0.0 kL	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol in Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	0.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
	Extended Detention		Detention	
Dedicated Airspace Credit	0.00	kL	0.00	kL
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	0.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	0.00	kL		
	Extended Detention		Detention	
Dynamic Airspace Credit	0.00	kL	0.00	kL
Combined Rainwater Tank Credit	0.00	kL	0.00	kL
Maximum Rainwater Tank Credit	0.00	kL	0.00	kL
Rainwater Tank Credit per Dwelling	0.00	kL	0.00	kL
Rainwater Tank Credit for the Site	0.00	m ³	0.00	m ³

Signature: _____

Date: _____

On-Site Detention Calculation Sheet for Upper Parramatta River Catchment HED Secondary Outlet

Project:	Arthur Phillip High School and Parramatta Public School - Sub-Catchment South Two				
Site Address	Macquarie St, Parramatta NSW 2150				
Job No:	247436				
Designer:	ASK				
Telephone:					

Site Data					
OSD Area:	Lower Parramatta River Catchment				
L.G.A	Parramatta City Council				
Site Area	0.9	ha	9,000	m ²	
Total Roof Area	0.25	ha	2,500	m ²	
Area of Site draining to OSD Storage	0.9	ha	9,000	m ²	Satisfactory
Residual Site Area (Lot Area - Roof Area)	0.650	ha			
Area Bypassing Storage	0	ha			
Area Bypassing / Residual Site Area	0.0%				Satisfactory
No. of Dwellings on Site	1				Satisfactory
Site Area per Dwelling	0.900	ha			
Roof Area per Dwelling	0.250	ha			

Basic OSD Parameters					
		Extended Detention		Detention	
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage	455 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet	150 L/s/ha

OSD Tank Bypass			
Residual Lot Capture in OSD Tank	100%		
Adjusted SRDs	40	L/s/ha	150 L/s/ha

OSD Calculations					
		Extended Detention		Detention	
Basic SSR Volume	Ext Detention Storage	270.00	m ³	Total Storage	409.50 m ³
Total Rainwater Tank Credits		0.10	m ³		0.11 m ³
Storage Volume				Total	409.39 m ³
Storage Volume	Ext Detention Storage	269.90	m ³	Flood Detention Storage	139.50 m ³
OSD Discharges	Primary Outlet	36.00	L/s	Secondary Outlet	135.00 L/s
RL of Top Water Level of Storage		7.200	m		7.200 m
RL of Orifice Centre-line		6.300	m		6.300 m
Number of Orifices		1			1
Estimated Downstream Flood Level		0.00	1.5 yr ARI		6.30 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-6.30	Satisfactory	Satisfactory	0.00 m
Design Head to Orifice Centre		0.900	m	TWL Ext Detn Storage - RL Orifice	0.900 m
Calculated Orifice Diameter		135	mm	Satisfactory	Satisfactory
					261 mm

Overflow Weir & Freeboard Calculation			
RL of Minimum Habitable Floor Level		8.200	m
RL of Minimum Garage Floor Level		8.200	m
Length of Overflow Weir		3.60	m
Site Runoff Coefficient	Parramatta City Council	0.75	
Storm Intensity (5 min 100 yr ARI)		206	mm/h
Peak Flow over Weir		386.3	L/s
Depth of Flow over Weir		163	mm
Freeboard to Habitable Floor	Satisfactory	837	mm
Freeboard to Garage Floor	Satisfactory	837	mm

Rainwater Tank Calculations (per Dwelling)					
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed					
The calculations assume that the same size rainwater tank is installed on each dwelling					
				Min	Max
% of Roof draining to Rainwater Tank	100.0%		Satisfactory	3.0%	100%
Total Rainwater Tank Volume	15.00	kL	Tank Volume OK		
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol in Tank < 10% Total Tank Vol		
Total Tank Vol - Min Top-up Vol	15.00	kL			
Dedicated Airspace					
Dedicated Airspace	0.00	kL	Satisfactory		
	Extended Detention		Detention		
Dedicated Airspace Credit	0.00	kL		0.00	kL
Maximum Tank PSD	40	L/s/ha			
Maximum Tank Discharge	0.0	L/s			
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace		
Calculated Orifice Diameter	0	mm	No Dedicated Airspace		
Dynamic Airspace					
Maximum Dynamic Storage (Nett Vol)	15.00	kL	Controls minimum % Roof to Rainwater Tank		
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory		
Dynamic Airspace at start of Storm	2.58	kL			
	Extended Detention		Detention		
Dynamic Airspace Credit	0.10	kL		0.11	kL
Combined Rainwater Tank Credit	0.10	kL		0.11	kL
Maximum Rainwater Tank Credit	15.00	kL		15.00	kL
Rainwater Tank Credit per Dwelling	0.10	kL		0.11	kL
Rainwater Tank Credit for the Site	0.10	m ³		0.11	m ³

Signature: _____

Date: _____

Appendix D

MUSIC link report

MUSIC-*link* Report

Project Details		Company Details	
Project:	ARTHUR PHILLIP HIGH SCHOOL & PARRAMATTA PUBLIC SCHOOL	Company:	Arup
Report Export Date:	11/03/2016	Contact:	Sasha Kovacian
Catchment Name:	APHS	Address:	Level 10 201 Kent Street PO Box 76 Millers Point Sydney 2000
Catchment Area:	3.009ha	Phone:	
Impervious Area*:	72.37%	Email:	Sasha.kovacina@arup.com
Rainfall Station:	67035 LIVERPOOL (WHITLAM)		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1967 - 31/12/1976 11:54:00 PM		
Mean Annual Rainfall:	857mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.1.0		
MUSIC-link data Version:	6.0		
Study Area:	Parramatta		
Scenario:	Parramatta Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Parramatta River	Reduction	Node Type	Number	Node Type	Number
Flow	23.1%	Buffer Node	2	Urban Source Node	6
TSS	85.8%	Rain Water Tank Node	2		
TP	66.9%	Detention Basin Node	4		
TN	47.3%	Generic Node	3		
GP	100%				

Comments

Roof areas modeled per. Draft Music Modelling Guidelines for New South Wales pollutant generation rates.

Tanks modeled with out Evapo loss.



Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Buffer	Buffer	Proportion of upstream impervious area treated	None	None	0.1
Buffer	Buffer Roof	Proportion of upstream impervious area treated	None	None	1
Detention	Detention Basin	% Reuse Demand Met	None	None	0
Detention	Detention Basin	% Reuse Demand Met	None	None	0
Detention	Detention Basin	% Reuse Demand Met	None	None	0
Detention	Detention Basin	% Reuse Demand Met	None	None	0
Receiving	Parramatta River	% Load Reduction	None	None	23.1
Receiving	Parramatta River	GP % Load Reduction	90	None	100
Receiving	Parramatta River	TN % Load Reduction	45	None	47.3
Receiving	Parramatta River	TP % Load Reduction	60	None	66.9
Receiving	Parramatta River	TSS % Load Reduction	85	None	85.8
Urban	North One	Area Impervious (ha)	None	None	0.386
Urban	North One	Area Pervious (ha)	None	None	0.043
Urban	North One	Total Area (ha)	None	None	0.43
Urban	North Two	Area Impervious (ha)	None	None	0.507
Urban	North Two	Area Pervious (ha)	None	None	0.026
Urban	North Two	Total Area (ha)	None	None	0.534
Urban	Roof	Area Impervious (ha)	None	None	0.25
Urban	Roof	Area Pervious (ha)	None	None	0
Urban	Roof	Total Area (ha)	None	None	0.25
Urban	Roof North Two	Area Impervious (ha)	None	None	0.275
Urban	Roof North Two	Area Pervious (ha)	None	None	0
Urban	Roof North Two	Total Area (ha)	None	None	0.275
Urban	South One	Area Impervious (ha)	None	None	0.174
Urban	South One	Area Pervious (ha)	None	None	0.695
Urban	South One	Total Area (ha)	None	None	0.87
Urban	South Two	Area Impervious (ha)	None	None	0.583
Urban	South Two	Area Pervious (ha)	None	None	0.066
Urban	South Two	Total Area (ha)	None	None	0.65

Only certain parameters are reported when they pass validation



Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Detention	Detention Basin	Evaporative Loss as % of PET	100	100	0
Detention	Detention Basin	Evaporative Loss as % of PET	100	100	0
Detention	Detention Basin	Evaporative Loss as % of PET	100	100	0
Detention	Detention Basin	Evaporative Loss as % of PET	100	100	0
Urban	Roof	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0
Urban	Roof	Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.12	0.12	0
Urban	Roof	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	0
Urban	Roof	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.19	0.19	0
Urban	Roof	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	0
Urban	Roof	Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.17	0.17	0
Urban	Roof	Impervious Area Rainfall Threshold (mm/day)	1	1	0.3
Urban	Roof	Stormflow Total Nitrogen Mean (log mg/L)	0.42	0.42	0.3
Urban	Roof	Stormflow Total Phosphorus Mean (log mg/L)	-0.45	-0.45	-0.89
Urban	Roof	Stormflow Total Suspended Solids Mean (log mg/L)	2.2	2.2	1.3
Urban	Roof North Two	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0
Urban	Roof North Two	Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.12	0.12	0
Urban	Roof North Two	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	0
Urban	Roof North Two	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.19	0.19	0
Urban	Roof North Two	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	0
Urban	Roof North Two	Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.17	0.17	0
Urban	Roof North Two	Impervious Area Rainfall Threshold (mm/day)	1	1	0.3
Urban	Roof North Two	Stormflow Total Nitrogen Mean (log mg/L)	0.42	0.42	0.3
Urban	Roof North Two	Stormflow Total Phosphorus Mean (log mg/L)	-0.45	-0.45	-0.89
Urban	Roof North Two	Stormflow Total Suspended Solids Mean (log mg/L)	2.2	2.2	1.3

Only certain parameters are reported when they pass validation