

**at&l**

## **Oakdale South Estate**

### **Lot 2B Stormwater Report**

**CLIENT/ GOODMAN**

**DATE/ SEPTEMBER 2020**

**CODE/ 20-781**

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## **Document Registration**

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## Executive Summary

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Goodman Property Services (Aust) Pty Ltd are developing the Oakdale South Estate (OSE) site for the purposes of providing a warehouse and distribution complex. The Oakdale South site is a precinct within the wider 'Oakdale' Estate development and forms part of a progressive development designed to make 'Oakdale' a regional distribution park of warehouses, distribution centers and freight logistics facilities.

The Oakdale South project is a staged development including bulk earthworks, civil works, and services infrastructure and stormwater management.

This development application encompasses the planned phase of civil works on the Oakdale South site Lot 2B site which includes:

- Proposed associated cut to fill and importing fill for bulk earthworks to construct the pad levels.
- Proposed associated stormwater design.
- Proposed associated pavement design.
- Erosion and Sedimentation Control plan.

The site is located in the Penrith City Council Local Government Area (LGA). In order to meet the council requirements for Hydraulic Design and Water Sensitive Urban Design, DRAINS and MUSIC modelling software has been used to calculate the required output.

The Lot 2B stormwater catchment falls into the Oakdale South development Catchment B as per the Oakdale South Civil Report (approved under SSD 6917, by Ministry of Planning – 25/08/2017). The Precinct based bio-retention basins have been designed and constructed to both attenuate stormwater flows and treat the nutrients to Penrith City Council reduction targets. The Precinct On Site Detention Basin is designed to mitigate post development flows to pre-developed flows for peak Average Recurrence Interval (ARI) events and has been sized to ensure that for all storm events up to and including the 1:100 ARI event the development does not increase stormwater flows in any downstream areas.

## 1. Introduction

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AT&L was commissioned by Goodman to prepare a Stormwater Management Report for the proposed industrial warehouse development on Lot 2B, at Oakdale South Estate (OSE), Oakdale.

The subject site is situated within the Penrith City Council LGA. The aim of the report is to assess the potential impacts of the proposed development with respect to the Civil and Infrastructure Works. It has been prepared in accordance with Penrith City Council current design guidelines, the relevant Australian Standards and the relevant Austroad Guidelines.

### 1.1. Scope of Report

#### **Summary**

This report discusses the design philosophy and how stormwater is managed within Lot 2B of Oakdale South development. It includes:

- Stormwater Management
  - On Site Detention (OSD)
  - Piped and Overland Flows
  - Water Sensitive Urban Design (WSUD)
- Sedimentation and Erosion Control

The proposed site plan covering the entire Oakdale South development along with the proposed Precinct 2 layout is attached within Appendix A.

## 2. Site Description

### 2.1. Existing Site

The subject site is located within the Oakdale South Estate Precinct 2 and Lot 2B comprises a total area of 48,881m<sup>2</sup> (4.89 ha). Refer Site Plan within Appendix A. The site is bounded by Chelodina St (Road 3) to the south and industrial allotments Lot 2A to the west Lot 1D north (all subject to separate approvals) and industrial land to the east. Refer to Figure 1.

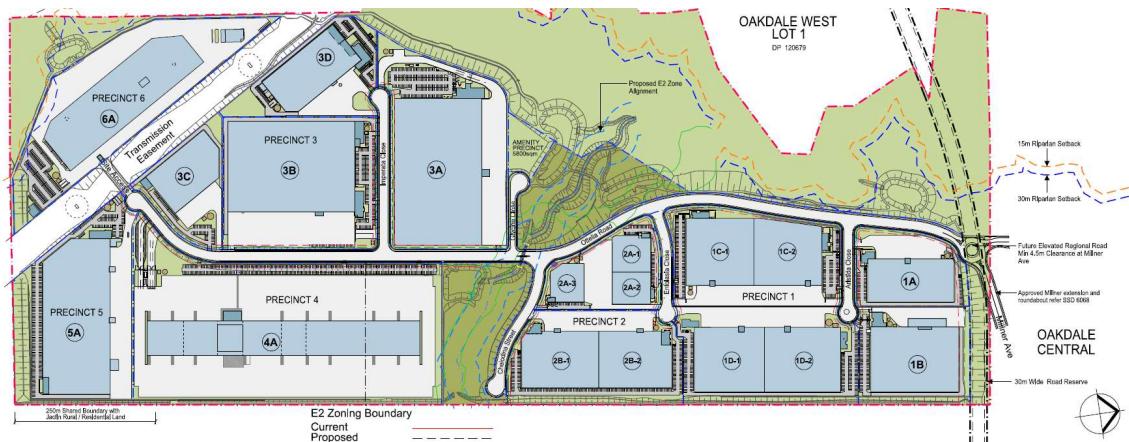


Figure 1 – Oakdale South Estate Plan

Previously, the site comprised of farmland and is classified as “greenfield” with an entire coverage of pervious areas. The site is currently bulk earthworked with a drainage swale within the middle falling towards the northern boundary. This is to ensure runoff flows off the site and drains into the adjacent sediment basin.

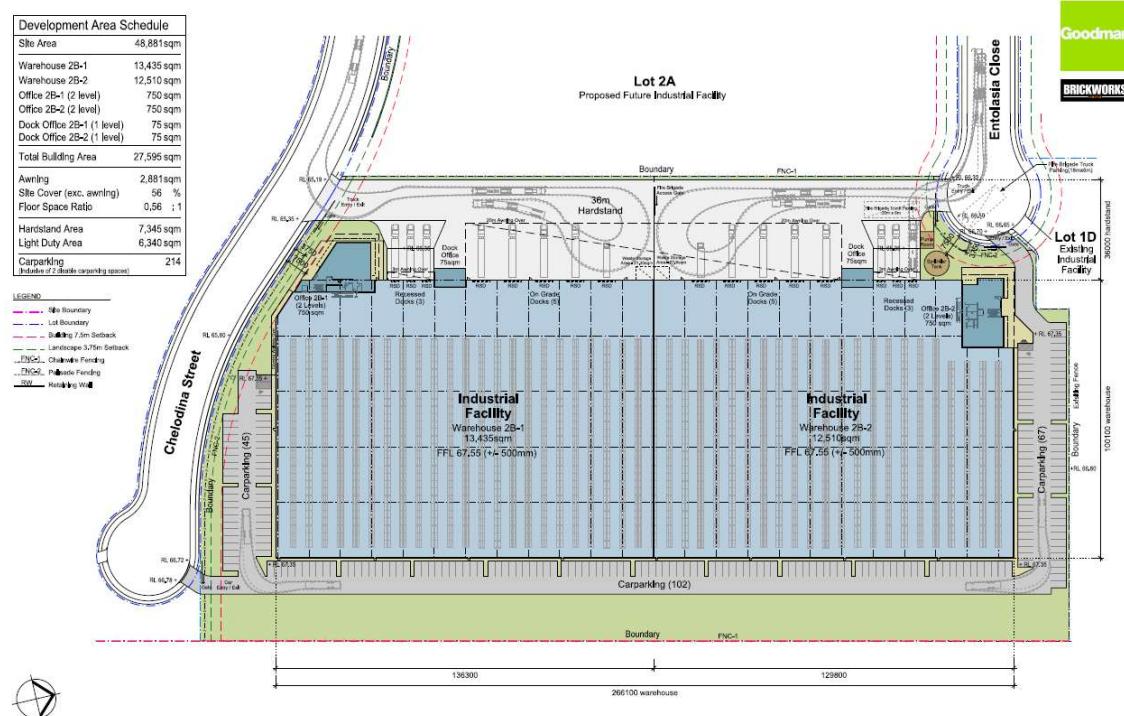


Figure 2 - Existing Site (Nearmap Image)

## 2.2. Proposed Development

The proposed development lot is 48,881m<sup>2</sup> in area will comprise two large industrial warehouse facilities including adjoining office space, loading docks, access roads, carparking and landscaping.

Refer to Figure 2 for Architectural Warehouse Plan prepared by SBA Architects for full Development Area Schedule.



**Figure 3 - Proposed Lot 2B Development Layout**

### 3. Stormwater Management

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#### 3.1. The Site

The stormwater catchment associated with this lot is:

- Catchment B = 13.98 Ha

A catchment area plan for each lot is shown in Appendix A within the Overall Stormwater Catchment Plan.

The site is located in the Penrith City Council Local Government area and is bound by the Ottelia Rd (Road 1), Chelodina St (Road 3) to the south and west and industrial land to the north and east.

#### 3.2. Council & Precinct Requirements & Recommendations

All stormwater drainage for Lot 2B within OSE development is designed to comply with the following:

- Penrith City Council Design Guidelines for Engineering Works
- Penrith City Council Water Sensitive Urban Design (WSUD) Policy December 2013
- C3 Water Management DCP.

The stormwater design/drawings within precinct 2 (attached in Appendix A) has incorporated the recommendation within section 6 of the PSM Salinity Management report (PSM1541-113L Rev 3) – attached on appendix E.

A summary of the design requirements adopted is listed below:

- Precinct based basins will serve the development as detention and bio-retention basins. No on-lot detention basin/tank is required
- A Stormwater drainage network within lot to discharge into a dedicated OSD / bio-retention basin
- WSUD to achieve target reductions:
  - 85% Total Suspended Solids (TSS)
  - 60% Total Phosphorus (TP)
  - 45% Total Nitrogen (TN)
  - 90% Gross Pollutants (GP)
- Finished Floor Levels (FFL) to have minimum 500mm freeboard to 100 year overland flows.
- A gross pollutant trap (GPT) will be installed within the development site on the final downstream stormwater pit prior to discharging off site. As an alternative to GPT, trash screen inserts (eg. Enviropods or equivalent) to be provided to all surface inlet pits. GPTs or trash screen inserts will be owned and maintained by the individual property owner.

Rainwater tanks are desirable for re-use for irrigation, toilet and other non-potable water uses. Rainwater tank size is determined in accordance with the Penrith City Council C3 Water Management DCP.

### 3.3. Modelling Software

DRAINS modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the estate level stormwater pipes. DRAINS is a computer program used for designing and analysing urban stormwater drainage systems and catchments. It is widely accepted by Council's across NSW as the basis for stormwater design and has been confirmed by Penrith City Council as the preferred stormwater software analysis package. DRAINS data files and output results are attached in Appendix C.

MUSIC modelling software has been used to evaluate pollutant loads from each developed lot. MUSIC data files and output results are attached in Appendix D.

### 3.4. Hydrology

- Pipe drainage shall be designed to accommodate the 20-year ARI storm event.
- The combined piped and overland flow paths shall be designed to accommodate the 100-year ARI storm event.
- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flowpath capable of carrying the total 100-year ARI storm event shall be provided. Alternatively the pipe and inlet system may be upgrade to accommodate the 100 year ARI storm event.
- Rainfall intensities shall be as per the Intensity-Frequency-Duration table in accordance with the Australian Rainfall and Runoff (AR&R) volume 2.
- Times of concentration for each sub catchment shall be determined using the kinematic wave equation.
- Runoff coefficients shall be calculated in accordance with AR&R. The fraction impervious shall be determined from analysis of the sub catchments.
- Flow width in gutter shall not exceed 2.5m for the minor design storm event.
- Velocity depth ratios shall not exceed 0.4 for all storms up to and including the 100 year ARI event.
- Inlet pits to be spaced so that flow width shall not exceed 80l/sec
- Bypass from any pit on grade shall not exceed 15% of the total flow at the pit
- Blockage factors of 20% and 50% shall be adopted for pits on grade and at sags respectively.

### 3.5. Hydraulics

- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design. The HGL shall be shown on all drainage long sections.
- The minimum pipe size shall be 375mm diameter RCP.
- Maximum spacing between pits shall not exceed 75m.
- The minimum pipe grade shall be 0.5%.
- All pipes shall be Rubber Ring Jointed unless noted otherwise.
- The minimum cover over pipes shall be 450mm in grassed areas and 600mm within carriageways.
- Where minimum cover cannot be achieved due to physical constraints the pipe class shall be suitably increased.
- All trafficable shall be Reinforced Concrete Pipes or Fibre Reinforced Cement equivalent.

- The pipe friction coefficients to adopted shall be:

Materials	Mannings – n	Colebrook-White – k	Min. Pipe Class
RCP	0.012	0.6	3
FRC	0.01	0.15	3

Table 1 - Pipe Details

- All pipes classes shall be designed for the ultimate service loads and where applicable, construction loads will be designed for.
- Pipes discharging to the overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients shall be calculated in accordance with Missouri Charts.
- A minimum 150mm freeboard shall be maintained between pit HGL and pit surface levels.
- Overland flowpaths shall maintain a minimum of 300mm freeboard to all habitable floor levels.
- Pits deeper than 1.2m shall contain step irons at 300 mm centers.

### 3.6. Catchments

A Stormwater Catchment Plan for each Catchment and the overall site is shown in Appendix A. As indicated all stormwater runoff from Precinct 2 drains via on lot underground drainage networks into the bioretention Basin B west of the lot. The Precinct 2 total catchment area draining into bio-retention Basin B is 13.98 Ha.

### 3.7. On-Site Detention (OSD)

As discussed in Section 4.2, OSD is required within the development to mitigate post developed flows to pre-developed flow rates for peak Average Recurrence Intervals (ARIs).

A summary of the OSD requirements for each catchment is as follows:

All stormwater runoff will drain into an OSD / Bio-retention Basin D to the west of the lot via on a Lot underground drainage network. This basin has been designed and sized to take into account the entire catchment which includes the development of Precinct 2. As a result, no further OSD is required for this lot.

### 3.8. Overland Flows

Overland flows within the batter areas, access roads, carparks and hardstand areas have been designed to be safely conveyed downstream.

Overland flow from the major storm event which exceeds the piped network capacity will be directed towards the western boundary of the site to flow into the road carriageway and ultimately into Bio-retention Basin B.

### 3.9. Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design encompasses all aspects of urban water cycle management, including water supply, wastewater and stormwater management. WSUD is intended to

minimise the impacts of development upon the water cycle and achieve more sustainable forms of urban development.

Stormwater quality treatment will ultimately be provided by the proposed bio-retention basin B to the west. The bio-retention Basin B was constructed as part of the early works/bulk earthworks for the overall Oakdale South Development.

Refer to Appendix D for MUSIC modelling results for Basin B. Also attached within Appendix D is the Oakdale South Estate overall Stormwater Catchment Plan. This indicates Precinct 2 within Catchment B drains into Bio-retention basin B. The treatment rates achieved by Basin B are as follows:

Pollutant	Sources (Kg/yr)	Residual Load (Kg/yr)	Reduction (%)	Target Reduction (%)
<b>Total Suspended Solids</b>	14,500	1,910	86.8	85
<b>Total Phosphorus</b>	27.9	8.86	68.2	60
<b>Total Nitrogen</b>	162	89.3	45	45
<b>Gross Pollutants</b>	2,060	22.3	98.9	90

**Table 2 - Basin B Treatment Rates**

Gross Pollutant Traps (GPT) will be installed on the western side of the site, prior to discharging off lot. Refer to Civil drawings for location of the GPTs. To this extent, no additional Stormwater Quality Improvements Devices (SQIDs) are proposed.

### 3.10. Conclusion

The proposed stormwater management strategy outlined above for Precinct 2 generally meets the previous objective of the site wide strategy previously prepared by AT&L State Significant Development Application civil design documents.

## 4. Water Balance

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### 4.1. General

The water balance was simulated using a water cycle management model as part of the MUSIC Model to allow the evaluation of various elements of the water cycle to be assessed at differing stages in the development.

Penrith City Council WSUD policy (July 2015) stipulates the rainwater tanks to meet 80% of non-potable demand including outdoor use, toilets and laundry.

### 4.2. Water Balance Objective

Potable water supplies in the Sydney area are in recognised short supply with projected population increases, potential climate change and periods of extended drought and any development in sources of the Sydney region places increasing demands on an already scarce water supply. As a result, government bodies, together with Sydney Water have encouraged sustainable development by the implementation of an integrated approach to water cycle management (potable water, sewage, stormwater and rainwater) to minimise demands of potable water supplies.

Whilst opportunities for Water Reuse include such initiatives as regional stormwater harvesting, black water recycling and recycled water, this development is limited to rainwater collection and reuse on an individual lot by lot basis.

As such, we have used MUSIC to establish an estimated tank size for each lot within the development and demonstrated the volume of water reuse possible and provide a more sustainable servicing solution.

### 4.3. Water Balance End Uses

AT&L has identified the following water demand end uses to be required across the development:

- toilet and urinal flushing;
- landscape watering (outdoor garden use).

Table 3 shows the proportion of total water demands for irrigation and toilet flushing within the development could be as much as 80% of total water demands across the development that may be potentially substituted for by rainwater reuse. The remaining 20% of the Development's water demands require a potable water supply.

This is compliant with Penrith City Council's WSUD policy which stipulates 80% reuse of non-potable demand.

### 4.4. Total Site Demands and Non-Potable Re-use Rates

The following rates were adopted from the Penrith City Council WSUD technical Guidelines.

- 0.1 kL/day per toilet or urinal

- 0.4 kL/year/m<sup>2</sup> as PET-Rain for Sprinklers

It has been assumed that the number of toilets is for DA purposes only and is subject to the client using the warehouse. As such the future total number may alter and the rainwater tank design will need to be revised as per council standards. All landscaping will be turf and tree planting will be at a minimum. It has been assumed that all future tree planting may only occur in parking islands within parking aisles. Refer to Table 3 for the Reuse parameters.

Portion of Proposed Warehouse Facility	Number /Area	Usage Rate	Total Usage
Total Number of Toilet and Urinals for 2B-1	14	0.1 kL/day	1.2 kL/day (6 days per week)
Total Number of Toilet and Urinals for 2B-2	16	0.1 kL/day	1.37 kL/day (6 days per week)
Total Garden / Landscape Area for 2B-1	72m <sup>2</sup>	0.4 kL/year/m <sup>2</sup>	30 kL/year
Total Garden / Landscape Area for 2B-2	72m <sup>2</sup>	0.4 kL/year/m <sup>2</sup>	30 kL/year

**Table 3 - Total Site Demands and Daily Usage**

#### 4.5. Rainwater Reuse

The use of rainwater collected in rainwater tanks from runoff on the roofs of the warehouse roofs provides a valuable alternative to potable water for a variety of non-potable end uses, such as vehicle washing, air conditioning cooling, and toilet flushing and watering.

We have assumed for this development, irrigation and toilet flushing will be plumbed to the rainwater tanks. Other uses such as truck washing maybe considered at the detailed design stage.

A rainwater tank model was constructed to simulate the rainwater tank operations and select the optimal rainwater tank size, in doing so, the following considerations were made:

- Rainfall received;
- Roof area or runoff area;
- Roof Wetting;
- First Flush; and
- Rainwater demands (by end use).

#### 4.6. Rainwater Tank Model Assumptions

The rainwater tank model assumptions built into the scenarios assumed the following:

#### 4.6.1. Rainfall received

The rainfall runoff that could potentially be captured by the rainfall tank from the roof of each building was simulated individually for the 'dry', 'wet' and 'average' rainfall year within each scenario run.

#### 4.6.2. Roof Wetting, First Flush Diversions and Overflow

While it is assumed that rainfall runoff has the potential to runoff 100% of the area of the roof into the rainwater tank, the proportion of rainfall that actually reaches the rainwater tank is affected by four factors:

- It is assumed that the initial 2mm of rainfall that falls on the roof is considered 'wetting', that is, potential rainfall runoff that is not captured by the rainwater tank, but is rather 'lost runoff' as evaporation or other;
- To prevent sediment and other pollutants entering the rainwater tank, a portion of the initial runoff from the roof is transferred to stormwater, this is known as the 'first flush'. The portion of water diverted as part of the first flush differs for each facility depending on the amount of pollution each roof is susceptible to.
- As the development is located in a predominantly light industrial area, where there may be potential for some roof pollution, a standard first flush volume of 1mm of runoff from across the roof area has been adopted.
- Any roof runoff that exceeds the rainwater tank capacity is 'overflow' and is directed to the stormwater drainage system.

### 4.7. Rainwater Tank Modelling

#### 4.7.1. General

For the MUSIC analysis the following parameters are assumed:

- An allowance for 20% loss in rainwater tank size volume to allow for anaerobic zones, mains water top up levels and overflow levels
- Approximately 5,300m<sup>2</sup> of the total roof area can drain into the rainwater harvest tank
- The daily and yearly PET-Rain usage is calculated based on the requirements provided by Penrith City Council.

Summary of usage rates provided in Table 3.

#### 4.7.2. Rainwater Tank Modelling Results

The use of a rainwater tank was simulated for 'average' rainfall conditions to service three differing combinations of end uses for each Facility being:

Warehouse	Total Roof Area (m <sup>2</sup> )	Roof Area draining to tank (m <sup>2</sup> )	Size of Tank(kL)	% of total non-potable water used from tank (based on MUSIC modelling)
2B-1	13,455	5,300	33	80.33
2B-2	12,560	5,300	30	80.44

**Table 4 – Percentage of Non-Potable Water Used from Tank**

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#### 4.8. Conclusion

The use of rainwater harvest tanks and the design basis to size the tanks is to ensure a minimum of 80% of all non-potable water on Lot 2B can be sourced from the tank. Results demonstrates a commitment to water conservation, recycling and minimising the usage of mains water. The number of toilets is for DA purposes only and are subject to detail design. As such the future rainwater tank design will need to be revised as per Penrith City Council's DCP 2014.

This is in line with the industry best practice and the NSW Stage Government's objective of reducing the amount of potable (drinking) water consumed for non-potable uses.

## 5. Sedimentation and Erosion Control

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### 5.1. Sedimentation and Erosion Control (Construction)

Soil and Water Management Plans (SWMP) has been prepared in accordance with the NSW Department of Housing Publication titled: Managing Urban Stormwater - Soils and Construction (2004) for the whole site. Refer to AT&L Civil drawings within Appendix E of the EIS.

### 5.2. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods
- Work areas that have not been stabilised
- Extraction of construction water from waterways during low rainfall periods
- Clearing of vegetation and the methods adopted, particularly in advance of construction works
- Stripping of topsoil, particularly in advance of construction works
- Bulk earthworks and construction of pavements
- Works within drainage paths, including depressions and waterways
- Stockpiling of excavated materials
- Storage and transfer of oils, fuels, fertilisers and chemicals
- Maintenance of plant and equipment
- Ineffective implementation of erosion and sediment control measures
- Inadequate maintenance of environmental control measures
- Time taken for the rehabilitation / revegetation of disturbed areas

### 5.3. Potential Impacts

The major potential impacts on the riparian environment relate to erosion of disturbed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil
- Increased water turbidity
- Decreased levels of dissolved oxygen
- Changed salinity levels
- Changed pH levels
- Smothering of stream beds and aquatic vegetation
- Reduction in aquatic habitat diversity
- Increased maintenance costs
- Decrease in waterway capacity leading to increased flood levels and durations

### 5.4. Construction Methodology

The following construction methodology will be followed to minimise the impact of sedimentation due to construction works:

- Diversion of “clean” water away from the disturbed areas and discharge via suitable scour protection.

- Provision of hay bale type flow diverters to catch drainage and divert to “clean” water drains.
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required).
- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the site.
- Provision of catch drains to carry sediment-laden water to sediment basins.
- Provision of silt fences to filter and retain sediments at source.
- Where future construction and building works are not proposed, the rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding

## 5.5. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section will need to be carried out as long as either earthworks or quarrying is being conducted and all areas re-established.

The Contractor’s site Superintendent will inspect the site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the SWMP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology. Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways
- Ensure that drains operate properly and to effect any repairs
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas
- Remove trapped sediment whenever less than design capacity remains within the structure
- Ensure rehabilitated lands have effectively reduced the erosion hazard and to initiate upgrading or repair as appropriate
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated
- Remove temporary soil conservation structures as the last activity in the rehabilitation

## 5.6. Conclusion

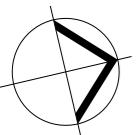
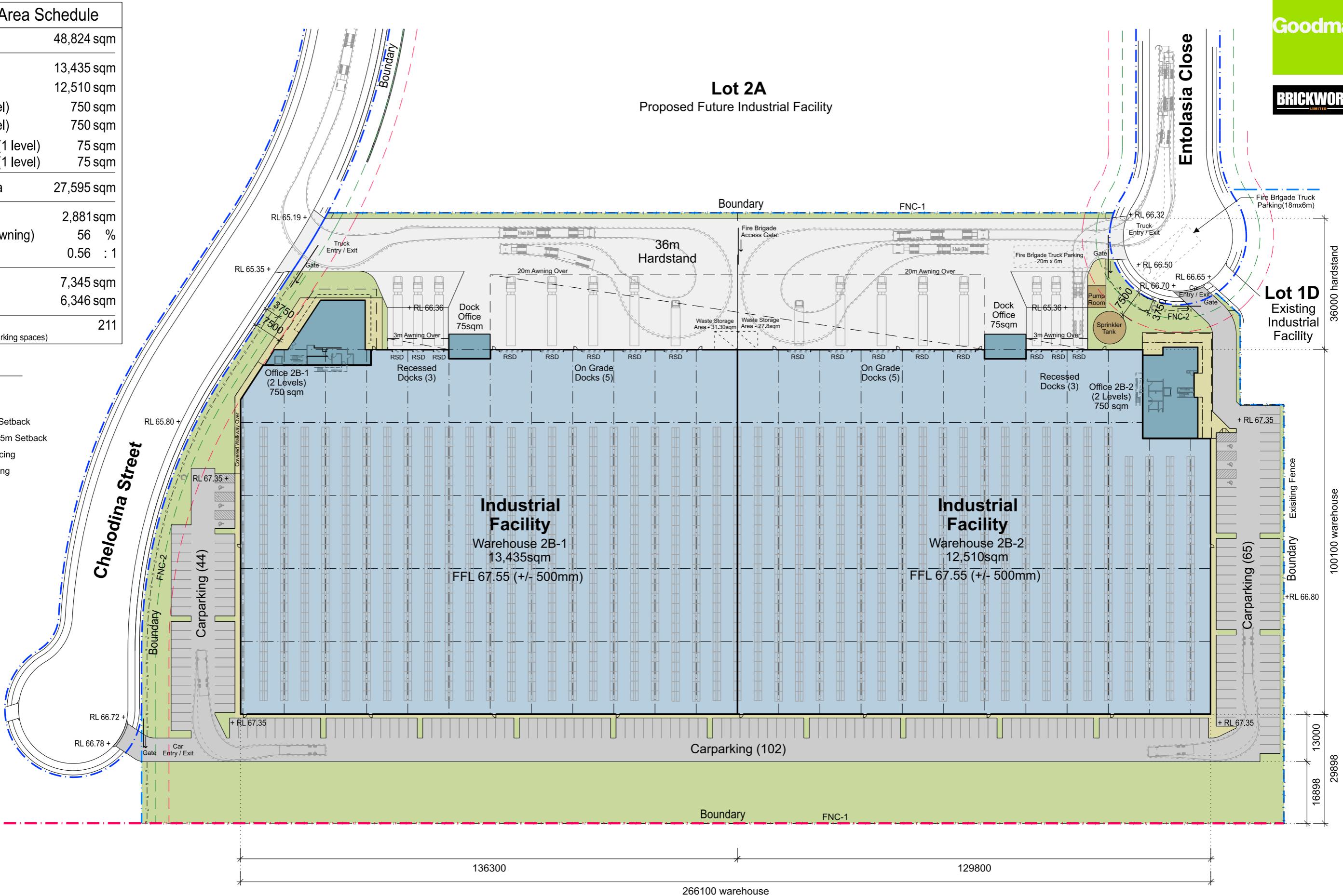
The erosion control measures proposed for the site will comply with the requirements of Penrith City Council and The Department of Environment, Climate Change and Water (DECC). The proposed SWMP will ensure that the best management practice is applied to the development site in controlling and minimising the negative impacts of soil erosion.

# Appendix A

## Proposed Site Plans/ Architectural Plan

Civil Engineers & Project Managers

Development Area Schedule		
Site Area	48,824	sqm
Warehouse 2B-1	13,435	sqm
Warehouse 2B-2	12,510	sqm
Office 2B-1 (2 level)	750	sqm
Office 2B-2 (2 level)	750	sqm
Dock Office 2B-1 (1 level)	75	sqm
Dock Office 2B-2 (1 level)	75	sqm
Total Building Area	27,595	sqm
Awning	2,881	sqm
Site Cover (exc. awning)	56	%
Floor Space Ratio	0.56	: 1
Hardstand Area	7,345	sqm
Light Duty Area	6,346	sqm
Carparking (inclusive of 6 disable carparking spaces)	211	



# Appendix B

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AT&L – Civil Works & Erosion and Sediment Control Drawings

Civil Engineers & Project Managers

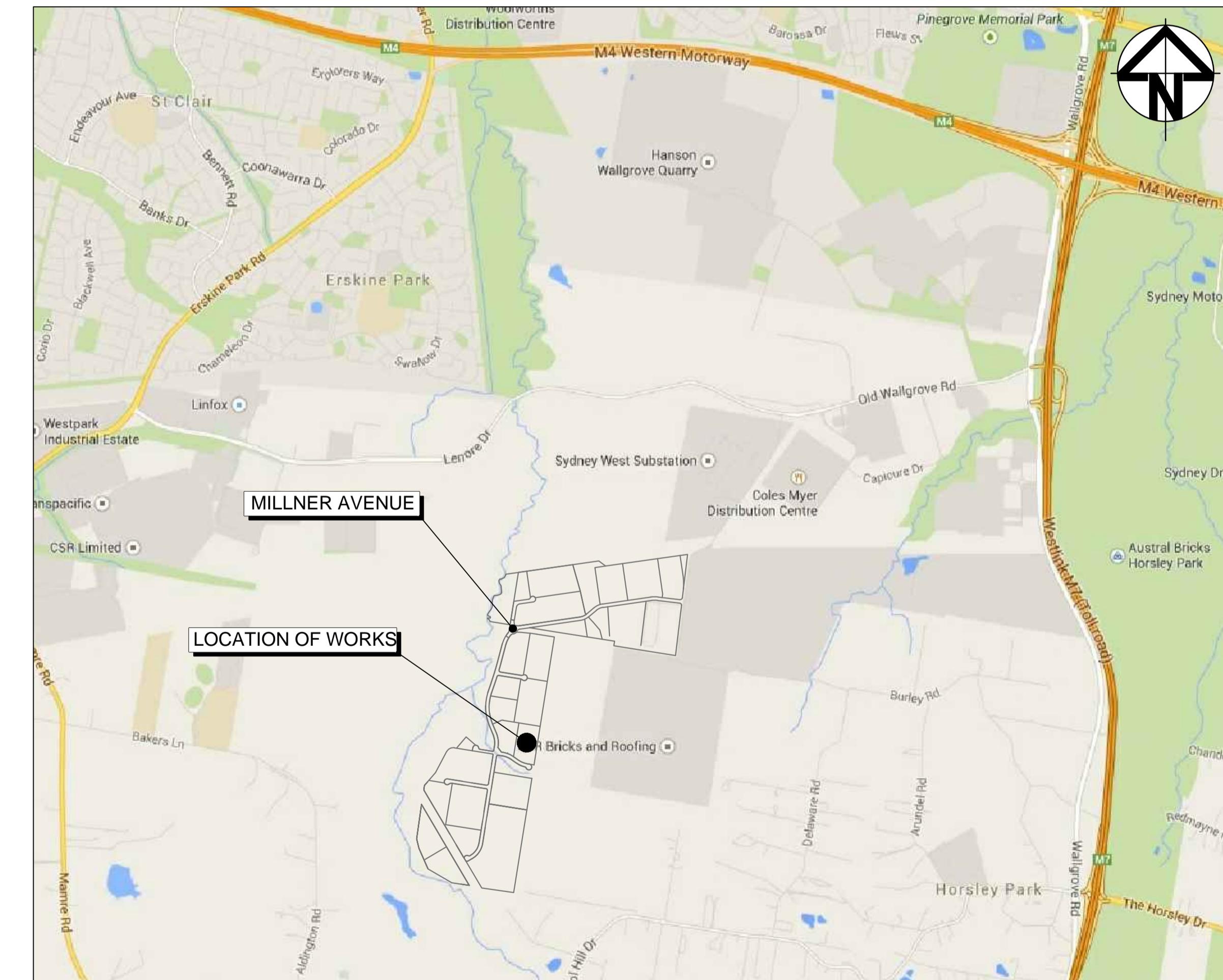
# OAKDALE SOUTH ESTATE

## LOT 2B

### CIVIL WORKS PACKAGE DEVELOPMENT APPLICATION

#### DRAWING LIST

DWG NO.	DRAWING TITLE
20-781-C200	COVER SHEET AND LOCALITY PLAN
20-781-C201	GENERAL NOTES
20-781-C205	GENERAL ARRANGEMENT PLAN
20-781-C206	TYPICAL SECTIONS
20-781-C210	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1
20-781-C211	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2
20-781-C212	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 3
20-781-C213	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 4
20-781-C220	SITEWORKS DETAILS
20-781-C225	STORMWATER DRAINAGE DETAILS
20-781-C230	BULK EARTHWORKS CUT/FILL PLAN
20-781-C235	PAVEMENT PLAN
20-781-C240	EROSION AND SEDIMENT CONTROL PLAN
20-781-C245	EROSION AND SEDIMENT CONTROL DETAILS



LOCALITY PLAN  
NTS

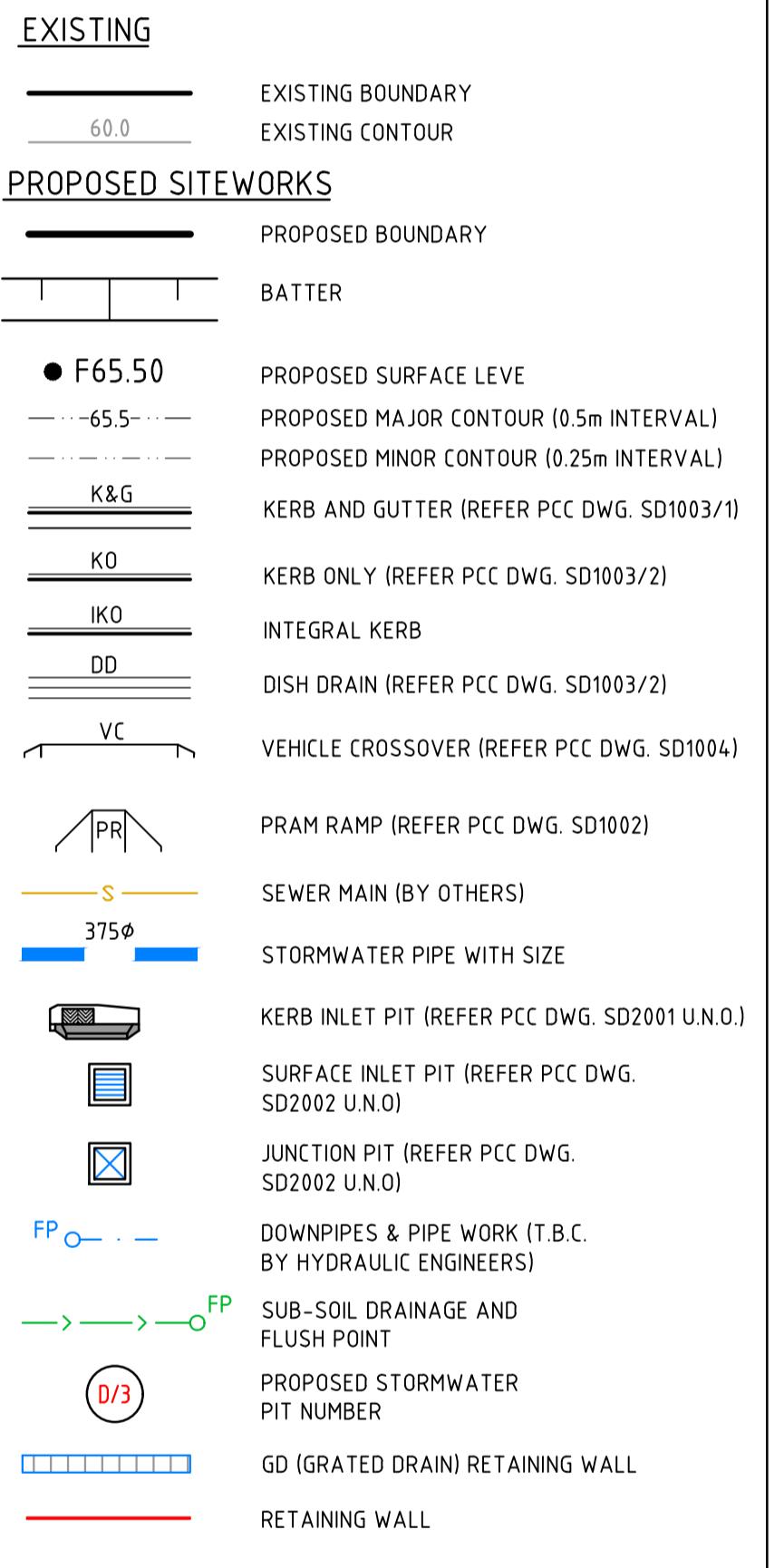
Bar Scales	
A	ISSUED FOR DA APPROVAL 02-09-20
Issue	Description Date
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	Drawn TK
	Designed FX
Height Datum	AHD Checked AT
Grid	MGA Approved AT
Client	Goodman
Civil Engineers and Project Managers	
at&l Level 7, 153 Walker Street North Sydney NSW 2060 ABN 96 130 882 405 Tel: 02 9439 1777 Fax: 02 9923 1055 www.atl.net.au info@atl.net.au	
Project	INDUSTRIAL DEVELOPMENT OAKDALE SOUTH LOT 2B
Title	
COVER SHEET AND LOCALITY PLAN	
Drawing No.	20-781-C200
Issue	A

## KERBING NOTES

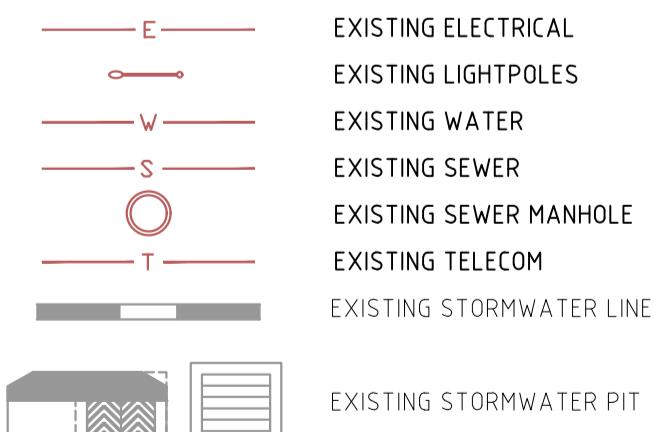
- ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF MPa 25 U.N.O IN REINFORCED CONCRETE NOTES.
- ALL KERBS, GUTTERS, DITCH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 100mm GRANULAR BASE COURSE COMPAKTED TO MINIMUM 95% MODIFIED DRY DENSITY (AS 1289 5.2.1).
- EXPANSION JOINTS (EJ) TO BE FORMED FROM 10mm COMPRESSIBLE CORK FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
- WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
- BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DITCH DRAINS TO BE STEEL FLOAT FINISHED.
- IN THE REPLACEMENT OF KERB AND GUTTER - EXISTING ROAD PAVEMENT IS TO BE SAWCUT 900mm U.N.O FROM THE LIP OF GUTTER. UPON COMPLETION OF THE NEW KERB AND GUTTER NEW BASE COURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O. EXISTING ALLOWMENT DRAINAGE PIPES ARE TO BE BUILT INTO THE NEW KERB AND GUTTER WITH 100mm DIA HOLE. EXISTING KERB AND GUTTER IS TO BE COMPLETELY REMOVED WHERE NEW KERB AND GUTTER IS SHOWN.

## OVERALL SITWORKS

### LEGEND - COMBINED



## EXISTING SERVICES LEGEND



## SITEWORKS NOTES

- ORIGIN OF LEVELS: REFER SURVEY NOTES.
- CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED AT & L.
- MAKE SMOOTH CONNECTION WITH EXISTING WORKS.
- ALL TRENCH BACKFILL MATERIAL SHALL BE COMPAKTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.
- ALL SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACKFILLED WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UPSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPAKTED IN 150mm LAYERS TO MINIMUM 98% MODIFIED MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1(2017). (OR A DENSITY INDEX OF NOT LESS THAN 75).
- PROVIDE 10mm WIDE EXPANSION JOINTS BETWEEN BUILDINGS AND ALL CONCRETE OR UNIT PAVEMENTS.
- ASPHALTIC CONCRETE SHALL CONFORM TO RMS. SPECIFICATION R116.
- ALL BASE COURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH RMS. FORM 3051 (UNBOUND). RMS. FORM ACCORDANCE WITH AS 1289 5.2.1(2017) FREQUENCY OF COMPAKCTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m OF BASE COURSE MATERIAL PLACED.
- AS AN ALTERNATIVE TO THE USE OF IGNEOUS ROCK AS A SUB-BASE MATERIAL IN (A) A CERTIFIED RECYCLED CONCRETE MATERIAL COMPLYING WITH RMS. FORM 3051 AND 3051.1 WILL BE CONSIDERED SUBJECT TO MATERIAL SAMPLES AND APPROPRIATE CERTIFICATIONS BEING PROVIDED TO THE SATISFACTION OF AT & L.
- SHOULD THE CONTRACTOR WISH TO USE A RECYCLED PRODUCT THIS SHALL BE CLEARLY INDICATED IN THEIR TENDER AND THE PRICE DIFFERENCE BETWEEN AN IGNEOUS PRODUCT AND A RECYCLED PRODUCT SHALL BE CLEARLY INDICATED.
- WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED BY OTHERS, (e.g. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS. 3052 (BOUND) COMPAKTED TO MINIMUM 98% MODIFIED DENSITY IN TO MINIMUM 95% MODIFIED DENSITY IN ACCORDANCE WITH AS 1289 5.2.1(2017)

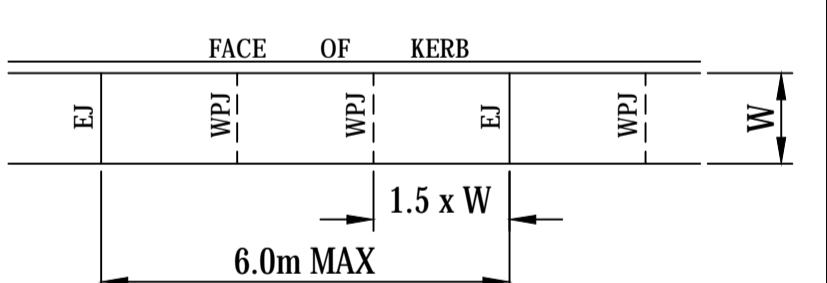
## STORMWATER DRAINAGE NOTES

- STORMWATER DESIGN CRITERIA:  
 A) AVERAGE RECURRENCE INTERVAL:  
 1:100 YEARS ROOFED AREAS TO SURCHARGE PIT  
 1:2? YEARS EXTERNAL PAVEMENTS  
 (B) RAINFALL INTENSITIES:  
 TIME OF CONCENTRATION: MINUTES 5  
 1:100 YEARS= ?? mm/hr  
 1:2? YEARS= ?? mm/hr  
 (C) RUNOFF COEFFICIENTS:  
 ROOF AREAS: C = 1.0 100  
 EXTERNAL PAVEMENTS: C = 1.0 ??
- PIPES 300 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS 2 APPROVED SPICOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O.
- PIPES UP TO 300 DIA SHALL BE SEWER GRADE uPVC WITH SOLVENT WELDED JOINTS.
- EQUIVALENT STRENGTH VCP OR FRC PIPES MAY BE USED.
- ALL STORMWATER DRAINAGE LINES UNDER PROPOSED BUILDING SLABS TO BE uPVC PRESSURE PIPE GRADE 6. ENSURE ALL VERTICALS AND DOWNPIPES ARE uPVC PRESSURE PIPE, GRADE 6 FOR A MIN OF 3.0m IN HEIGHT.
- PIPES TO BE INSTALLED TO TYPE HS3 (ROAD) HS2 (LOTS) SUPPORT IN ACCORDANCE WITH AS 3725 (2007) IN ALL CASES BACKFILL TRENCH WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UPSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPAKTED IN 150mm LAYERS TO MINIMUM 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75).
- ALL INTERNAL WORKS WITHIN PROPERTY BOUNDARIES ARE TO COMPLY WITH THE REQUIREMENTS OF AS 3500.3.1 (2006) AND AS/NZS 3500.3.2 (2010).
- PREFAB PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY AT & L.
- ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.
- WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
- CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
- GRATES AND COVERS SHALL CONFORM TO AS 3996.
- ALL INTERNAL PIT DIMENSIONS TO CONFORM TO AS3500.3 TABLE 7.5.2.1
- AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
- ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS.

## JOINTING NOTES

### PEDESTRIAN PAVEMENT JOINTS

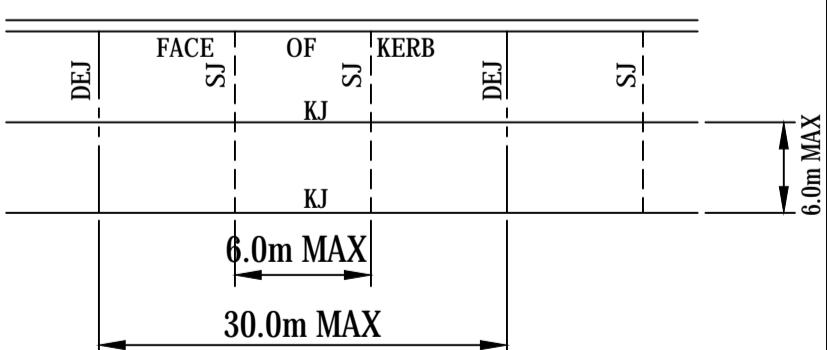
- ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS. (U.N.O)
- EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.
- WEAKENED PLANE JOINTS ARE TO BE LOCATED AT A MAX. SPACING OF 1.5 x WIDTH OF THE PAVEMENT.
- WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.
- PEDESTRIAN PAVEMENT JOINT DETAIL.



NB: CHECK RELEVANT COUNCIL REQUIREMENTS IF IN PUBLIC ROAD.

### VEHICULAR PAVEMENT JOINTS

- ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS. (U.N.O)
- ALL VEHICULAR PAVEMENTS TO BE JOINTED AS SHOWN ON DRAWINGS.
- KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED AT A MAX OF 6.0m CENTRES.
- SAWN JOINTS SHOULD GENERALLY BE LOCATED AT A MAX OF 6.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX 30.0m CENTRES
- VEHICULAR PAVEMENT JOINT DETAIL.



## CONCRETE NOTES

- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600(2018) CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
- CONCRETE QUALITY ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT I SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

ELEMENT	AS 3600 Fc MPa AT 28 DAYS	SPECIFIED SLUMP	NOMINAL AGG. SIZE
VEHICULAR BASE KERBS, PATHS, AND PITS	32 25	60 80	20 20

- CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL  
 - PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379.

- NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY AT & L.
- CLEAR CONCRETE COVER TO ALL REINFORCEMENT FOR DURABILITY SHALL BE 40mm TOP AND 70mm FOR EXTERNAL EDGES UNLESS NOTED OTHERWISE.
- ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS. PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.
- THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS. ALL CONCRETE INCLUDING SLABS ON GROUND AND FOOTINGS SHALL BE COMPACTED AND CURED IN ACCORDANCE WITH R.M.S. SPECIFICATION R83.
- REINFORCEMENT SYMBOLS:  
 N DENOTES GRADE 450 N BARS TO AS/NZS 4671 GRADE N  
 R DENOTES 230 R HOT ROLLED PLAIN BARS AS/NZS 4671  
 SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS/NZS 4671

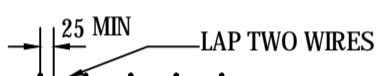
NUMBER OF BARS IN GROUP | BAR GRADE AND TYPE

17 N 20 250

NOMINAL BAR SIZE IN mm | SPACING IN mm

THE FIGURE FOLLOWING THE FABRIC SYMBOL SL IS THE REFERENCE NUMBER FOR FABRIC TO AS/NZS 4671.

8. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:

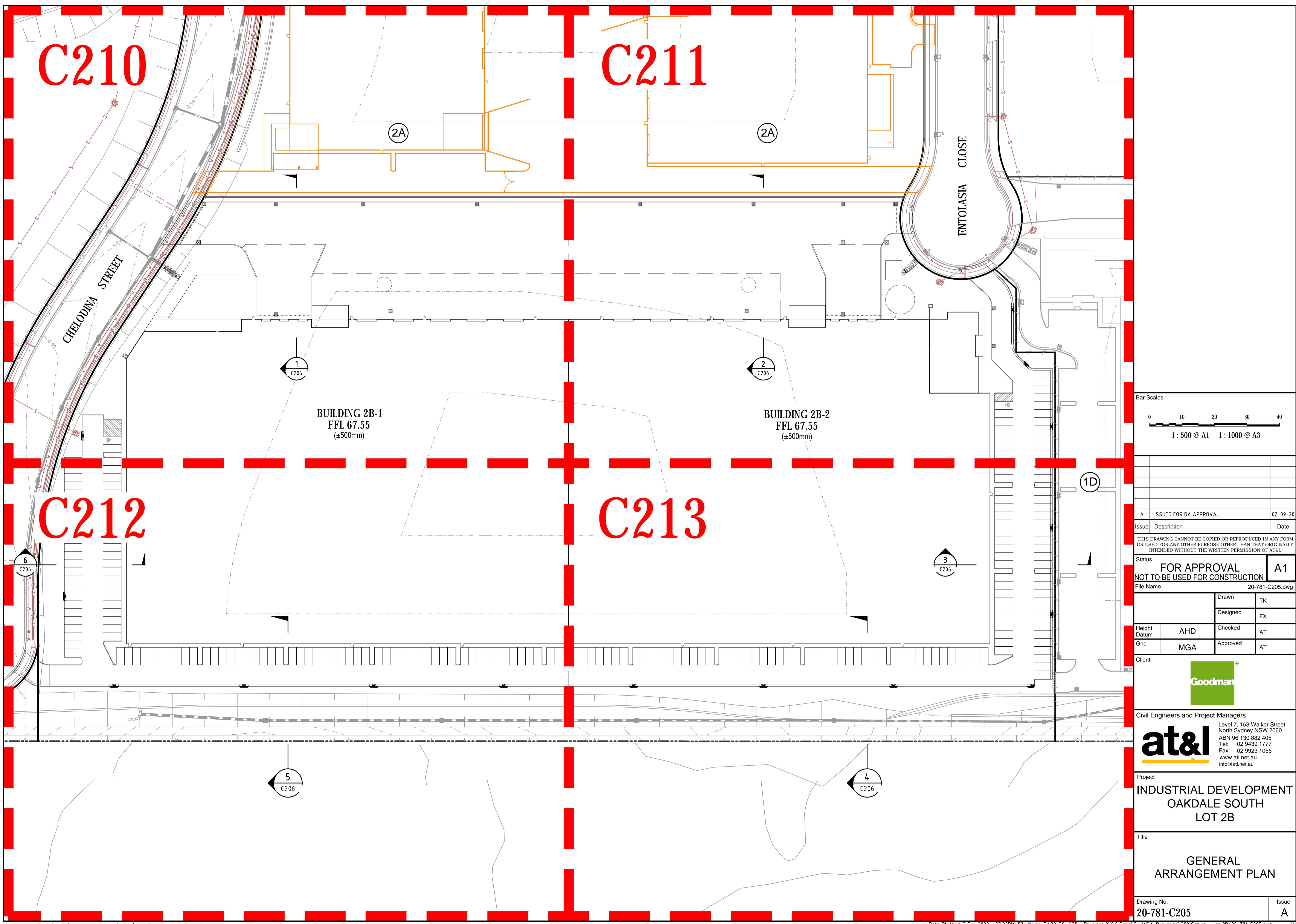


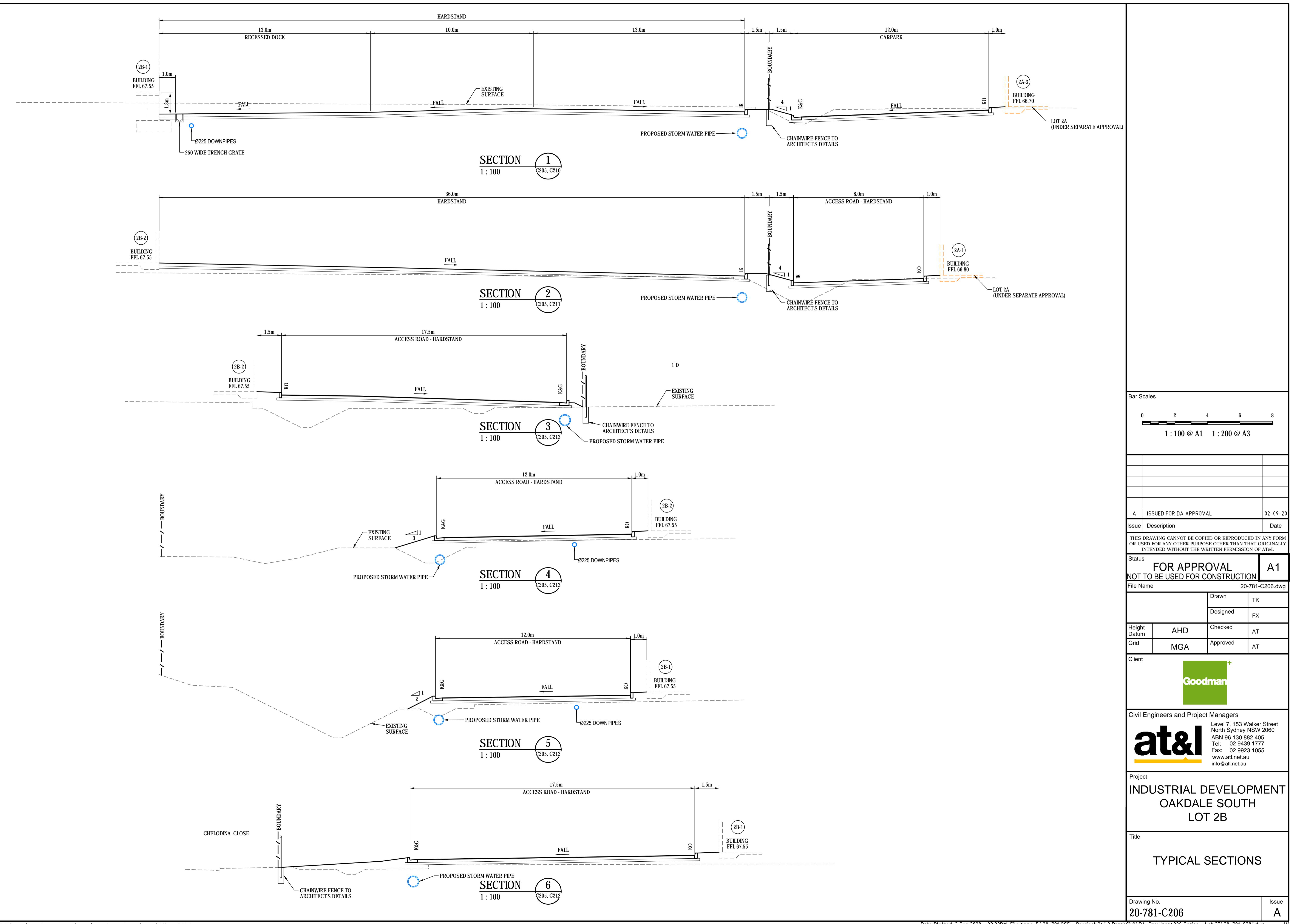
## SURVEY NOTES

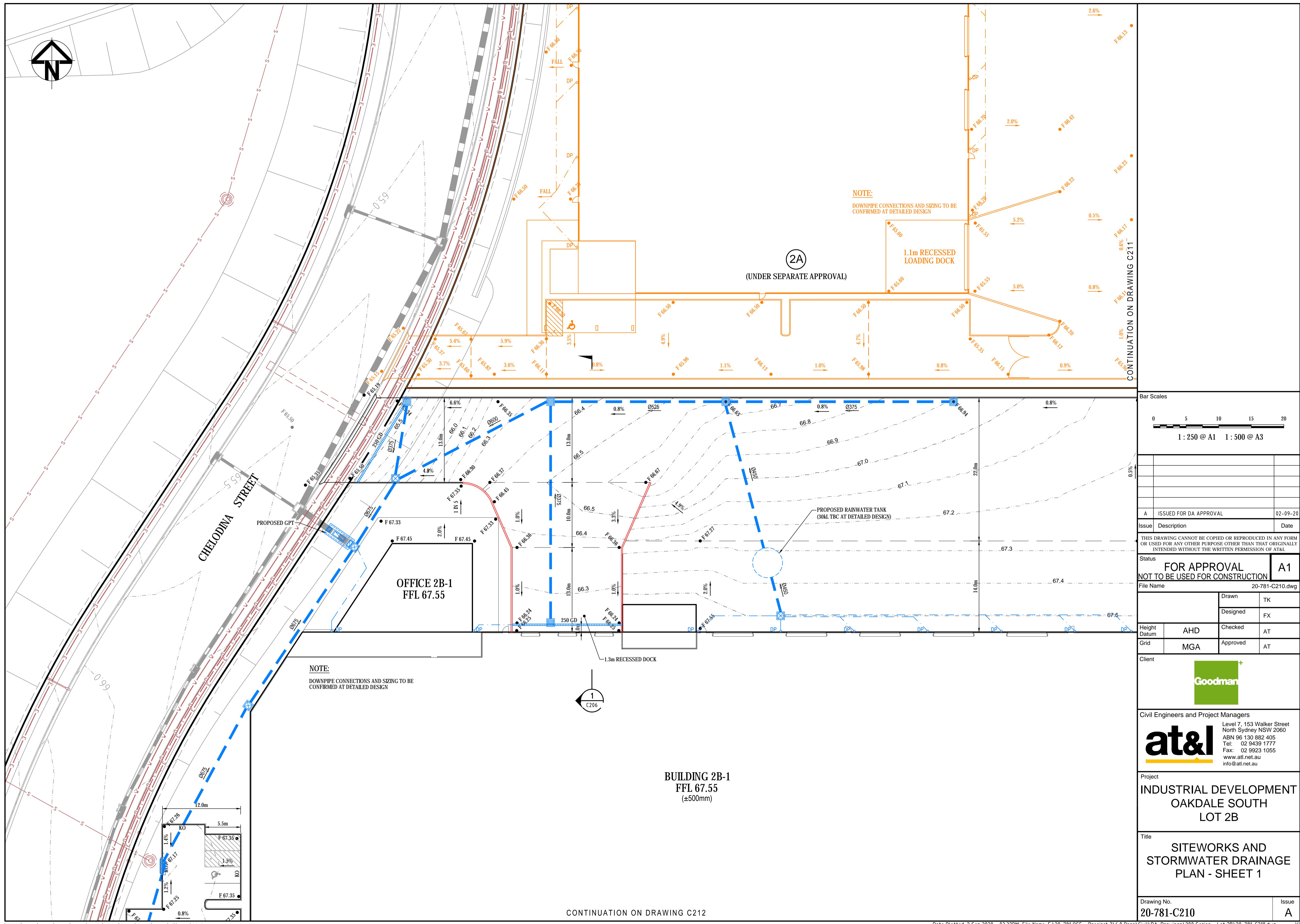
THE EXISTING SITE CONDITIONS HAS BEEN SURVEY AS PART OF THE WORK AS EXECUTED PLANS PREPARED BY BURTON CONTRACTORS. THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. AT & L DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.

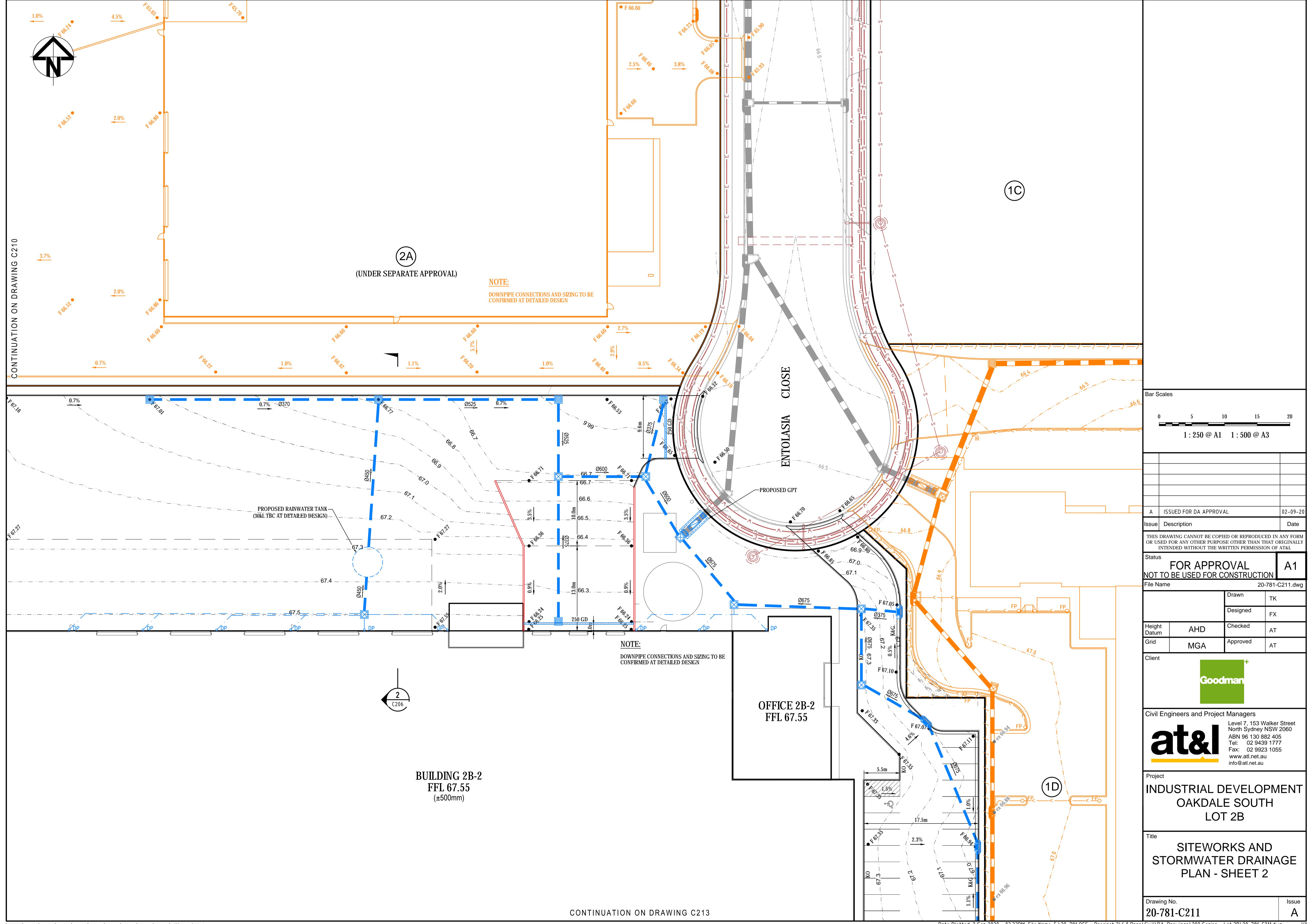
SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT AT & L.

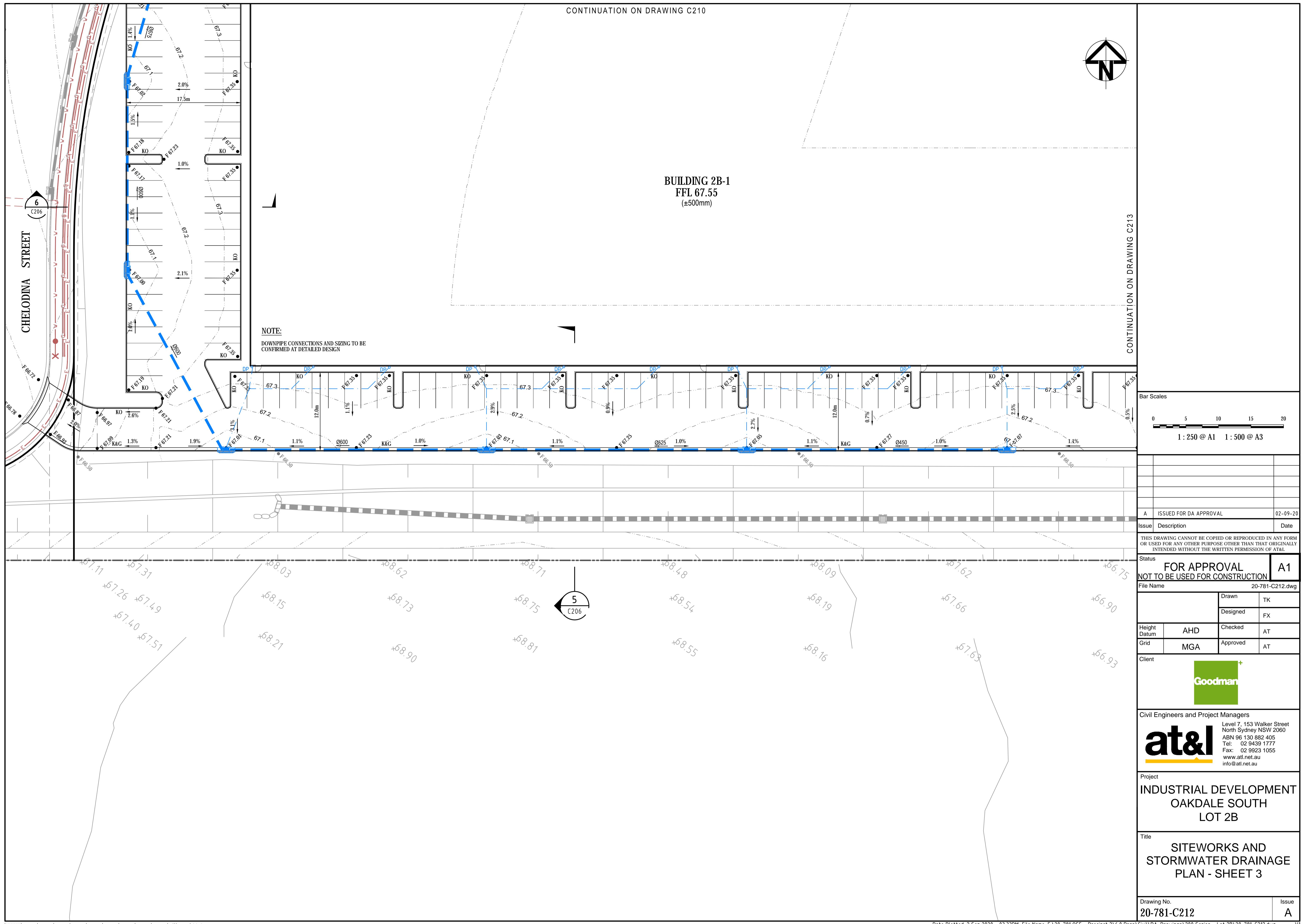
- ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
- ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
  - PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
  - ENSURING THAT NOTHING IS NAILED TO THEM
  - PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS.
    - ENCROACHMENT ONLY OCCURS ON ONE SIDE AND NO CLOSER TO THE TRUNK THAN EITHER 1.5 METRES OR HALF THE DISTANCE BETWEEN THE OUTER EDGE OF THE DRIP LINE AND THE TRUNK, WHICH EVER IS THE GREATER
    - A DRAINAGE SYSTEM THAT ALLOWS AIR AND WATER TO CIRCULATE THROUGH THE ROOT ZONE (E.G. A GRAVEL BED) IS PLACED UNDER ALL FILL LAYERS OF MORE THAN 300 MILLIMETRES DEPTH
    - CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.
- TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.
- STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.
- ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
- WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE. I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.
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- TEMPORARY











CONTINUATION ON DRAWING C212

# BUILDING 2B-2 FFL 67.55 (±500mm)

FFL 67.  
(±500m)

( $\pm 500$  nm)

CONTINUATION ON DRAWING C:212

**NOTE:**  
DNPIPE CONNECTIONS AND SIZING TO  
CONFIRMED AT DETAILED DESIGN

The diagram illustrates a 3D printed bridge structure with three spans. The bridge is supported by a central vertical column and three horizontal beams. The spans are labeled 'F66.50' and are connected by a central support. The bridge is shown in perspective, with the background being a light gray and the bridge structure in a darker shade of gray.

A topographic map showing contour lines and elevation data. A dashed horizontal line represents a reference level. Elevation values are marked along the contour lines, such as +65.04, +65.76, +65.84, +65.64, +65.41, +65.21, +66.07, +65.95, +65.95, +65.78, +66.57, and +67.45. A circular callout labeled '4 C206' is located near the bottom center.

A	ISSUED FOR DA APPROVAL	02-09-20

Issue	Description	Date
THIS DRAWING CANNOT BE COPIED OR REPRODUCED IN ANY FORM OR USED FOR ANY OTHER PURPOSE OTHER THAN THAT ORIGINALLY INTENDED WITHOUT THE WRITTEN PERMISSION OF AT&L		
Status	<b>FOR APPROVAL</b> NOT TO BE USED FOR CONSTRUCTION	

NOT TO BE USED FOR CONSTRUCTION		
File Name	20-781-C213.dwg	
	Drawn	TK
	Designed	FX
Height	Checked	

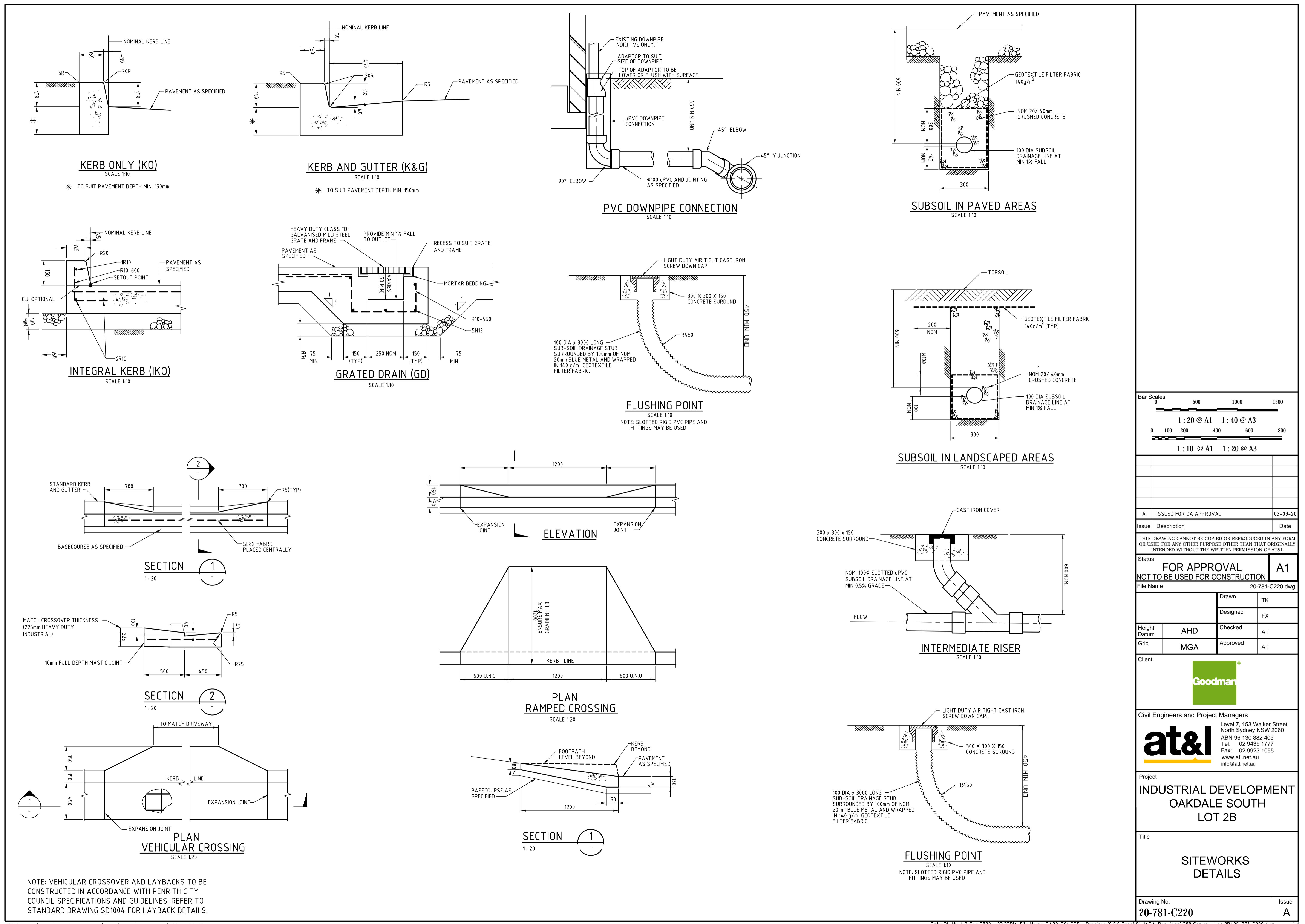
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66 Client			 +

**atl**  
Tel: 02 9439 1777  
Fax: 02 9923 1055  
[www.atl.net.au](http://www.atl.net.au)  
[info@atl.net.au](mailto:info@atl.net.au)

Title

# SITEWORKS AND STORMWATER DRAINAGE PLAN - SHEET 4

Drawing No.		Issue
20-781-C213		A



**PIT CHAMBER DETAIL FOR PIPES UP TO 5250 (TYPE 1)**  
SCALE: 1:20

**PIT CHAMBER DETAIL FOR PIPES FROM 600Ø TO 1200Ø (TYPE 2)**  
(ENLARGED CHAMBER)  
SCALE: 1:20

PIPE DIA. 'd'	WIDTH 'W (U.N.O.)'	WALL T	FABRIC/COV 'SL'
600	900	150	SL82
675	940	150	SL82
750	1020	150	SL82
825	1100	150	SL82
900	1180	200	SL82
1050	1350	200	SL92
1200	1510	200	SL102

CHAMBER DEPTH EXCEEDING 2m IN HEIGHT CERTIFIED APPROVED BY STRUCTURAL ENGINEER.

**TYPICAL CORNER DETAIL**  
SCALE: 1:20

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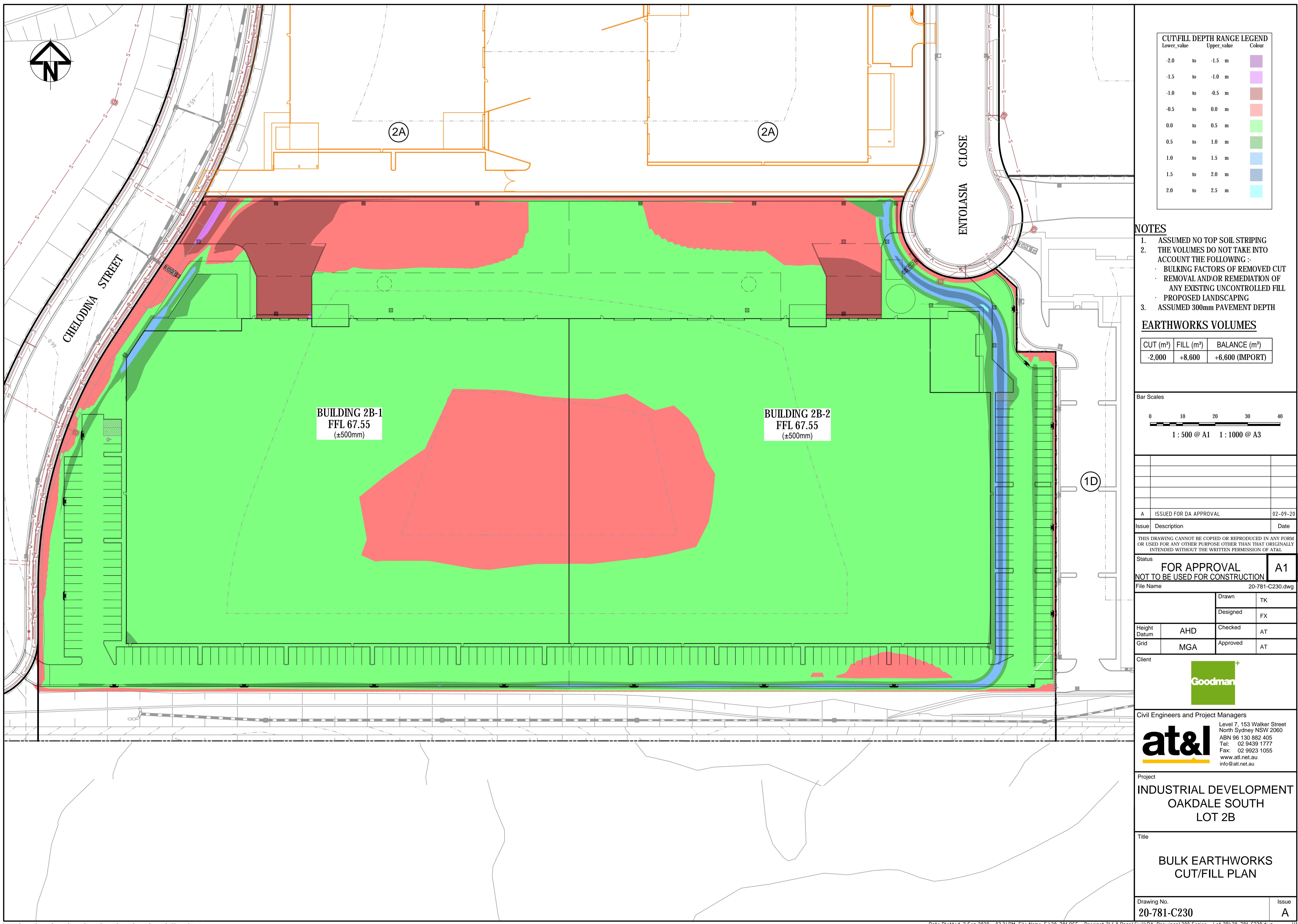
PIPE DIA. 'd'	WIDTH 'W (U.N.O.)'	WALL T	FABRIC/COV 'SL'
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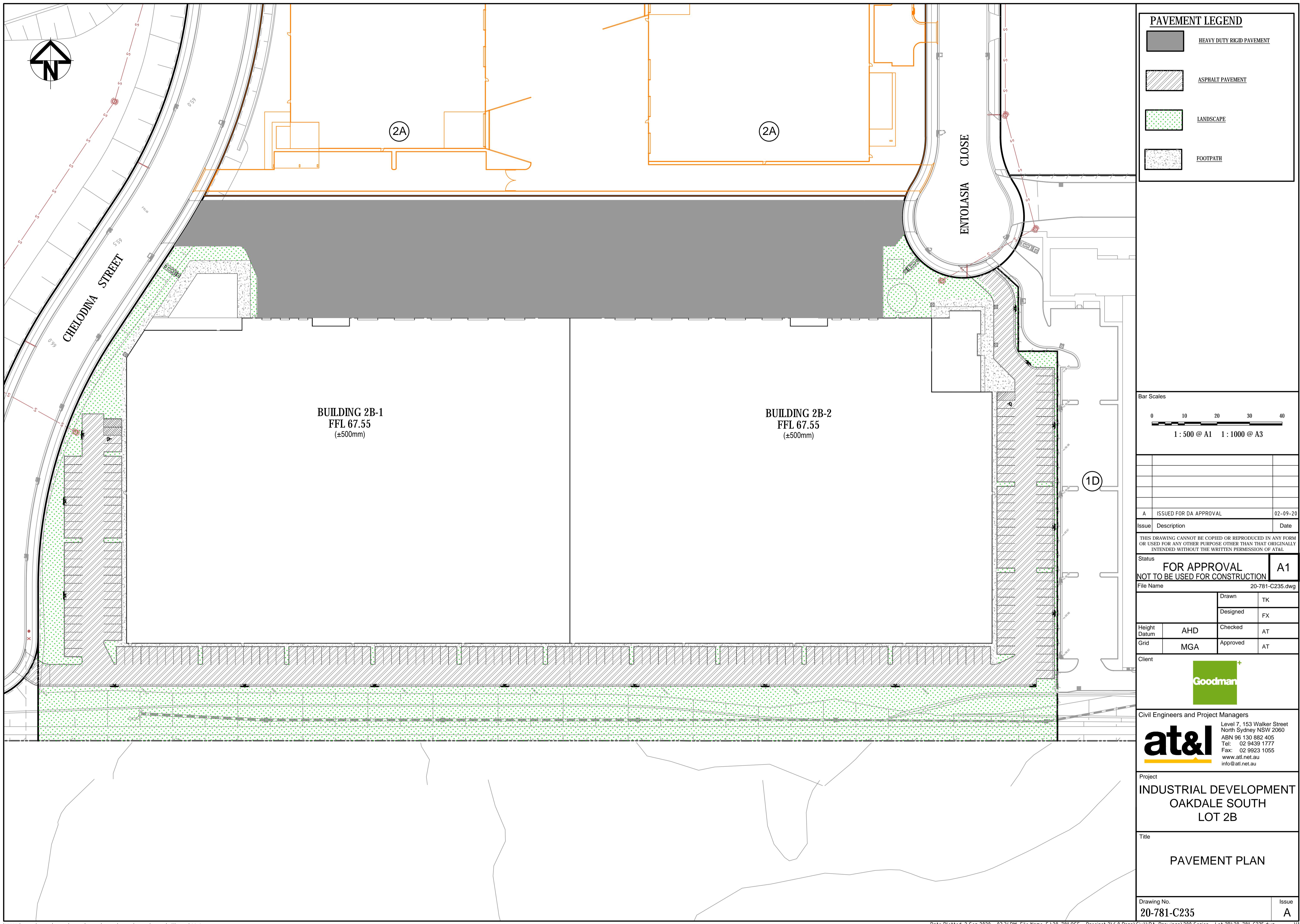
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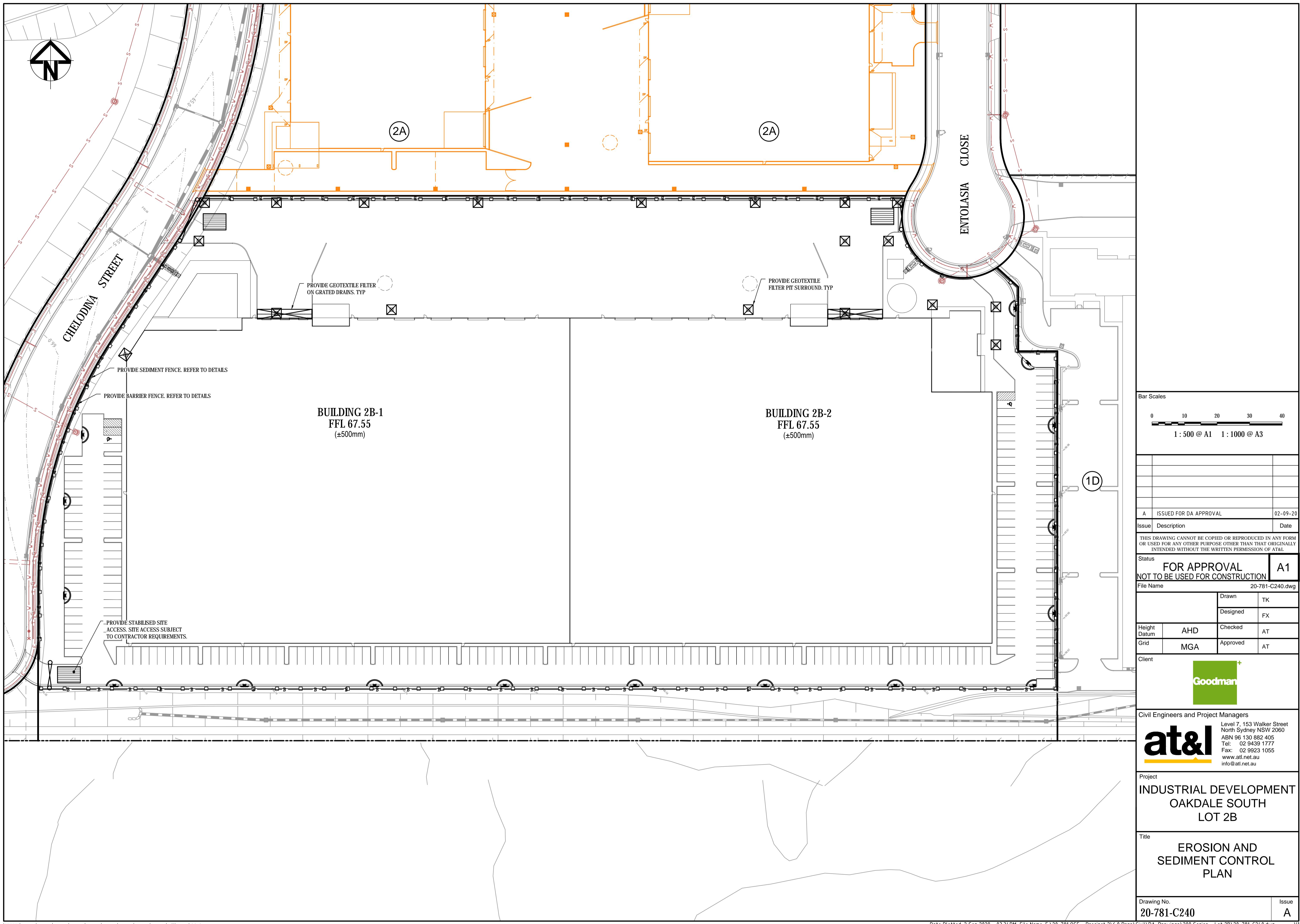
**TYPICAL CORNER DETAIL**  
SCALE: 1:20

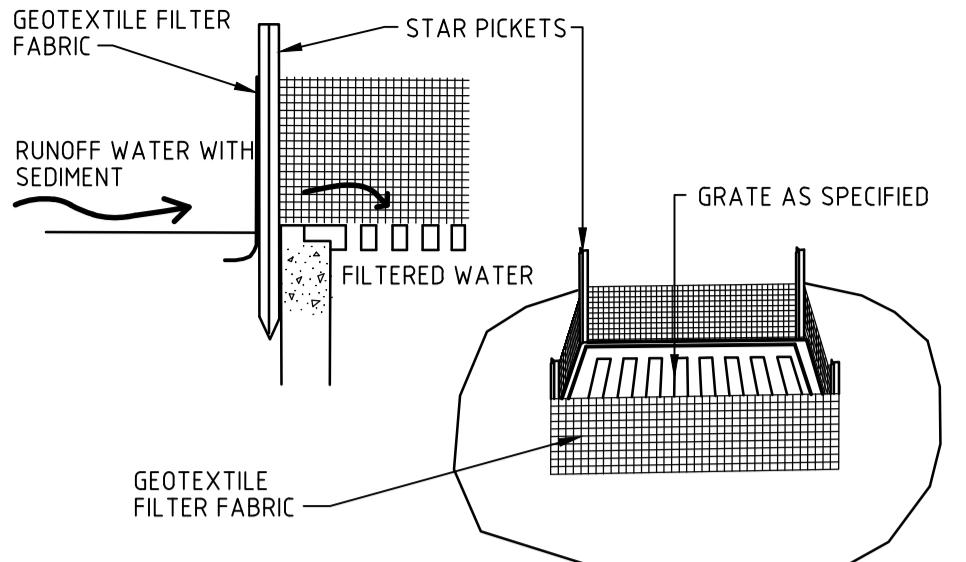
**PIT CHAMBER DETAIL FOR PIPES UP TO 5250 (TYPE 1)**  
SCALE: 1:20

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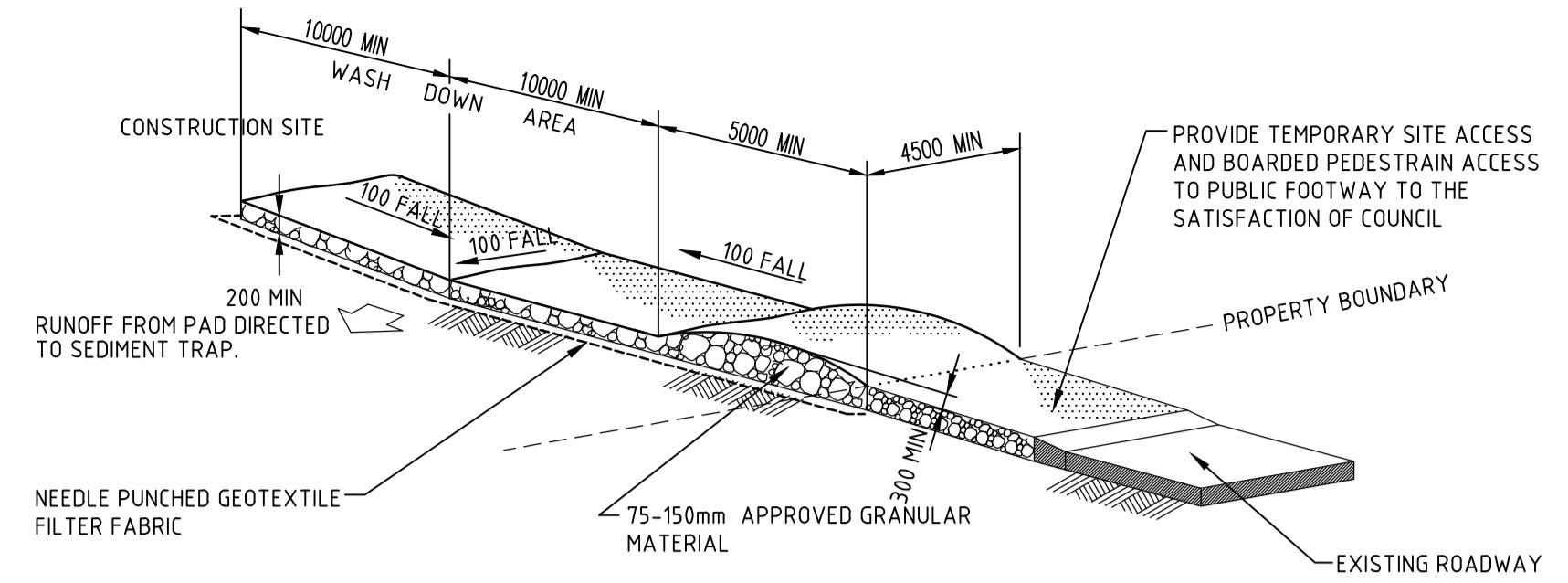






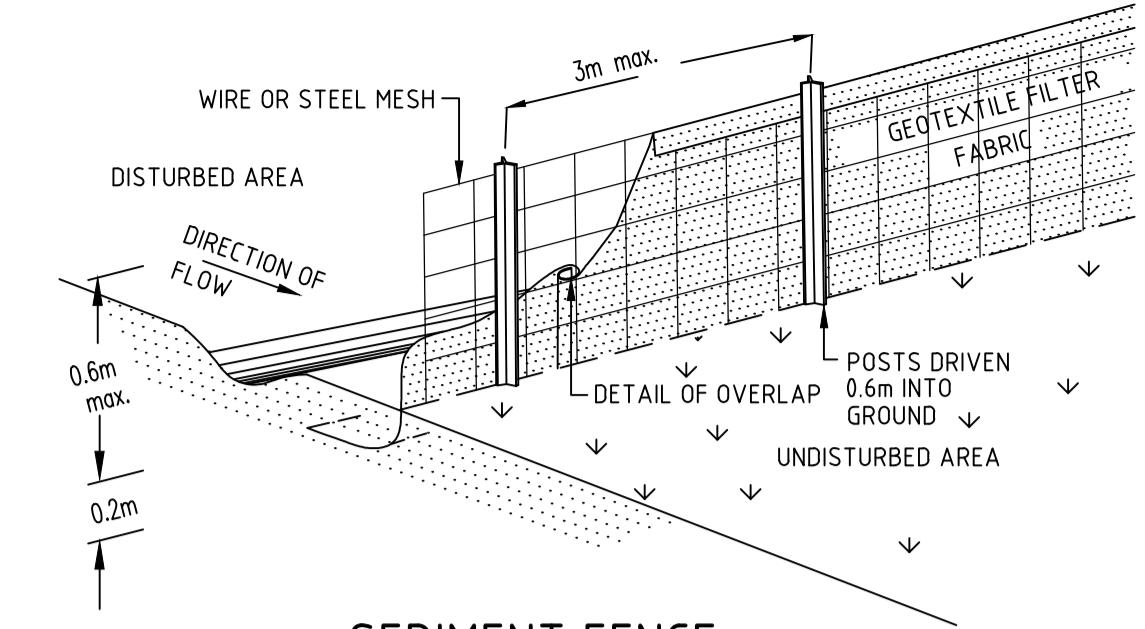
GEOTEXTILE FILTER PIT SURROUND

NTS



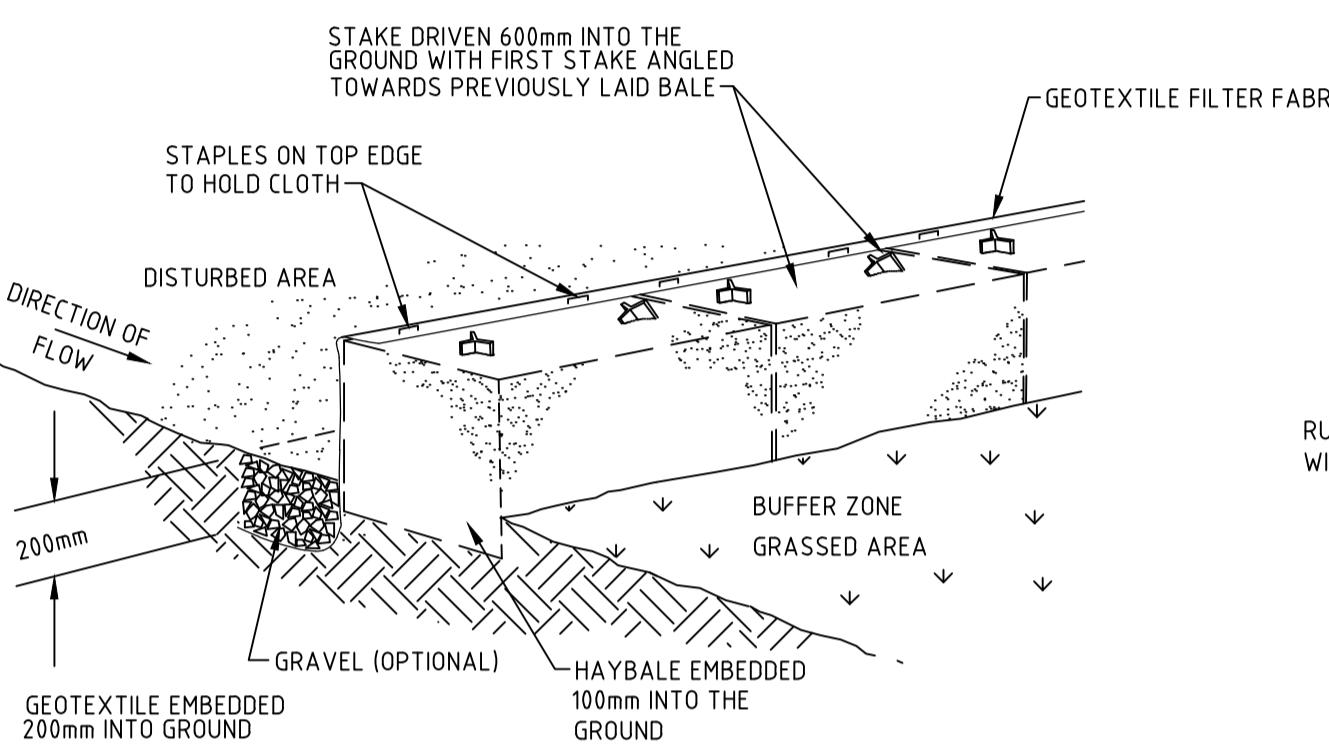
STABILISED SITE ACCESS AND TRUCK WASH DOWN AREA

NTS



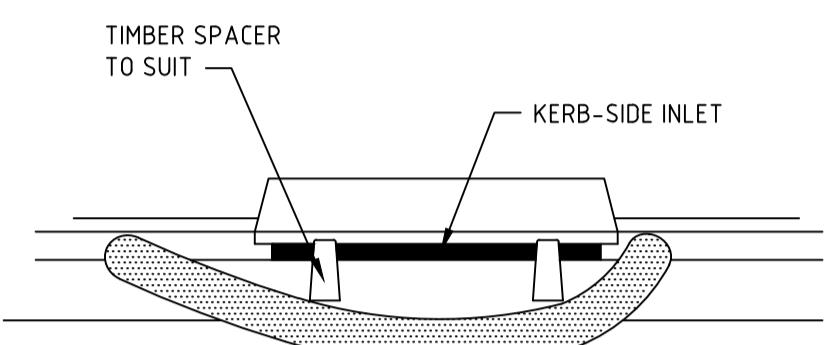
SEDIMENT FENCE

NTS



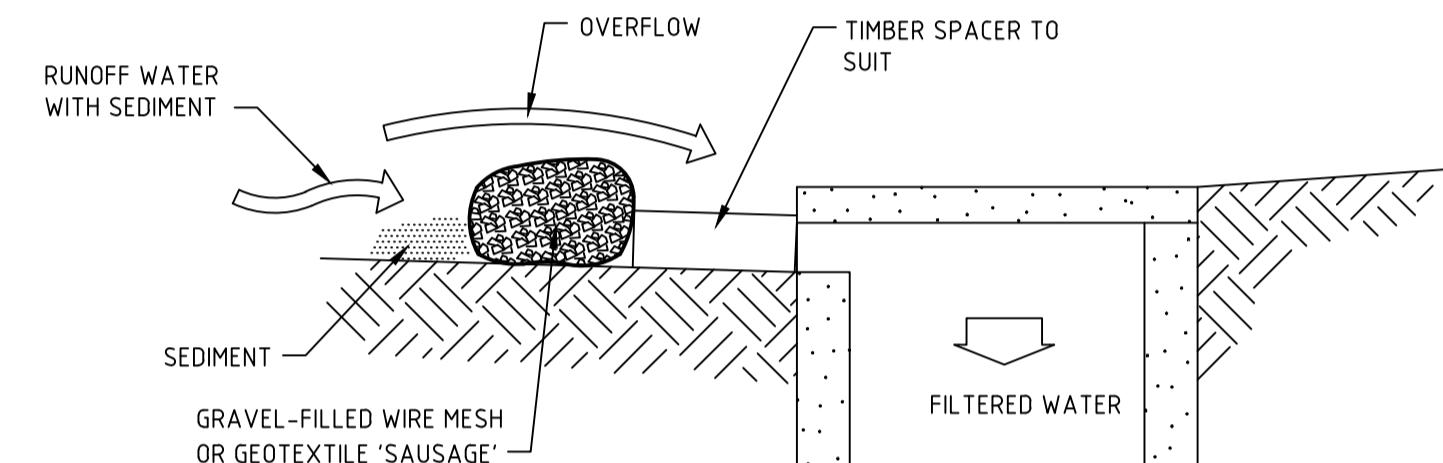
HAYBALE AND GEOTEXTILE SEDIMENT FILTER

NTS



MESH AND GRAVEL INLET FILTER

NTS



Bar Scales

A	ISSUED FOR DA APPROVAL	02-09-20	
Issue	Description	Date	

THIS DRAWING CANNOT BE COPIED OR REPRODUCED IN ANY FORM  
OR USED FOR ANY OTHER PURPOSE OTHER THAN THAT ORIGINALLY  
INTENDED WITHOUT THE WRITTEN PERMISSION OF AT&L

Status **FOR APPROVAL** A1  
NOT TO BE USED FOR CONSTRUCTION

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Height Datum	AHD	Checked AT
Grid	MGA	Approved AT

Client  


Civil Engineers and Project Managers  
**at&l**  
Level 7, 153 Walker Street  
North Sydney NSW 2060  
ABN 96 130 882 405  
Tel: 02 9439 1777  
Fax: 02 9923 1055  
www.atl.net.au  
info@atl.net.au

Project  
**INDUSTRIAL DEVELOPMENT**  
**OAKDALE SOUTH**  
**LOT 2B**

Title  
**EROSION AND  
SEDIMENT CONTROL  
DETAILS**

Drawing No. 20-781-C245 Issue A

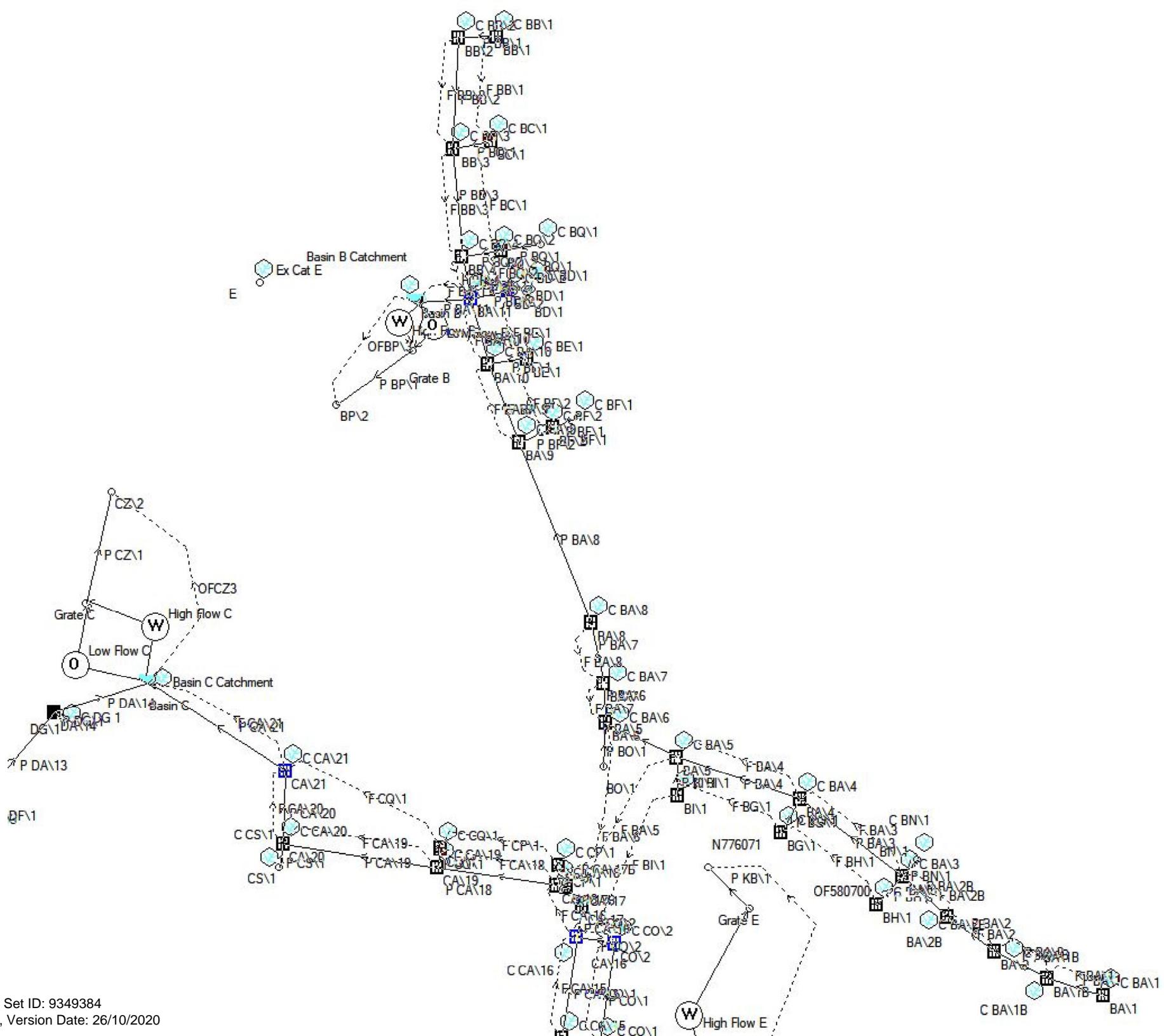
Date Plotted: 2 Sep 2020 - 03:34PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\200 Series - Lot 2B\20-781-C245.dwg

# Appendix C

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## Overall Precinct DRAINS Model

Civil Engineers & Project Managers

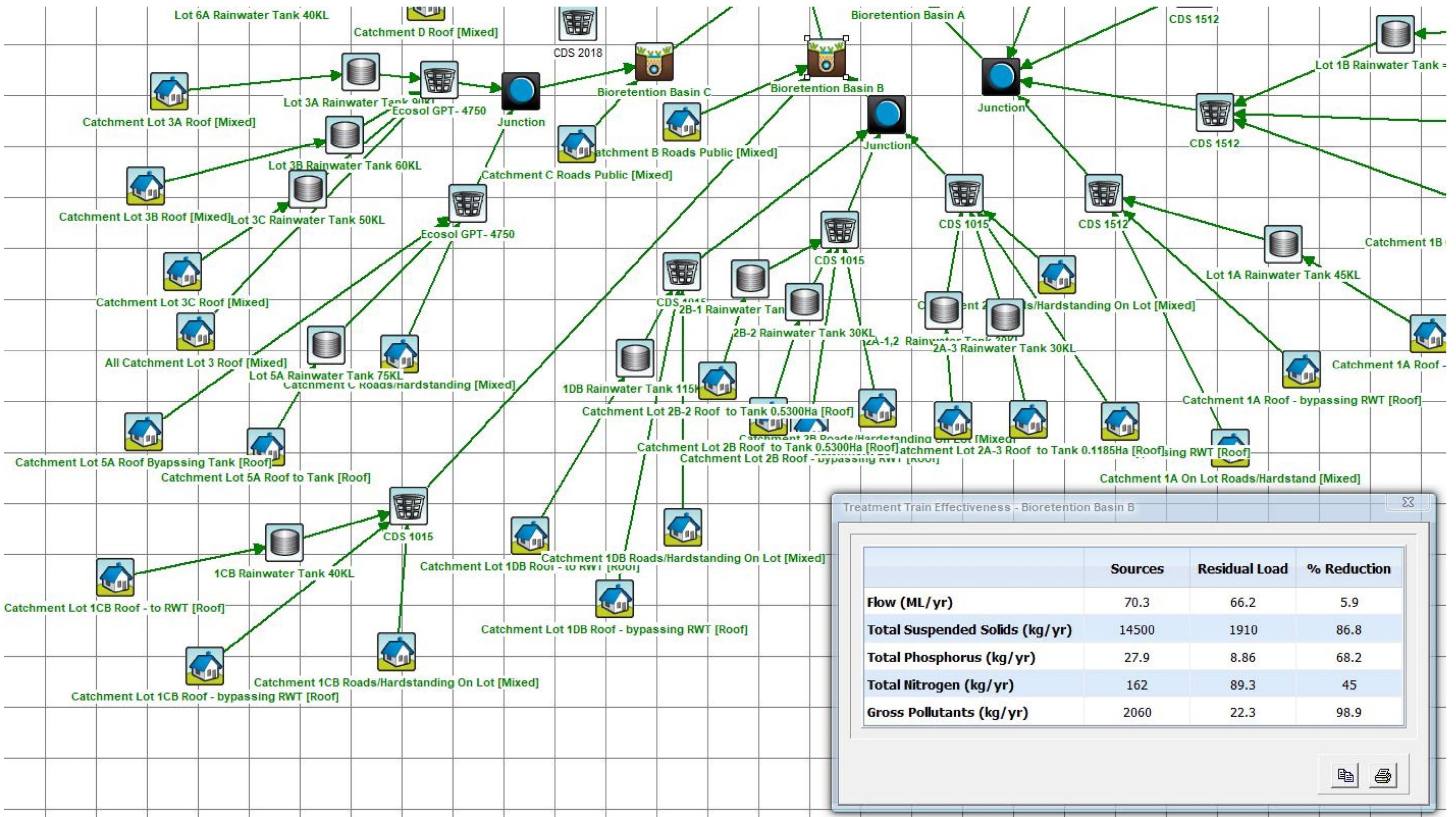


# Appendix D

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## MUSIC Model and Results

Civil Engineers & Project Managers



# Appendix E

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## Salinity Management Plan

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Civil Engineers & Project Managers



Our Ref: PSM1541-113L REV3

9 September 2015

Goodman Property Services (Aust) Pty Ltd  
Level 17, 60 Castlereagh Street  
SYDNEY NSW 2000

**RE: OAKDALE SOUTH ESTATE – SALINITY MANAGEMENT PLAN**

**1 INTRODUCTION**

This letter presents a Salinity Management Plan (SMP) prepared by Pells Sullivan Meynink (PSM) for Oakdale South Estate (OSE). This was prepared to accompany our salinity investigation in accordance with our email proposal dated 5 June 2015.

This SMP has been prepared to inform a State Significant Development Application (SSDA) for the staged development of the OSE. The aim of the SMP is to provide controls for the potential impacts of the proposed development on site salinity and has been prepared in accordance with WSROC Salinity Code of Practice (2004) salinity management guidelines.

The letter responds to the Secretary's Environmental Assessment Requirements (SEARs) as they relate to salinity impacts as documented in Table 1. This letter supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS and development plans submitted with the SSDA.

**TABLE 1**  
**SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARs) FOR**  
**SOILS AND WATER**

RELEVANT SEARs	RESPONSE
An outline of the proposed water requirements, including a consolidated site water balance, details of water supply sources, usage data and efficiency measures.	By other consultants, i.e. hydrologist or civil designers.
A detailed assessment of potential soil (including contamination and acid sulphate soil), surface water, groundwater and salinity impacts of the proposed development, including adequate mitigating and monitoring measures.	<p>Mitigation and monitoring measures are discussed within this document (Ref. PSM1541-113L).</p> <p>Assessment of soil, in terms of salinity and acid sulphate soils is described within the soil salinity and aggressivity investigation letter (Ref. PSM1541-112L).</p> <p>We understand that contamination is dealt with by other consultants, i.e. an environmental consultant</p>
An assessment of the potential impacts of the development on Ropes Creek, its on-site tributaries and riparian areas.	By other consultants, i.e. civil designers.
An assessment of flooding impacts associated with the proposal including details of any flood liability of the site and changes to floor behaviour.	By other consultants, i.e. hydrologist or civil designers.
Description of the proposed erosion and sediment controls during construction and operation.	Some erosion and sediment controls are discussed within this document.
Proposed cut and fill works associated with the development, and measures to minimise the extent of cut and fill.	By other consultants, i.e. civil designers.

## **2 PROPOSED DEVELOPMENT**

The SSDA for the OSE seeks approval for:

An overarching planning framework to guide the staged development of the OSE including:

- An Indicative Master Plan and Structure Plan
- Development Controls for the OSE
- A Biodiversity Offset Strategy

Stage 1 Development of the Estate including:

1. A package of estate-wide site preparation works to be implemented in stages including:
  - Subdivision.
  - Bulk earthworks (including construction of detention basins).
  - Construction of retaining walls, road and utility infrastructure/services.
  - Environmental management measures and protocols for the site.
2. Development for the purposes of warehousing and distribution including:
  - The construction of warehouse buildings in Precincts 1, 4 and 5.
  - The construction of hardstand, loading, car parking and landscaping in Precincts 1, 4 and 5.
  - The fit out and use of buildings in Precincts 1, 4 and 5 for generic warehousing and distribution uses.

## **3 DOCUMENTS RELIED UPON**

In preparing the SMP, we have taken into consideration:

1. The results of the salinity assessment completed by PSM and presented in our letter (Ref. PSM 1541-112L).
2. Details of the proposed developments as presented in the “*Oakdale South Earthworks Cut/Fill Plan*” by AT&L (ref. SKC004 14-193 issue P1 dated 3 December 2014).
3. WSROC Salinity Code of Practice (2004) salinity management guidelines.

## **4 OBJECTIVE OF SMP**

The objective of this SMP is to effectively manage site salinity, to minimise the effect of the proposed development on the salinity processes and to protect the proposed development from salinity damage.

## **5 SALINITY ASSESSMENT**

The PSM salinity assessment noted that:

1. The soils present on site are sodic to highly sodic.
2. The soils present on site are non-saline with some slightly to moderately saline.

## **6 RECOMMENDATIONS**

### **6.1 Development components**

This SMP addresses the components of the proposed development at both the construction stage and for the permanent works. Recommendations regarding the following development components are provided in the following sections:

1. Earthworks
2. Gardens and landscaped areas
3. Roads, footpaths and hardstand areas
4. Surface water, stormwater and drainage
5. Detention basins
6. Durability of concrete structures in contact with the ground
7. Masonry structures
8. Groundwater management.



## 6.2 Earthworks

We understand that the development will be sympathetic to the site topography and the environment and thus aim to minimise the cut and fill. The design and construction of the earthworks should consider the following recommendations:

1. Vegetation cover should be established and maintained on permanent batters as soon as practical upon completion to control erosion.
2. The final surface of all areas of the development should be graded to prevent the ponding of surface water.
3. Subsoil drainage should be considered for areas where the designer considers accumulation of groundwater may occur. We do not consider that any significant such areas are likely at this site.
4. Erosion control of temporary batters, stockpiles and disturbed areas should be planned prior to undertaking the earthworks and implemented during the earthworks. Consideration should be given to:
  - a. Grading and sealing partially completed surfaces.
  - b. Installation of clearly visible fencing and traffic control measures to prevent unnecessary trafficking of areas and ensuing site disturbance.
  - c. Establishing set vehicular access points and roads.
  - d. Protecting stockpiles (temporary vegetation or mulching) where these are to be left in place for long durations.
5. Sediment control shall be implemented by means of sediment traps and silt fencing where considered necessary.
6. Where for landscaping purposes or erosion control the designer requires gypsum or lime stabilisation, these should be planned to be undertaken as part of the initial earthworks.

## 6.3 Gardens and landscaped areas

The proposed development will result in the majority of the site comprising roads, footpaths, and hardstand areas. Garden and landscaped areas are likely to be of limited extent. The design and construction of the gardens and landscaped areas should consider the following recommendations:

1. Where possible areas of established vegetation, particularly large trees, should be retained.
2. Selection of plant species should consider the soil conditions, including moderate salinity, relatively poor fertility and clayey low permeability soil profiles. Promotion of successful revegetation is likely to require use of nutrient rich topsoil. Saline topsoils should not be imported to site.

3. Recharge of groundwater and potential for water logging should be minimised by:
  - a. Adopting plant species with minimal watering requirements.
  - b. Adopting 'waterwise' gardening principles.
  - c. Minimising use of potable water in landscaped areas.
  - d. Properly designed and implemented irrigation systems.
  - e. Establishment of perennial species and deep rooted trees.

#### **6.4 Roads, footpaths and hardstand areas**

As stated, the proposed development will result in the majority of the site comprising roads, footpaths, and hardstand areas. The design and construction of roads, footpaths and hardstand areas should consider the following recommendations:

1. Roads, footpath and hardstand surfaces should be graded and the grades maintained at all times to prevent ponding of surface water at locations where this can result in infiltration into the underlying soils (e.g. pavement joints).
2. Connections between the roads, footpath and hardstand surfaces and the surface water and stormwater drainage infrastructure should be designed, constructed and maintained to restrict infiltration into underlying soils.
3. Services that are to be located below the roads, footpath and hardstand surfaces should be installed, where practical, at the time of construction.

#### **6.5 Surface water, stormwater and drainage**

Surface water, stormwater and drainage design should aim at restricting infiltration into the ground resulting in groundwater recharge. The design and construction of surface water, stormwater and drainage measures should thus consider the following recommendations:

1. Disturbance of natural drainage patterns should be reduced. Where these are disturbed or altered appropriate artificial drainage should be installed.
2. Stormwater and surface water should be managed to restrict infiltration.
3. Temporary water retaining structures used during construction should be managed to restrict infiltration.
4. Stormwater and surface water infrastructure should be designed and constructed to minimise the likelihood of leakage.
5. Guttering and down pipes should be connected and maintained.
6. Surface water runoff should be directed around all exposed surfaces, temporary stockpiles and landscaped areas.

## **6.6 Detention basins**

Detention basins should be designed such that recharge into the groundwater system is controlled. On this basis, the design of temporary and permanent on site detention will need to consider the requirement to line the basin with an impermeable liner (clay layer or synthetic liner) or simply vegetate the exposed base.

In assessing the above requirement the design will need to consider the proposed basin location, the subsurface conditions at the basin, the proximity of the basin to other structures, the proposed storage volume and storage depth and the likely duration of water storage.

In saline environments reducing the water infiltration into the soil and groundwater recharge is considered desirable. On this site, the majority of the site is to be developed with roads and paved areas thus significantly reducing surface water infiltration. The amount of infiltration that can be tolerated at the detention basins will need to be assessed in terms of the overall water balance on site.

Where ponds intended to be permanently full are proposed, such as recreational or aesthetic ponds or fountains, it is recommended that the base of the permanent pond be lined with an impermeable liner. The liner to be adopted (clay or synthetic) shall be a matter of design.

## **6.7 Durability of concrete structures in contact with the ground**

In designing structural concrete elements in contact with the ground the design should consider the results of the salinity, sulphate, chloride and pH testing on the soil and groundwater and the durability requirements in AS2159:2009 and AS3600:2009.

Both these standards provide guidance on minimum concrete grade/strength and minimum cover requirements.

Based on the results of the salinity assessments it is recommended that:

1. The design of structural concrete members in contact with the ground (excluding piles) adopt an A2 exposure classification as defined in AS3600:2009.
2. The design of concrete cast in situ piles adopt a mild classification as defined in AS2159:2009.

## **6.8 Masonry structures**

Having given consideration to the very low to moderate soil salinity on site, the relatively deep water table, and the low permeability soils present on site it is considered that the design and construction of masonry structures including damp proof courses, moisture barriers and selection of brick and construction materials should be undertaken in accordance with the relevant building industry standard. We do not expect special attention to salinity will be required.

## 6.9 Groundwater management

The intention of groundwater maintenance at this site is to reduce the likelihood of recharge of the groundwater resulting in rising of the groundwater table to near the ground surface.

The very low to moderate soil salinity on site, the relatively deep water table, and the low permeability soils combine to reduce the likelihood of a rising groundwater table. Further, the development involves a very significant reduction in infiltration over the site.

Furthermore, the recommendations in Section 5.3 to 5.6 regarding gardens and landscaped areas, roads, footpaths and hardstand areas, surface water, stormwater and drainage and detention basins are aimed at reducing the potential for groundwater recharge.

In addition to these recommendations, it is recommended that use of infiltration pits to disperse surface water be avoided.

## 6.10 Importation of soil

It may be required to import topsoil or other soil onto site. Materials to be imported to site should be assessed for suitability for the intended use. Saline or contaminated soils should not be imported to site.

## 7 SIGN OFF

We recommend the following:

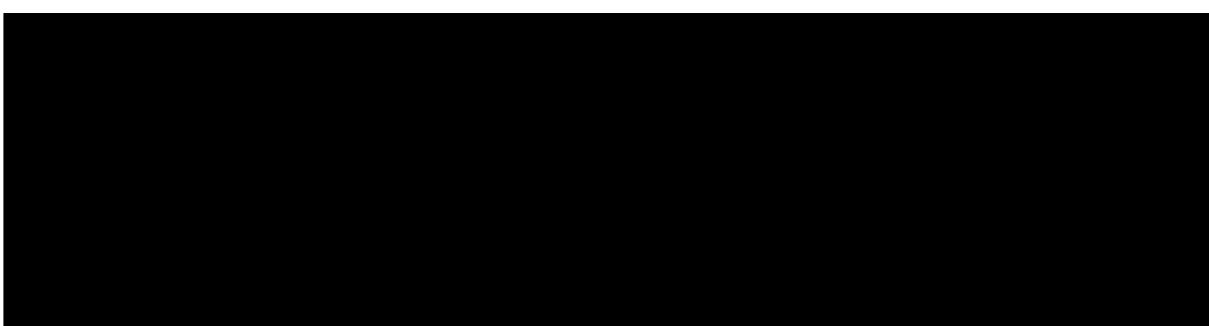
The designer and contractor responsible for construction of the various development components be required to sign-off their design and the as built, certifying that:

*"The works have been designed/constructed having given appropriate consideration to the recommendations in the SMP (Ref. PSM1541-113L dated xxx)".*

The designer and contractors should contact PSM during the works if they have any queries with regards to the requirements in the SMP or if conditions significantly differ from those described in this SMP.

Please do not hesitate to contact the undersigned if you have any queries.

For and on behalf of  
PELLS SULLIVAN MEYNINK





SYDNEY  
LEVEL 7 153 WALKER STREET  
NORTH SYDNEY NSW 2060  
02 9439 1777  
[INFO@ATL.NET.AU](mailto:INFO@ATL.NET.AU)