

Figure 4 - Potential Evacuation via Jones Street (SIX Maps)

12.7 Potential Effects of Climate Change

The flood modelling undertaken by WMA also considered the effects of climate change on the 1% AEP flood event, namely increases in rainfall intensity and tail water due to sea level rise.

12.7.1 Increase in Rainfall Intensity

Increases in the 1% AEP rainfall intensity are shown to result in noticeable increases in the flood levels within major overland flow paths and the areas located towards the bottom of the Blackwattle Bay catchment. The results for rainfall increase in comparison to the base case 1% AEP flood level taken from the Blackwattle Bay Catchment Flood Study 2015 by WMA are tabulated below. Flood levels are provided up and downstream of the subject site where Wattle Street intersects William Henry and Fig Street. Interpolation between the levels provided in the flood study was used to estimate the effects of the rainfall intensity increases on peak 1% AEP flood levels at the intersection of Quarry Street.

Location ID	Description	1% AEP Flood Level	10% Increase	20% Increase	30% Increase
13	William Henry / Wattle Street	3.74	0.04	0.08	0.13
Interpolated values	Quarry Street / Wattle Street	2.99 (WMA flood certificate)	0.05	0.10	0.16
14	Fig Street / Wattle Street	2.86	0.05	0.11	0.17

Table 16 - Interpolated Increases in Flood Depth Due to Rainfall Intensity (WMA 2015)

12.7.1 Sea Level Rise

Increases in the tail water levels within Blackwattle Bay are mainly shown to affect the lower regions of the catchment. WMA considered two scenarios for sea level rise; 0.4m and 0.9m. The results of the same locations evaluated by WMA for rainfall intensity were interpolated to evaluate the expected site specific effects of sea level rise. The results are tabulated below.

Location ID	Description	1% AEP Flood Level	Sea Level Rise of 0.4m	Sea Level Rise of 0.9m
13	William Henry / Wattle Street	3.74	0	0
Interpolated values	Quarry Street / Wattle Street	2.99 (WMA flood certificate)	0.01	0.03
14	Fig Street / Wattle Street	2.86	0.01	0.04

Table 17 - Interpolated Increases in Flood Depth Due to Sea Level Rise (WMA 2015)

From the above it can be seen that the worst case increase to peak 1% AEP flood levels at the site are a result of a 30% increase in rainfall resulting in a new flood level of RL 3.15m AHD (RL 2.99 + 0.16m). The flood planning level of the car park is currently proposed at RL 3.05m AHD and so would experience 100mm of inundation. This small increase would be insufficient to cause the displacement of vehicles or create hazards to persons. Flood proof gates could be retrofitted as future mitigation measures at the vehicle entrance off Wattle Street in order to prevent the ingress of flood waters.

12.8 Additional Flood Risk Issues

A number of additional flood risk issues were considered in the preparation of this assessment:

Flood Compatible Construction

All structures are to have flood compatible building components below the Flood Planning Levels. The construction method will utilise concrete, block or brick work in order to satisfy this condition.

Structural Soundness

Certification will be provided by a structural engineer engaged for the development to ensure that all structures are to be designed to withstand the forces of floodwater, debris and buoyancy up to the Flood Planning Levels.

Site Emergency Response Flood Plan

A site emergency response flood plan detailing the flood inundation and mitigation measures as well as the proposed relocation of people to a safe location should be implemented by operations and management. The staff employed at the new school will be required to be trained for typical emergency situations such as fires. In addition to this generalised training the management of a flood event can also be incorporated into the responsibility of staff members. It is recommended that a flood plan address the following items:

- The training and action required for the management of a flood event including the deployment of flood mitigation measures and relocation of persons.

- Similarly to fire wardens, flood wardens can be appointed and made responsible for managing the evacuation procedures. Flood evacuation drills can also be scheduled to ensure all persons are aware of the correct procedure.
- The maintenance and operation schedules of any alarm and warning systems implemented. E.g. a ball float alarm system can be installed within the lower lying pits which would then sound and activate alarms and any flood mitigation measures.
- Locations of the appropriate flood warning signage.

12.9 Flood Risk Assessment Recommendations:

The key strategies to be adopted for the development include the following:

- The development is to provide freeboard to the Flood Planning Levels outlined in Table 15.
- An alarm warning system, flood warning and evacuation route signage shall be incorporated as part of the redevelopment of the school. Signage shall also be erected within the undercroft car park.
- The building shall be constructed from flood compatible materials and designed to withstand flood pressure and impacts from debris carried in flood waters. The design shall also be certified by a structural engineer engaged on the development.

13.0 Conclusions

The New Ultimo Pymont Public School has the potential to lead to significant adverse changes in water quantity and quality leaving the site if a water sensitive urban design management strategy is not adopted during the design and development stage of the project. The measures outlined in this report extend beyond the traditional civil works management measures to consider the overall impact of all construction related activities on the surrounding man-made and natural environments. Best practices must now encompass the effects of flooding, water quality and maintenance of these items to develop an appropriate water management strategy to ensure that development occurs in an ecologically sustainable way. For further details on the ecologically sustainable strategies proposed for the management of water efficiency, non-potable water, sewer and trade waste are available in the Integrated Water Management Plan prepared by JHA.

Prepared by
**TAYLOR THOMSON WHITTING
(NSW) PTY LTD**



WILLIAM WEBB
Civil Engineer

Authorised By
**TAYLOR THOMSON WHITTING
(NSW) PTY LTD**



PAUL YANNOULATOS
Technical Director

Appendix A

Sedimentation and Erosion Control Plan

NEW ULTIMO PYRMONT PUBLIC SCHOOL



SITE LOCALITY PLAN
NOT TO SCALE - IMAGE COURTESY OF NSW SPATIAL INFORMATION EXCHANGE

GENERAL NOTES

- Contractor must verify all dimensions and existing levels on site prior to commencement of works. Any discrepancies to be reported to the Engineer.
- Strip all topsoil from the construction area. All stripped topsoil shall be disposed of off-site unless directed otherwise.
- Make smooth connection with all existing works.
- Compact subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.
- All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority, the Contractor is to ensure that the drawings used for construction have been approved by all relevant authorities prior to commencement site.
- All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority is to be carried out in accordance with the requirements of the relevant Authority. The Contractor shall obtain these requirements from the Authority. Where the requirements of the Authority are different to the drawings and specifications, the requirements of the Authority shall be applicable.
- For all temporary batters refer to geotechnical recommendations.

REFERENCE DRAWINGS

- These drawings have been based from, and to be read in conjunction with the following Consultants drawings. Any conflict to the drawings must be notified immediately to the Engineer.

Consultant	Dwg Title	Dwg No	Rev	Date
SURVEYING & SPATIAL	DETAIL SURVEY	57345SH1		07.09.15
INFORMATION SERVICES				
DESIGN INC.	GROUND - LOWER	DA-2300	Q	20.10.17
DESIGN INC.	LEVEL 01 - LIBRARY	DA-2301	Q	20.10.17
DESIGN INC.	LEVEL 03 - UPPER	DA-2303	Q	20.10.17
CARDNO	DETAIL SURVEY	11842801001	01	16.08.17

SURVEY AND SERVICES INFORMATION

SURVEY
 Origin of levels : PM 42341
 Datum of levels : A.H.D. AUSTRALIAN HEIGHT DATUM
 Coordinate system : MGA
 Survey prepared by : SURVEYING & SPATIAL INFORMATION SERVICES
 Setout Points : CONTACT THE SURVEYOR

Taylor Thomson Whitting does not guarantee that the survey information shown on these drawings is accurate and will accept no liability for any inaccuracies in the survey information provided to us from any cause whatsoever.

UNDERGROUND SERVICES - WARNING
 The locations of underground services shown on Taylor Thomson Whittings drawings have been plotted from diagrams provided by service authorities. This information has been prepared solely for the authorities own use and may not necessarily be updated or accurate.

The position of services as recorded by the authority at the time of installation may not reflect changes in the physical environment subsequent to installation.

Taylor Thomson Whitting does not guarantee that the services information shown on these drawings shows more than the presence or absence of services, and will accept no liability for inaccuracies in the services information shown from any cause whatsoever.

The Contractor must confirm the exact location and extent of services prior to construction and notify any conflict with the drawings immediately to the Engineer/Superintendent.

The contractor is to get approval from the relevant state survey department, to remove/adjust any survey mark. This includes but is not limited to; State Survey Marks (SSM), Permanent Marks (PM), cadastral reference marks or any other survey mark which is to be removed or adjusted in any way.
Taylor Thomson Whitting plans do not indicate the presence of any survey mark. The contractor is to undertake their own search.

BOUNDARY AND EASEMENT NOTE

The property boundary and easement locations shown on Taylor Thomson Whitting drawing's have been based from information received from : **No boundary information received.**
Refer architect for boundary information and locations
 Taylor Thomson Whitting makes no guarantees that the boundary or easement information shown is correct.
 Taylor Thomson Whitting will accept no liabilities for boundary inaccuracies. The contractor/builder is advised to check/confirm all boundaries in relation to all proposed work prior to the commencement of construction. Boundary inaccuracies found are to be reported to the superintendent prior to construction starting.

SITeworks NOTES

- All basecourse material to comply with RMS specification No 3051 and compacted to minimum 98% modified standard dry density in accordance with AS 1289 5.2.1.
- All trench backfill material shall be compacted to the same density as the adjacent material.
- All service trenches under vehicular pavements shall be backfilled with an approved select material and compacted to a minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1.

BULK EARTHWORKS NOTES

- All bulk earthworks setout from grid lines U.N.O.
- All batters at a slope of 1.5(H) : 1 (V) U.N.O. - MAX 3.0m HIGH
- Excavated material may be used as form fill below floor slabs provided,
 - it complies with the specification requirements for fill material,
 - the placement moisture content complies with the Geotechnical Consultants requirements, and allows filling to be placed and proofrolled in accordance with the specification. Where necessary the Contractor must moisture condition the excavated material to meet these requirements.
 - Compacted to a density of at least 95% of it's standard MDD.
 - The base is rolled to improve surface compaction.
- Compact fill areas and subgrade to not less than:

Location	Standard dry density (AS 1289 5.1.1.)	Moisture (OMC)
Under building slabs on ground:	98%	±2%
Under roads and carparks:	98%	±2%
Landscape areas:	95%	±2%

- Before placing fill, proof roll exposed subgrade with a 10 tonne minimum smooth drum vibrating roller with 7 passes to test subgrade and then remove soft spots (areas with more than 3mm movement under roller).
Soft spots to be replaced with select fill U.N.O.
- Contractor shall place safety barriers around excavations in accordance with relevant safety regulations.
- For interpretation of bulk earthworks foot print line shown on the bulk earthworks drawings refer to the bulk earthworks construction legend.
- Bulk earthwork drawings are not to be used for detailed excavation.
- Refer to Geotechnical Report prepared by -
JK Geotechnics - 3036158rpt
Environmental investigation Services - E30361Khrpt

CIVIL SAFETY IN DESIGN

Taylor Thomson Whitting (NSW) Pty Ltd operates under Safe Work Australia's Code of Conduct for the Safe Design of Structures. These drawings shall be read in conjunction with the Taylor Thomson Whitting Transfer of Information Letter and Civil Risk and Solutions Register.
 Under the Code of Conduct it is the Client's responsibility to provide a copy of the Civil Risk and Solutions Register to the Principal Contractor.
 It is the Principal Contractor's responsibility to review the hazards and risks identified during the design process to ensure a safe workplace is maintained for the construction, maintenance and eventual demolition of the civil infrastructure.

SAFETY IN DESIGN

Contractor to refer to Appendix B of the Civil Specification for the Civil Risk and Solutions Register.

EXISTING SERVICES
 Contractor to be aware existing services are located within the site. Location of all services to be verified by the Contractor prior to commencing works. Contractor to confirm with relevant authority regarding measures to be taken to ensure services are protected or procedures are in place to demolish and/or relocate.

EXISTING STRUCTURES
 Contractor to be aware existing structures may exist within the site. To prevent damage to existing structure(s) and/or personnel, site works to be carried out as far as practicable possible from existing structure(s).

EXISTING TREES
 Contractor to be aware existing trees exist within the site which need to be protected. To prevent damage to trees and/or personnel, site works to be carried out as far as practicable possible from existing trees. Advice needs to be sought from Arborist and/or Landscape Architect on measures required to protect trees.

GROUNDWATER
 Contractor to be aware ground water levels are close to existing surface level. Temporary de-watering may be required during construction works.

EXCAVATIONS
 Deep excavations due to stormwater drainage works is required. Contractor to ensure safe working procedures are in place for works. All excavations to be fenced off and batters adequately supported to approval of Geotechnical Engineer.

GROUND CONDITIONS
 Contractor to be aware of the site geotechnical conditions. Refer to geotechnical report by JK Geotechnics for details.

HAZARDOUS MATERIALS
 Existing asbestos products & contaminated material may be present on site. Contractor to ensure all hazardous materials are identified prior to commencing works. Safe working practices as per relevant authority to be adopted and appropriate PPE to be used when handling all hazardous materials. Refer to geotechnical/environmental report by Environmental Investigation Services for details.

CONFINED SPACES
 Contractor to be aware of potential hazards due to working in confined spaces such as stormwater pits, trenches and/or tanks. Contractor to provide safe working methods and use appropriate PPE when entering confined spaces.

MANUAL HANDLING
 Contractor to be aware manual handling may be required during construction. Contractor to take appropriate measures to ensure manual handling procedures and assessments are in place prior to commencing works.

WATER POLLUTION
 Contractor to ensure appropriate measures are taken to prevent pollutants from construction works contaminating the surrounding environment.

SITE ACCESS/EGRESS
 Contractor to be aware site works occur in close proximity to footpaths and roadways. Contractor to erect appropriate barriers and signage to protect site personnel and public.

VEHICLE MOVEMENT
 Contractor to supply and comply with traffic management plan and provide adequate site traffic control including a certified traffic marshal to supervise vehicle movements where necessary.

EROSION AND SEDIMENT CONTROL NOTES

- All work shall be generally carried out in accordance with
 - Local authority requirements,
 - EPA - Pollution control manual for urban stormwater,
 - LANDCOM NSW - Managing Urban Stormwater: Soils and Construction ("Blue Book").
- Erosion and sediment control drawings and notes are provided for the whole of the works. Should the Contractor stage these works then the design may be required to be modified. Variation to these details may require approval by the relevant authorities. The erosion and sediment control plan shall be implemented and adopted to meet the varying situations as work on site progresses.
- Maintain all erosion and sediment control devices to the satisfaction of the superintendent and the local authority.
- When stormwater pits are constructed prevent site runoff entering the pits unless silt fences are erected around pits.
- Minimise the area of site being disturbed at any one time.
- Protect all stockpiles of materials from scour and erosion. Do not stockpile loose material in roadways, near drainage pits or in watercourses.
- All soil and water control measures are to be put back in place at the end of each working day, and modified to best suit site conditions.
- Control water from upstream of the site such that it does not enter the disturbed site.
- All construction vehicles shall enter and exit the site via the temporary construction entry/exit.
- All vehicles leaving the site shall be cleaned and inspected before leaving.
- Maintain all stormwater pipes and pits clear of debris and sediment. Inspect stormwater system and clean out after each storm event.
- Clean out all erosion and sediment control devices after each storm event.

- Sequence Of Works**
- Prior to commencement of excavation the following soil management devices must be installed.
 - Construct silt fences below the site and across all potential runoff sites.
 - Construct temporary construction entry/exit and divert runoff to suitable control systems.
 - Construct measures to divert upstream flows into existing stormwater system.
 - Construct sedimentation traps/basin including outlet control and overflow.
 - Construct turf lined swales.
 - Provide sandbag sediment traps upstream of existing pits.
 - Construct geotextile filter pit surround around all proposed pits as they are constructed.
 - On completion of pavement provide sand bag kerb inlet sediment traps around pits.
 - Provide and maintain a strip of turf on both sides of all roads after the construction of kerbs.

WATER QUALITY TESTING REQUIREMENTS

Prior to discharge of site stormwater, groundwater and seepage water into council's stormwater system, contractors must undertake water quality tests in conjunction with a suitably qualified environmental consultant outlining the following:

- Compliance with the criteria of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- If required subject to the environmental consultants advice, provide remedial measures to improve the quality of water that is to be discharged into Councils storm water drainage system. This should include comments from a suitably qualified environmental consultant confirming the suitability of these remedial measures to manage the water discharged from the site into Councils storm water drainage system. Outlining the proposed, ongoing monitoring, contingency plans and validation program that will be in place to continually monitor the quality of water discharged from this site. This should outline the frequency of water quality testing that will be undertaken by a suitably qualified environmental consultant.

DRAWING SCHEDULE	
No	Drawing Title
C000	NOTES AND LEGEND SHEET
C001	EROSION & SEDIMENT CONTROL PLAN
C002	EROSION & SEDIMENT CONTROL DETAILS
C005	CONCEPT STORMWATER MANAGEMENT PLAN SHEET 1 OF 3
C006	CONCEPT STORMWATER MANAGEMENT PLAN SHEET 2 OF 3
C007	CONCEPT STORMWATER MANAGEMENT PLAN SHEET 3 OF 3

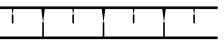
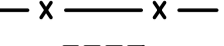








Reference: C000.rvt - USER: william - Plot File Created: Oct 23, 2017 - 10:23am

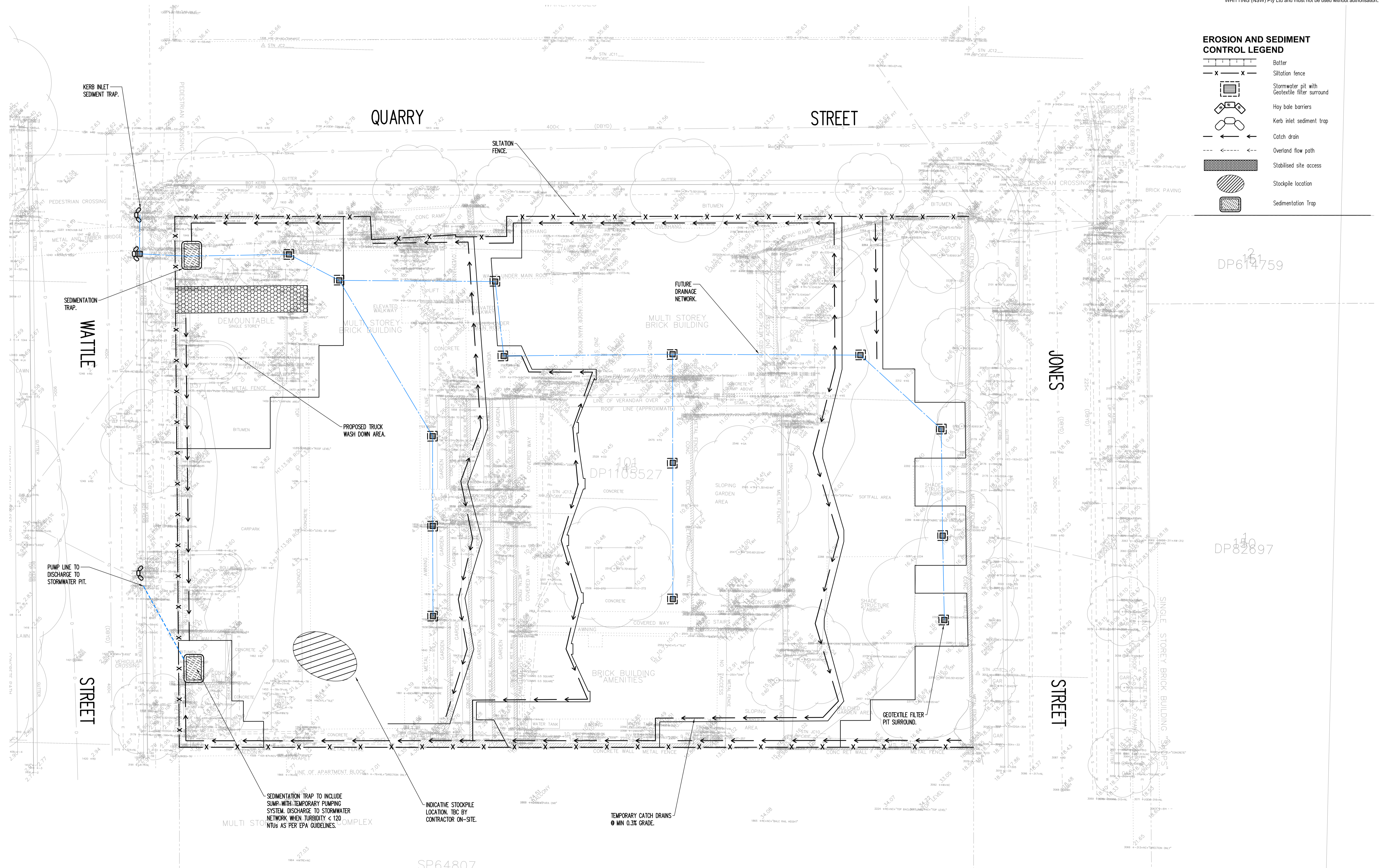
A1 0 1 2 3 4 5 6 7 8 9 10

Architect DESIGNINC L12 / 77 PACIFIC HWY NORTH SYDNEY, NSW 2060			Structural Engineer 812 9439 7288 48 Chandos Street St Leonards NSW 2065			Project NEW ULTIMO PYRMONT PUBLIC SCHOOL			Sheet Subject NOTES AND LEGENDS SHEET			Scale : A1 1:100, 1:20			Drawn PW			Authorised		
Job No 151959			Drawing No C000			Revision 1			Plot File Created: Oct 23, 2017 - 10:23am											

Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date
1	ISSUE FOR SSDA	WW	PW	23.10.17					
P1	PRELIMINARY	WW	PW	22.06.17					

EROSION AND SEDIMENT CONTROL LEGEND

-  Batter
-  Siltation fence
-  Stormwater pit with Geotextile filter surround
-  Hay bale barriers
-  Kerb inlet sediment trap
-  Catch drain
-  Overland flow path
-  Stabilised site access
-  Stockpile location
-  Sedimentation Trap



DP614759

DP82897

SP64807

File Name: C001.dwg - USER: willow - Plot File Created: Oct 23, 2017 - 10:23am

A1	0	1	2	3	4	5	6	7	8	9	10
----	---	---	---	---	---	---	---	---	---	---	----

Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date
1	ISSUE FOR SSD DA	WW	PW	13.09.17										
P1	PRELIMINARY	WW	PW	22.06.17										

Architect
DESIGNINC
 L12/77 PACIFIC HWY NORTH SYDNEY, NSW 2060

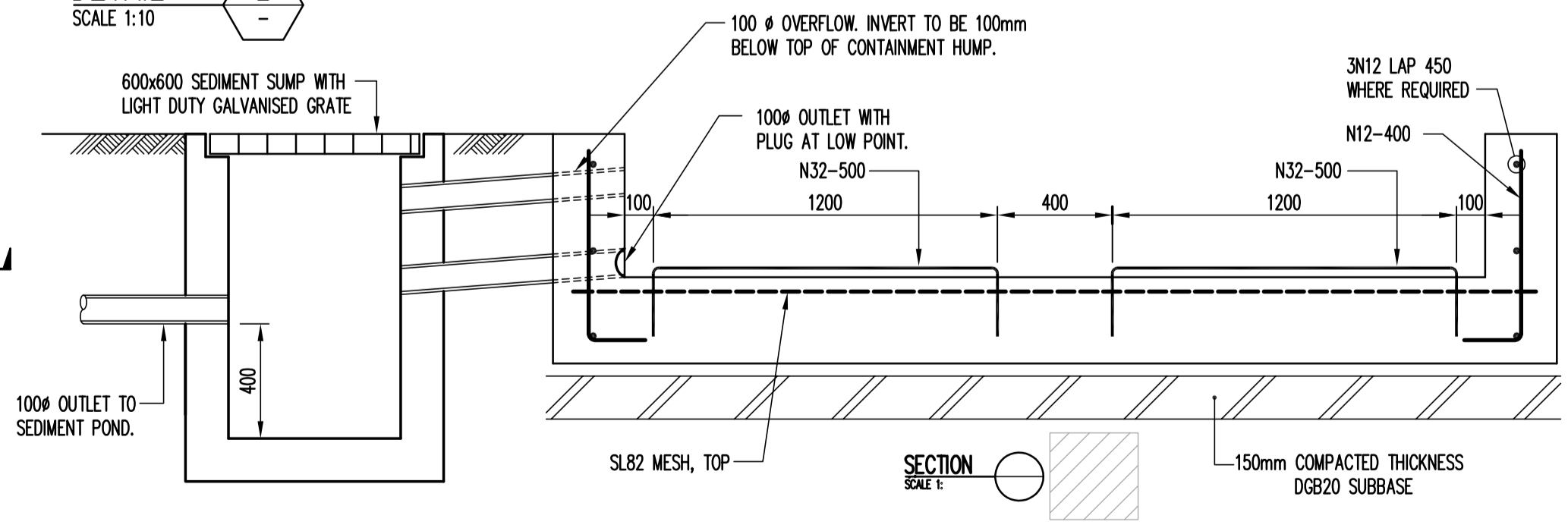
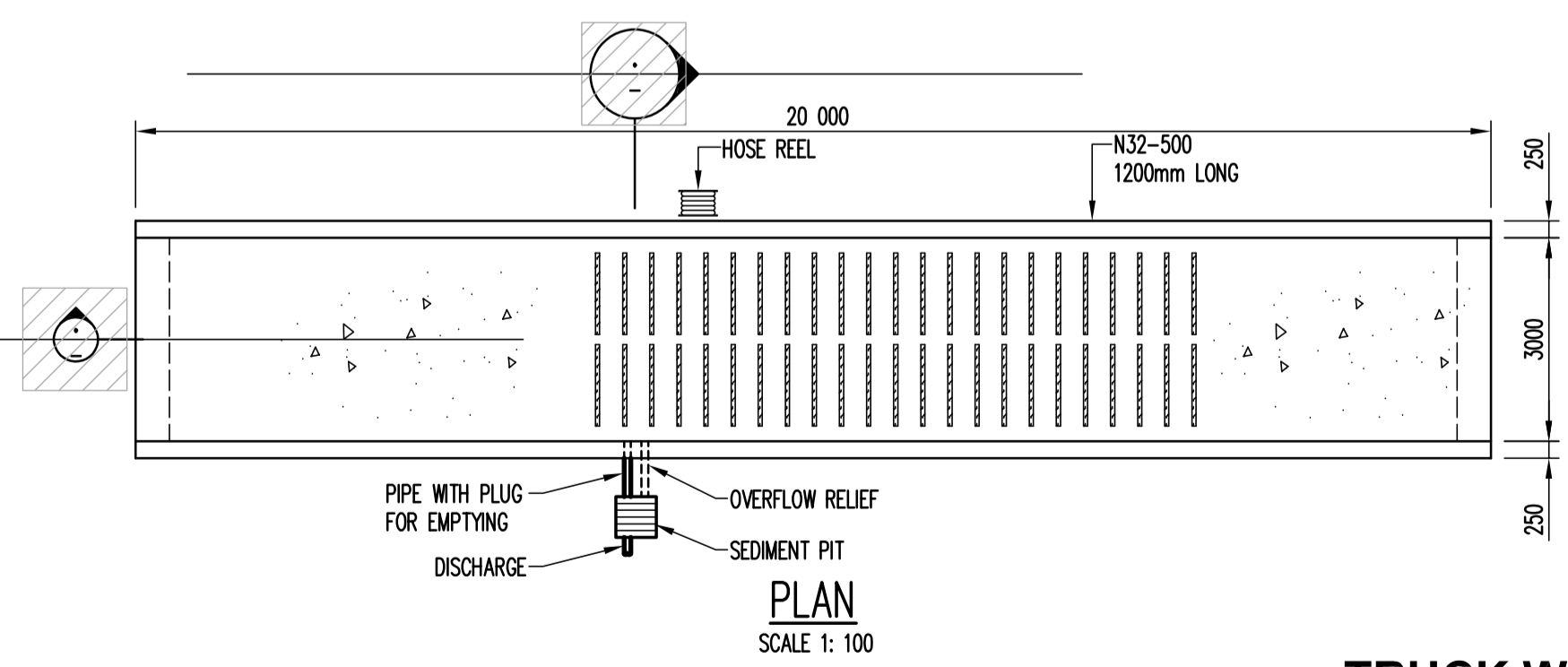
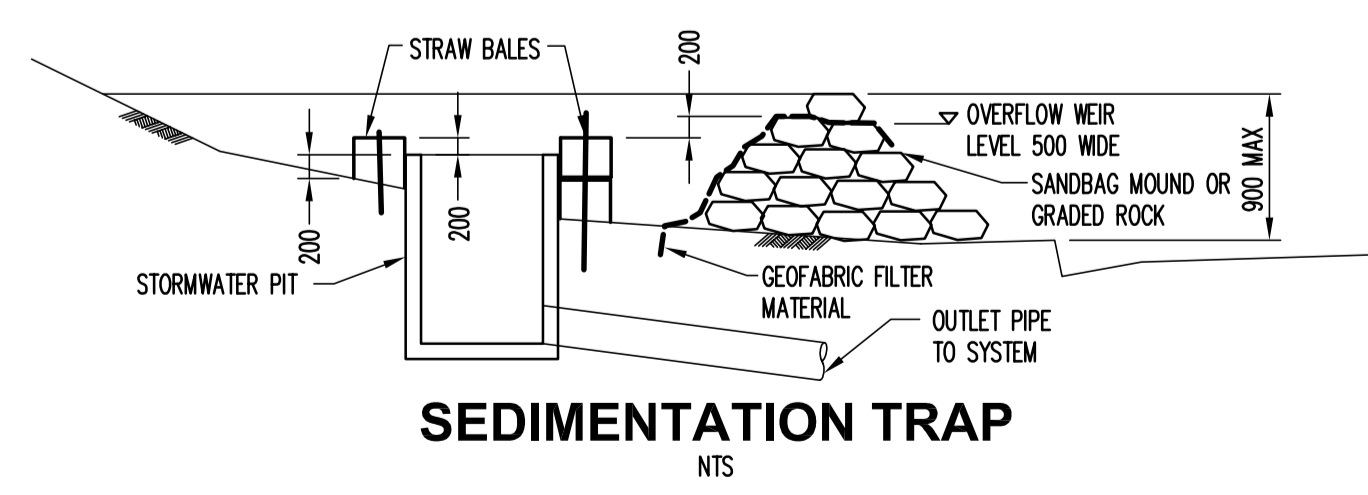
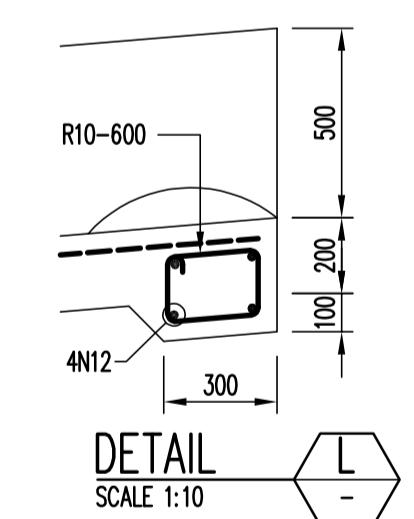
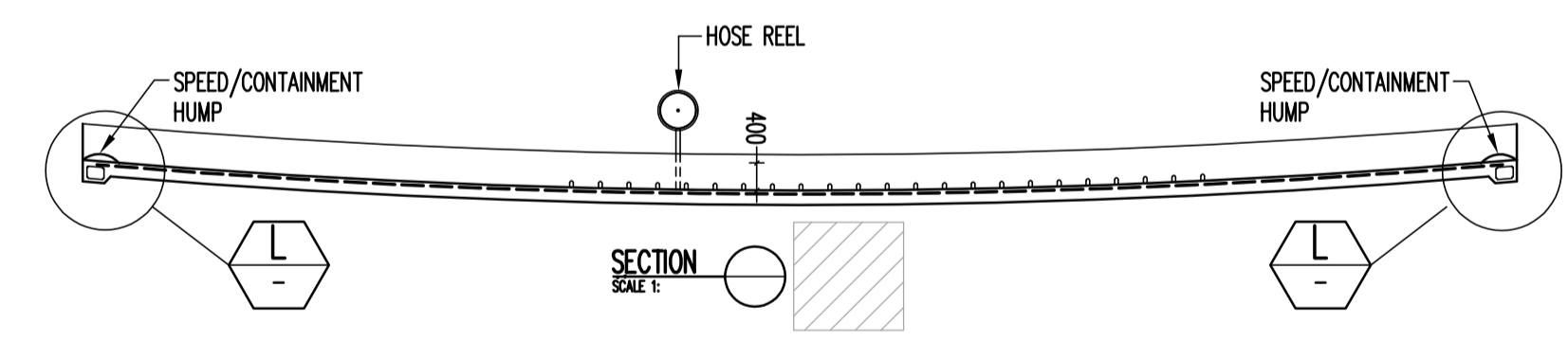
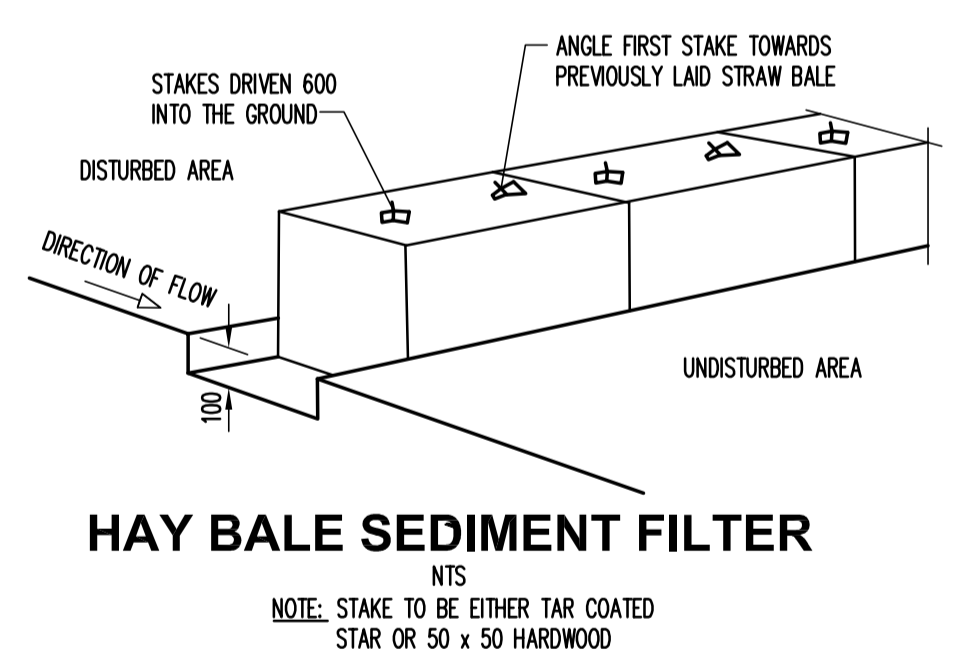
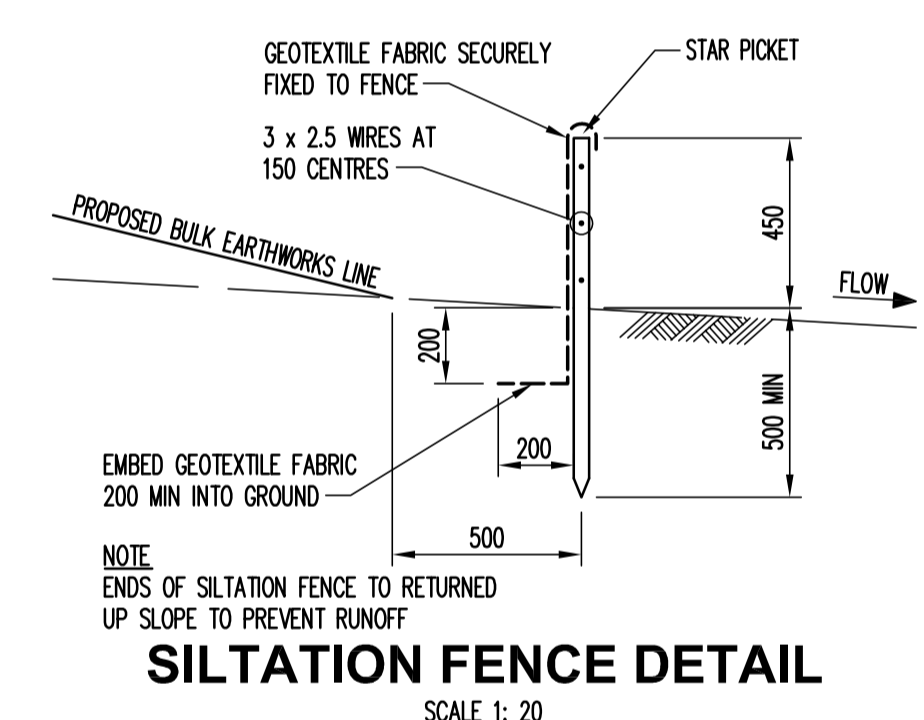
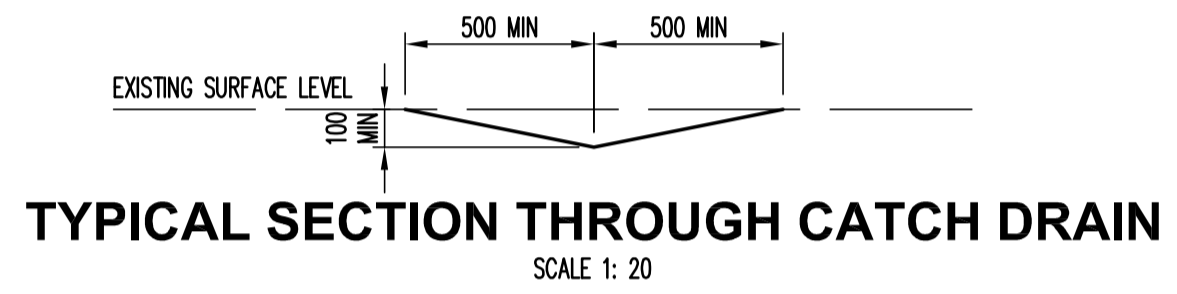
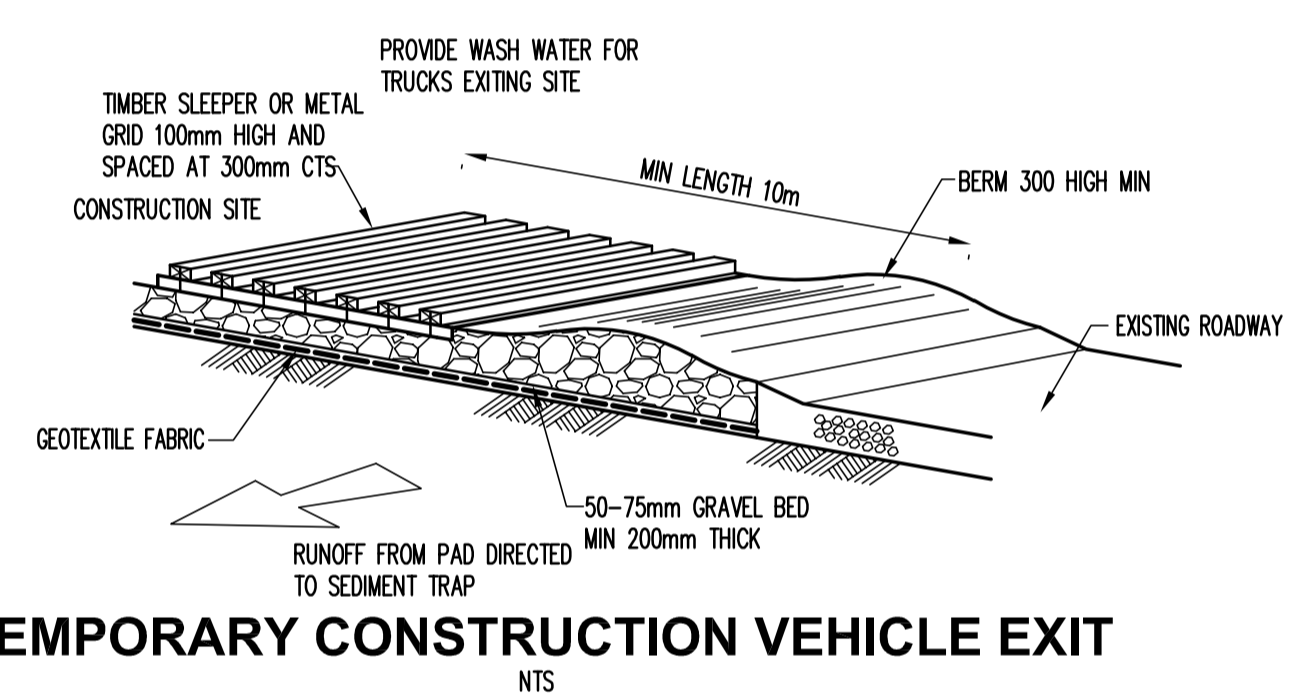
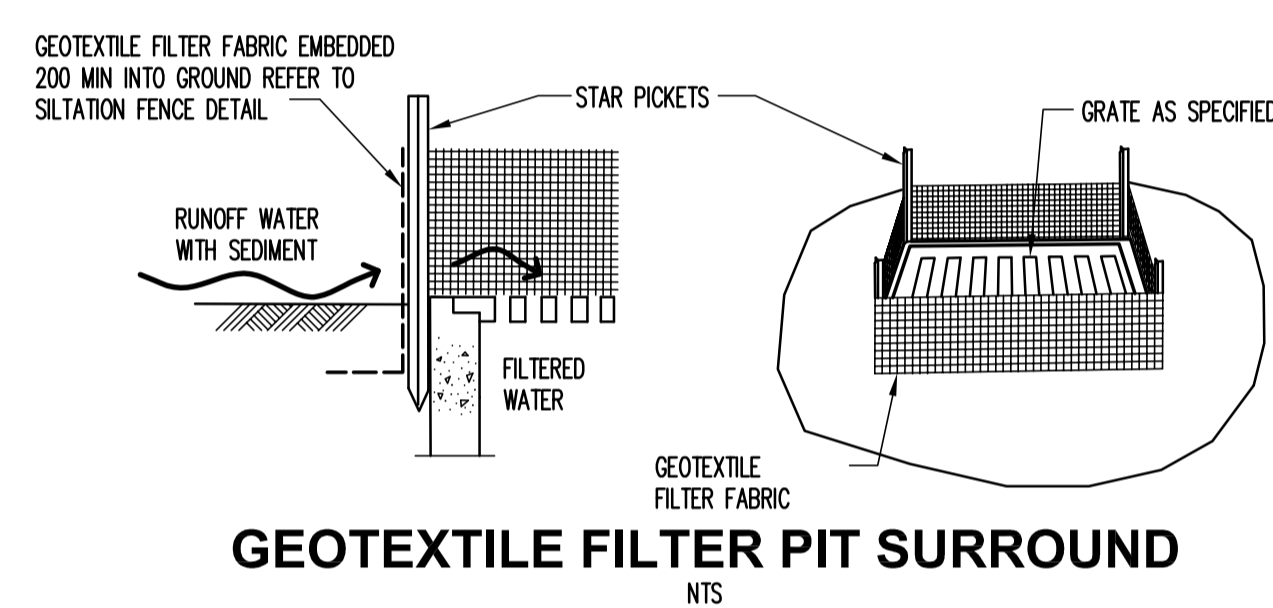
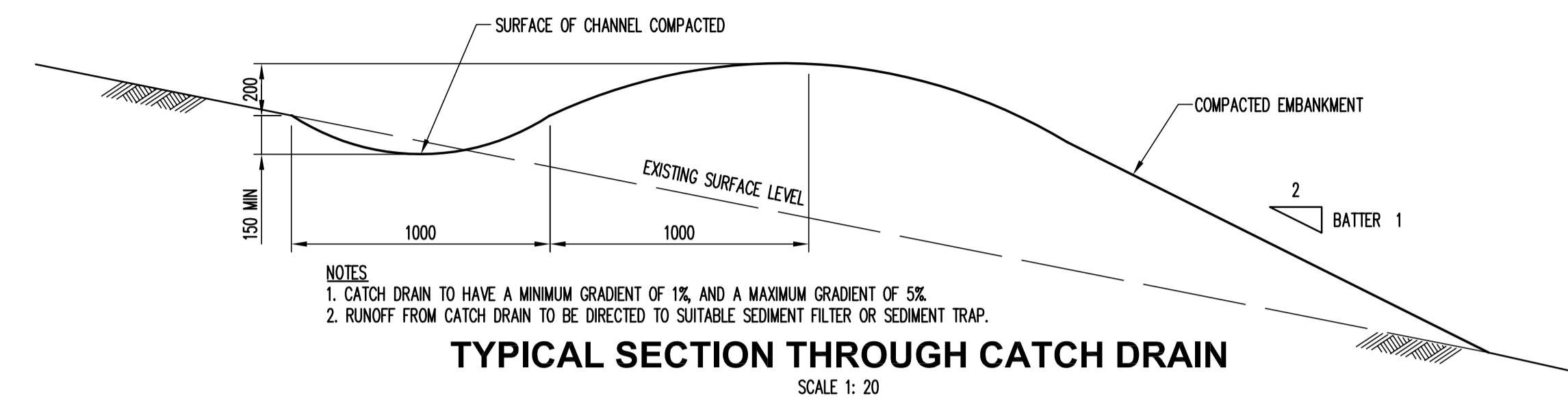
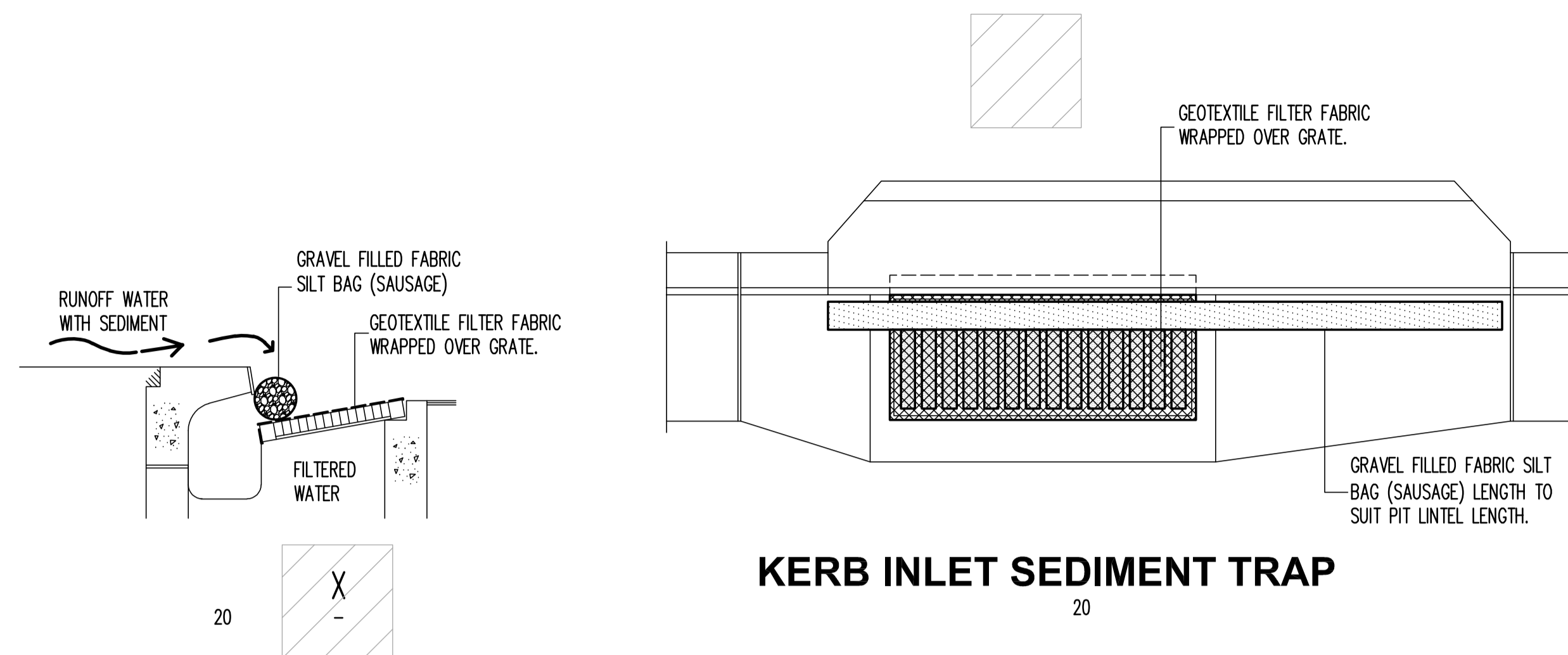
Structural Engineer

 612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project
NEW ULTIMO PYRMONT PUBLIC SCHOOL

Sheet Subject
EROSION AND SEDIMENT CONTROL PLAN

Scale: A1 1:200	Drawn PW	Authorised
Job No 151959	Drawing No C001	Revision 1
Plot File Created: Oct 23, 2017 - 10:23am		



TRUCK WASH DOWN / CONSTRUCTION EXIT

File Name: C002.dwg - USER: whitem - Plot File Created: Oct 23, 2017 - 10:24am

A1	0	1	2	3	4	5	6	7	8	9	10
----	-------	---	---	---	---	---	---	---	---	---	---	----

Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date
1	ISSUE FOR SSD DA	WW	PW	13.09.17										
P1	PRELIMINARY	WW	PW	22.06.17										

Architect
DESIGNINC
L12 / 77 PACIFIC HWY NORTH SYDNEY, NSW 2060

Structural Engineer
TTW Taylor Thomson Whitting
612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project
NEW ULTIMO PYRMONT PUBLIC SCHOOL

Sheet Subject
EROSION AND SEDIMENT CONTROL DETAILS

Scale: A1
1:200

Drawn
PW

Authorised

Job No
151959

Drawing No
C002

Revision
1

Plot File Created: Oct 23, 2017 - 10:24am