Oakdale South Estate

Lot 2A Stormwater Report

CLIENT/ GOODMAN

DATE/ SEPTEMBER 2020

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Commercial in Confidence

Document Registration

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004	Issue for Approval	16-09-20	Adrian Liu	☒	☐
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Contents

Executive Summary

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 2A 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 2A 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

AT&L was commissioned by Goodman to prepare a Stormwater Management Report for the proposed industrial warehouse development on Lot 2A, 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 2A 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 2A comprises a total area of 25,685m^2 (2.69 ha). Refer Site Plan within Appendix A. The site is bounded by Chelodina St (Road 3) to the south, Ottelia Rd to the west, Entolasia Close (Road &) to the north and industrial allotment Lot 2A to the east Refer to Figure 1.

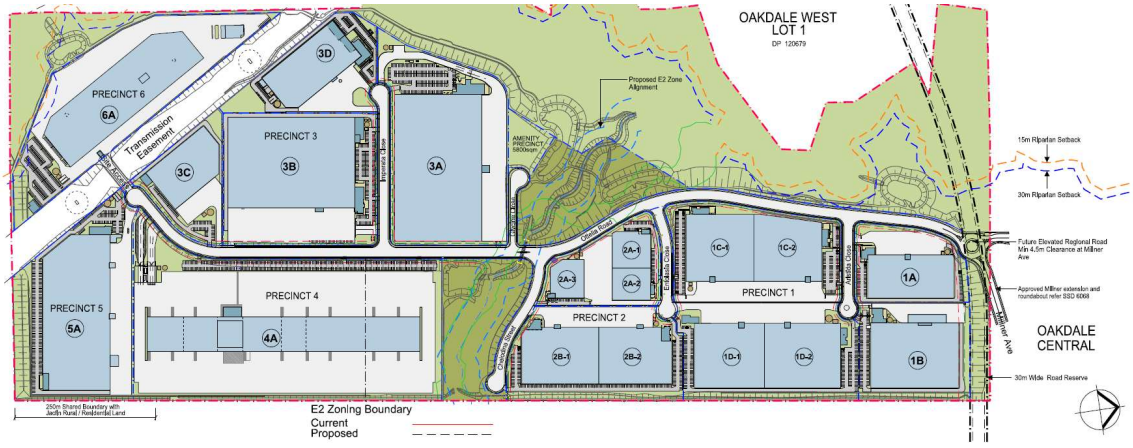


Figure 1 – Oakdale South Estate Plan

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 sediment basin at the low point of the site. Drainage swales ensure runoff flows are captured and discharged into the sediment basin.

Figure 2 - Existing Site (Nearmap Image)

2.2. Proposed Development

The proposed development lot is 25,685m^2 in area will comprise three 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.

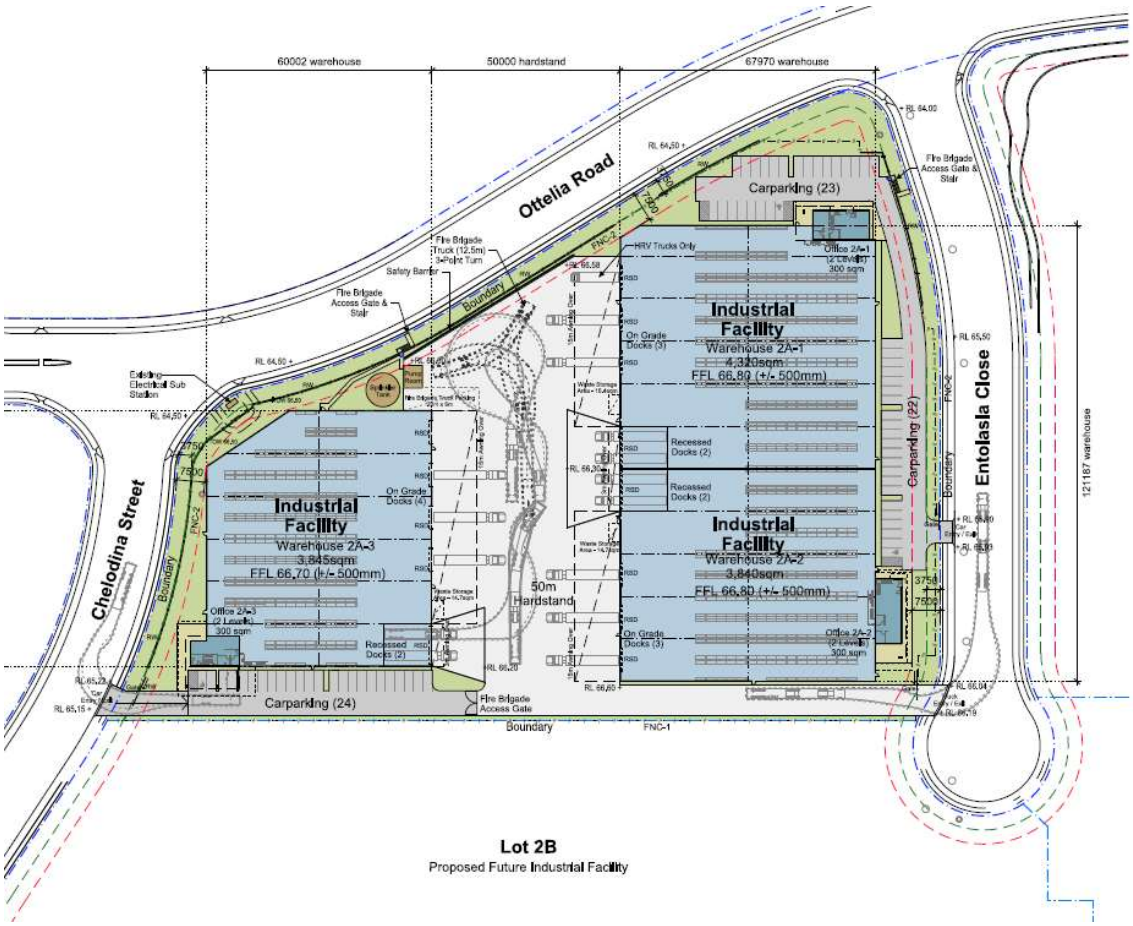


Figure 3 - Proposed Lot 2A Development Layout

3. Stormwater Management

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 west and south and industrial allotments land to the north and east.

3.2. Council & Precinct Requirements & Recommendations

All stormwater drainage for Lot 2A 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 (%)
Total Suspended Solids	14,500	1,910	86.8	85
Total Phosphorus	27.9	8.86	68.2	60
Total Nitrogen	162	89.3	45	45
Gross Pollutants	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

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/m2 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 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 2A-1/2	11	0.1 kL/day	0.94 kL/day (6 days per week)
Total Number of Toilet and Urinals for 2A-3	6	0.1 kL/day	0.51 kL/day (6 days per week)
Total Garden / Landscape Area for 2A-1/2	32m^2	0.4 kL/year/m^2	12.8 kL/year
Total Garden / Landscape Area for 2A-3	16m^2	0.4 kL/year/m^2	6.4 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 30% 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^2)	Roof Area draining to tank (m^2)	Size of Tank(kL)	% of total non-potable water used from tank (based on MUSIC modelling)
2A-1/2	**8,168**	**2,450 (30%)**	**30**	**82.77**
2A-3	**3,950**	**1,185 (30%)**	**30**	**91.74**

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

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 2A 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

5.1. Sedimentation and Erosion Control (Construction)

This 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 B.

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 distributed 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 affectively 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 Plans

Goodman

BRICKWORKS LIMITED

Lot 3A
Existing Industrial Facility

Glycine Close

Ottelia Road

60002 warehouse | 50000 hardstand | 67970 warehouse

RL 64.50 +

3750 | 7500

Fire Brigade Truck (12.5m) 3-Point Turn

Safety Barrier

Fire Brigade Access Gate & Stair

Boundary

FNC-2

RW

+RL 66.58

HRV Trucks Only

Carparking (23)

Office 2A-1 (2 Levels) 300 sqm

+ RL 64.00

Fire Brigade Access Gate & Stair

+ RL 65.50

Existing Electrical Sub Station

+RL 66.50

Pump Room

Sprinkler Tank

Fire Brigade Truck Parking 20m x 6m

TOW 66.50

RL 64.50 +

3750 | 7500

Industrial Facility
Warehouse 2A-1
4,320sqm
FFL 66.80 (+/- 500mm)

On Grade Docks (3)

RSD

15m Awning Over

Waste Storage Area - 15.4sqm

Recessed Docks (2)

+RL 66.30

3m Awning Over

Carparking (22)

Entolasia Close

121187 warehouse

67952 warehouse

Chelodina Street

Industrial Facility
Warehouse 2A-3
3,845sqm
FFL 66.70 (+/- 500mm)

On Grade Docks (4)

Waste Storage Area - 14.7sqm

50m Hardstand

Industrial Facility
Warehouse 2A-2
3,840sqm
FFL 66.80 (+/- 500mm)

On Grade Docks (3)

Office 2A-2 (2 Levels) 300 sqm

Gate

+ RL 65.90

Car Entry / Exit

+ RL 65.93

Office 2A-3 (2 Levels) 300 sqm

Recessed Docks (2)

RL 66.20

RL 66.60 +

RL 65.22 +

Car Entry / Exit

RL 65.15 +

Carparking (24)

Fire Brigade Access Gate

+ RL 66.04

Truck Entry / Exit

+ RL 66.19

Boundary

FNC-1

Lot 2B
Proposed Future Industrial Facility

Lot 1C
Approved Future Industrial Facility

LEGEND

- Site Boundary
- Lot Boundary
- Building 7.5m Setback
- Landscape 3.75m Setback
- FNC-1 Chainwire Fencing
- FNC-2 Palisade Fencing
- RW Retaining Wall

Development Area Schedule

Site Area	25,685 sqm
Warehouse 2A-1	4,320 sqm
Warehouse 2A-2	3,840 sqm
Warehouse 2A-3	3,845 sqm
Office 2A-1 (2 level)	300 sqm
Office 2A-2 (2 level)	300 sqm
Office 2A-3 (2 level)	300 sqm
Total Building Area	12,905 sqm
Awning	1,860 sqm
Site Cover (exc. awning)	50 %
Floor Space Ratio	0.50 : 1
Hardstand Area	6,300 sqm
Light Duty Area	2,660 sqm
Carparking (inclusive of 3 disable carparking spaces)	69

SBA ARCHITECTS

Oakdale South Estate — Proposed Industrial Facility - Building 2A — **Site Plan / Floor Plan**

Horsley Park — Development Application

1:500 @ A1
1:1000 @ A3

11 Sept 2020

OAK 2A DA 200 (C)
Project No: 19146

Appendix B

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

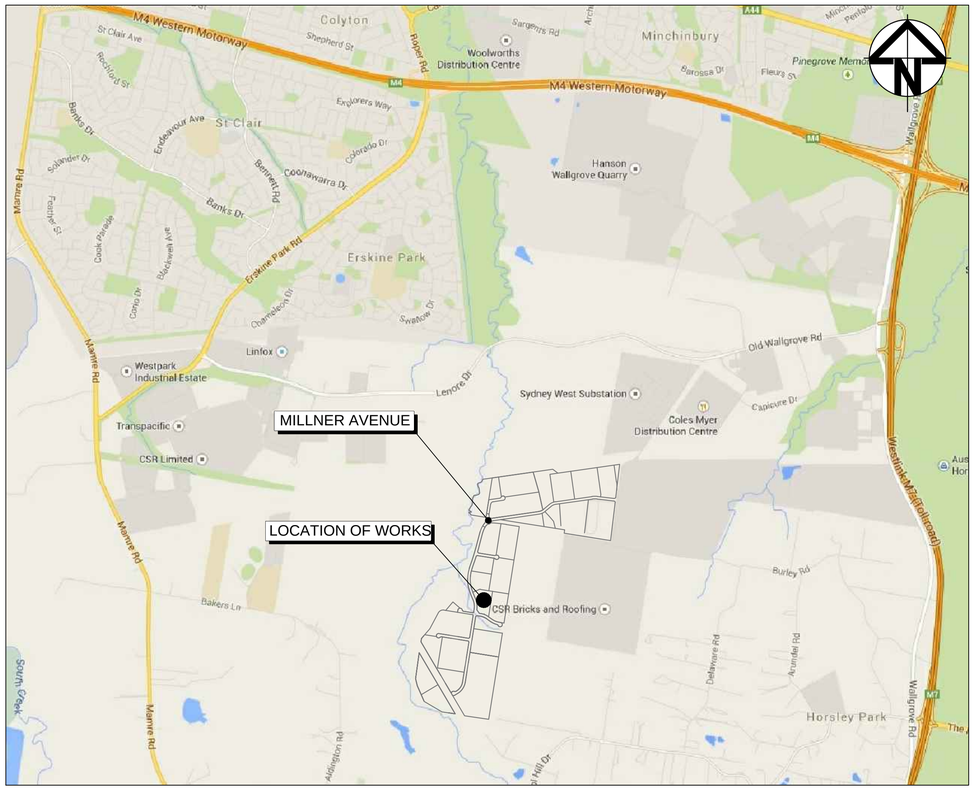
OAKDALE SOUTH ESTATE

LOT 2A

CIVIL WORKS PACKAGE
DEVELOPMENT APPLICATION

DRAWING LIST

DWG NO.	DRAWING TITLE
20-781-C100	COVER SHEET AND LOCALITY PLAN
20-781-C101	GENERAL NOTES
20-781-C105	GENERAL ARRANGEMENT PLAN
20-781-C106	TYPICAL SECTIONS
20-781-C110	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1
20-781-C111	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2
20-781-C120	SITEWORKS DETAILS
20-781-C125	STORMWATER DRAINAGE DETAILS
20-781-C130	BULK EARTHWORKS CUT/FILL PLAN
20-781-C135	PAVEMENT PLAN
20-781-C140	EROSION AND SEDIMENT CONTROL PLAN
20-781-C145	EROSION AND SEDIMENT CONTROL DETAILS



LOCALITY PLAN
NTS

Bar Scales

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

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION
A1

File Name: 20-781-C100.dwg

		Drawn	TK
		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

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 2A

Title
COVER SHEET AND LOCALITY PLAN

Drawing No.: 20-781-C100
Issue: A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:11PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C100.dwg V1

Document Set ID: 9351261
Version: 1, Version Date: 27/10/2020

KERBING NOTES

1. ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa. U.N.O IN REINFORCED CONCRETE NOTES.
2. ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 100mm GRANULAR BASECOURSE COMPACTED TO MINIMUM 95% MODIFIED DRY DENSITY (AS 1289 5.2.1).
3. EXPANSION JOINTS (E.J) 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.
4. 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.
5. BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DISH DRAINS TO BE STEEL FLOAT FINISHED.
6. 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 BASECOURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O. EXISTING ALLOTMENT 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 SITEWORKS LEGEND - COMBINED

EXISTING

- EXISTING BOUNDARY
- 60.0 EXISTING CONTOUR

PROPOSED SITEWORKS

- PROPOSED BOUNDARY
- BATTER
- F65.50 PROPOSED SURFACE LEVE
- 65.5 PROPOSED MAJOR CONTOUR (0.5m INTERVAL)
- PROPOSED MINOR CONTOUR (0.25m INTERVAL)
- K&G KERB AND GUTTER (REFER PCC DWG. SD1003/1)
- KO KERB ONLY (REFER PCC DWG. SD1003/2)
- IKO INTEGRAL KERB
- DD DISH DRAIN (REFER PCC DWG. SD1003/2)
- VC VEHICLE CROSSOVER (REFER PCC DWG. SD1004)
- PR PRAM RAMP (REFER PCC DWG. SD1002)
- S SEWER MAIN (BY OTHERS)
- 375ø STORMWATER PIPE WITH SIZE
- KERB INLET PIT (REFER PCC DWG. SD2001 U.N.O.)
- SURFACE INLET PIT (REFER PCC DWG. SD2002 U.N.O)
- JUNCTION PIT (REFER PCC DWG. SD2002 U.N.O)
- DP DOWNPIPES & PIPEWORK. (T.B.C. BY HYDRAULIC ENGINEERS)
- FP SUB-SOIL DRAINAGE AND FLUSH POINT
- D/3 PROPOSED STORMWATER PIT NUMBER
- GD (GRATED DRAIN) RETAINING WALL
- RETAINING WALL

EXISTING SERVICES LEGEND

- E EXISTING ELECTRICAL
- EXISTING LIGHTPOLES
- W EXISTING WATER
- S EXISTING SEWER
- EXISTING SEWER MANHOLE
- T EXISTING TELECOM
- EXISTING STORMWATER LINE
- EXISTING STORMWATER PIT

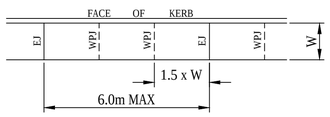
SITEWORKS NOTES

1. ORIGIN OF LEVELS:- REFER SURVEY NOTES.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED TO AT & L.
3. MAKE SMOOTH CONNECTION WITH EXISTING WORKS.
4. ALL TRENCH BACKFILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.
5. 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 UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED 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)
6. PROVIDE 10mm WIDE EXPANSION JOINTS BETWEEN BUILDINGS AND ALL CONCRETE OR UNIT PAVEMENTS.
7. ASPHALTIC CONCRETE SHALL CONFORM TO RMS. SPECIFICATION R116.
8. ALL BASECOURSE 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 COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m OF BASECOURSE MATERIAL PLACED.
9. ALL SUB-BASE COURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH RMS. FORM 3051, 3051.1 AND COMPACTED FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m OF SUB-BASE COURSE MATERIAL PLACED.
10. AS AN ALTERNATIVE TO THE USE OF IGNEOUS ROCK AS A SUB-BASE MATERIAL IN (9) 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.
11. 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.
12. WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED BY OTHERS, (eg. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS. 3052 (BOUND) COMPACTED TO MINIMUM 98% MODIFIED DENSITY IN TO MINIMUM 95% MODIFIED DENSITY IN ACCORDANCE WITH A.S 1289 5.2.1(2017)

JOINTING NOTES

PEDESTRIAN PAVEMENT JOINTS

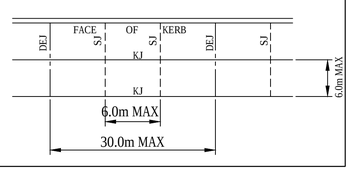
1. ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS. (U.N.O)
2. EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.
3. WEAKENED PLANE JOINTS ARE TO BE LOCATED AT A MAX. SPACING OF 1.5 x WIDTH OF THE PAVEMENT.
4. WHERE POSSIBLE JOINTS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



NB: CHECK RELEVANT COUNCIL REQUIREMENTS IF IN PUBLIC ROAD.

VEHICULAR PAVEMENT JOINTS

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



STORMWATER DRAINAGE NOTES

1. STORMWATER DESIGN CRITERIA:
   A) AVERAGE RECURRENCE INTERVAL:
   1:100 YEARS ROOFED AREAS TO SURCHARGE PIT
   1:?? YEARS EXTERNAL PAVEMENTS
   (B) RAINFALL INTENSITIES:
   TIME OF CONCENTRATION: MINUTES 5
   1:100 YEARS= ?? mm/hr
   1:?? YEARS= ?? mm/hr
   (C) RUNOFF COEFFICIENTS:
   ROOF AREAS: C =1.0 100
   EXTERNAL PAVEMENTS: C =1.0 ??
2. PIPES 300 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS '2' APPROVED SPIGOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O.
3. PIPES UP TO 300 DIA SHALL BE SEWER GRADE uPVC WITH SOLVENT WELDED JOINTS.
4. EQUIVALENT STRENGTH VCP OR FRC PIPES MAY BE USED.
5. 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.
6. 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 UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED 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)
7. 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).
8. PRECAST PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY AT & L.
9. ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.
10. WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
11. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
12. GRATES AND COVERS SHALL CONFORM TO AS 3996.
13. ALL INTERNAL PIT DIMENSIONS TO CONFORM TO AS3500.3 TABLE 7.5.2.1
14. AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
15. 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.

BULK EARTHWORKS NOTES

1. ORIGIN OF LEVELS: REFER SURVEY NOTES
2. STRIP ALL TOPSOIL/ORGANIC MATERIAL FROM CONSTRUCTION AREA AND REMOVE FROM SITE OR STOCK PILE AS DIRECTED BY SUPERINTENDENT.
3. EXCAVATED MATERIAL TO BE USED AS STRUCTURAL FILL PROVIDED THE PLACEMENT MOISTURE CONTENT OF THE MATERIAL IS +/- 2% OF THE OPTIMUM MOISTURE CONTENT.
4. COMPACT FILL AREAS AND SUBGRADE TO NOT LESS THAN:

LOCATION	STANDARD DRY DENSITY (AS 1289 E 5.1.1.)
UNDER BUILDING SLABS ON GROUND	98%
UNDER ROADS AND CARPARKS	98%
LANDSCAPED AREAS UNLESS NOTED OTHERWISE	98%

5. FOR NON COHESIVE MATERIAL, COMPACT TO 75% DENSITY INDEX.
6. BEFORE PLACING FILL, PROOF ROLL EXPOSED SUBGRADE WITH AN 8 TONNE (MIN) DEADWEIGHT SMOOTH DRUM VIBRATORY ROLLER TO DETECT THEN REMOVE SOFT SPOTS (AREAS WITH MORE THAN 2mm MOVEMENT UNDER ROLLER).
7. FREQUENCY OF COMPACTION TESTING SHALL BE NOT LESS THAN :-
   (A) 1 TEST PER 200m^2 OF FILL PLACED PER 300 LAYER OF FILL.
   (B) 3 TESTS PER VISIT
   (C) 1 TEST PER 1000m^3 OF EXPOSED SUBGRADE
   TESTING SHALL BE "LEVEL 1" TESTING IN ACCORDANCE WITH AS 3798 (2007).
8. FILLING TO BE PLACED AND COMPACTED IN MAXIMUM 150mm LAYERS
9. NO FILLING SHALL TAKE PLACE TO EXPOSE SUBGRADE UNTIL THE AREA HAS BEEN PROOF ROLLED IN THE PRESENCE OF AT & L AND APPROVAL GIVEN IN WRITING THAT FILLING CAN PROCEED.

CONCRETE NOTES

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600(2018) CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
2. CONCRETE QUALITY ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

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

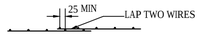
- CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL
- PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379.

3. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY AT & L.
4. CLEAR CONCRETE COVER TO ALL REINFORCEMENT FOR DURABILITY SHALL BE 40mm TOP AND 70mm FOR EXTERNAL EDGES UNLESS NOTED OTHERWISE.
5. 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.
6. 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.
7. REINFORCEMENT SYMBOLS:
   N DENOTES GRADE 450 N BARS TO AS/NZS 4671 GRADE N
   R DENOTES 230 R HOT ROLLED PLAIN BARS TO 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 BEING 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.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THE SITE SUPERINTENDENT/ENGINEER WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED.
2. ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENT
   b. EPA REQUIREMENTS
   c. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
4. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
5. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

LAND DISTURBANCE

6. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   (A) INSTALL A WIND FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   (B) INSTALL A SEDIMENT FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   (C) CONSTRUCT STABILISED CONSTRUCTION ENTRANCE TO LOCATION AS DETERMINED BY SUPERINTENDENT/ENGINEER. REFER DETAIL.
   (D) INSTALL SEDIMENT BASIN AS SHOWN ON PLAN
   (E) INSTALL SEDIMENT TRAPS AS SHOWN ON PLAN.
   (F) UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

EROSION CONTROL

7. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.
8. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

SEDIMENT CONTROL

9. 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.
10. 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.
11. 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.
12. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

OTHER MATTERS

13. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
14. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   (A) PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
   (B) ENSURING THAT NOTHING IS NAILED TO THEM
   (C) PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS.
   (I) 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
   (II) 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
   (III) CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.

CONTRACTOR SHALL CALL;
DIAL BEFORE YOU DIG 1100
PRIOR TO COMMENCEMENT OF WORK TO OBTAIN ALL CURRENT SERVICE AUTHORITY PLANS

DIAL BEFORE YOU DIG www.1100.com.au

Bar Scales

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

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION
A1

File Name: 20-781-C101.dwg

		Drawn	TK
		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

Client: Goodman

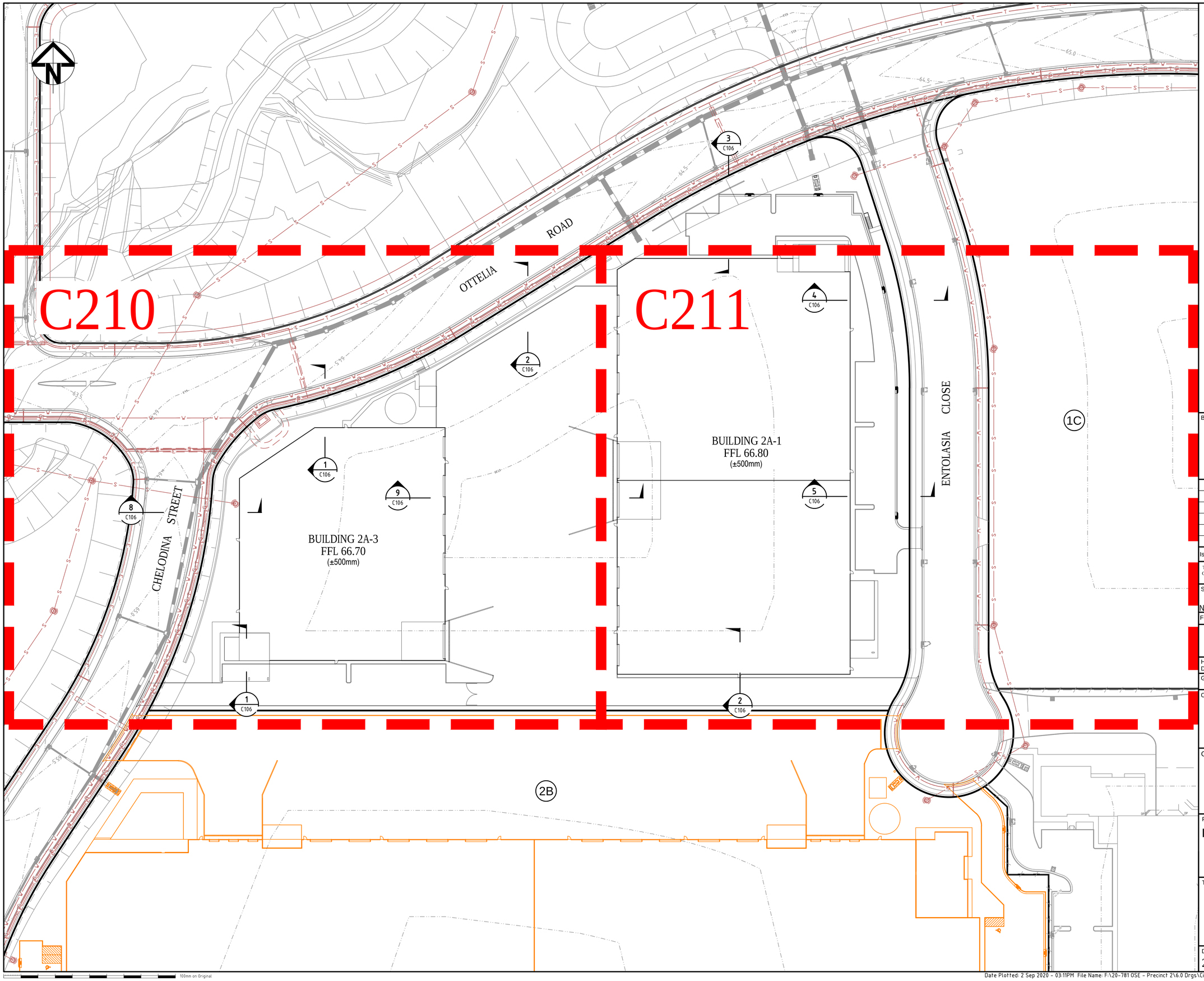
Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

Project:
INDUSTRIAL DEVELOPMENT
OAKDALE SOUTH
LOT 2A

Title:
GENERAL NOTES

Drawing No. 20-781-C101
Issue A

100mm on Original



Bar Scales

0 10 20 30 40

1 : 500 @ A1 1 : 1000 @ A3

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

Status
FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

File Name 20-781-C105.dwg

		Drawn	TK
		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

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 2A

Title
GENERAL
ARRANGEMENT PLAN

Drawing No. 20-781-C105

Issue A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:11PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C105.dwg V1

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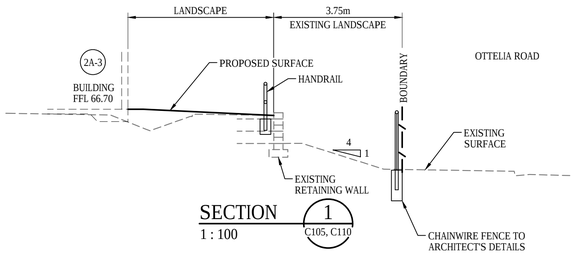
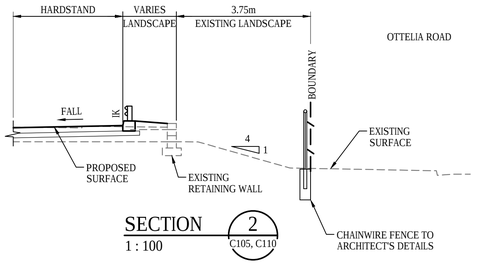
Version: 1, Version Date: 27/10/2020



SECTION 1
1 : 100 C105, C110



SECTION 2
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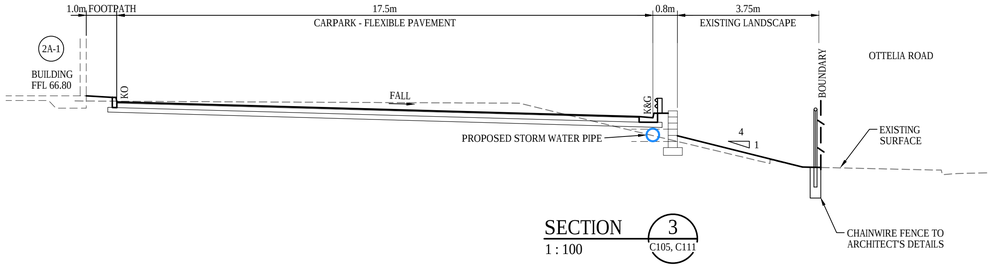

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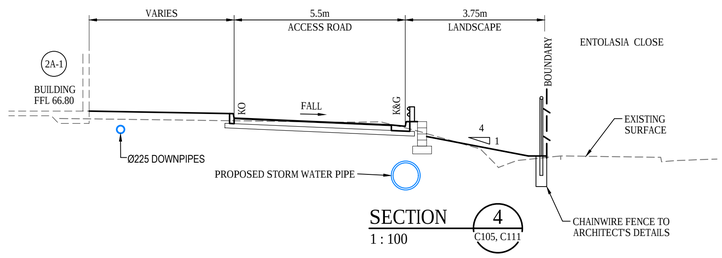

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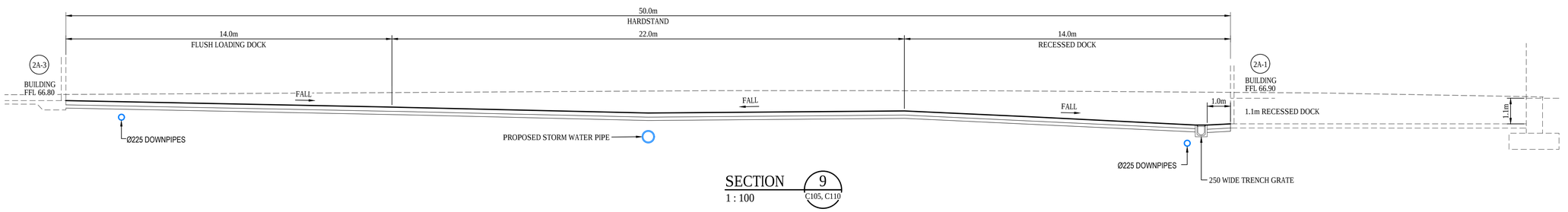

SECTION 9
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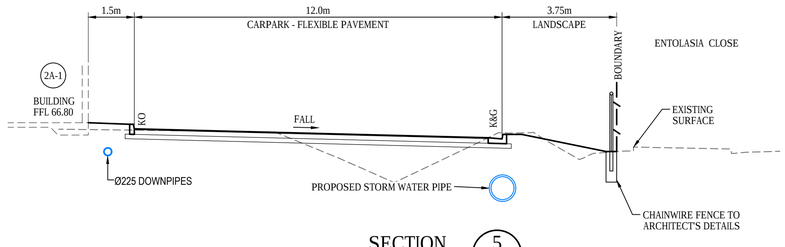

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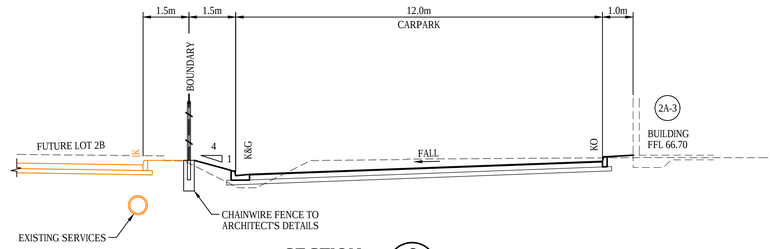
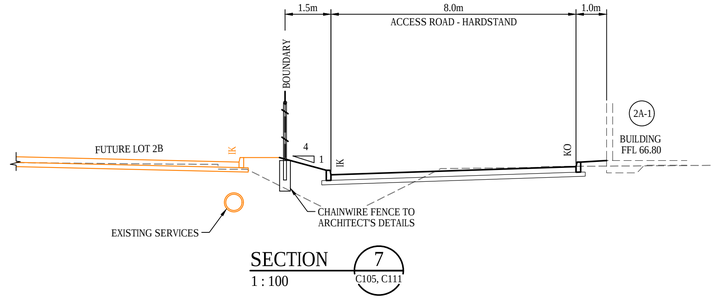
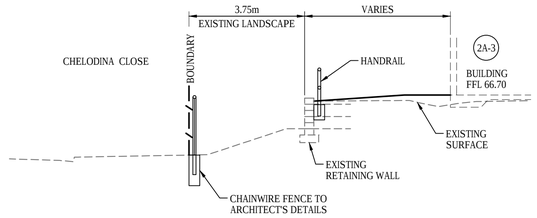


SECTION 6
1 : 100 C105, C111



SECTION 7
1 : 100 C105, C111



SECTION 8
1 : 100 C105, C110

Bar Scales

0 2 4 6 8

1 : 100 @ A1 1 : 200 @ A3

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

Status
FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

File Name 20-781-C106.dwg

		Drawn	TK
		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

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 2A

Title
TYPICAL SECTIONS

Drawing No. 20-781-C106

Issue A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:12PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C106.dwg V1

OTTELIA ROAD

CHELODINA STREET

BUILDING 2A-3
FFL 66.70
(±500mm)

EXISTING SUB STATION

PROPOSED RAINWATER TANK (30kL TBC AT DETAILED DESIGN)

PROPOSED RAINWATER TANK (30kL TBC AT DETAILED DESIGN)

1.1m RECESSED LOADING DOCK

1.1m RECESSED LOADING DOCK

NOTE:

DOWNPIPE CONNECTIONS AND SIZING TO BE CONFIRMED AT DETAILED DESIGN

NOTE:

DOWNPIPE CONNECTIONS AND SIZING TO BE CONFIRMED AT DETAILED DESIGN

NOTE:

DOWNPIPE CONNECTIONS AND SIZING TO BE CONFIRMED AT DETAILED DESIGN

CONTINUATION ON DRAWING C211

Bar Scales

0 5 10 15 20

1 : 250 @ A1 1 : 500 @ A3

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

Status: FOR APPROVAL
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A1

File Name: 20-781-C110.dwg

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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 2A

Title

SITEWORKS AND STORMWATER DRAINAGE PLAN - SHEET 1

Drawing No. 20-781-C110

Issue A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:12PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C110.dwg V1

CONTINUATION ON DRAWING C210

BUILDING 2A-1
FFL 66.80
(±500mm)

BUILDING 2A-2
FFL 66.80
(±500mm)

NOTE:

DOWNPIPE CONNECTIONS AND SIZING TO BE CONFIRMED AT DETAILED DESIGN

PROPOSED RETAINING WALL

ENTOLASIA CLOSE

OTTELIA ROAD

INSET
SCALE 1 : 250

PROPOSED RETAINING WALL

G.P.T
T.B.C

1C

2A

Bar Scales

0 5 10 15 20

1 : 250 @ A1 1 : 500 @ A3

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

Status
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NOT TO BE USED FOR CONSTRUCTION

A1

File Name 20-781-C111.dwg

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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 2A

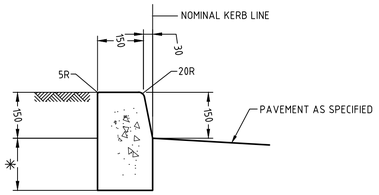
Title
SITEWORKS AND STORMWATER DRAINAGE PLAN - SHEET 2

Drawing No. 20-781-C111

Issue A

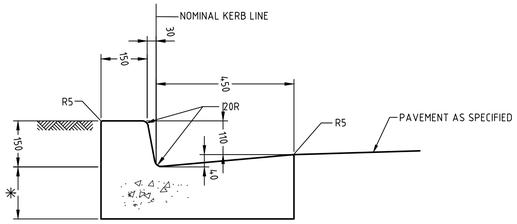
100mm on Original

Date Plotted: 2 Sep 2020 - 03:12PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C111.dwg V1



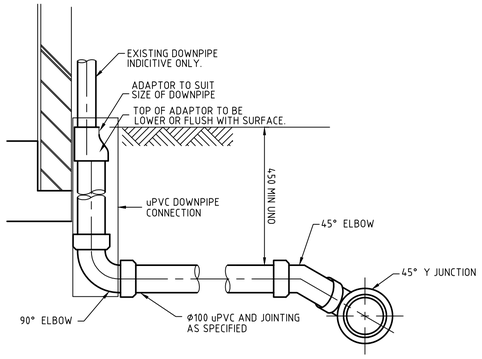
KERB ONLY (KO)
SCALE 1:10

✳ TO SUIT PAVEMENT DEPTH MIN. 150mm

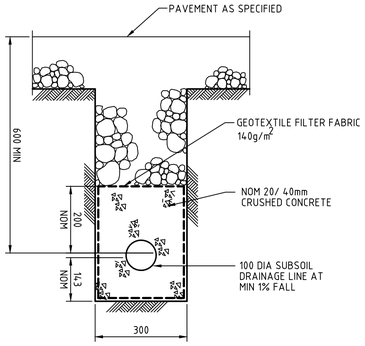


KERB AND GUTTER (K&G)
SCALE 1:10

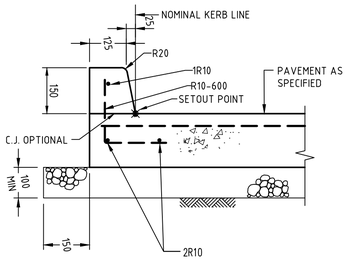
✳ TO SUIT PAVEMENT DEPTH MIN. 150mm



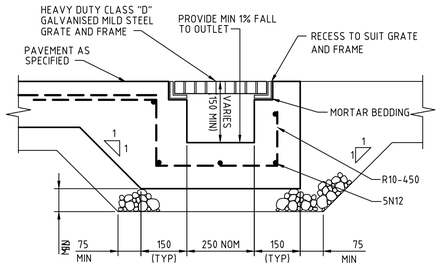
PVC DOWNPIPE CONNECTION
SCALE 1:10



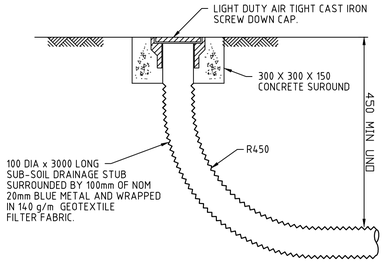
SUBSOIL IN PAVED AREAS
SCALE 1:10



INTEGRAL KERB (IKO)
SCALE 1:10

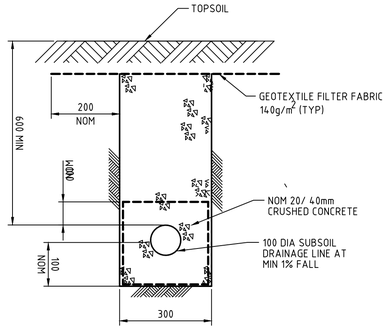


GRATED DRAIN (GD)
SCALE 1:10

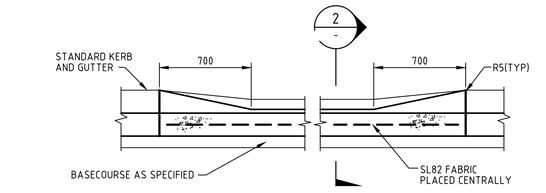


FLUSHING POINT
SCALE 1:10

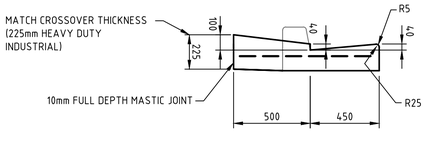
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED



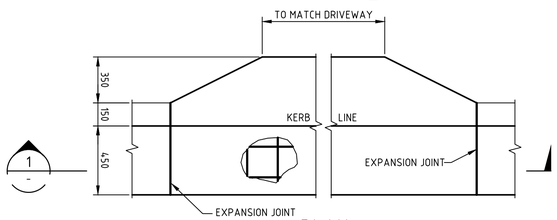
SUBSOIL IN LANDSCAPED AREAS
SCALE 1:10



SECTION 1
1 : 20

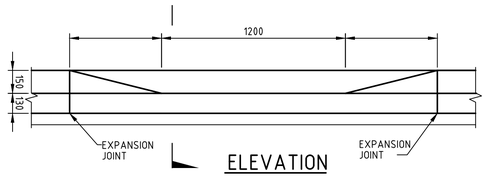


SECTION 2
1 : 20

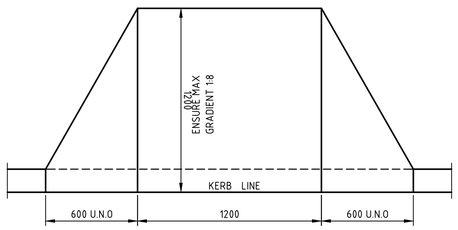


PLAN VEHICULAR CROSSING
SCALE 1:20

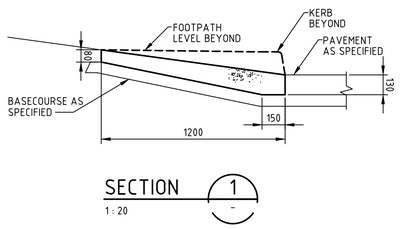
NOTE: VEHICULAR CROSSOVER AND LAYBACKS TO BE CONSTRUCTED IN ACCORDANCE WITH PENRITH CITY COUNCIL SPECIFICATIONS AND GUIDELINES. REFER TO STANDARD DRAWING SD1004 FOR LAYBACK DETAILS.



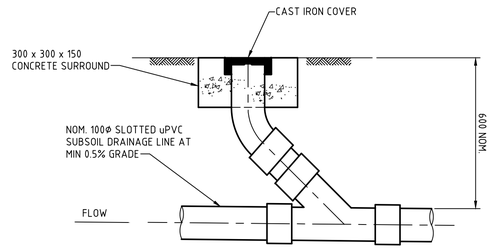
ELEVATION



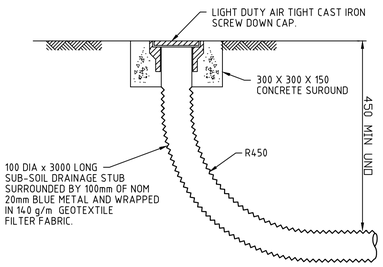
PLAN RAMPED CROSSING
SCALE 1:20



SECTION 1
1 : 20



INTERMEDIATE RISER
SCALE 1:10



FLUSHING POINT
SCALE 1:10

NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED

Bar Scales
0 500 1000 1500
1 : 20 @ A1 1 : 40 @ A3
0 100 200 400 600 800
1 : 10 @ A1 1 : 20 @ A3

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

Status: FOR APPROVAL
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A1

File Name: 20-781-C120.dwg

		Drawn	TK
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Grid	MGA	Approved	FX

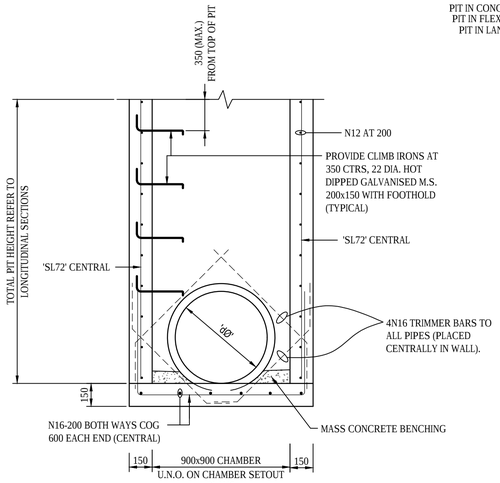
Client: Goodman

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 2A

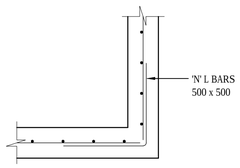
Title
SITEWORKS DETAILS

Drawing No. 20-781-C120
Issue A



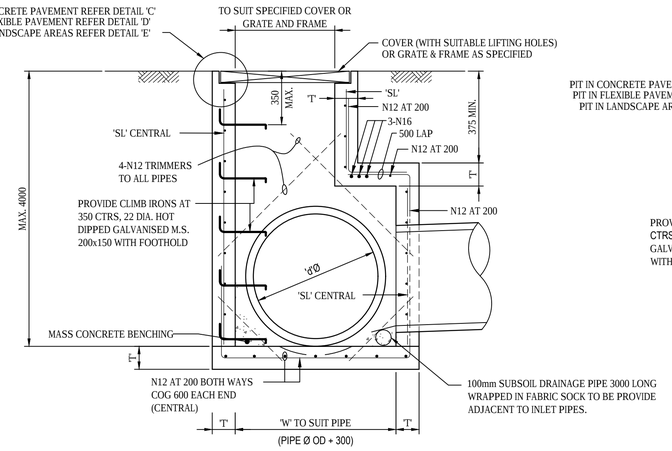
PIT CHAMBER DETAIL FOR PIPES UP TO 525Ø (TYPE 1)

SCALE: 1:20



TYPICAL CORNER DETAIL

SCALE 1:20



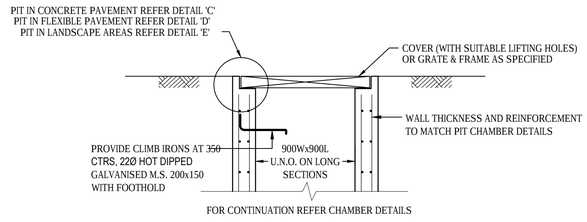
PIT CHAMBER DETAIL FOR PIPES FROM 600Ø TO 1200Ø TYPE 2

(ENLARGED CHAMBER)

SCALE: 1:20

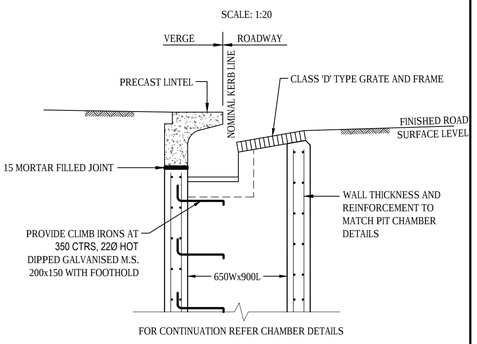
PIPE DIA. 'dØ'	WIDTH 'W' (U.N.O)	WALL 'T'	FABRIC/COV 'SL'
600	900	150	SL82
675	940	150	SL82
750	1020	150	SL82
825	1100	150	SL82
900	1180	200	SL82
1050	1350	200	SL92
1200	1510	200	SL102

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



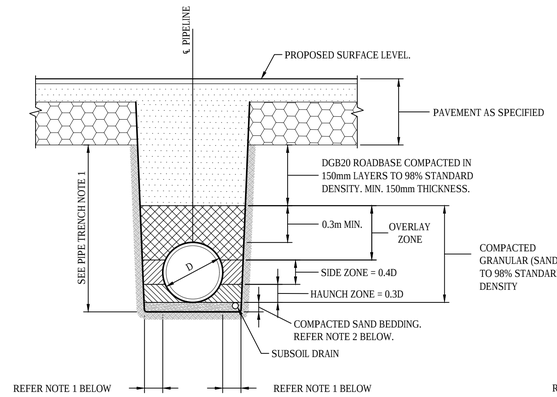
STANDARD SURFACE INLET OR SEALED JUNCTION PIT

SCALE: 1:20



STANDARD GRATED KERB INLET PIT WITH LINTEL

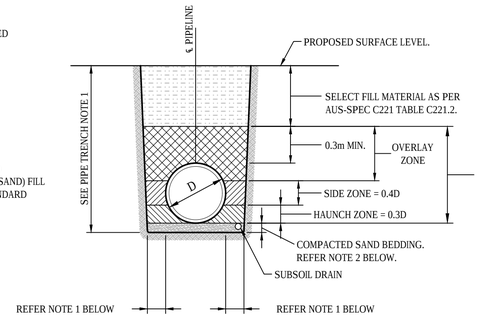
SCALE: 1:20



PIPE TRENCH BELOW PAVEMENT

N.T.S.

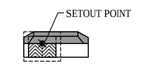
NOTE
1. ≥0.2D OR 0.3m (WHICHEVER IS GREATER)
2. 100mm FOR PIPE DIA. ≤1500



PIPE TRENCH BELOW LANDSCAPING (HS3)

N.T.S.

NOTE
1. ≥0.2D OR 0.3m (WHICHEVER IS GREATER)
2. 100mm FOR PIPE DIA. ≤1500



KERB INLET PIT
SCALE 1 :100

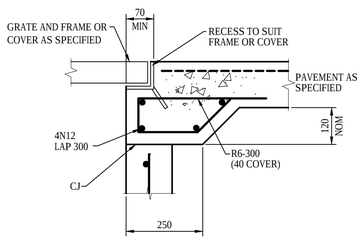
SURFACE INLET PIT
SCALE 1 :100

JUNCTION PIT
SCALE 1 :100

HEADWALL
SCALE 1 :100

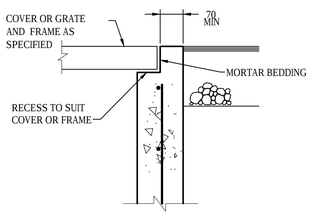
STORMWATER PIT SETOUT POINTS

REFER PIT SETOUT PLANS FOR ENLARGED CHAMBERS



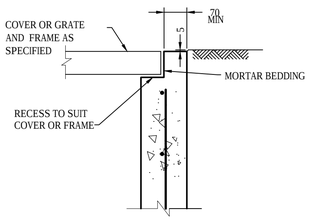
DETAIL "C"

SCALE 1:10



DETAIL "D"

SCALE 1:10



DETAIL "E"

SCALE 1:10

PIPE TRENCH NOTES

1. IN UNDERTAKING TRENCH EXCAVATION, THE CONTRACTOR SHALL PROVIDE ANY SHORING, SHEET PILING OR OTHER STABILISATION OF THE TRENCH NECESSARY TO COMPLY WITH OH&S REGULATION REQUIREMENTS. THE SIDES ARE NOT TO BE LOADED & SHALL BE KEPT CLEAR OF LOOSE MATERIAL ETC. SAFE ACCESS & EGRESS SHALL BE PROVIDED AT ALL TIMES.

2. THE TRENCH SHALL BE EXCAVATED TO A WIDTH 1.4 TIMES THE EXTERNAL DIAMETER OF THE PIPE, OR TO THE EXTERNAL DIAMETER OF THE PIPE PLUS 300mm ON EACH SIDE, WHICHEVER IS THE GREATER.

NOTE

1. STANDARD GULLY PITS REFER TO LIVERPOOL CITY COUNCIL STANDARD DRAWINGS FOR DETAILS

FOR INLET SIZE, PIT CHAMBER SIZE AND SETOUT REFER TO STORMWATER LONGITUDINAL SECTIONS.

2. REINFORCING MESH IS TO BE BENT TO LAP 300 AROUND ALL CORNERS. VERTICAL BARS ARE NOT TO BE CUT. ALTERNATELY PROVIDE N12 "L" BARS (500x500) AT 400 VERTICAL CTS.

3. COMPRESSIVE STRENGTH (F'c) FOR CAST IN SITU CONCRETE SHALL BE A MINIMUM 32 MPa AT 28 DAYS.

4. TOP OF BENCHING SHALL BE ½ OF OUTLET PIPE DIAMETER.

5. 100mm SUBSOIL DRAINAGE PIPE 3000 LONG WRAPPED IN FABRIC SOCK TO BE PROVIDE ADJACENT TO INLET PIPES.

6. ALL PITS SHALL BE PROVIDED WITH A LOCKING CLIP.

7. PIT GRATE TO BE 'WELDLOK' GULLY GRATE GG 78-50 OR APPROVED EQUIVALENT.

8. DURING INSTALLATION OF GRATE AND FRAME CONTRACTOR IS TO ENSURE CLEARANCE BETWEEN LINTEL AND OPENED GRATE (REFER TO INSTALLATION TOLERANCE).

9. PROVIDE STEP IRONS AS INDICATED FOR PITS DEEPER THAN 1200.

10. N12 AT 200 CENTRALLY PLACED MAY BE USED IN LIEU OF MESH. LAP 500 AT CORNERS

11. MINIMUM REINFORCEMENT COVER TO BE 45mm UNLESS NOTED OTHERWISE

15. CHAMBER DEPTH EXCEEDING 2m IN HEIGHT WILL BE DESIGNED AND APPROVED BY STRUCTURAL ENGINEER

16. CONCRETE STRENGTH: - UNLESS NOTED OTHERWISE

ELEMENT	f'c MPa (28 DAYS)	SLUMP	MAX AGG SIZE	CEMENT TYPE
PITS	32	80mm	20mm	GP

Bar Scales

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

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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 2A

Title
STORMWATER DRAINAGE DETAILS

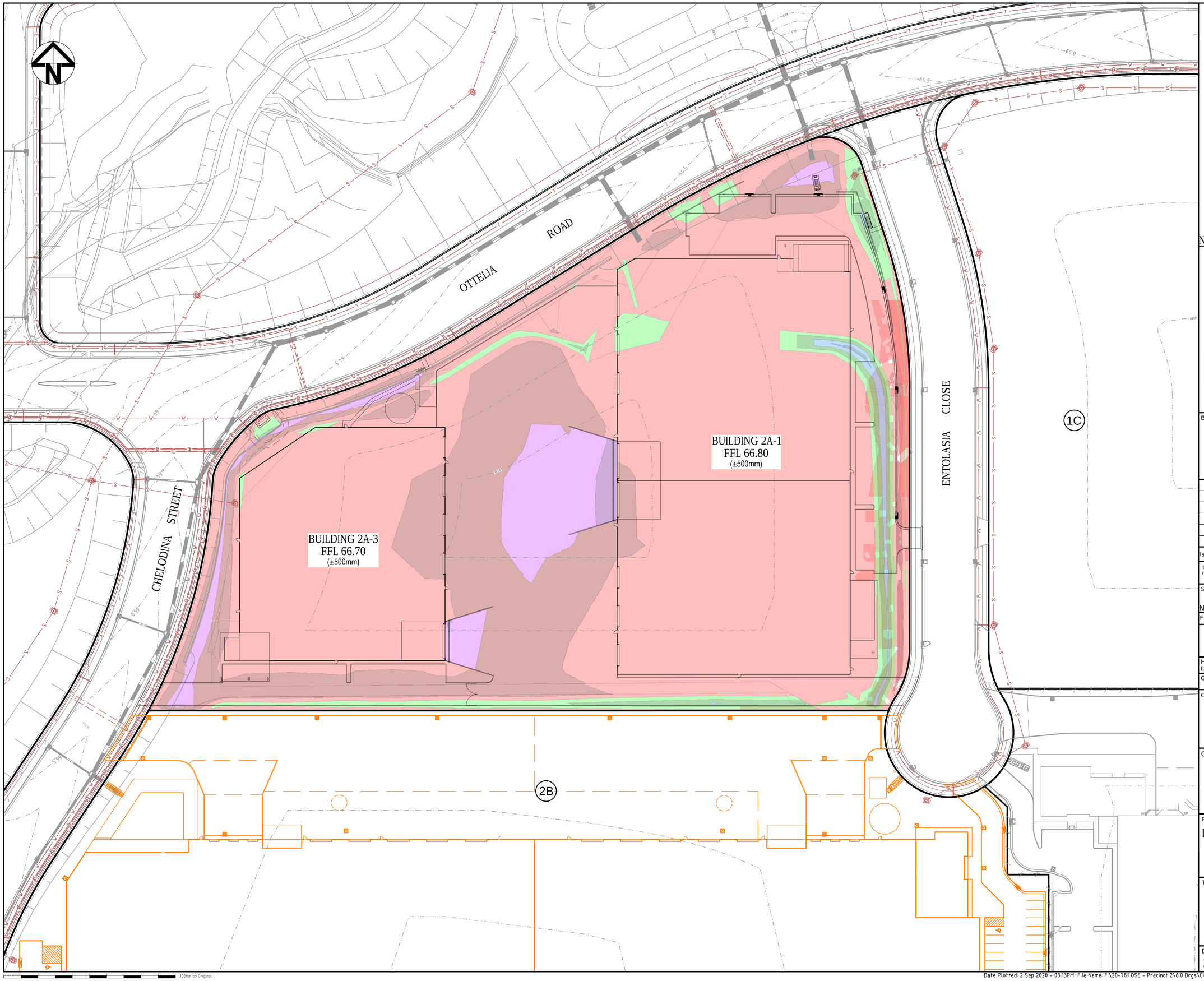
Drawing No. 20-781-C125

Issue A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:30PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C125.dwg V1

Document Set ID: 9351261
Version: 1, Version Date: 27/10/2020



CUT\FILL DEPTH RANGE LEGEND

Lower_value		Upper_value		Colour
-2.0	to	-1.5	m	
-1.5	to	-1.0	m	
-1.0	to	-0.5	m	
-0.5	to	0.0	m	
0.0	to	0.5	m	
0.5	to	1.0	m	
1.0	to	1.5	m	
1.5	to	2.0	m	
2.0	to	2.5	m	

NOTES

1. ASSUMED NO TOP SOIL STRIPING
2. THE VOLUMES DO NOT TAKE INTO ACCOUNT THE FOLLOWING :-
   - BULKING FACTORS OF REMOVED CUT
   - REMOVAL AND\OR REMEDIATION OF ANY EXISTING UNCONTROLLED FILL
   - PROPOSED LANDSCAPING
3. ASSUMED 300mm PAVEMENT DEPTH

EARTHWORKS VOLUMES

CUT (m³)	FILL (m³)	BALANCE (m³)
-10,000	+800	-9,200 (EXPORT)

Bar Scales

0 10 20 30 40

1 : 500 @ A1 1 : 1000 @ A3

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

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

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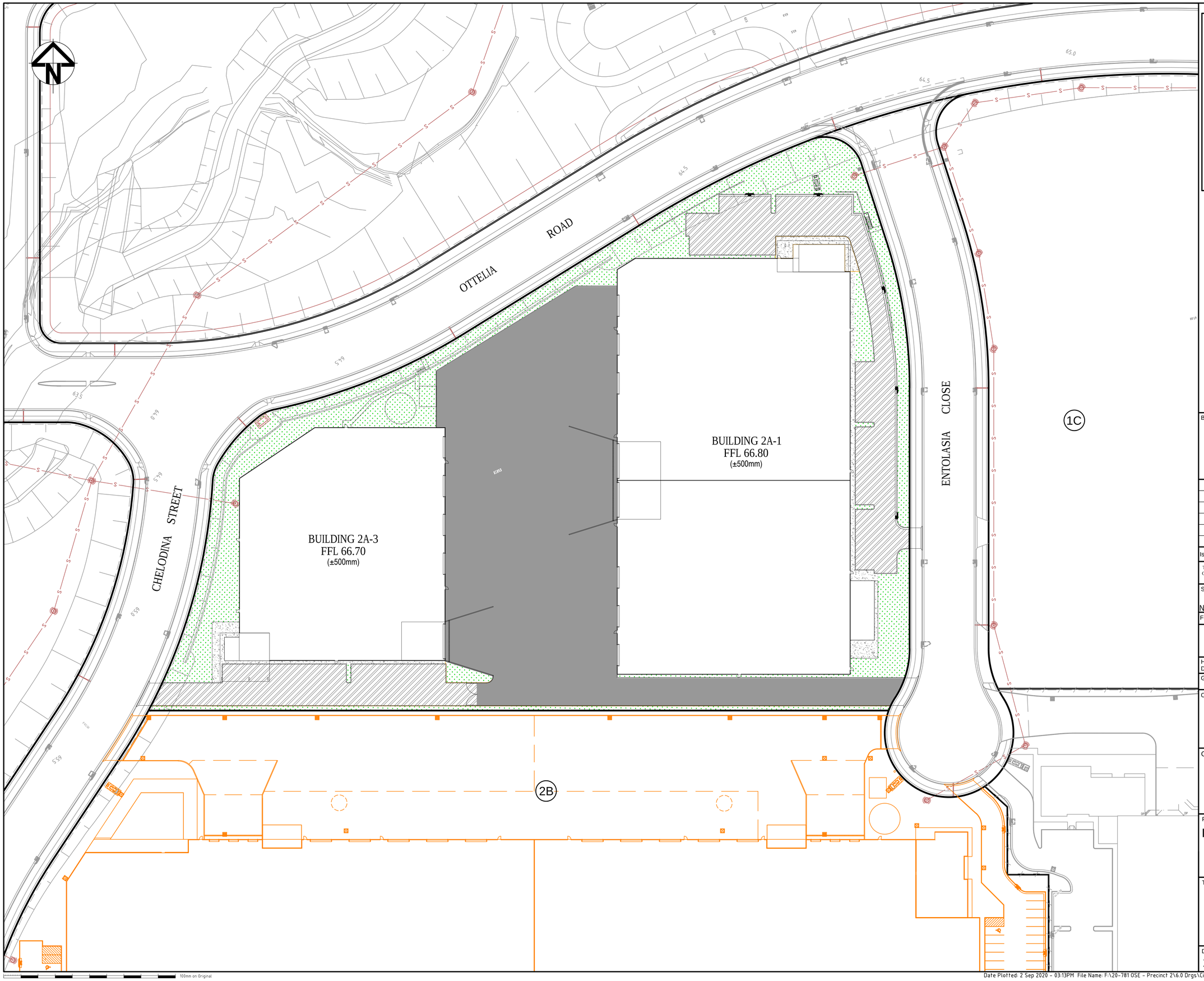
Project
INDUSTRIAL DEVELOPMENT
OAKDALE SOUTH
LOT 2A

Title
BULK EARTHWORKS
CUT/FILL PLAN

Drawing No. 20-781-C130

Issue A

Date Plotted: 2 Sep 2020 - 03:13PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C130.dwg V1



PAVEMENT LEGEND

- HEAVY DUTY RIGID PAVEMENT
- ASPHALT PAVEMENT
- LANDSCAPE
- FOOTPATH

Bar Scales

0 10 20 30 40

1 : 500 @ A1 1 : 1000 @ A3

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

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

File Name: 20-781-C135.dwg

		Drawn	TK
		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

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 2A

Title

PAVEMENT PLAN

Drawing No. 20-781-C135

Issue A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:13PM File Name: F:\20-781OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C135.dwg V1

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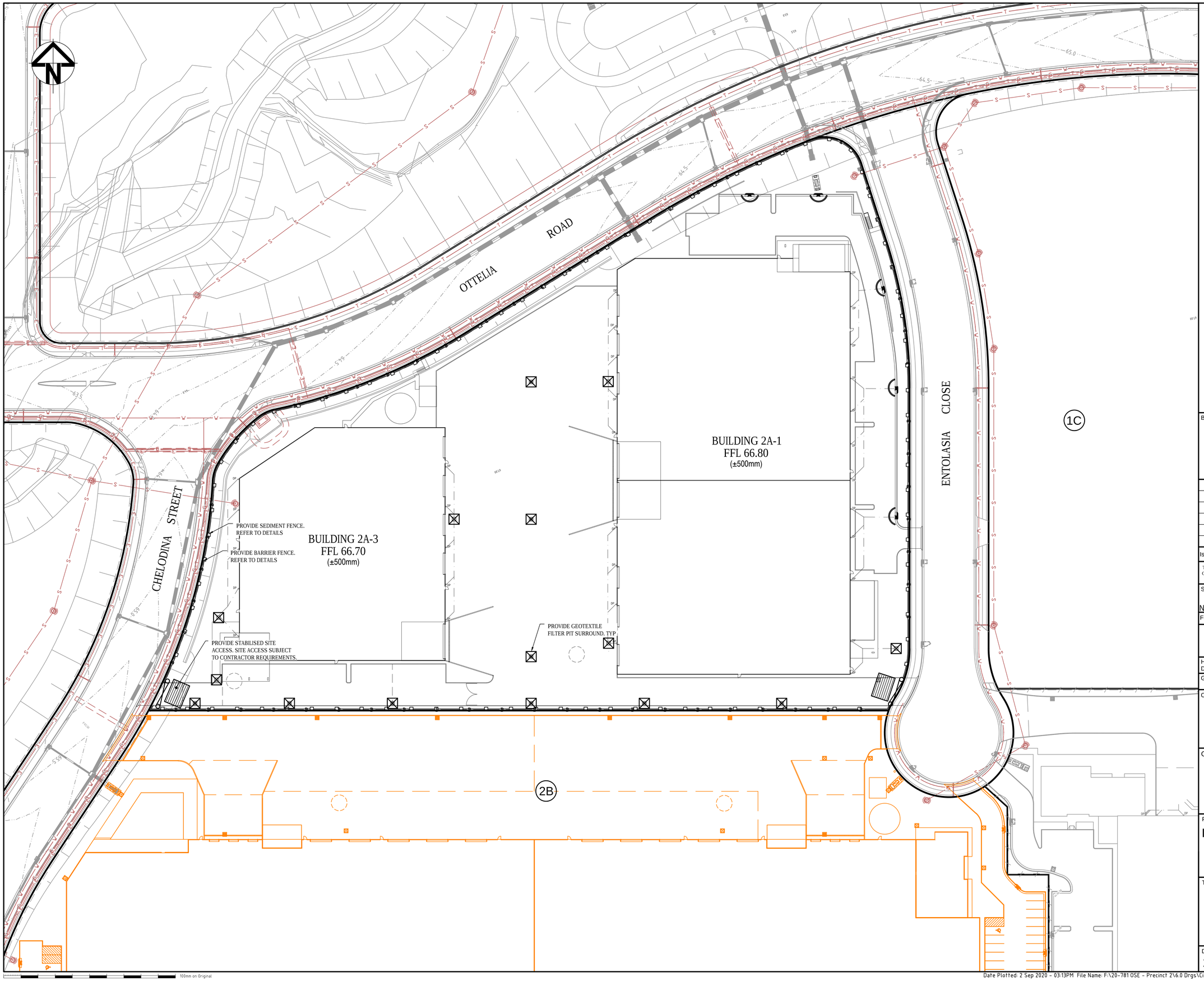

Bar Scales

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1 : 500 @ A1 1 : 1000 @ A3

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

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION — A1

File Name: 20-781-C140.dwg

		Drawn	TK
		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

Client: Goodman

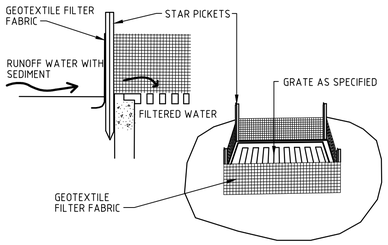
Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

Project
INDUSTRIAL DEVELOPMENT
OAKDALE SOUTH
LOT 2A

Title
EROSION AND
SEDIMENT CONTROL
PLAN

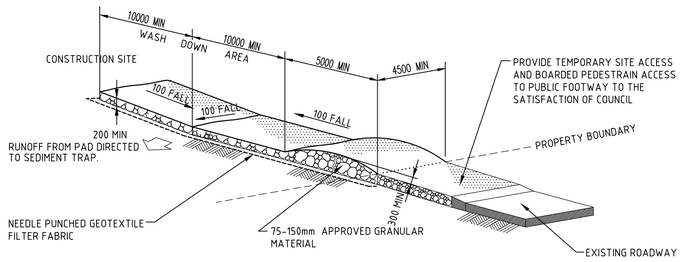
Drawing No. 20-781-C140 — Issue A

Date Plotted: 2 Sep 2020 - 03:13PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C140.dwg V1



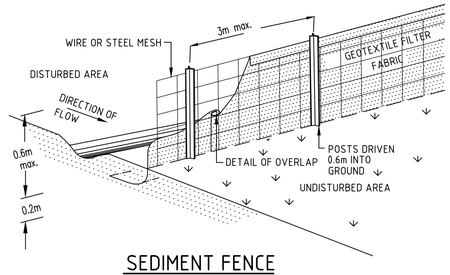
GEOTEXTILE FILTER PIT SURROUND

NTS



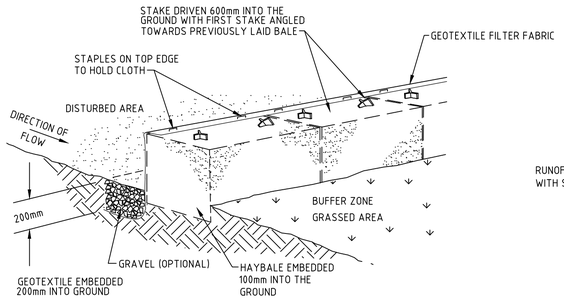
STABILISED SITE ACCESS AND TRUCK WASH DOWN AREA

NTS



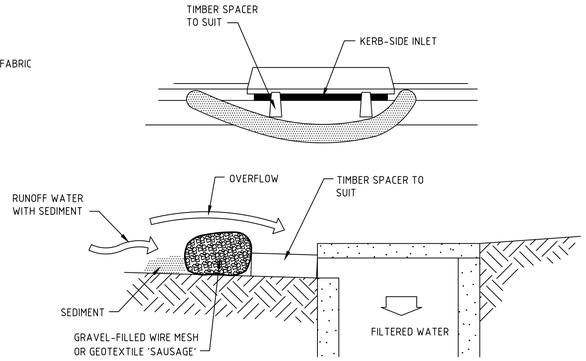
SEDIMENT FENCE

NTS



HAYBALE AND GEOTEXTILE SEDIMENT FILTER

NTS



MESH AND GRAVEL INLET FILTER

NTS

Bar Scales

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

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

File Name: 20-781-C145.dwg

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		Designed	SM
Height Datum	AHD	Checked	FX
Grid	MGA	Approved	FX

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 2A

Title
EROSION AND SEDIMENT CONTROL DETAILS

Drawing No. 20-781-C145

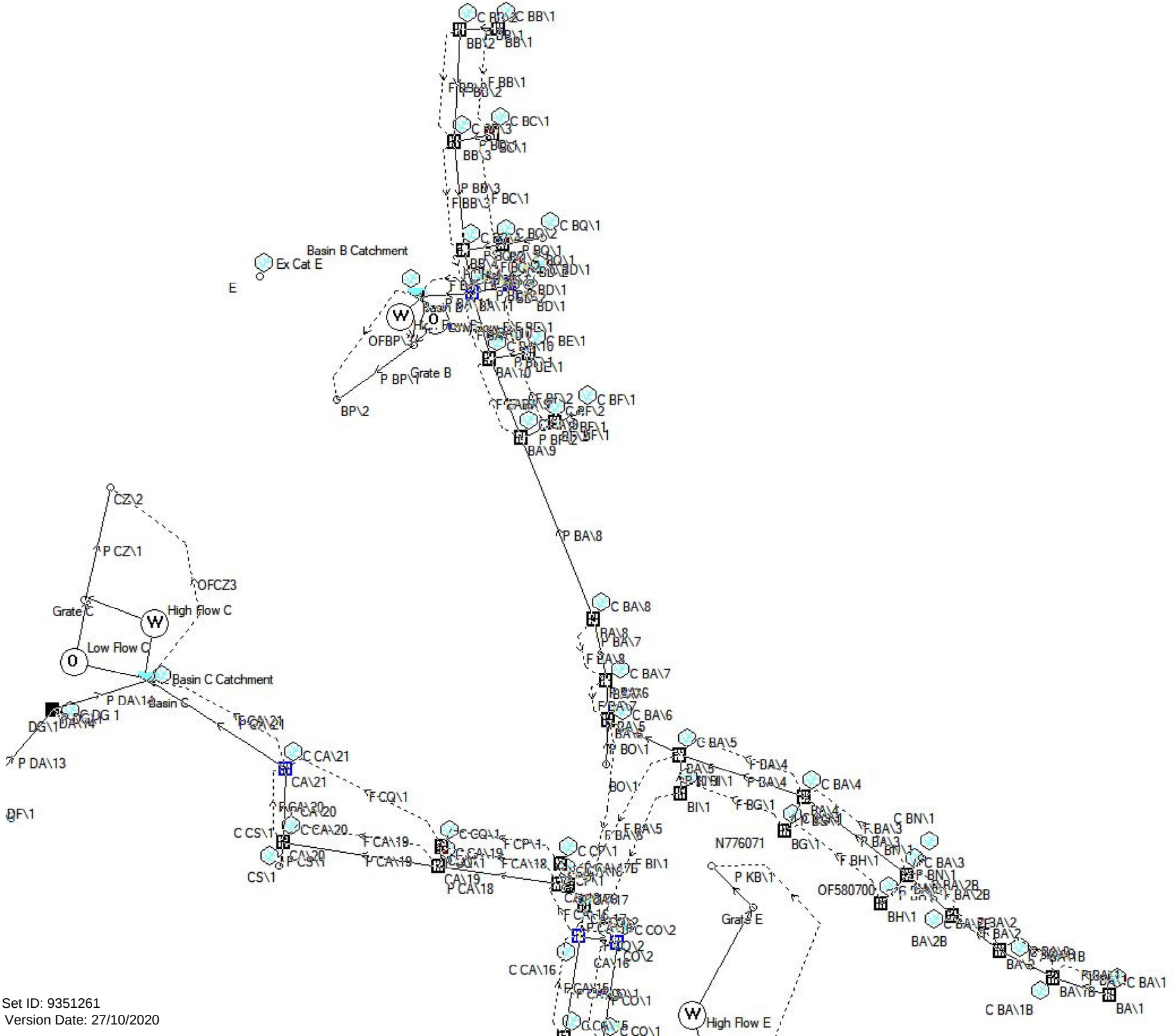
Issue A

100mm on Original

Date Plotted: 2 Sep 2020 - 03:13PM File Name: F:\20-781 OSE - Precinct 2\6.0 Drgs\Civil\DA-Drawings\100 Series - Lot 2A\20-781-C145.dwg V1

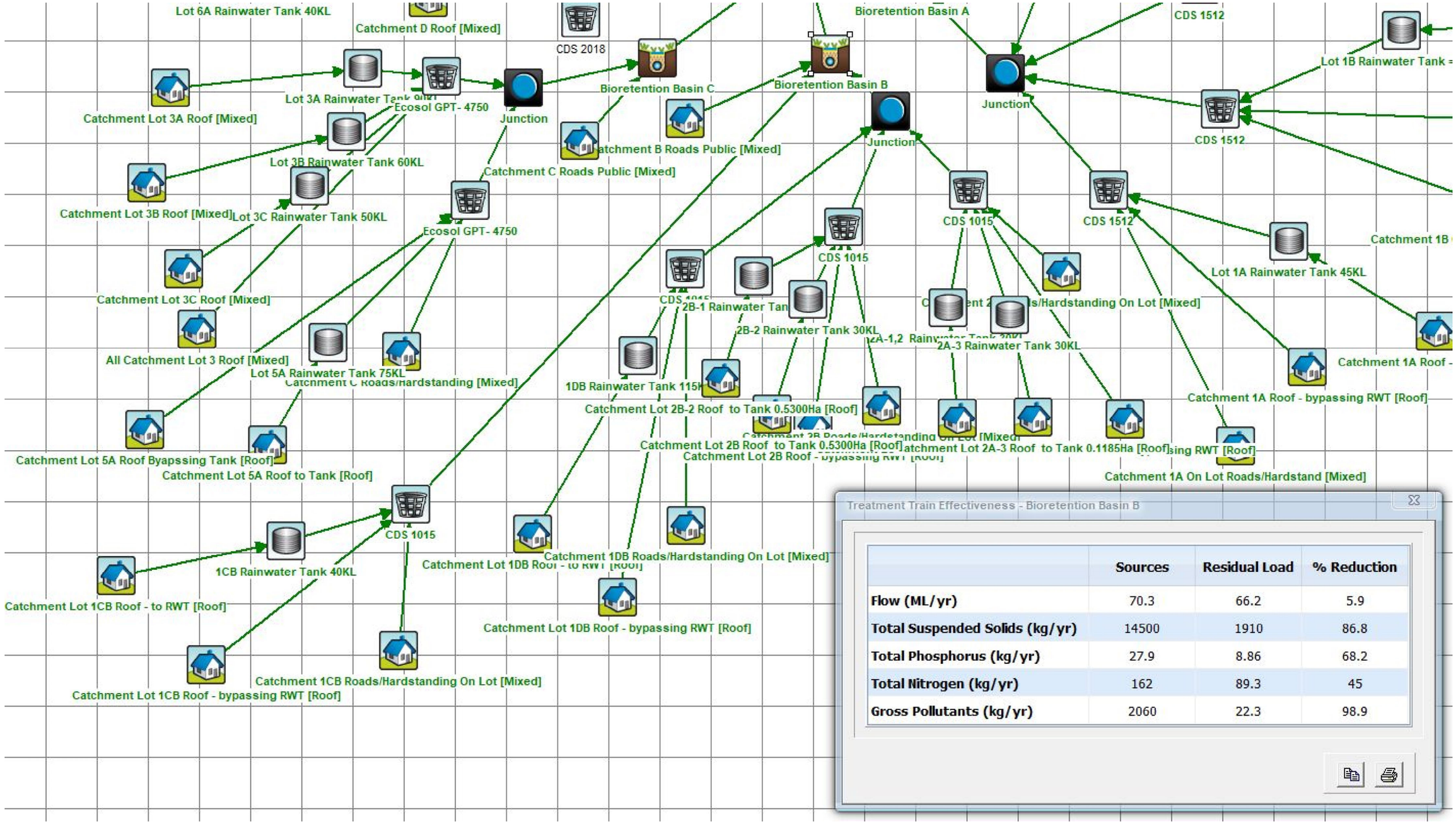
Appendix C

Overall Precinct DRAINs Model



Appendix D

MUSIC Model and Results



Treatment Train Effectiveness - Bioretention Basin B

	Sources	Residual Load	% Reduction
Flow (ML/yr)	70.3	66.2	5.9
Total Suspended Solids (kg/yr)	14500	1910	86.8
Total Phosphorus (kg/yr)	27.9	8.86	68.2
Total Nitrogen (kg/yr)	162	89.3	45
Gross Pollutants (kg/yr)	2060	22.3	98.9

Appendix E

Salinity Management Plan

Pells Sullivan Meynink
Engineering Consultants
Rock-Soil-Water

G3 56 Delhi Road
North Ryde NSW 2113
P: 61-2 9812 5000
F: 61-2 9812 5001
mailbox@psm.com.au
www.psm.com.au

Our Ref: PSM1541-113L REV3

9 September 2015

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

ATTENTION: KYM DRACOPOULOS
kym.dracopoulos@goodman.com

Dear Kym,

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 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
SCRETARY'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.	Mitigation and monitoring measures are discussed within this document (Ref. PSM1541-113L). Assessment of soil, in terms of salinity and acid sulphate soils is described within the soil salinity and aggressivity investigation letter (Ref. PSM1541-112L). We understand that contamination is dealt with by other consultants, i.e. an environmental consultant
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 is 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

AGUSTRIA SALIM
Senior Geotechnical Engineer

GARRY MOSTYN
Chief Engineer

SYDNEY
LEVEL 7 153 WALKER STREET
NORTH SYDNEY NSW 2060
02 9439 1777
INFO@ATL.NET.AU

BRISBANE
SUITE A LEVEL 11
127 CREEK STREET
BRISBANE QLD 4000
07 3211 9581
INFO-QLD@ATL.NET.AU

atl.net.au