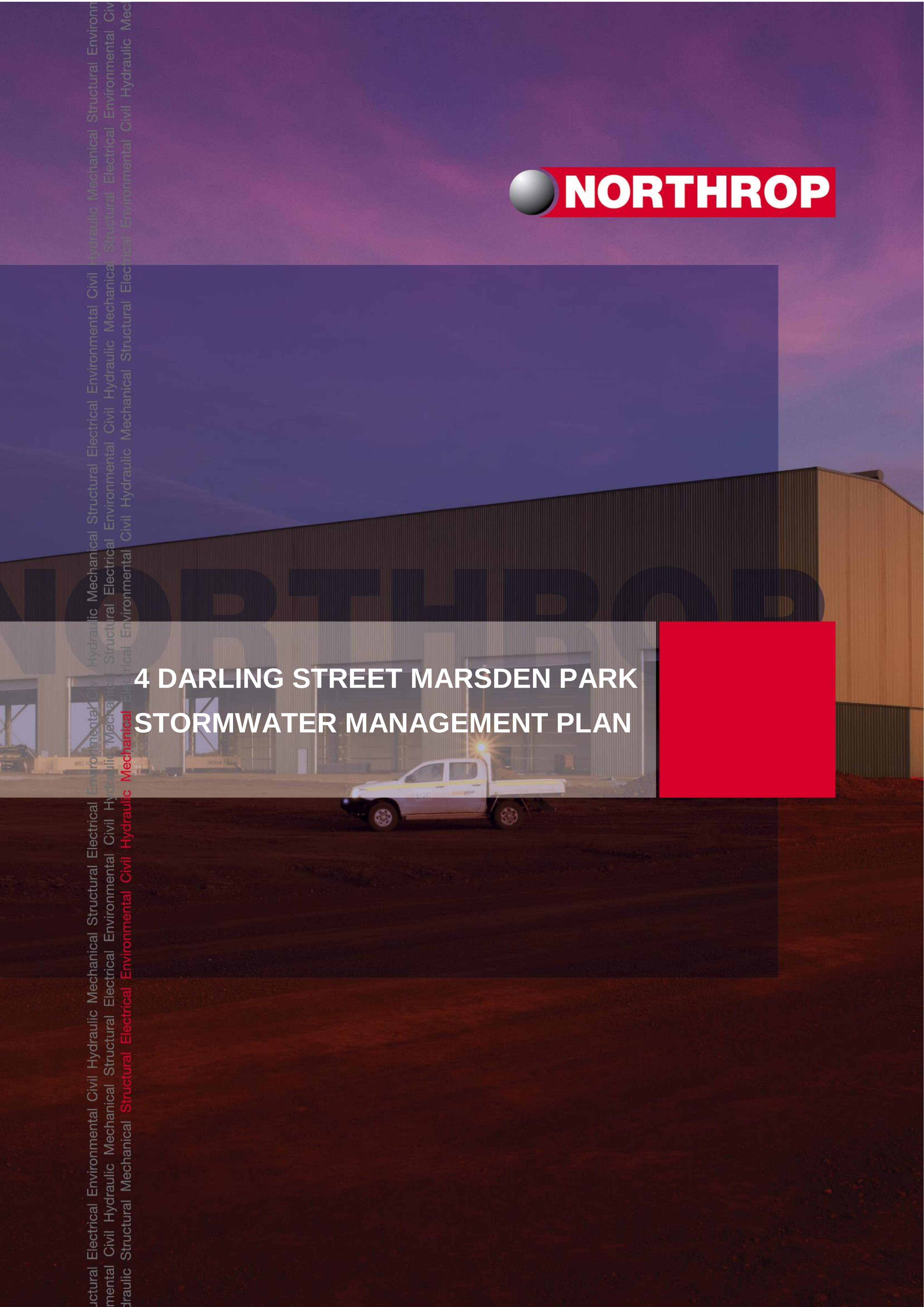

4 DARLING STREET MARSDEN PARK
STORMWATER MANAGEMENT PLAN

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Document Control

Prepared for	Sydney Business Park
Project Name	4 Darling Street, Marsden Park
File Reference	S172938-CR01-C
Date	28/03/18

Document Control

S172938-CR01–C Stormwater Management Strategy Report

Rev	Description	Prepared by	Reviewed by	Issue Date	Client App	Approval Date
A	Draft Issue	CP	SF	13.03.18		
B	Issued for Development Application	CP	SF	28.03.18		
C	Re-issued for Development Application	CP	SF	28.08.18		

Contents

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1. Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Sydney Business Park to prepare civil engineering design and documentation in support of a Development Application (DA) submission to Blacktown City (Council) for the proposed warehouse development at 4 Darling Street, Marsden Park (the site).

This report covers:

- Erosion and sediment control;
- Bulk earthworks;
- Stormwater quantity and quality management; and
- Water Sensitive Urban Design.

2. Related Reports and Documents

This report is to be read in conjunction with the following documents:

a. Development Application Documentation prepared by Northrop (refer Appendix A):
   - 172938-DAC01.01 Cover Sheet, Drawing Schedule and Locality Plan;
   - 172938-DAC02.01 Concept Sediment and Soil Erosion Control Plan;
   - 172938-DAC02.11 Sediment and Soil Erosion Control Details;
   - 172938-DAC03.01 Bulk Earthworks Cut and Fill Plan;
   - 172938-DAC04.01 Siteworks and Stormwater Management Plan – Sheet 01;
   - 172938-DAC04.02 Siteworks and Stormwater Management Plan – Sheet 02;
   - 172938-DAC04.03 Siteworks and Stormwater Management Plan – Sheet 03;
   - 172938-DAC04.04 Siteworks and Stormwater Management Plan – Sheet 04;
   - 172938-DAC05.11 Stormwater Longitudinal Section – Sheet 01;
   - 172938-DAC05.12 Stormwater Longitudinal Section – Sheet 02;
   - 172938-DAC05.13 Stormwater Longitudinal Section – Sheet 03;
   - 172938-DAC05.14 Stormwater Longitudinal Section – Sheet 04;
   - 172938-DAC05.15 Stormwater Longitudinal Section – Sheet 05;
   - 172938-DAC05.20 Stormwater Analysis Results;
   - 172938-DAC08.01 Catchment Plan;
   - 172938-DAC09.01 Typical Details – Sheet 01.
b. Marsden Park Industrial Precinct – Post Exhibition Water Cycle Management Strategy Report prepared by J. Wyndham Prince, 2011;
c. Road, Drainage and Basin Design: Marsden Park Industrial Stage 1.02B, prepared by Calibre;
d. NSW Department of Housing Manual – Managing Urban Stormwater Soil & Construction 2004; and
e. Developer Handbook for Water Sensitive Urban Design prepared by Blacktown City Council 2013.

3. The Development Site

3.1. Site Description

Sydney Business Park is situated on the western side of Bells Creek between South Street and Castlereagh Freeway, which separates it from the suburbs of Hassall Grove and Bidwill. The subject site is within Blacktown City Council local government area and is part of the Marsden Park Industrial Precinct in the North West Growth Centre as presented in Figure 1.

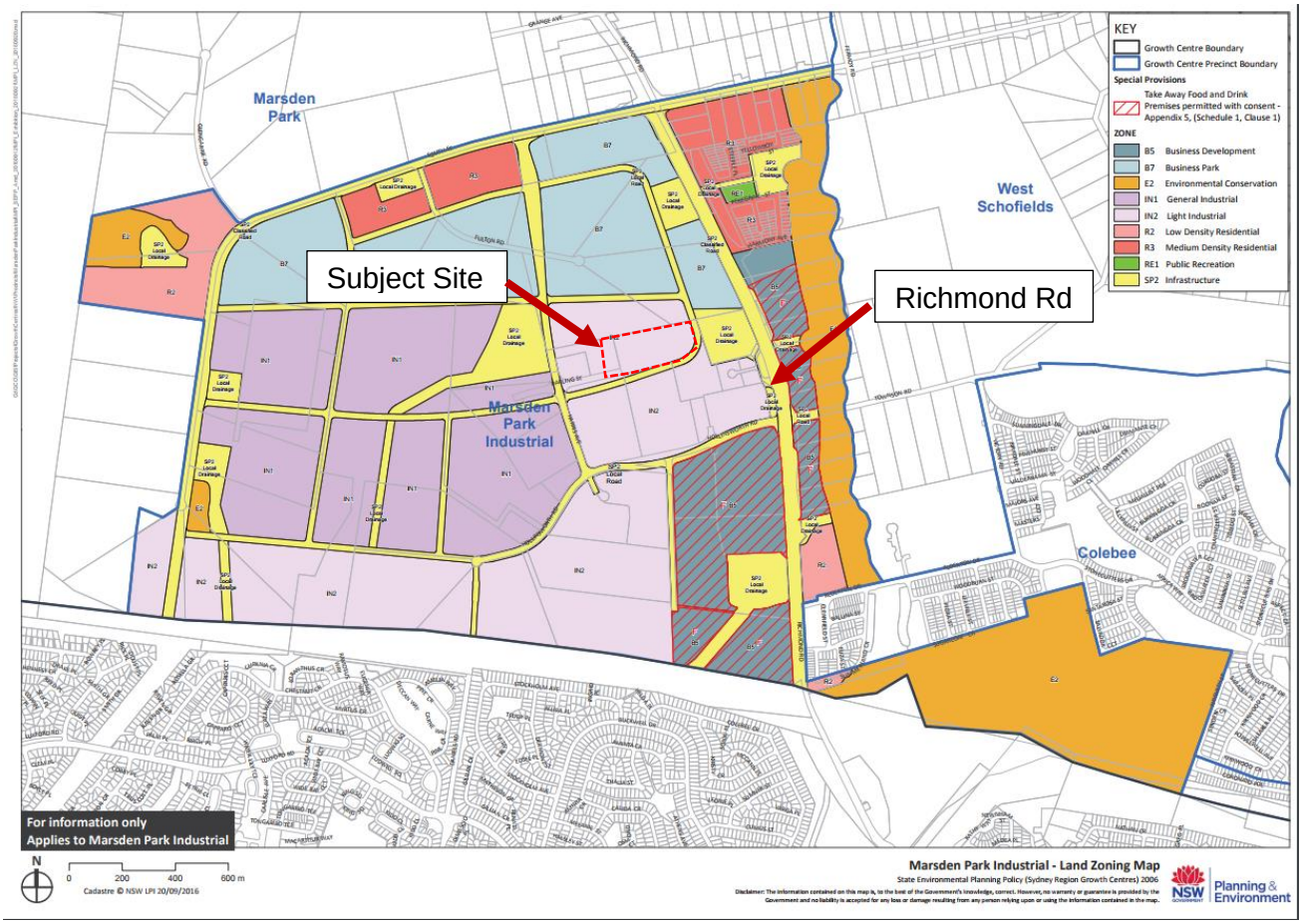

Figure 1 - Site Locality (Department of Planning and Infrastructure, 2013)

The site occupies approximately 5.72 hectares and is situated:

- West of Richmond Road;
- Near an existing regional on-site detention basin to the south east; and
- Adjacent to a vacant lot to the north, and a commercial development to the west.

Figure 2 - Site Plan (NEARMAP, 2018)

3.2. Proposed Development

The proposed development involves construction of a warehouse with associated office, loading dock, truck turning areas, car parking, a separate showroom building and landscape areas.

Refer to the architectural drawings prepared by Reid Campbell and Northrop's civil drawing package for more detailed site description.

The site currently falls to the south east corner. A portion of the site falls to the north. All surface runoff will be directed to the southern and eastern boundary. Stormwater runoff will be collected by a below ground pit and pipe stormwater drainage network.

The development will comprise of roof catchments, hardstand catchments (car parking, loading dock and driveways) and landscaped areas. A portion of the roof catchment will be directed to a rainwater reuse tank. Any overflow from the rainwater tank will be discharged to the pit and pipe network. The rainwater tank will pre-treat captured runoff. Gross pollutant and coarse sediment traps at each surface inlet pit will provide pre-treatment to runoff from paved areas. Prior to discharging to Council's stormwater drainage network all surface runoff will be treated by a proprietary filtration system which is located at the downstream end of the drainage system.

On-site stormwater detention is not provided within the site. Stormwater quantity control is provided by a regional on-site detention basin located south east of the site.

4. Erosion and Sediment Control

Erosion and sedimentation control has been designed in accordance with Council requirements and the NSW Department of Housing Manual, “Managing Urban Stormwater Soil & Construction” 2004 prior to any earthworks commencing on site. The concept sediment and erosion control measures are documented in Northrop’s Development Application drawing 172938-DAC02.01.

4.1. Sediment Basin

A sediment basin has been designed to capture site runoff during construction and has been located towards the eastern side of the site, in the lowest point. The construction of the basin will be done in stages to enable maximum runoff capture assisted by the diversion of swales to capture and direct runoff to the basins.

Calculations to determine concept design basin sizes have been based on available geotechnical information regarding soil types and through the use of the Soils and Construction Volume 1 Manual.

To ensure the sediment basins are working effectively they are to be maintained throughout the construction works. Maintenance includes water removal by pumping to reach the minimum storage volume at the lower level of the settling zone. The settling zone will be identified by pegs to clearly show the level at which design storage capacity is available.

The pumped water from the sediment basins will be reused to irrigate areas of hydro-mulch and for dust control during construction.

Weirs are to be provided to control overflow for rainfall events in excess of the 100 year ARI storm event.

Below is the concept sediment basin sizing table.

Table 1 - Concept Sediment Basin Volumes

Basin	Catchment Area (Ha)	Volume Required (m^3)	Volume Provided (m^3)
South East	5.71	1228.57	1230

4.2. Construction Measures

Prior to any earthworks commencing, erosion and sediment control measures will have to be implemented in accordance with the approved drawings. The measures shown on the drawings describe the minimum treatment requirements. The contractor will be required to modify the erosion and sedimentation control measures to suit the construction program, sequencing and techniques. Erosion and sediment control measures include:

- A fence around the site.
- A security fence surrounding the site office area and the proposed sediment basins;
- Sediment fencing downstream of all disturbed areas, and any topsoil stockpiles;
- Installation of silt arrestors to collect site runoff and retain suspended particles;
- Dust control measures which includes covering stockpiles, maintain site fences and watering exposed areas;
- Placement of hay bales or mesh and gravel filters along proposed catch drains and around stormwater inlets pits; and
- The construction of temporary sediment basins as noted above in Section 4.1

5. Bulk Earthworks

The proposed works will consist of earthworks cut and fill operations to establish design levels. The levels have been designed to optimise cut to fill across the site and minimise the need to import or export material from the site. The existing site has a natural fall which runs throughout the site from North West side to the Eastern side. The majority of the cut will come from western side and used to fill the eastern side. This is represented on Northrop's Bulk Earthworks Drawing 172938-DAC03.01.

The bulk earthworks quantities are summarised in Table 2.

Table 2 - Concept Earthworks Volumes

Earthworks	Volume (m^3)
Cut	27,509
Fill	28,804
Balance	1,295 Import

Any stockpiled material, including topsoil, shall be located as far away as possible from any associated natural watercourses. Sediment Fences shall be installed on the downstream side of stockpiles and the embankment formation. All stockpiles and embankment formations shall be stabilised by hydro-seeding or hydro-mulching on formation.

The bulk earthworks cut/fill volumes provided are conceptual only and are subject to change pending final coordination and detailed design. It should be noted the above mentioned cut/fill operations have been calculated based on the following assumptions.

- No allowance for soil bulking factors;
- No allowance for spoil generated from utility service and stormwater drainage trenching;
- No allowance for spoil generated from water quality media; and
- A 330mm pavement depth

5.1. Construction Sequence

Bulk earthworks sequencing is as follows:

- Provision of site erosion and sediment control measures outlined in Section 4;
- Clearing of vegetation from the development site. Cleared vegetation will be either removed from site or mulched;
- Stripping and stockpiling of topsoil suitable for reuse;
- Inspection of exposed underlying material to ensure conformity with design assumptions and requirements;
- Placement of fill in layers not greater than 200mm in thickness and compacted to not less than 98% Standard Maximum Dry Density (SMDD) in accordance with the geotechnical report; and
- Spread topsoil to a maximum depth of 200mm and hydro-seed or hydro-mulch disturbed areas.

6. Stormwater Management Objectives and Controls

6.1. Development Control Plan Objectives

The stormwater management strategy for Sydney Business Park has been developed in accordance with the Water Sensitive Urban Design and Integrated Water Cycle Management, prepared by Blacktown City Council.

Blacktown City Council Integrated Water Cycle Management DCP (Ref. 6) states the following objectives:

(a) Protect and enhance natural watercourses and their associated ecosystems and ecological processes
(b) Minimise potable water demand and wastewater generation
(c) Minimise stream erosion by matching the post development runoff regime to the pre development or natural water runoff regime
(d) Mitigate the impacts of development on water quality and quantity;
(e) Mitigate the impacts of development on groundwater, particularly in saline groundwater environments;
(f) Ensure any changes to the existing groundwater regime do not adversely impact upon any other properties and the environment;
(g) Integrate water cycle management measures into the landscape and urban design to maximise amenity;
(h) Minimise the potential impacts of development and other associated activities on the aesthetic, recreational and ecological values of receiving waters;
(i) Minimise soil erosion and sedimentation resulting from site disturbing activities;
(j) Ensure the principles of ecologically sustainable development are applied in consideration of economic, social and environmental values in water cycle management.

The stormwater quantity and quality management for the subject site have been developed at a precinct planning level outlined in the “Marsden Park Industrial Precent- Post Exhibition Water Cycle Management Strategy Report” (J. Wyndham Prince, Feb 2011).

6.2. Stormwater Management Controls

Marsden Park Industrial Precent- Post Exhibition Water Cycle Management Strategy Report states that the sites catchment area will drain into the regional Basin I to ensure that peak post development discharges are restricted to pre development discharges and that the quality of the post development stormwater discharges meet the requirements of the NSW Department of Planning and Blacktown City Council.

A water quality treatment strategy proposed for the site has been designed to achieve the objectives (stated above) and controls as outlined below:

Controls are as follows:

- Rainwater tanks on each allotment, installed during building construction;
- Proprietary GPT units upstream of each stormwater discharge point to trunk drainage channels;
- On-lot water quality devices for commercial/industrial and medium/high density residential catchments;

- Precinct based bio-retention/filtration raingarden systems.

Stormwater quantity and quality management measures will be discussed in sections 7 and 8 of this report respectively.

7. Stormwater Quantity Management

7.1. Existing Catchment

The existing catchment for 4 Darling Street is approximately 5.64ha in size and is within the Bells Creek catchment area. The area generally drains from the West to East, with the site low point located in the south-eastern corner. The run off from the site area drains towards the regional Basin I which will discharge to culverts under Richmond Road and into tributaries of Bells Creek.

Figure 3 below shows the pre-development catchment plan for Sydney Business Park area.

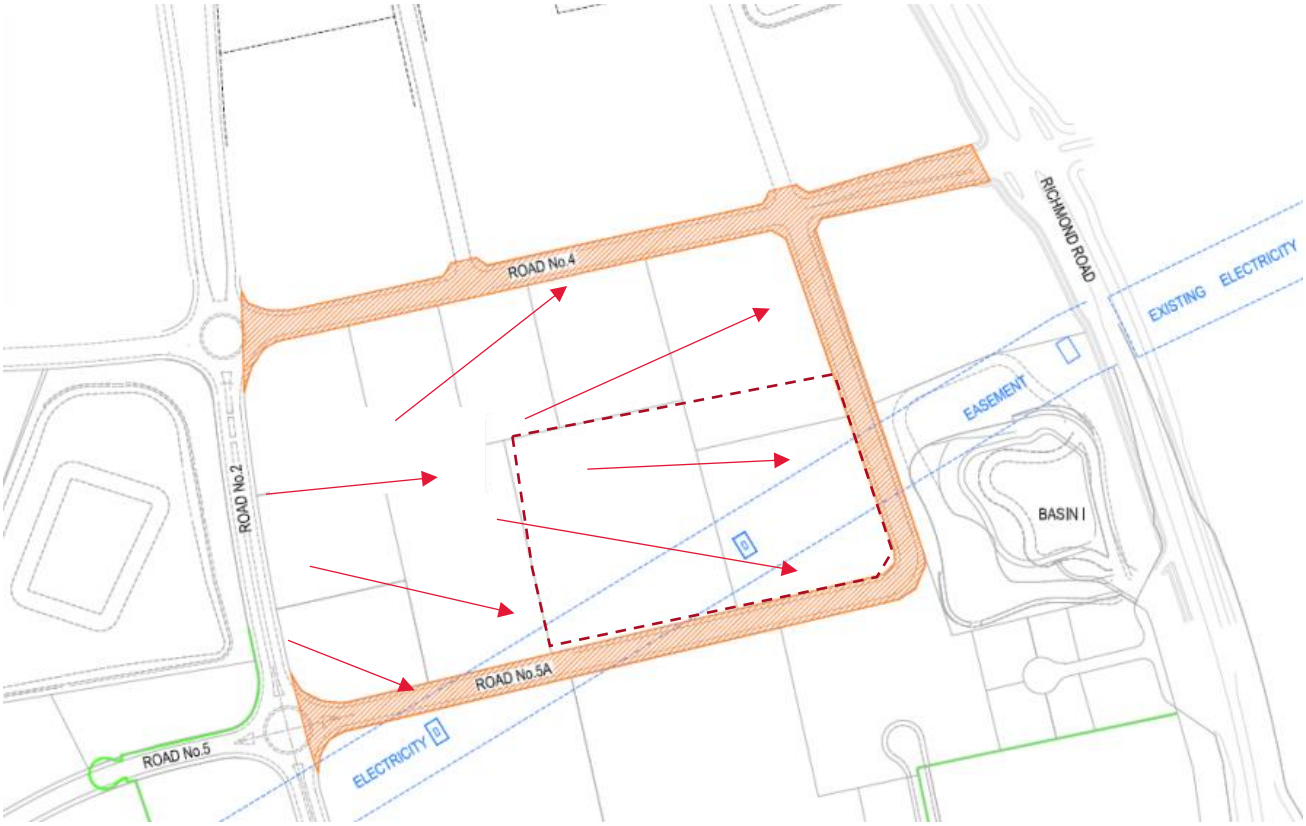

Figure 3 - Pre-Development Catchment Plan

Permissible site discharge rates (PSD) for each storm event were not calculated as the proposed Basin I is designed to restrict post development peak discharges from the site, to predevelopment levels for the 5 year and 100 year ARI storms events.

7.2. Stormwater Quantity Management Strategy

The stormwater quantity management strategy has been designed so that the run off from the various catchments will discharge to the external (road) stormwater drainage network, which discharges into the precinct based detention basin.

The site has been divided into catchments which can be referred in Figure 4.

Figure 4 - Catchment Areas

7.3. Hydrological Modelling

The Hydrology of the existing catchment and bio-retention raingarden sizes were modelled using DRAINS software. The existing slopes of the catchments were calculated based on site survey prepared by Freeburn Surveying (refer Appendix B).

In order to initialise the DRAINS model tail water levels were adopted from the hydraulic grade levels as documented in the construction certificate documentation for Marsden Park Stage 1.02B by Calibre Consulting.

A stormwater analysis of the network drainage system for a 20 and 100 year ARI indicated the Flow Depth and Velocity were all in accordance with council requirements. Refer to DRAINS Model and Longsection Results Drawing DAC05.11 to DAC05.15.

A gutter flow with analysis was prepared to support the modification of two existing pits that are located within the south-western driveway for the development. The proposed stormwater strategy includes converting these kerb inlet pits to v-grate pits and introducing kerb inlet pits downstream of the driveway. The flow width analysis results are included in Table 3 below and compare flow widths along the gutter under existing and proposed conditions. The existing conditions have been extracted from the construction certificate documentation for Marsden Park Stage 1.02B by Calibre Consulting.

Table 3 - Flow Width Analysis Results

Pit Number	Gutter Flow Width (m)	
	Existing	Proposed
Existing pit - 11/2 (as documented by Calibre)	1.61	0.78
Existing pit - 11/3 (as documented by Calibre)	1.78	1.01
Existing pit - 11/4 (as documented by Calibre)	1.76	1.27
Existing pit - 11/5 (as documented by Calibre)	1.94	1.55

8. Stormwater Quality Management

8.1. Adopted Water Quality Objectives

The main objectives for stormwater quality are indicated in Developer Handbook for Water Sensitive Urban Design V1.1 November 2013 and are presented in Table 4 below:

Table 4 - Water Quality Targets

Pollutant	% Reduction Post-Development Average Annual Load Reduction
Gross Pollutants	90
Total Suspended Solids (TSS)	85
Total Phosphorous (TP)	65
Total Nitrogen (TN)	45

8.2. Stormwater Quality Management Scheme

The first stage of the stormwater treatment train is pit inlet filter baskets (trash baskets). The filter baskets will provide pre-treatment by capturing gross pollutants and the coarser suspended solids. The secondary treatment is provided by proprietary filter cartridges and will remove nutrients such as nitrogen and phosphorous.

8.3. Rainwater Tanks

The rainwater tank will collect approximately one third of the roof water from the development which will pass through a first flush system prior to capture. The rainwater tank will be located adjacent beneath the carpark and incorporate a 100 year overflow to the external stormwater drainage network.

The collected water will be used for toilet flushing and landscape irrigation only. The tank will be equipped with the following:

- Solid access lid and step irons;
- High level overflow to external stormwater drainage network;
- Duty and standby pump configured for alternative operation;
- Mains water top-up; and
- Associated float valves and control panels.

A water balance model was created to determine the reduction in runoff days as a result of the rainwater tank. The following inputs were adopted:

- Rainfall and catchment data as per parameters discussed above;
- Roof area draining to tank approximately = 8,000 m^2
- Initial tank volume = 230,000L.

The water usage was estimated using both Blacktown City Council's Developer Handbook for Water Sensitive Urban Design and Water by Design Draft Stormwater Harvesting Guidelines (by property type) guide.

- Development Type: Industrial Warehouse
- Total Roof Area: 8,000 m^2
- Total Bathrooms: 24
- Flushing Demand (kL/day/toilet): 0.1
- Total Average Daily Demand (kL/day): 2.4
- Total Landscape Area to be Irrigated by Rainwater Tank: 5,400 m^2
- Landscape Demand (kL/year/m^2): 0.4
- Total Average Daily Demand (kl/year): 2160

The results of the water balance model are shown in Figure 5 below.

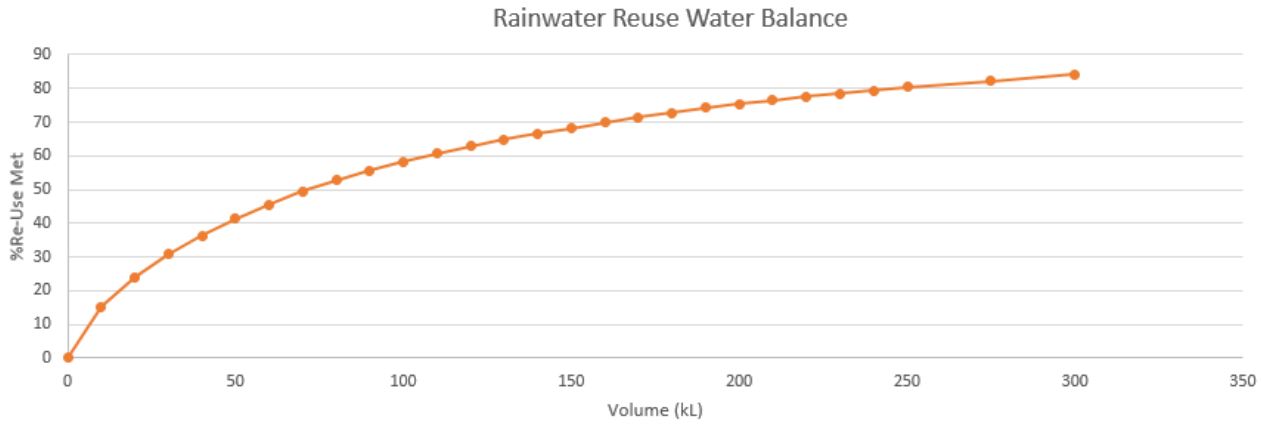

Figure 5 – Rainwater Reuse Graph

The results show that with a 230,000L tank the re-use demand met is 80.4%.

Due to the standard usage of non-potable water in the proposed development the 80% target required by Council is able to be achieved. The tank size has therefore been taken at a point where the demand/tank size relationship reaches 80% demand resulting in the 230,000L rainwater tank.

8.4. Rainfall Data

For the analysis of the MUSIC modelling, historical rainfall records were obtained from the Bureau of Meteorology for Station No. 067035 at Liverpool (Whitlam Centre). The MUSIC analysis was undertaken using a 6 min time step for year 1967 to 1976 of historical data.

The mean annual rainfall for the modelled data was 857mm.

The evapotranspiration values have been entered from the default data provided by the MUSIC software for the Sydney area.

8.5. Methodology

The water quality modelling software MUSIC v6 was used to analyse the performance of the treatment train. Figure 6 shows the MUSIC node and link diagram used to describe the proposed treatment train. The model has been built to assess the adequacy of the Stormwater treatment measure proposed and to ensure that the quality of stormwater meets the objectives prior to stormwater runoff leaving the site.

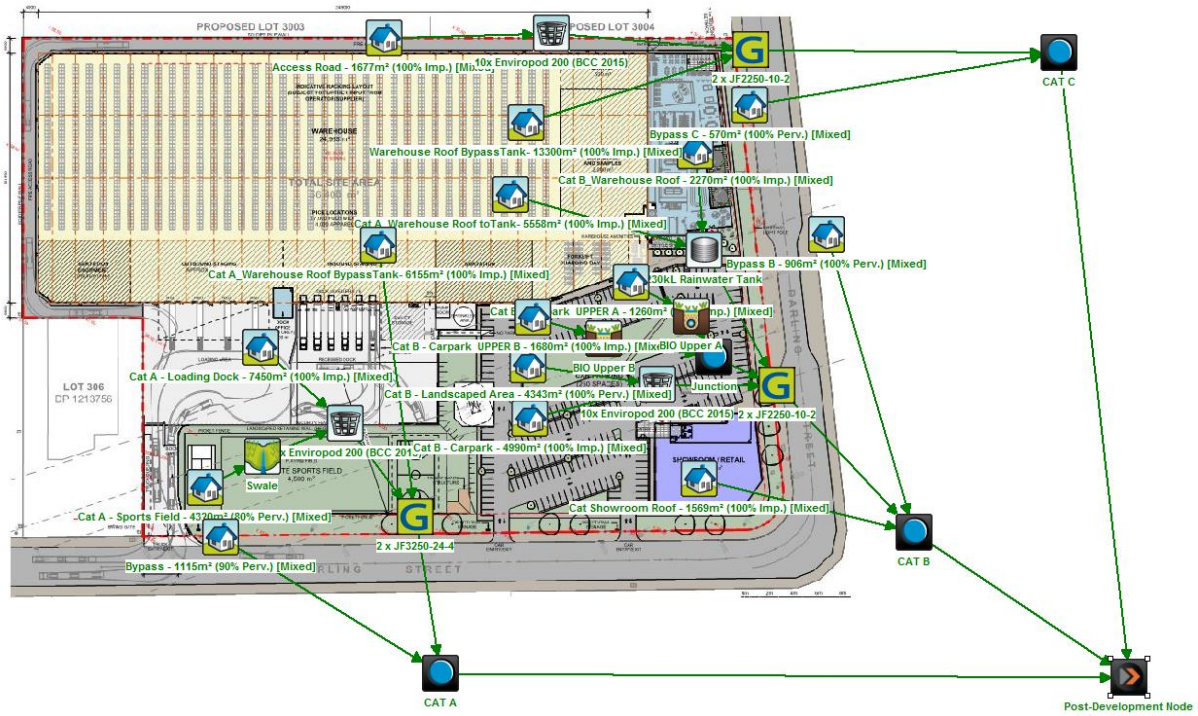

Figure 6 - MUSIC Link and Node Diagram

The following rainfall and runoff parameters shown in Table 5 have been utilised.

Table 5 - Rainfall Runoff Parameters

Parameter	Recommended Values
Rainfall Threshold (mm/day)	1.4
Soil Storage Capacity (mm)	170
Initial Storage (% of Capacity)	30
Field Capacity (mm)	70
Infiltration Capacity Coefficient – a	210
Infiltration Capacity Exponent – b	4.7
Initial Depth (mm)	10
Daily Recharge Rate (%)	50
Daily Base flow Rate (%)	4
Daily Deep Seepage Rate (%)	0

The pollutant concentration parameters used in the model were based on information provided in "Using MUSIC in Sydney's Drinking Water Catchment", Sydney Catchment Authority, 2012. The parameters are listed in table below:

Table 6 - Water Quality Parameters for MUSIC Source Nodes

Land- Use Category		Log TSS (mg/L)		Log TP (mg/L)		Log TN (mg/L)	
		Storm Flow	Base flow	Storm Flow	Base Flow	Storm Flow	Base Flow
Roof Areas	Mean	1.30	1.20	-0.89	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Road Areas	Mean	2.43	1.20	-0.30	-0.85	0.34	0.11
	Std Dev	0.32	0.17	0.25	019	0.19	0.12
Other Impervious Areas	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Pervious Areas	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12

8.6. Model Results

The results of the analysis showed the treatment train will achieve the water quality targets set out in Council's DCP. Table 7 below displays the effectiveness of the treatment train for the primary and secondary treatment.

The water quality model created using MUSIC software provides an indication of the pollutant removal rates expected when a treatment train of water quality measures is applied to the proposed layout of the development.

Table 7 - MUSIC Model Results

Pollutant	Before Treatment	After Treatment	% Reduction	% Objective	Compliance
Total Suspended Solids (kg/yr)	6800	621	90.9	85	OK
Total Phosphorus (kg/yr)	12.6	3.92	68.9	65	OK
Total Nitrogen (kg/yr)	81.2	35.2	56.6	45	OK
Gross Pollutants (kg/yr)	905	67.3	92.6	90	OK

8.7. Proposed Stormwater Treatment Train

In order to achieve the reduction targets the following treatment devices are required as part of the treatment train:

- Jellyfish Stormwater treatment

A total of six (6) cartridges, (2x) JF2250 and (2x) JF3250 are to be introduced to the design as a major filter device located at the end of the treatment train to treat all sub-catchments. This stormwater quality treatment technology incorporates a pre-treatment with light-weight membrane filtration and removes a high level and a wide variety of stormwater pollutants. The capture rates provided by the TARP- Field Study, 2012 and MRDC Floatables Testing, 2008:

  - TSS 89%
  - TN 51%
  - TP 59%
  - Litter 99%

- Bio-Swales

Bio Retention Swales (Bio-Swales) will act as secondary treatment for stormwater by detaining flows and promoting sedimentation. The media beds of the bio – retention system will be designed to 500mm deep with an average particle size of 0.5 mm and a hydraulic conductivity of 100 mm/hr with a minimum depth of storage above the media of 150mm. Direct filtration of particulate matter and nutrient stripping by bio films are established within the media bed and gravel layer.

The expected sediment and nutrient removal performance of the bio - retention systems was determined using the default parameters and equations provided in the MUSIC Blacktown City Council Nodes. Water quality reduction mechanisms in MUSIC are based on an exponential decay equation

- Stormwater360 Enviropod 200 Inserts

Enviropod 200 inserts will be used as a pre-treatment for stormwater runoff to capture litter and coarse sediment surface flows on the site. Enviropod inserts are to be installed on all surface inlet pits across the site. The following capture rates have been adopted for the MUSIC model, based on information provided by Stormwater360:

  - TSS 54%
  - TN 21%
  - TP 30%
  - Litter 100%

- 230kL Rainwater Tank

A 230kL rainwater tank will be implemented to capture stormwater runoff generated off the roof. The collected rainwater will be used for irrigation of the landscaped areas across the site and for toilet flushing.

8.8. Stream Erosion Index

As per Councils Development Control Plan 2015, Part J, Section 4.4, the development ensures that post development duration of stream forming flows are no greater than 3.5 times the pre-developed duration of stream forming flows.

Calculations of the Stream Erosion Index (SEI) have been completed as per Council's Developer Handbook for Water Sensitive Urban Design, adopted from the Draft NSW MUSIC Modelling Guide (Aug 2010). MUSIC v6 software has been used to estimate the SEI.

Estimating the critical flow

Step 1

$$t_c = 0.76A^{0.38} \qquad (A(km^2 = Ha/100), t_c(hour))$$

Total Area = 5.715 ha

$$t_c = 0.76 \times \frac{0.05715^{0.38}}{100}$$
$$t_c = 0.26\ hrs$$
$$t_c = 15.4\ mins$$

Step 2

With reference to the Rainfall Intensity Chart in the Engineering Guide for Development based on the 2 year ARI and calculated t_c in minutes.

$$I_2 = 64\ mm/hr$$

Step 3

$$C_2 = C_{10} \text{ x } FF_2$$

$$C_2 = 0.6 \times 0.74$$
$$C_2 = 0.444$$

Step 4

Rational Method

$$Q_2\left(\frac{m^3}{s}\right) = 0.278 \times C_2 \times I_2 \times \text{A}$$

$$Q_2\left(\frac{m^3}{s}\right) = 0.278 \times 0.444 \times 64 \times \frac{5.715}{100}$$

$$Q_2\left(\frac{m^3}{s}\right) = 0.452$$

Step 5

$$Q_{Crit}\left(\frac{m^3}{s}\right) = 0.25 \times 0.452$$

$$Q_{Crit}\left(\frac{m^3}{s}\right) = 0.113$$

Table 8 - SEI Flow Music Results

	Inflow Pre-development	Inflow Post-development
Flow (ML/yr)	1.76	5.40

Council's target for SEI is a value less than 3.5. The SEI for the development has been calculated using the following equation as per Council's guideline.

$$SEI = \sum(Q_{post} - Q_{critical}) \ / \ \sum(Q_{pre} - Q_{critical})$$

$$SEI = \frac{5.40 - 0.113}{1.76 - 0.113}$$

The resultant SEI for the proposed development **= 3.086**

After modelling, it was found that the Council's target for the SEI value less than 3.5 was achieved which demonstrates that the proposed waterway will be stable.

9. Conclusion

Based on investigations, analyses and designs, it is anticipated that there Blacktown City Council's stormwater quantity and quality measures will be met by the management measures proposed as part of the industrial development at 4 Darling Street, Marsden Park.

The Water Management Plan herein, proposes a series of individual elements arranged in a treatment train consisting of on-lot treatment, street level treatment and precinct based public domain infrastructure treatment measures. Suggested structural elements for the development include:

- Stormwater pit filter inserts
- Bio-Swales
- Proprietary filter cartridge systems downstream
- Rainwater reuse tank - 230,000L Tank.

The stormwater assessment report has been prepared to conform to the requirements of the Council's Growth Centre Precincts Development Control Plan (DCP) 2010 and Council's Engineering Guide for Development, 2005.

Appendix A – Civil Engineering Plans

4 DARLING STREET, MARSDEN PARK

CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

SOURCE : NEARMAP.COM.AU (©2018)

DRAWING SCHEDULE	
DRG No.	DRAWING TITLE
DAC01.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
DAC02.01	CONCEPT SEDIMENT AND SOIL EROSION CONTROL PLAN
DAC02.11	SEDIMENT AND SOIL EROSION CONTROL DETAILS
DAC03.01	EARTHWORKS CUT AND FILL PLAN
DAC04.01	SITEWORKS AND STORMWATER MANAGEMENT PLAN – SHEET 01
DAC04.02	SITEWORKS AND STORMWATER MANAGEMENT PLAN – SHEET 02
DAC04.03	SITEWORKS AND STORMWATER MANAGEMENT PLAN – SHEET 03
DAC04.04	SITEWORKS AND STORMWATER MANAGEMENT PLAN – SHEET 04
DAC05.11	STORMWATER LONGITUDINAL SECTIONS – SHEET 1
DAC05.12	STORMWATER LONGITUDINAL SECTIONS – SHEET 2
DAC05.13	STORMWATER LONGITUDINAL SECTIONS – SHEET 3
DAC05.14	STORMWATER LONGITUDINAL SECTIONS – SHEET 4
DAC05.15	STORMWATER LONGITUDINAL SECTIONS – SHEET 5
DAC05.20	STORMWATER ANALYSIS RESULTS
DAC06.01	BOUNDARY ALIGNMENT PLAN
DAC06.11	BOUNDARY LONGITUDINAL SECTION – SHEET 1
DAC06.12	BOUNDARY LONGITUDINAL SECTION – SHEET 2
DAC06.13	BOUNDARY LONGITUDINAL SECTION – SHEET 3
DAC08.01	CATCHMENT PLAN
DAC09.01	TYPICAL DETAILS – SHEET 01

DRAWN: C. PASKE DESIGNED: M. SANTIAGO JOB MANAGER: J. GILLIGAN VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18

CLIENT: sydney business park

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Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: **4 DARLING STREET, MARSDEN PARK**

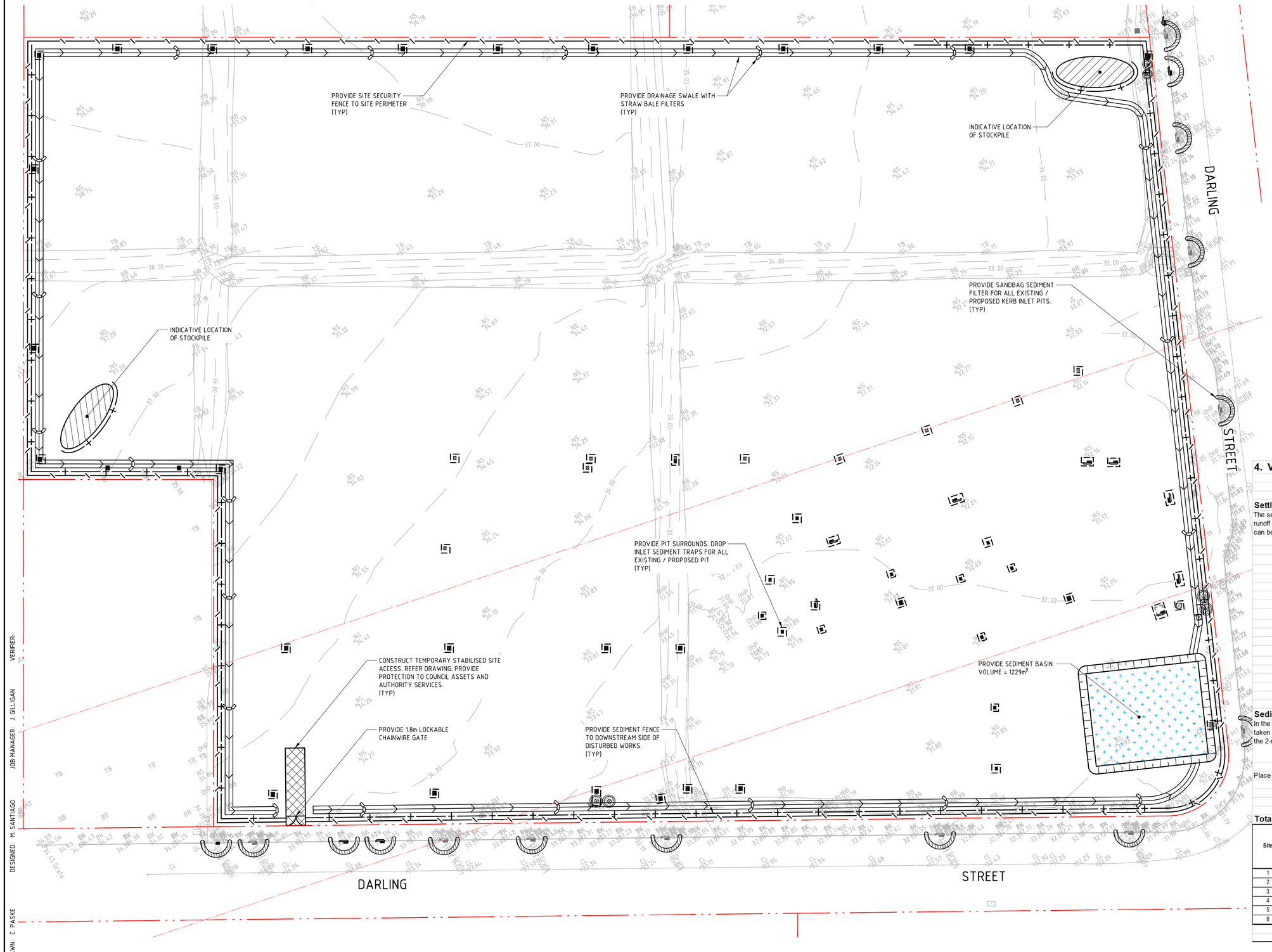
DRAWING TITLE: **CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION**

COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN

JOB NUMBER: **172938**

DRAWING NUMBER: **DAC01.01** REVISION: **02**

DRAWING SHEET SIZE = A1



LEGEND

- BOUNDARY LINE
- EASEMENT LINE
- E-OH — EASEMENT LINE
- EXISTING CONTOURS
- SEDIMENT FENCE
- SECURITY FENCE
- WIRE MESH AND GRAVEL SEDIMENT FILTER
- STRAW BALE FILTER
- DROP INLET SEDIMENT TRAP
- DRAINAGE SWALE
- STABILISED SITE ACCESS
- STOCKPILE
- SEDIMENT BASIN

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's s

$$V = 10 \times C_v \times A \times R_{x\text{-day, y-\%ile}} \ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day, y-\%ile}}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Sectio

Place an "X" in the box below to show the sediment storage zone design parameters used here:

	50% of settling zone capacity.
X	2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day, y-\%ile}}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.65	32.2	5.641	1171.57929	57	1228.57929
2						
3						
4						
5						
6						

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18

DESIGNED: M. SANTIAGO
DRAWN: C. PASKE
JOB MANAGER: J. GILLIGAN
VERIFIER:

CLIENT: sydney business park
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: REIDCAMPBELL

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
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SCALE 1:500@ A1 (0 5 10 15 20 25m)

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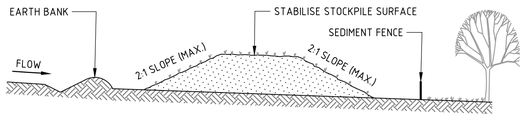
PROJECT: 4 DARLING STREET, MARSDEN PARK

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION
CONCEPT SEDIMENT AND SOIL EROSION CONTROL PLAN

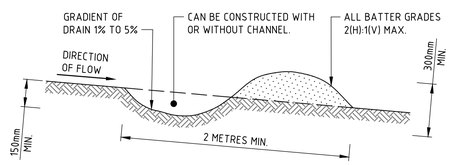
JOB NUMBER: 172938
DRAWING NUMBER: DAC02.01
REVISION: 02
DRAWING SHEET SIZE = A1



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

STOCKPILES

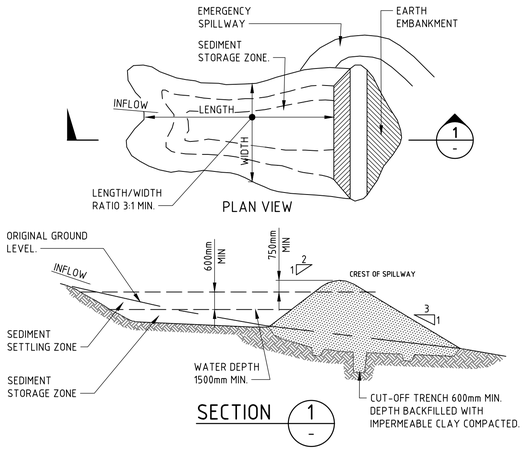


CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

NOTE: ONLY TO BE USED AS TEMPORARY BANK
WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

EARTH BANK - LOW FLOW (DRAINAGE SWALE)

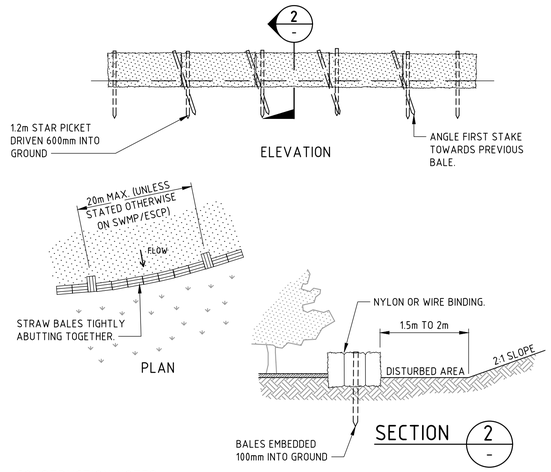


CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

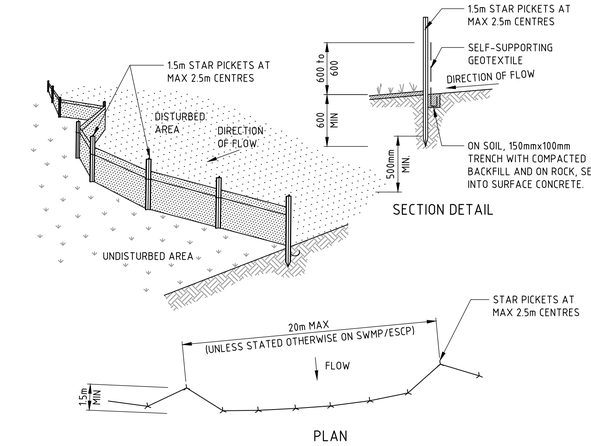
SEDIMENT BASIN



CONSTRUCTION NOTES

1. CONSTRUCT THE STRAW BALE FILTER AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE.
2. PLACE BALES LENGTHWISE IN A ROW WITH ENDS TIGHTLY ABUTTING. USE STRAW TO FILL ANY GAPS BETWEEN BALES. STRAWS ARE TO BE PLACED PARALLEL TO GROUND.
3. ENSURE THAT THE MAXIMUM HEIGHT OF THE FILTER IS ONE BALE.
4. EMBED EACH BALE IN THE GROUND 75mm TO 100mm AND ANCHOR WITH TWO 1.2 METRE STAR PICKETS OR STAKES. ANGLE THE FIRST STAR PICKET OR STAKE IN EACH BALE TOWARDS THE PREVIOUSLY LAID BALE. DRIVE THEM 600mm INTO THE GROUND AND, IF POSSIBLE, FLUSH WITH THE TOP OF THE BALES. WHERE STAR PICKETS ARE USED AND THEY PROTRUDE ABOVE THE BALES, ENSURE THEY ARE FITTED WITH SAFETY CAPS.
5. WHERE A STRAW BALE FILTER IS CONSTRUCTED DOWNSLOPE FROM A DISTURBED BATTER, ENSURE THE BALES ARE PLACED 1 TO 2 METRES DOWNSLOPE FROM THE TOE.
6. ESTABLISH A MAINTENANCE PROGRAM THAT ENSURES THE INTEGRITY OF THE BALES IS RETAINED - THEY COULD REQUIRE REPLACEMENT EACH TWO TO FOUR MONTHS.

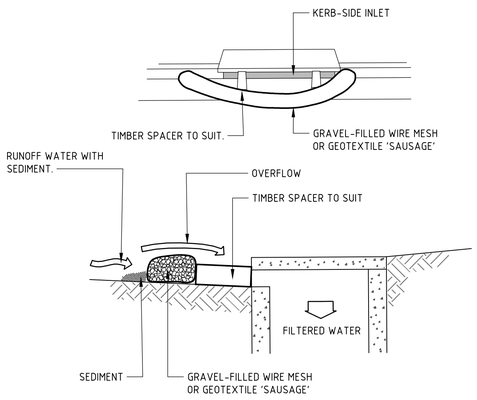
STRAW BALE FILTER



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE

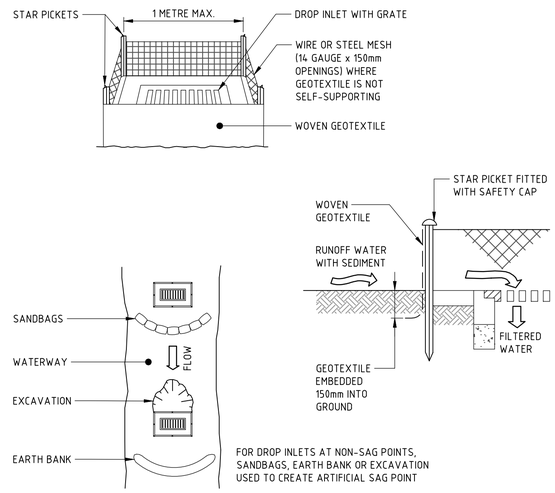


NOTE:THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN APPROVED SWMP/ESCP.

CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

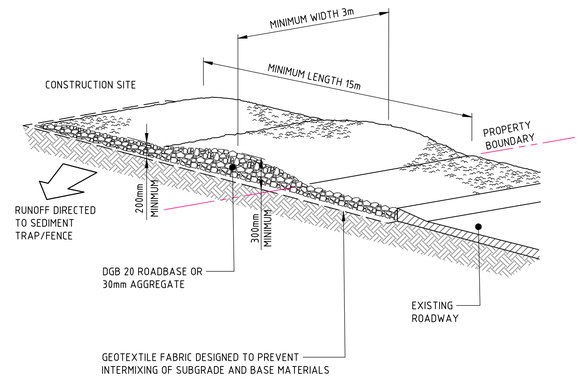
MESH AND GRAVEL INLET FILTER



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS

DESIGNED: M. SANTIAGO
DRAWN: C. PASKE
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18

CLIENT: sydney business park
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: REIDCAMPBELL

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NOT TO SCALE

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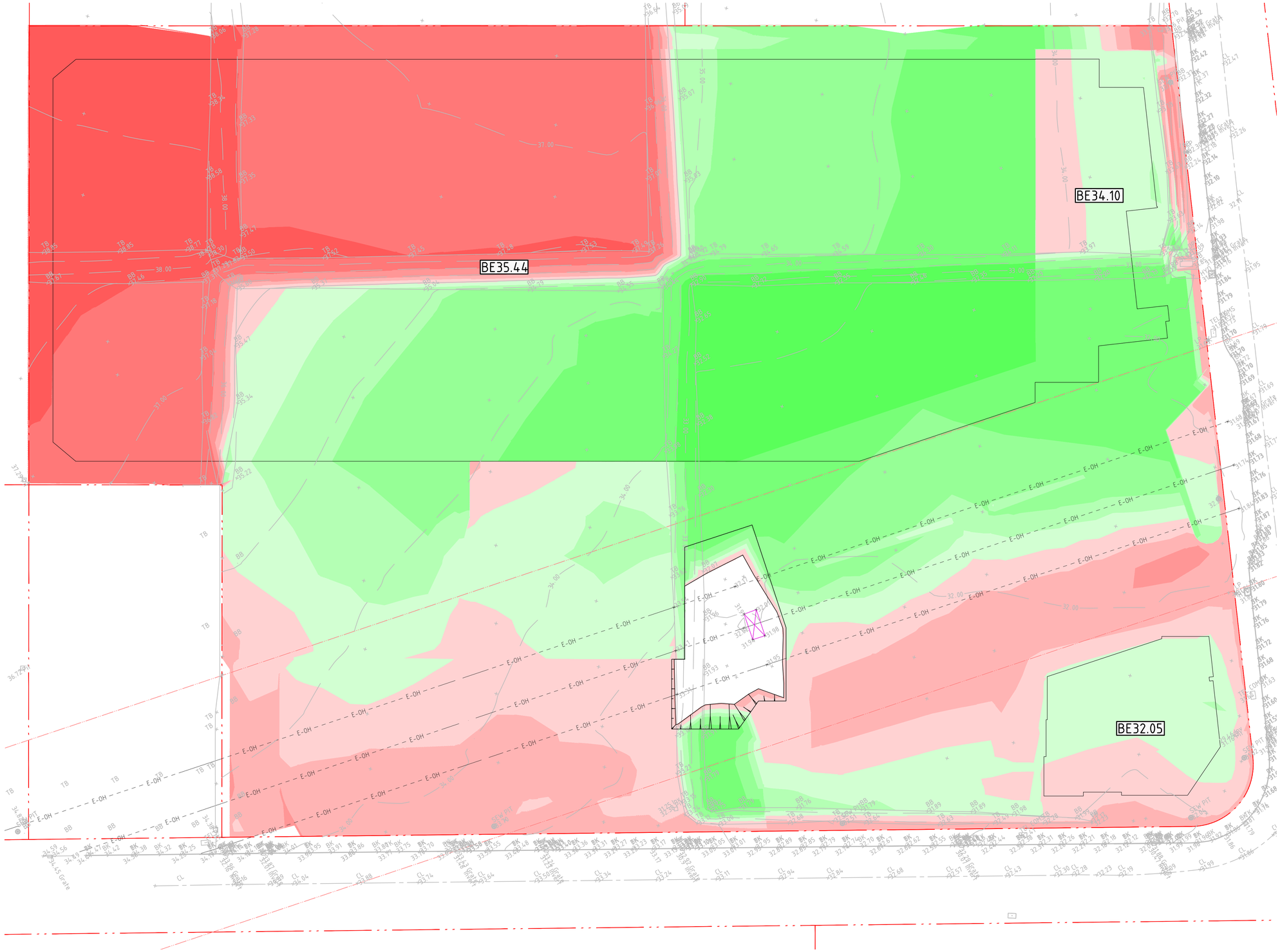
PROJECT: **4 DARLING STREET, MARSDEN PARK**

DRAWING TITLE: **CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION**

SEDIMENT AND SOIL EROSION CONTROL DETAILS

JOB NUMBER: **172938**
DRAWING NUMBER: **DAC02.11**
REVISION: **02**
DRAWING SHEET SIZE = A1



LEGEND

- BOUNDARY LINE
- EASEMENT LINE
- RL.XX.XX — BULK EARTWORKS SPOT HEIGHT
- BEXX.XX — BULK EARTHWORKS PAD LEVEL
- BATTERS
- XX.XX — CONTOURS

DEPTH OF CUT

- - 999m TO - 15.0m
- - 15.0m TO - 10.0m
- - 10.0m TO - 5.0m
- - 5.0m TO - 2.0m
- - 2.0m TO - 1.0m
- - 1.0m TO - 0.5m
- - 0.5m TO - 0.25m
- - 0.25m TO - 0.0m

DEPTH OF FILL

- 0.0m TO 0.25m
- 0.25m TO 0.5m
- 0.5m TO 1.0m
- 1.0m TO 2.0m
- 2.0m TO 5.0m
- 5.0m TO 10.0m
- 10.0m TO 15.0m
- 15.0m TO 999m

LIMIT OF WORKS — LIMIT OF WORKS

DRAWN: C. PASKE
DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

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01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
03	ISSUED FOR INFORMATION	JO		TB	04.07.18
04	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT: sydney business park

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ARCHITECT: REIDCAMPBELL

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SCALE 1:800@A1 — 0 10 20 30 40m

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PROJECT: **4 DARLING STREET, MARSDEN PARK**

DRAWING TITLE: **CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION**

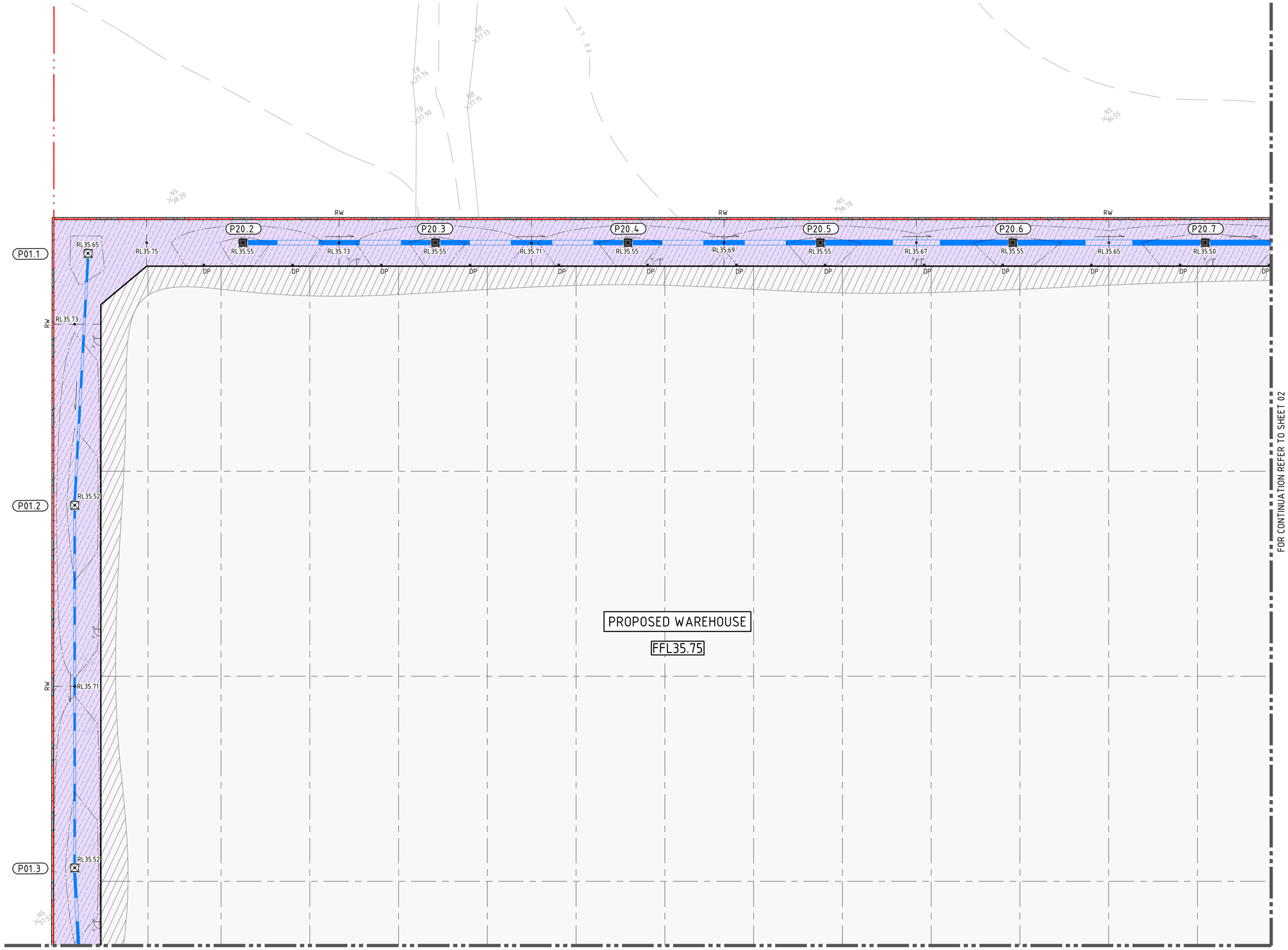
EARTHWORKS CUT AND FILL PLAN

JOB NUMBER: **172938**

DRAWING NUMBER: **DAC03.01**

REVISION: **04**

DRAWING SHEET SIZE = A1



LEGEND

- BOUNDARY LINE
- EASEMENT LINE
- E-OH — EXISTING OVERHEAD TRANSMISSION LINE
- EXISTING TRANSMISSION TOWER
- PROPOSED KERB
- SAWCUT AND PAVEMENT INFILL
- KO — KERB ONLY
- KG — KERB AND GUTTER
- RW — RETAINING WALL - TYPE 1
- eRW — EXISTING RETAINING WALL
- CE — CONCRETE EDGING
- CREST
- X.X — DIRECTION OF GRADE
- VC — VEHICULAR CROSSING
- KR — KERB RAMP
- WHEEL STOP
- •B — BOLLARD
- ⊘B — ANTI-RAM BOLLARD
- ✱ — KERB TAPER TO 0
- FFLXX.XX — PROPOSED FINISHED FLOOR LEVEL
- PROPOSED BATTERS
- • RLXX.XX — PROPOSED SPOT HEIGHT
- × eRLXX.XX — EXISTING SPOT HEIGHT
- XX.XX — PROPOSED CONTOURS
- EXISTING CONTOURS
- ⌀150 — PROPOSED STORMWATER PIPE
- SW — EXISTING STORMWATER PIPE
- GRATED INLET PIT (NEW / EXTG)
- KERB INLET PIT (NEW / EXTG)
- RWT — PROPOSED RAINWATER TANK
- WQT — PROPOSED WATER QUALITY TANK
- VEHICULAR CONCRETE PAVEMENT - TYPE '1'
- ASPHALT PAVEMENT - TYPE '2'
- CONCRETE PAVEMENT - TYPE '3'
- FIRE-TRAIL PAVEMENT - TYPE '4'
- LANDSCAPING

DRAWN: C. PASKE
DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

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03	ISSUED FOR INFORMATION	JO		TB	04.07.18
04	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
05	ISSUED FOR COUNCIL APPROVAL	CP		TB	28.08.18
06	RE-ISSUED FOR COUNCIL APPROVAL	CP		TB	29.08.18

CLIENT: sydney business park
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SCALE 1:250@ A1 — 0 2 4 6 8 10 12m

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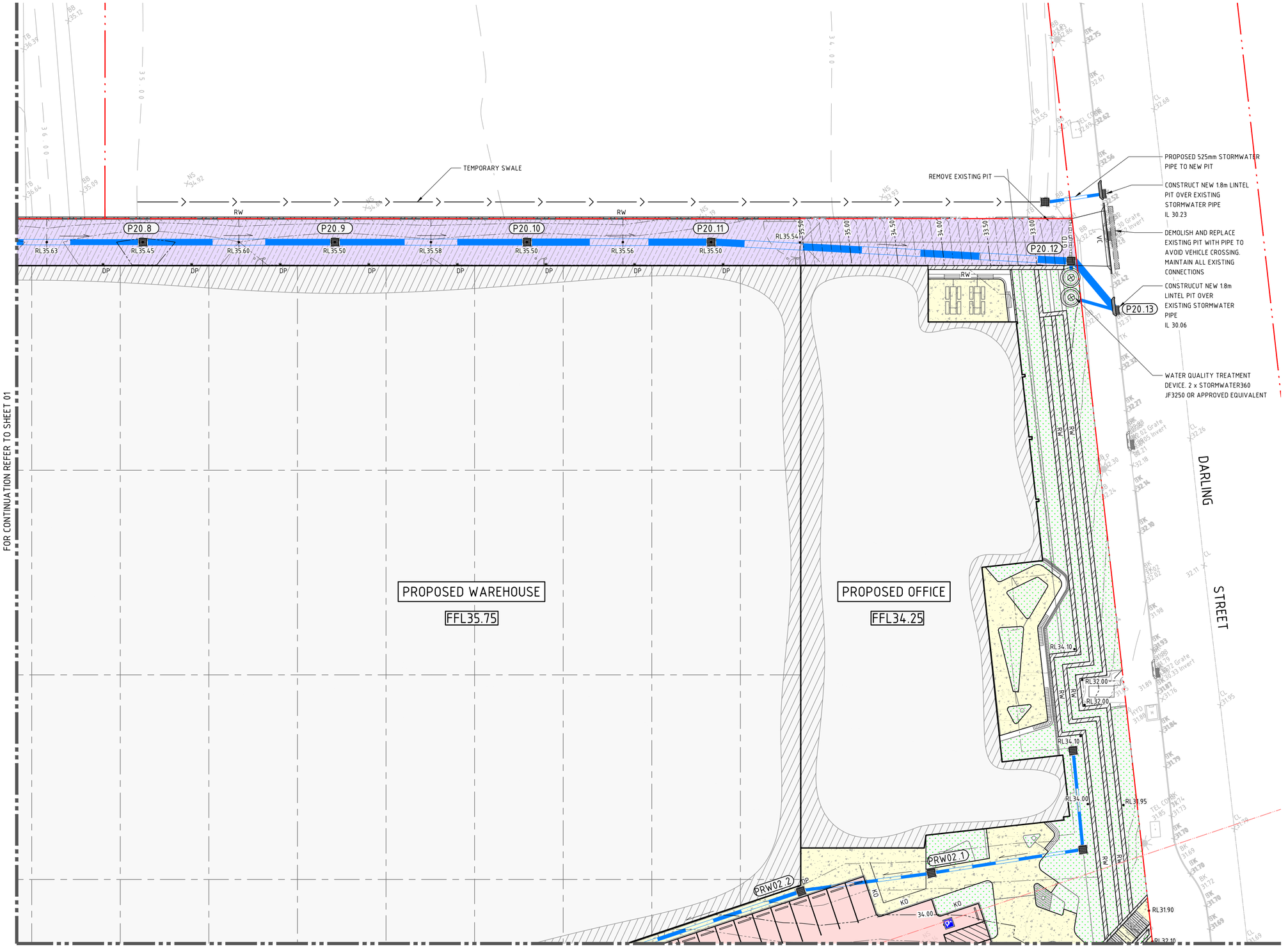
DRAWING TITLE: **CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION**

SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 01

JOB NUMBER: **172938**
DRAWING NUMBER: **DAC04.01**
REVISION: **06**
DRAWING SHEET SIZE = A1



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DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

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SCALE 1:250@ A1 — 0 2 4 6 8 10 12m

NORTHROP
Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: 4 DARLING STREET, MARSDEN PARK

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 02

JOB NUMBER: 172938
DRAWING NUMBER: DAC04.02
REVISION: 06
DRAWING SHEET SIZE = A1

FOR CONTINUATION REFER TO SHEET 01

PROPOSED WAREHOUSE

FFL35.75

"LOT 306"
DP 1213756
(EXISTING AUS REO SITE)

P01.4 P01.5 P01.6 P01.7 P01.8 P01.9 P01.10 P01.11

P05.1 P05.2

P02.1 P02.2

PRW01.1

P03.1 P03.2

PEX01.1 PEX01.2 PEX01.3 PEX01.4 PEX01.5 PEX01.6

DARLING STREET

DEMOLISH EXISTING KERB INLET PIT. REINSTATE PIPE

MATCH TO EXISTING VEHICLE CROSSING

REPLACE EXISTING KERB INLET PIT WITH HEAVY DUTY 'V-GRATE'

NEW 2.4m EKI PIT OVER EXISTING STORMWATER LINE. PIT IL 31.78

NEW 2.4m EKI PIT OVER EXISTING STORMWATER LINE. PIT IL 31.66

SPLITTER PIT TO DIRECT LOW FLOW (6 MONTH ARI) TO TREATMENT DEVICE

WATER QUALITY TREATMENT DEVICE. 2 x STORMWATER360 JF3250 OR APPROVED EQUIVALENT

FOR CONTINUATION REFER TO SHEET 04

LEGEND

- BOUNDARY LINE
- EASEMENT LINE
- E-OH — EXISTING OVERHEAD TRANSMISSION LINE
- EXISTING TRANSMISSION TOWER
- PROPOSED KERB
- SAWCUT AND PAVEMENT INFILL
- KO — KERB ONLY
- KG — KERB AND GUTTER
- RW — RETAINING WALL - TYPE 1
- eRW — EXISTING RETAINING WALL
- CE — CONCRETE EDGING
- CREST
- X.X — DIRECTION OF GRADE
- VC — VEHICULAR CROSSING
- KR — KERB RAMP
- WHEEL STOP
- B — BOLLARD
- ∅B — ANTI-RAM BOLLARD
- KERB TAPER TO 0
- FFLXX.XX — PROPOSED FINISHED FLOOR LEVEL
- PROPOSED BATTERS
- RLXX.XX — PROPOSED SPOT HEIGHT
- eRLXX.XX — EXISTING SPOT HEIGHT
- XX.XX — PROPOSED CONTOURS
- EXISTING CONTOURS
- ∅150 — PROPOSED STORMWATER PIPE
- SW — EXISTING STORMWATER PIPE
- GRATED INLET PIT (NEW / EXTG)
- KERB INLET PIT (NEW / EXTG)
- RWT — PROPOSED RAINWATER TANK
- WQT — PROPOSED WATER QUALITY TANK
- VEHICULAR CONCRETE PAVEMENT - TYPE '1'
- ASPHALT PAVEMENT - TYPE '2'
- CONCRETE PAVEMENT - TYPE '3'
- FIRE-TRAIL PAVEMENT - TYPE '4'
- LANDSCAPING

DRAWN: C. PASKE
DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
03	ISSUED FOR INFORMATION	JO		TB	04.07.18
04	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
05	ISSUED FOR COUNCIL APPROVAL	CP		TB	28.08.18
06	RE-ISSUED FOR COUNCIL APPROVAL	CP		TB	29.08.18

CLIENT: sydney business park

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: REIDCAMPBELL

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE

SCALE 1:250@ A1

0 2 4 6 8 10 12m

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PROJECT: **4 DARLING STREET, MARSDEN PARK**

DRAWING TITLE: **CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION**

SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 03

JOB NUMBER: **172938**

DRAWING NUMBER: **DAC04.03**

REVISION: **06**

DRAWING SHEET SIZE = A1

FOR CONTINUATION REFER TO SHEET 02

FOR CONTINUATION REFER TO SHEET 03

PROPOSED WAREHOUSE

FFL35.75

PROVIDE BIO-SWALE

PROVIDE BIO-SWALE

PROPOSED RETAIL

FFL32.20

DARLING STREET

DARLING STREET

WATER QUALITY TREATMENT DEVICE. 2 x STORMWATER360 JF3250 OR APPROVED EQUIVALENT

EXISTING CONNECTION POINT TO COUNCIL SYSTEM TO REMAIN

RWT 230KL

P01.12 P04.1 P06.1 P10.1 P10.2 P10.3 P10.4 P10.5 P10.6 P10.7 P10.8 P10.9 P10.10 P10.11 P11.1 P11.2 P12.1 P12.2 P12.3 P13.1 P13.2 P21.1 PEX01.7 PRW01.2 PRW01.4 PRW02.3

RL31.82 RL31.80 RL31.71 RL31.69 RL31.70 RL31.94 RL32.12

LEGEND

- BOUNDARY LINE
- EASEMENT LINE
- E-OH — EXISTING OVERHEAD TRANSMISSION LINE
- EXISTING TRANSMISSION TOWER
- PROPOSED KERB
- SAWCUT AND PAVEMENT INFILL
- KO — KERB ONLY
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- CE — CONCRETE EDGING
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- VC — VEHICULAR CROSSING
- KR — KERB RAMP
- WHEEL STOP
- • B — BOLLARD
- ⊘B — ANTI-RAM BOLLARD
- ✱ — KERB TAPER TO 0
- FFLXX.XX — PROPOSED FINISHED FLOOR LEVEL
- PROPOSED BATTERS
- • RLXX.XX — PROPOSED SPOT HEIGHT
- × eRLXX.XX — EXISTING SPOT HEIGHT
- XX.XX — PROPOSED CONTOURS
- XX.XX — EXISTING CONTOURS
- ϕ150 — PROPOSED STORMWATER PIPE
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- LANDSCAPING

DRAWN: C. PASKE
DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

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06	RE-ISSUED FOR COUNCIL APPROVAL	CP		TB	29.08.18

CLIENT: sydney business park

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SCALE 1:250@ A1

0 2 4 6 8 10 12m

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PROJECT: 4 DARLING STREET, MARSDEN PARK

DRAWING TITLE: CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

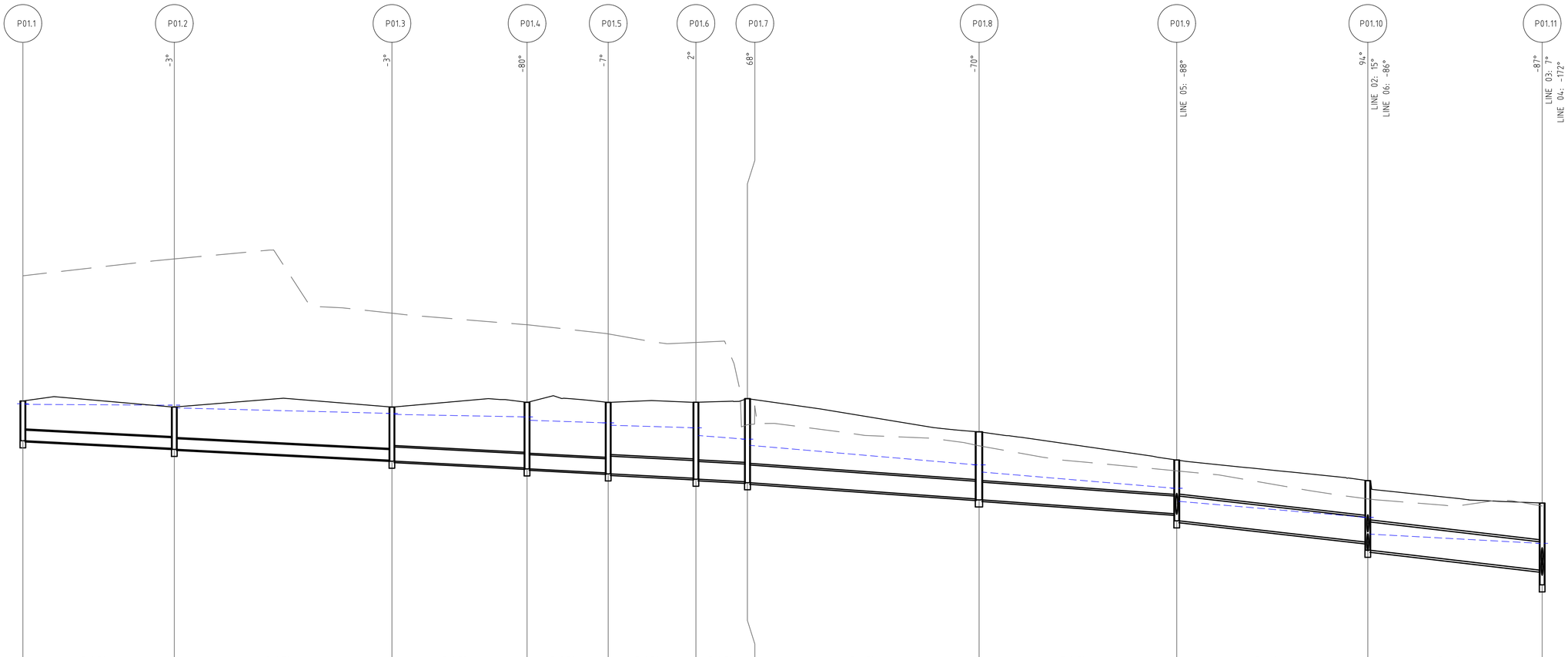
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 04

JOB NUMBER: 172938

DRAWING NUMBER: DAC04.04

REVISION: 06

DRAWING SHEET SIZE = A1



PIPE GRADE (%)		G=0.5%		G=0.5%		G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=0.7%	G=0.7%	G=1.1%	G=1.1%
PIPE SIZE (mm)		225		225		300	300	375	375	375	375	525	600
Vf - FULL PIPE VELOCITY (m/s)		Vf=0.59		Vf=1.09		Vf=1.01	Vf=1.22	Vf=1.15	Vf=1.75	Vf=1.78	Vf=1.83	Vf=2.25	Vf=2.23
Q20 - PIPE FLOW (L/s)		Q=19		Q=43		Q=68	Q=86	Q=126	Q=193	Q=197	Q=202	Q=477	Q=580
DRAINAGE LINE										01			
DATUM RL	27.0												
H.G.L. (20yr)	35.593 35.579	35.561 35.561		35.388 35.388		35.314 35.314	35.242	35.186 35.186	35.136	35.083 35.083	34.919	34.841 34.841	34.711	34.297 34.297	34.144	33.801 33.801	33.524	33.184 33.184	32.829	32.634 32.634
FINISHED SURFACE	35.651	35.523		35.522		35.622		35.620		35.623		35.700		34.998		34.400		33.962		33.488
NATURAL SURFACE	38.303	38.661		37.511		37.267		37.072		36.891		35.149		34.700		34.169		33.576		33.425
PIPE INVERT LEVEL	34.807	34.647 34.626		34.395 34.375		34.232 34.212		34.126 34.106		34.013 33.993		33.939 33.919		33.575 33.555		33.261 33.111		32.661 32.488		32.066
DEPTH TO INVERT	0.844	0.876 0.896		1.126 1.146		1.390 1.410		1.494 1.514		1.610 1.630		1.761 1.781		1.423 1.443		1.138 1.288		1.301 1.474		1.422
CO-ORDINATED SETOUT	E299571.360 N6267447.615	E299576.752 N6267415.957		E299586.898 N6267370.937		E299594.588 N6267343.333		E299611.727 N6267344.934		E299629.875 N6267349.006		E299640.585 N6267351.098		E299667.198 N6267309.789		E299708.073 N6267319.049		E299747.595 N6267328.015		E299753.264 N6267291.482
CHAINAGE	0.000	32.114		78.263		106.919		124.132		142.732		153.644		202.783		244.695		285.220		322.191

LINE 01

DRAWN: C.PASKE
DESIGNED: M.SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
03	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
04	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT
sydney business park
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ARCHITECT
REIDCAMPBELL

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PROJECT
4 DARLING STREET, MARSDEN PARK

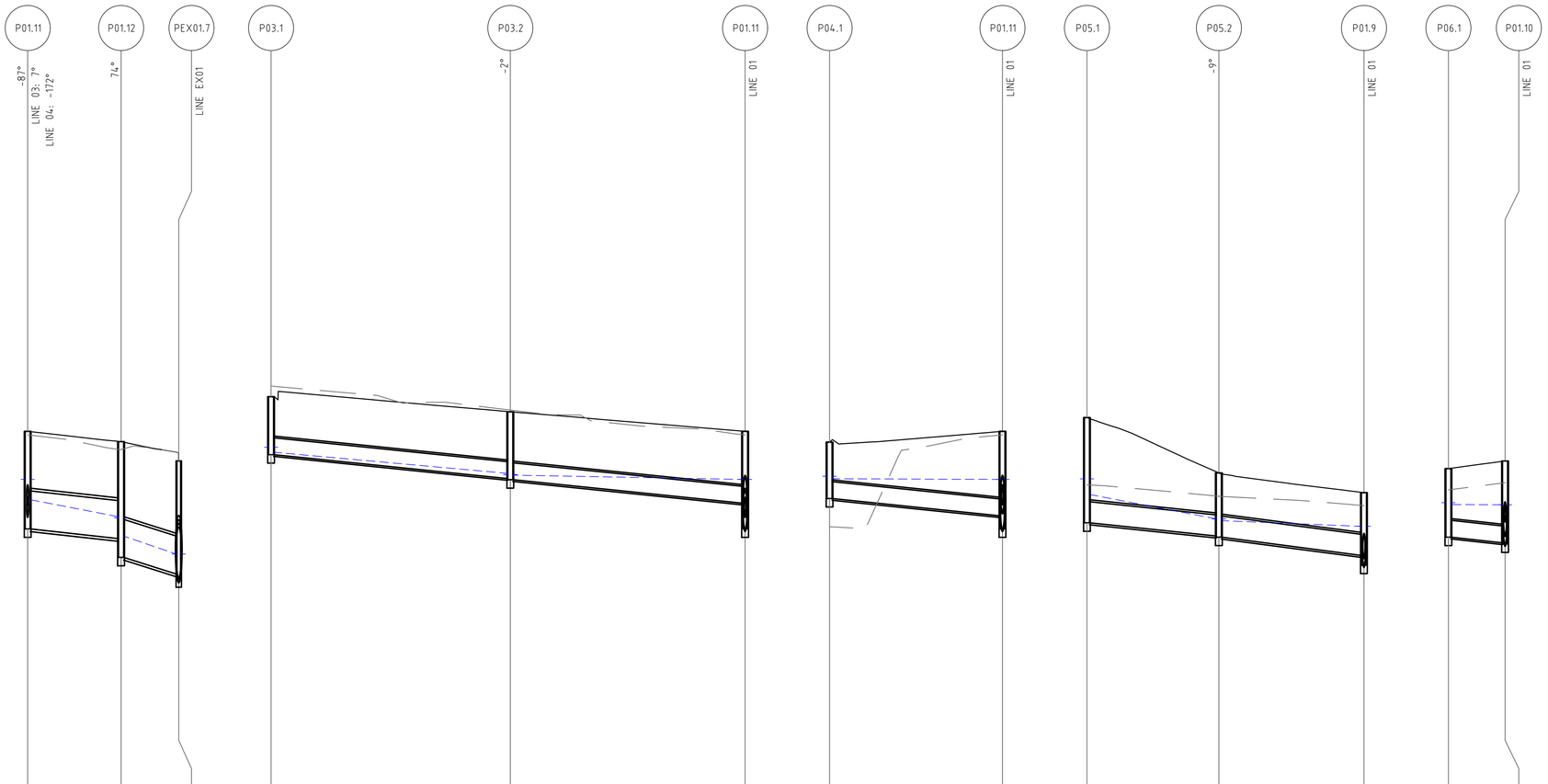
DRAWING TITLE
CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

STORMWATER LONGITUDINAL SECTIONS - SHEET 1

JOB NUMBER **172938**

DRAWING NUMBER **DAC05.11** REVISION **04**

DRAWING SHEET SIZE = A1



LINE 01

	P01.11 – P01.12	P01.12 – PEX01.7
PIPE GRADE (%)	G=1.0%	G=2.9%
PIPE SIZE (mm)	675	675
Vf - FULL PIPE VELOCITY (m/s)	Vf=2.32	Vf=2.39
Q20 - PIPE FLOW (L/s)	Q=702	Q=702
DRAINAGE LINE	01	01

DATUM RL 24.0

	P01.11	P01.12	PEX01.7
H.G.L. (20yr)	32.634 32.634 32.274	31.971 31.953 31.627	31.309 31.309 31.036
FINISHED SURFACE	33.488	33.306	32.963
NATURAL SURFACE	33.425	33.166	32.963
PIPE INVERT LEVEL	32.066 31.755	31.582 31.250	30.950 30.870
DEPTH TO INVERT	1.422 1.733	1.724 2.056	2.013 2.093
CO-ORDINATED SETOUT	E299753.264 N6267291.482	E299769.766 N6267293.240	E299773.556 N6267283.733
CHAINAGE	322.191	338.786	349.021

LINE 03

	P03.1 – P03.2	P03.2 – P01.11
PIPE GRADE (%)	G=1.0%	G=1.0%
PIPE SIZE (mm)	300	300
Vf - FULL PIPE VELOCITY (m/s)	Vf=1.08	Vf=1.31
Q20 - PIPE FLOW (L/s)	Q=26	Q=25
DRAINAGE LINE	03	03

DATUM RL 24.0

	P03.1	P03.2	P01.11
H.G.L. (20yr)	33.205 33.117	32.741 32.720 32.710	32.634 32.634 32.274
FINISHED SURFACE	34.103	33.835	33.488
NATURAL SURFACE	34.291	33.865	33.425
PIPE INVERT LEVEL	33.074	32.649 32.629	32.212 31.755
DEPTH TO INVERT	1.029	1.186 1.206	1.276 1.733
CO-ORDINATED SETOUT	E299671.120 N6267273.146	E299712.706 N6267281.839	E299753.264 N6267291.482
CHAINAGE	0.000	42.485	84.174

LINE 04

	P04.1 – P01.11
PIPE GRADE (%)	G=1.0%
PIPE SIZE (mm)	300
Vf - FULL PIPE VELOCITY (m/s)	Vf=0.78
Q20 - PIPE FLOW (L/s)	Q=29
DRAINAGE LINE	04

DATUM RL 24.0

	P04.1	P01.11
H.G.L. (20yr)	32.690 32.646	32.634 32.634 32.274
FINISHED SURFACE	33.296	33.488
NATURAL SURFACE	31.796	33.425
PIPE INVERT LEVEL	32.295	31.987 31.755
DEPTH TO INVERT	1.001	1.500 1.733
CO-ORDINATED SETOUT	E299783.084 N6267298.818	E299753.264 N6267291.482
CHAINAGE	-13.735	16.974

LINE 05

	P05.1 – P05.2	P05.2 – P01.9
PIPE GRADE (%)	G=1.0%	G=1.3%
PIPE SIZE (mm)	375	375
Vf - FULL PIPE VELOCITY (m/s)	Vf=1.87	Vf=2.27
Q20 - PIPE FLOW (L/s)	Q=187	Q=181
DRAINAGE LINE	05	05

DATUM RL 26.0

	P05.1	P05.2	P01.9
H.G.L. (20yr)	34.644 34.367	33.933 33.933 33.902	33.801 33.801 33.524
FINISHED SURFACE	35.733	34.750	34.400
NATURAL SURFACE	34.537	34.335	34.169
PIPE INVERT LEVEL	33.863	33.629 33.609	33.284 33.111
DEPTH TO INVERT	1.869	1.121 1.141	1.116 1.288
CO-ORDINATED SETOUT	E299698.779 N6267367.216	E299701.400 N6267343.929	E299708.073 N6267319.049
CHAINAGE	0.000	23.433	49.193

LINE 06

	P06.1 – P01.10
PIPE GRADE (%)	G=1.0%
PIPE SIZE (mm)	300
Vf - FULL PIPE VELOCITY (m/s)	Vf=0.48
Q20 - PIPE FLOW (L/s)	Q=27
DRAINAGE LINE	06

DATUM RL 25.0

	P06.1	P01.10
H.G.L. (20yr)	33.221 33.188	33.184 33.184 32.829
FINISHED SURFACE	33.826	33.962
NATURAL SURFACE	33.449	33.576
PIPE INVERT LEVEL	32.608	32.508 32.488
DEPTH TO INVERT	1.217	1.454 1.474
CO-ORDINATED SETOUT	E299757.386 N6267330.332	E299747.595 N6267328.015
CHAINAGE	0.000	10.062

NOT FOR CONSTRUCTION

DRAWN: C. PASKE
DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

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PROJECT
4 DARLING STREET,
MARSDEN PARK

DRAWING TITLE
CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

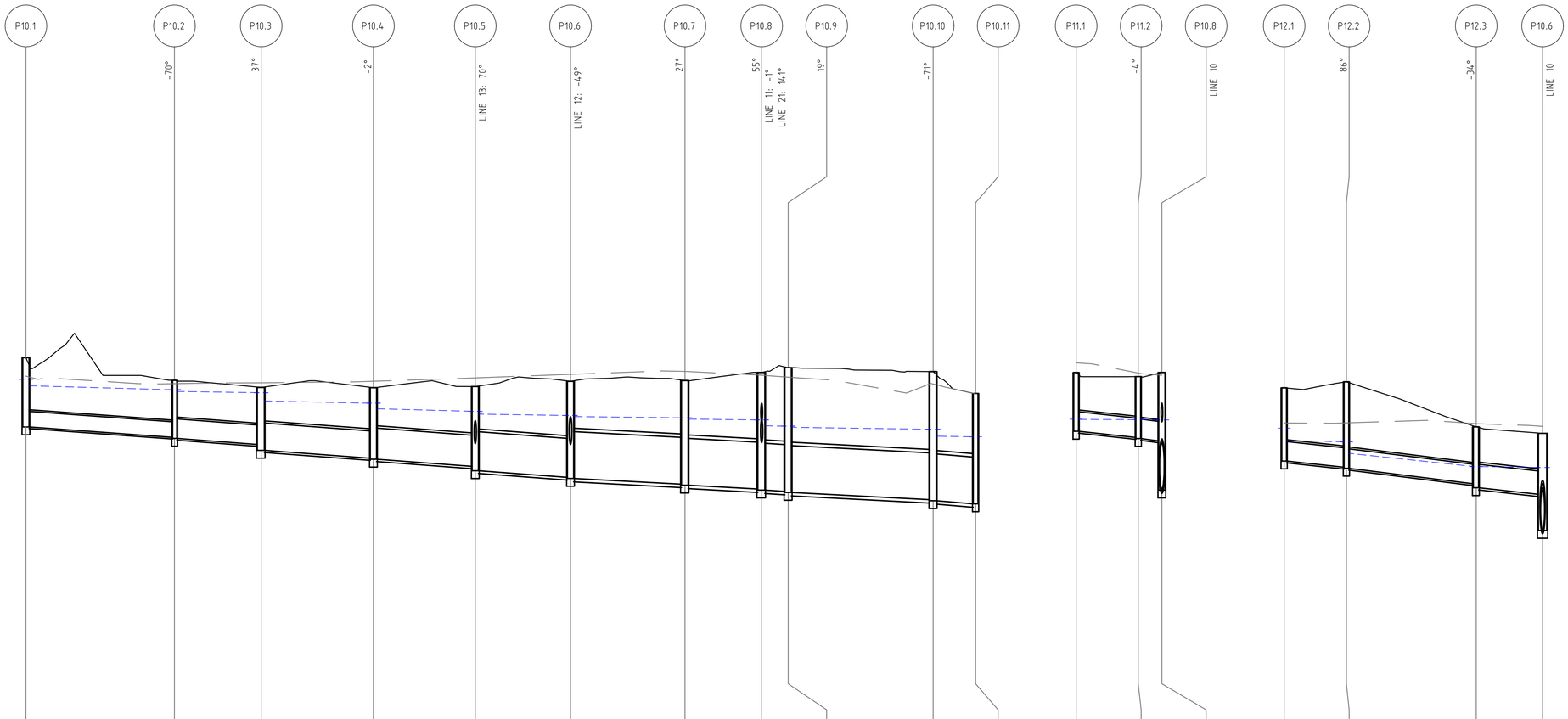
STORMWATER LONGITUDINAL
SECTIONS - SHEET 2

JOB NUMBER
172938

DRAWING NUMBER
DAC05.12

REVISION
04

DRAWING SHEET SIZE = A1



	P10.1–P10.2	P10.2–P10.3	P10.3–P10.4	P10.4–P10.5	P10.5–P10.6	P10.6–P10.7	P10.7–P10.8	P10.8–P10.9	P10.9–P10.10	P10.10–P10.11
PIPE GRADE (%)	G=0.7%	G=0.7%	G=0.7%	G=0.7%	G=0.7%	G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=0.7%
PIPE SIZE (mm)	300	375	525	600	750	900	900	900	900	900
Vf - FULL PIPE VELOCITY (m/s)	Vf=0.94	Vf=0.75	Vf=1.14	Vf=1.39	Vf=1.20	Vf=1.15	Vf=1.16	Vf=1.30	Vf=1.30	Vf=1.30
Q20 - PIPE FLOW (L/s)	Q=66	Q=80	Q=247	Q=393	Q=528	Q=733	Q=736	Q=827	Q=827	Q=827
DRAINAGE LINE	10									

DATUM RL 22.0

	P10.1	P10.2	P10.3	P10.4	P10.5	P10.6	P10.7	P10.8	P10.9	P10.10	P10.11
H.G.L. (20yr)	31.853 31.730	31.654 31.654 31.621	31.598 31.598 31.438	31.395 31.395 31.289	31.240 31.240 31.186	31.159 31.159 31.138	31.114 31.114 31.089	31.073 31.073 30.960	30.953 30.953 30.931	30.894 30.894 30.761	30.750 30.750 30.750
FINISHED SURFACE	32.270	31.836	31.698	31.694	31.716	31.816	31.832	31.985	32.079	32.003	31.582
NATURAL SURFACE	31.916	31.771	31.788	31.817	31.882	31.950	32.007	31.933	31.896	31.763	31.582
PIPE INVERT LEVEL	30.938	30.738 30.718	30.601 30.488	30.337 30.317	30.180 30.097	29.969 29.949	29.839 29.819	29.745 29.725	29.699 29.679	29.540 29.520	29.460 29.460
DEPTH TO INVERT	1.332	1.098 1.118	1.097 1.210	1.357 1.377	1.536 1.619	1.848 1.868	1.993 2.013	2.241 2.261	2.380 2.400	2.463 2.483	2.122 2.122
CO-ORDINATED SETOUT	E299771.553 N6267317.355	E299800.057 N6267315.541	E299806.783 N6267330.800	E299825.538 N6267341.486	E299842.280 N6267351.643	E299857.941 N6267361.141	E299876.858 N6267372.390	E299891.580 N6267373.279	E299894.755 N6267369.287	E299904.063 N6267343.021	E299912.229 N6267343.158
CHAINAGE	-21.614	6.948	23.624	45.209	64.792	83.108	105.117	119.866	124.966	152.833	161.000

LINE 10

	P11.1–P11.2	P11.2–P10.8
PIPE GRADE (%)	G=1.0%	G=1.0%
PIPE SIZE (mm)	375	375
Vf - FULL PIPE VELOCITY (m/s)	Vf=0.56	Vf=0.59
Q20 - PIPE FLOW (L/s)	Q=14	Q=23
DRAINAGE LINE	11	

DATUM RL 22.0

	P11.1	P11.2	P10.8
H.G.L. (20yr)	31.087 31.084	31.079 31.079 31.079	31.073 31.073 30.960
FINISHED SURFACE	31.985	31.907	31.985
NATURAL SURFACE	32.171	31.975	31.933
PIPE INVERT LEVEL	30.855	30.735 30.715	30.670 29.725
DEPTH TO INVERT	1.130	1.172 1.192	1.315 2.261
CO-ORDINATED SETOUT	E299882.272 N6267386.877	E299888.841 N6267376.900	E299891.580 N6267373.279
CHAINAGE	-6.510	5.436	9.977

LINE 11

	P12.1–P12.2	P12.2–P12.3	P12.3–P10.6
PIPE GRADE (%)	G=1.0%	G=1.2%	G=1.0%
PIPE SIZE (mm)	375	375	450
Vf - FULL PIPE VELOCITY (m/s)	Vf=1.02	Vf=1.90	Vf=2.02
Q20 - PIPE FLOW (L/s)	Q=112	Q=192	Q=191
DRAINAGE LINE	12		

DATUM RL 23.0

	P12.1	P12.2	P12.3	P10.6
H.G.L. (20yr)	31.914 31.680	31.652 31.652 31.432	31.178 31.178 31.178	31.159 31.159 31.138
FINISHED SURFACE	32.691	32.806	31.940	31.816
NATURAL SURFACE	32.014	32.017	32.001	31.950
PIPE INVERT LEVEL	31.283	31.163 31.143	30.845 30.770	30.642 29.949
DEPTH TO INVERT	1.408	1.643 1.663	1.095 1.170	1.174 1.868
CO-ORDINATED SETOUT	E299820.754 N6267378.702	E299830.832 N6267385.170	E299845.853 N6267365.243	E299857.941 N6267361.141
CHAINAGE	-38.040	-26.065	-1.111	11.655

LINE 12

VERIFIER:
JOB MANAGER: J. GILLIGAN
DESIGNED: M. SANTIAGO
DRAWN: C. PASKE

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
03	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
04	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT
sydney business park

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
REIDCAMPBELL

NORTHROP
Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT
4 DARLING STREET,
MARSDEN PARK

DRAWING TITLE
CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

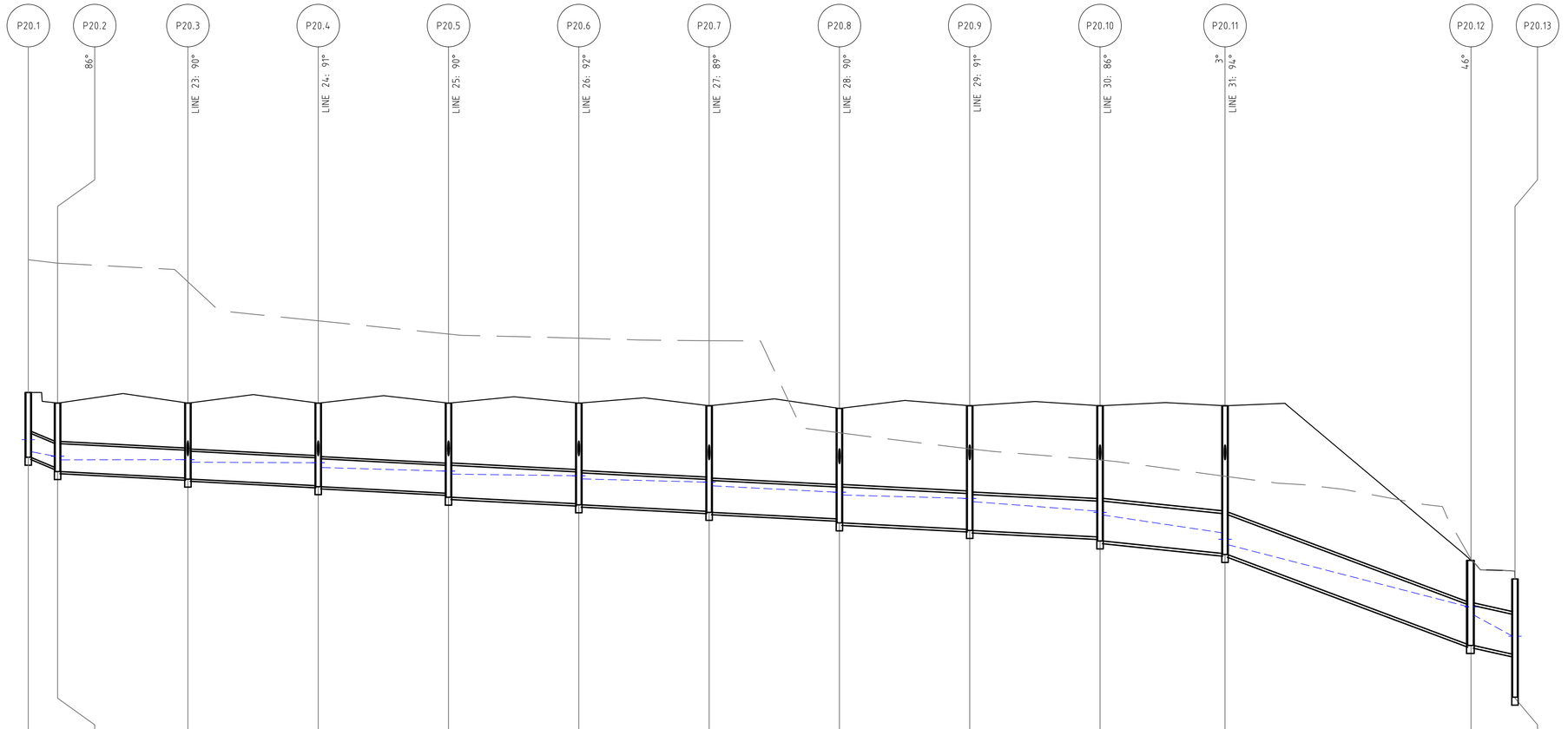
STORMWATER LONGITUDINAL
SECTIONS - SHEET 3

JOB NUMBER
172938

DRAWING NUMBER
DAC05.13

REVISION
04

DRAWING SHEET SIZE = A1



PIPE GRADE (%)		G=3.5%	G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=0.5%	G=1.0%	G=3.7%	G=2.0%	
PIPE SIZE (mm)		450	525	525	525	600	600	600	675	675	750	750	750	
Vf - FULL PIPE VELOCITY (m/s)		Vf=1.07	Vf=0.86	Vf=1.07	Vf=1.48	Vf=1.45	Vf=1.59	Vf=1.92	Vf=1.83	Vf=2.17	Vf=2.67	Vf=3.84	Vf=2.55	
Q20 - PIPE FLOW (L/s)		Q=86	Q=99	Q=179	Q=260	Q=340	Q=418	Q=499	Q=592	Q=670	Q=761	Q=854	Q=854	
DRAINAGE LINE								20						
DATUM RL		26.0												
H.G.L. (20yr)	34.862	34.638	34.550 34.550	34.482	34.486 34.486	34.438	34.429 34.429	34.339	34.271 34.271	34.215	34.184 34.184	34.125	34.064 34.064	33.995	33.874 33.874	33.822	33.758 33.758	33.698	33.518 33.495	33.447	33.109 32.989	32.889	31.718 31.718	31.568	31.166 31.166	31.166
FINISHED SURFACE	35.750		35.551		35.551		35.551		35.551		35.550		35.501		35.451		35.500		35.500		35.500			32.592		32.242
NATURAL SURFACE	38.246		38.181		37.831		37.098		36.849		36.770		36.724		34.992		34.691		34.481		34.174			32.615		32.242
PIPE INVERT LEVEL	34.532		34.338	34.263	34.140	34.120	33.998	33.978	33.855	33.780	33.658	33.638	33.515	33.495	33.373	33.298	33.175	33.155	33.033	32.958	32.723	32.703		31.012		30.828 30.020
DEPTH TO INVERT	1.218		1.213	1.288	1.411	1.431	1.553	1.573	1.695	1.770	1.893	1.913	1.985	2.005	2.078	2.153	2.325	2.345	2.468	2.543	2.778	2.798		1.580		1.414 2.222
CO-ORDINATED SETOUT	E299591.130 N6267447.832		E299590.295 N6267453.282		E299614.196 N6267458.668		E299638.097 N6267464.054		E299661.997 N6267469.440		E299685.898 N6267474.826		E299709.798 N6267480.213		E299733.699 N6267485.599		E299757.600 N6267490.985		E299781.500 N6267496.371		E299804.425 N6267501.538			E299850.030 N6267509.252		E299856.711 N6267504.384
CHAINAGE	-3.023		2.490		26.990		51.490		75.990		100.490		124.990		149.490		173.990		198.490		221.990			268.243		276.510

LINE 20

VERIFIER:

JOB MANAGER: J GILLIGAN

DESIGNED: M SANTIAGO

DRAWN: C PASKE

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
03	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
04	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT

sydney business park

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ARCHITECT

REIDCAMPBELL

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Sydney
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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT

4 DARLING STREET, MARSDEN PARK

DRAWING TITLE

CIVIL ENGINEERING WORKS DEVELOPMENT APPLICATION

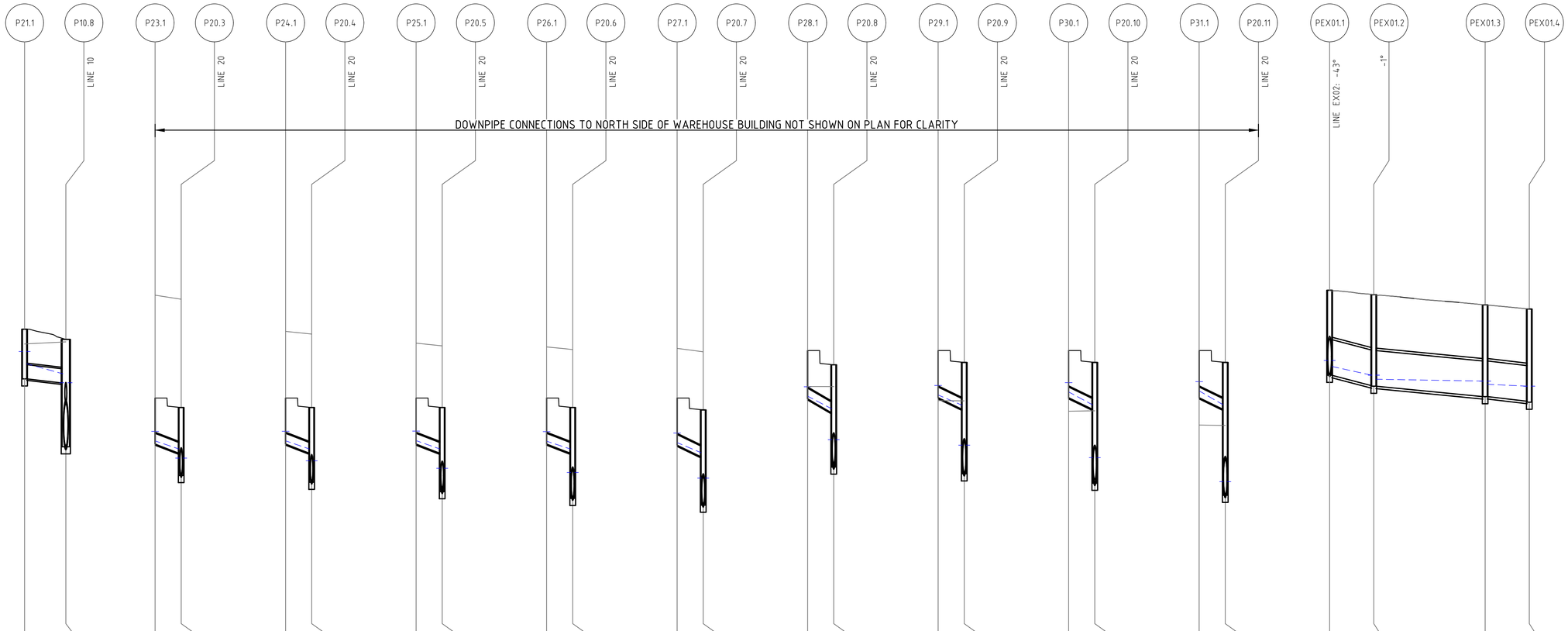
STORMWATER LONGITUDINAL SECTIONS - SHEET 4

JOB NUMBER **172938**

DRAWING NUMBER **DAC05.14**

REVISION **04**

DRAWING SHEET SIZE = A1



DOWNPIPE CONNECTIONS TO NORTH SIDE OF WAREHOUSE BUILDING NOT SHOWN ON PLAN FOR CLARITY

	LINE 21	LINE 23	LINE 24	LINE 25	LINE 26	LINE 27	LINE 28	LINE 29	LINE 30	LINE 31	LINE EX01
PIPE GRADE (%)	G=1.0%	G=3.5%	G=3.5%	G=3.5%	G=3.5%	G=4.4%	G=5.4%	G=4.5%	G=4.4%	G=4.5%	G=2.4% G=0.9% G=1.1%
PIPE SIZE (mm)	300	(2x)225	(2x)225	(2x)225	(2x)225	(2x)225	(2x)225	(2x)225	(2x)225	(2x)225	750 750 750
Vf - FULL PIPE VELOCITY (m/s)	Vf=1.51	Vf=1.24	Vf=1.24	Vf=1.26	Vf=1.23	Vf=1.32	Vf=1.43	Vf=1.33	Vf=1.50	Vf=1.56	Vf=2.00 Vf=1.94 Vf=1.73
Q20 - PIPE FLOW (L/s)	Q=94	Q=74	Q=74	Q=75	Q=73	Q=78	Q=84	Q=78	Q=90	Q=95	Q=280 Q=288 Q=311
DRAINAGE LINE	21	23	24	25	26	27	28	29	30	31	EX01
DATUM RL	22.0	27.0	27.0	27.0	27.0	27.0	26.0	26.0	26.0	26.0	23.0
H.G.L. (20yr)	31.731 31.472 31.260 31.073 30.960	35.049 34.848 34.677 34.486 34.438	35.051 34.850 34.677 34.429 34.339	35.054 34.854 34.677 34.271 34.215	35.044 34.842 34.676 34.184 34.125	35.013 34.813 34.599 34.064 33.995	34.988 34.790 34.525 33.874 33.822	35.015 34.815 34.599 33.758 33.698	35.075 34.880 34.606 33.495 33.447	35.096 34.902 34.609 32.989 32.889	32.541 32.416 32.231 32.231 32.146 32.108 32.108 32.040 32.000 32.000
FINISHED SURFACE	32.200 31.985	35.750 35.551	35.750 35.551	35.750 35.551	35.750 35.550	35.750 35.501	35.750 35.451	35.750 35.500	35.750 35.500	35.750 35.500	34.020 33.927 33.712 33.625
NATURAL SURFACE	31.889 31.933	37.916 37.831	37.154 37.098	36.906 36.849	36.826 36.770	36.796 36.724	34.993 34.992	34.697 34.691	34.472 34.481	34.182 34.174	34.020 33.927 33.712 33.625
PIPE INVERT LEVEL	31.154 31.067 29.725	34.782 34.587 34.120	34.782 34.587 33.978	34.782 34.587 33.780	34.782 34.587 33.638	34.757 34.512 33.495	34.734 34.439 33.298	34.757 34.512 33.155	34.757 34.512 32.958	34.757 34.512 32.703	32.230 32.010 32.000 31.780 31.780 31.781 31.683
DEPTH TO INVERT	1.046 0.919 2.261	0.968 0.964 1.431	0.968 0.964 1.573	0.968 0.964 1.770	0.968 0.964 1.913	0.993 0.989 2.005	1.016 1.012 2.153	0.993 0.988 2.345	0.993 0.988 2.543	0.993 0.988 2.798	1.790 1.917 1.927 1.932 1.931 1.942
CO-ORDINATED SETOUT	E299891.452 N6267364.586 E299891.580 N6267373.279	E299615.389 N6267453.299 E299614.196 N6267458.668	E299639.368 N6267458.703 E299638.097 N6267464.054	E299663.218 N6267464.077 E299661.997 N6267469.440	E299687.301 N6267469.505 E299685.898 N6267474.826	E299710.875 N6267474.817 E299709.798 N6267480.213	E299734.934 N6267480.239 E299733.699 N6267485.599	E299758.942 N6267485.650 E299757.600 N6267490.985	E299782.336 N6267490.922 E299781.500 N6267496.371	E299805.738 N6267496.196 E299804.425 N6267501.538	E299661.349 N6267256.830 E299670.415 N6267258.932 E299693.214 N6267264.439 E299702.264 N6267266.600
CHAINAGE	0.000 8.693	0.000 5.500	0.000 5.500	0.000 5.500	0.000 5.504	0.000 5.502	0.000 5.500	0.000 5.502	0.000 5.513	0.000 5.501	0.000 9.306 32.761 42.066

LINE 21 LINE 23 LINE 24 LINE 25 LINE 26 LINE 27 LINE 28 LINE 29 LINE 30 LINE 31 LINE EX01

NOT FOR CONSTRUCTION

VERIFIER:
JOB MANAGER: J. GILLIGAN
DESIGNED: M. SANTIAGO
DRAWN: C. PASKE

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	13.03.18
02	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
03	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
04	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT
sydney business park
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ARCHITECT
REIDCAMPBELL
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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT
4 DARLING STREET,
MARSDEN PARK

DRAWING TITLE
CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

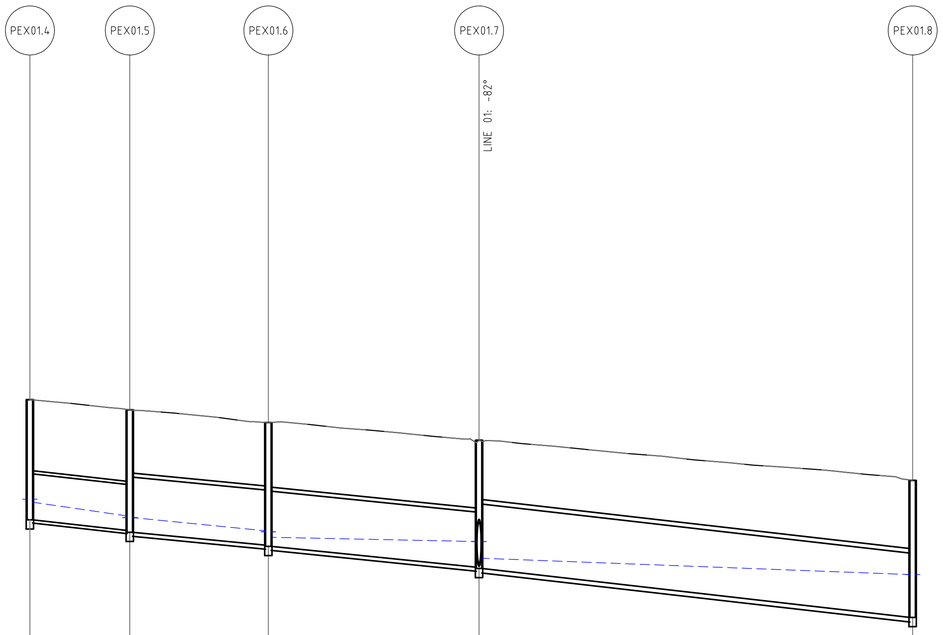
STORMWATER LONGITUDINAL
SECTIONS - SHEET 5

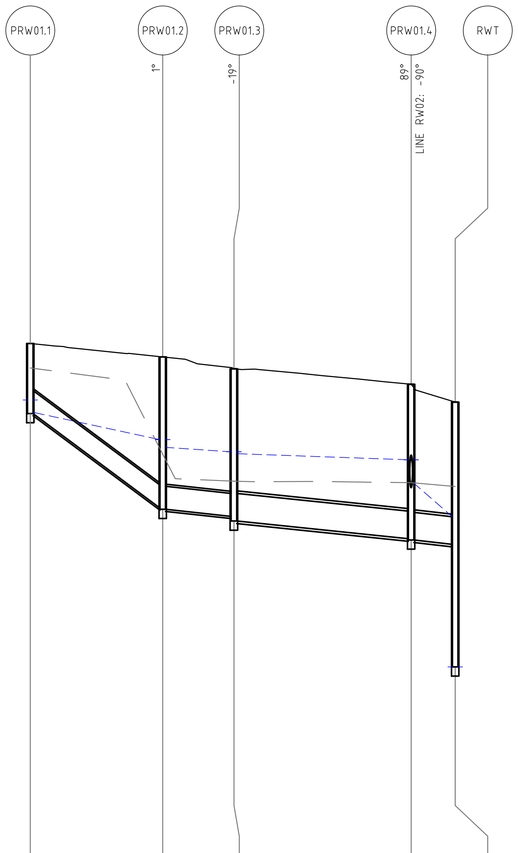
JOB NUMBER
172938

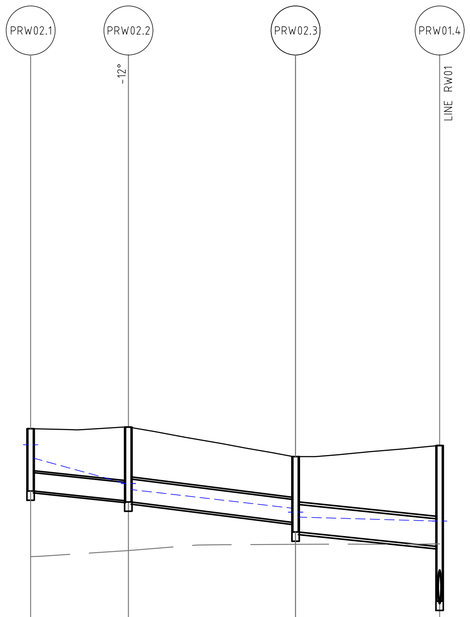
DRAWING NUMBER
DAC05.15

REVISION
04

DRAWING SHEET SIZE = A1







	PEX01.4–PEX01.5	PEX01.5–PEX01.6	PEX01.6–PEX01.7	PEX01.7–PEX01.8
PIPE GRADE (%)	G=1.1%	G=0.9%	G=1.0%	G=1.1%
PIPE SIZE (mm)	750	900	900	1050
Vf - FULL PIPE VELOCITY (m/s)	Vf=2.07	Vf=2.52	Vf=2.02	Vf=2.28
Q20 - PIPE FLOW (L/s)	Q=323	Q=337	Q=357	Q=1092
DRAINAGE LINE	EX01			

DATUM RL 23.0

	PEX01.4	PEX01.5	PEX01.6	PEX01.7	PEX01.8
H.G.L. (20yr)	32.000 32.000 31.951	31.727 31.700 31.700	31.484 31.468 31.378	31.309 31.309 31.036	30.770 30.770 30.770
FINISHED SURFACE	33.625	33.458	33.252	32.963	32.307
NATURAL SURFACE	33.625	33.458	33.252	32.963	32.307
PIPE INVERT LEVEL	31.683 31.663	31.490 31.460	31.250 31.230	30.890 30.870	30.070 30.070
DEPTH TO INVERT	1.942 1.962	1.968 1.998	2.002 2.022	2.073 2.093	2.237 2.237
CO-ORDINATED SETOUT	E299702.264 N6267266.600	E299718.114 N6267270.413	E299740.110 N6267275.697	E299773.556 N6267283.733	E299842.432 N6267300.035
CHAINAGE	42.066	58.368	80.990	115.388	186.166

LINE PEX01

	PRW01.1–PRW01.2	PRW01.2–PRW01.3	PRW01.3–PRW01.4	PRW01.4–RWT
PIPE GRADE (%)	G=7.1%	G=1.0%	G=1.0%	G=1.0%
PIPE SIZE (mm)	375	375	450	450
Vf - FULL PIPE VELOCITY (m/s)	Vf=1.55	Vf=1.64	Vf=1.41	Vf=3.23
Q20 - PIPE FLOW (L/s)	Q=113	Q=181	Q=224	Q=513
DRAINAGE LINE	RW01			

DATUM RL 23.0

	PRW01.1	PRW01.2	PRW01.3	PRW01.4	RWT
H.G.L. (20yr)	33.619 33.418	32.972 32.972 32.846	32.773 32.773 32.743	32.643 32.643 32.260	31.713 29.263 31.713
FINISHED SURFACE	34.542	34.322	34.127	33.876	33.585
NATURAL SURFACE	34.142	32.734	32.294	32.270	32.207
PIPE INVERT LEVEL	33.398	31.855 31.835	31.719 31.644	31.355 31.335	31.263 29.263
DEPTH TO INVERT	1.144	2.466 2.486	2.409 2.484	2.521 2.541	2.322 4.322
CO-ORDINATED SETOUT	E299733.072 N6267374.877	E299754.166 N6267379.615	E299765.543 N6267382.058	E299790.342 N6267396.927	E299794.109 N6267390.801
CHAINAGE	-62.876	-41.256	-29.620	-0.704	6.488

LINE PRW01

	PRW02.1–PRW02.2	PRW02.2–PRW02.3	PRW02.3–PRW01.4
PIPE GRADE (%)	G=1.0%	G=1.2%	G=1.0%
PIPE SIZE (mm)	300	375	450
Vf - FULL PIPE VELOCITY (m/s)	Vf=1.90	Vf=2.11	Vf=2.07
Q20 - PIPE FLOW (L/s)	Q=133	Q=176	Q=260
DRAINAGE LINE	RW02		RW02
DATUM RL	24.0		24.0

	PRW02.1	PRW02.2	PRW02.3	PRW01.4
H.G.L. (20yr)	33.889 33.671	33.256 33.256 33.157	32.852 32.787 32.708	32.643 32.643 32.260
FINISHED SURFACE	34.150	34.177	33.696	33.876
NATURAL SURFACE	32.063	32.162	32.263	32.270
PIPE INVERT LEVEL	33.133	32.974 32.954	32.620 32.464	32.229 31.335
DEPTH TO INVERT	1.017	1.203 1.223	1.075 1.232	1.647 2.541
CO-ORDINATED SETOUT	E299848.751 N6267428.756	E299833.727 N6267423.372	E299810.416 N6267409.172	E299790.342 N6267396.927
CHAINAGE	-16.933	-0.973	26.322	49.836

LINE PRW02

DRAWN: C. PASKE
DESIGNED: M. SANTIAGO
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT

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ARCHITECT

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PROJECT
4 DARLING STREET,
MARSDEN PARK

DRAWING TITLE
CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

STORMWATER LONGITUDINAL
SECTIONS - SHEET 6

JOB NUMBER
172938

DRAWING NUMBER
DAC05.16

REVISION
01

DRAWING SHEET SIZE = A1

12d Model Dynamic Drainage Results

Negative Flow Values Indicate Reverse Flows

DATA

Pit					Pipe											Catchment					
Pit Name	Pit Type	Surface RL (m)	Pit Max Ku	Blockage Factor %	Pipe Name	From	To	Pipe Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Pipe Type	Pipe Diameter (mm)	Pipe Roughness	Roughness Type	Catchmen Name	Area (Ha)	Imperviou Percentag (%)	Pervious Percentag (%)	Imperviou Tc (min)	Pervious Tc (min)
P01.7	900x900 G	34.753														P01.7					
P01.1	900x900 G	35.651	9.41	50	P01.1 to F	P01.1	P01.2	32.114	34.807	34.647	0.5	RRJ3	225	0.01	Manning	P01.1	0.012	100	0	5	10
P01.2	900x900 G	35.523	2	50	P01.2 to F	P01.2	P01.3	46.149	34.626	34.395	0.5	RRJ3	225	0.01	Manning	P01.2	0.03	100	0	5	10
P01.3	900x900 G	35.522	4.93	50	P01.3 to F	P01.3	P01.4	28.656	34.375	34.232	0.5	RRJ3	300	0.01	Manning	P01.3	0.029	100	0	5	10
P01.4	900x900 G	35.622	1.94	50	P01.4 to F	P01.4	P01.5	17.213	34.212	34.126	0.5	RRJ3	300	0.01	Manning	P01.4	0.012	100	0	5	10
P01.5	900x900 G	35.62	3.02	50	P01.5 to F	P01.5	P01.6	18.6	34.106	34.013	0.5	RRJ3	375	0.01	Manning	P01.5	0.011	100	0	5	10
P01.6	900x900 G	35.623	2.74	50	P01.6 to F	P01.6	P01.7	10.912	33.993	33.939	0.5	RRJ3	375	0.01	Manning	P01.6	0.011	100	0	5	10
P01.7	900x900 G	35.7	1.53	80	P01.7 to F	P01.7	P01.8	49.14	33.919	33.575	0.7	RRJ3	375	0.01	Manning	P01.7	0.226	100	0	5	10
P01.8	1200x120(	34.998	1.57	80	P01.8 to F	P01.8	P01.9	41.911	33.555	33.261	0.7	RRJ3	375	0.01	Manning	P01.8	0.096	100	0	5	10
P01.9	900x900 G	34.4	1.58	80	P01.9 to F	P01.9	P01.10	40.525	33.111	32.661	1.112	RRJ3	525	0.01	Manning	P01.9	0.21	100	0	5	10
P01.10	900x900 G	33.962	1.77	80	P01.10 to	P01.10	P01.11	36.971	32.488	32.066	1.142	RRJ3	600	0.01	Manning	P01.10	0.1	100	0	5	10
P01.11	900x900 G	33.488	1.96	80	P01.11 to	P01.11	P01.12	16.595	31.755	31.582	1.041	RRJ3	675	0.01	Manning	P01.11	0.177	5	95	5	10
P01.12	900x900 J.	33.306	1.69	80	P01.12 to	P01.12	PEX01.7	10.235	31.25	30.95	2.931	RRJ3	675	0.01	Manning	P01.12		0	0	5	10
PEX01.7	G.G.P. 2.4	32.963														PEX01.7					
P02.1	900x900 G	34.54	8.89	50	P02.1 to F	P02.1	P02.2	23.063	33.644	33.414	1	RRJ3	225	0.01	Manning	P02.1	0.082	100	0	5	10
P02.2	900x900 J.	34.549	1.22	80	P02.2 to F	P02.2	P01.10	25.135	33.339	32.908	1.715	RRJ3	300	0.01	Manning	P02.2	0.049	100	0	5	10
P01.10	900x900 G	33.962														P01.10					
P03.1	G.G.P. 2.4	34.103	7.35	80	P03.1 to F	P03.1	P03.2	42.485	33.074	32.649	1	RRJ3	300	0.01	Manning	P03.1	0.054	100	0	5	10
P03.2	900x900 G	33.835	0.2	80	P03.2 to F	P03.2	P01.11	41.689	32.629	32.212	1	RRJ3	300	0.01	Manning	P03.2	0.14	5	95	5	10
P01.11	900x900 G	33.488														P01.11					
P04.1	900x900 G	33.296	7.41	80	P04.1 to F	P04.1	P01.11	30.709	32.295	31.987	1	RRJ3	300	0.01	Manning	P04.1	0.083	5	95	5	10
P01.11	900x900 G	33.488														P01.11					
P05.1	900x900 G	35.733	8.85	50	P05.1 to F	P05.1	P05.2	23.433	33.863	33.629	1	RRJ3	375	0.01	Manning	P05.1	0.305	100	0	5	10
P05.2	SEALED 9(	34.75	0.23	80	P05.2 to F	P05.2	P01.9	25.76	33.609	33.284	1.263	RRJ3	375	0.01	Manning	P05.2		0	0		
P01.9	900x900 G	34.4														P01.9					
P06.1	900x900 G	33.826	7.32	50	P06.1 to F	P06.1	P01.10	10.062	32.608	32.508	1	RRJ3	300	0.01	Manning	P06.1	0.097	100	0	5	10
P01.10	900x900 G	33.962														P01.10					
P10.1	1200x120(	32.27	7.11	50	P10.1 to F	P10.1	P10.2	28.562	30.938	30.738	0.7	RRJ3	300	0.01	Manning	P10.1	0.116	5	95	5	10
P10.2	G.G.P. 2.4	31.836	1.42	80	P10.2 to F	P10.2	P10.3	16.676	30.718	30.601	0.7	RRJ3	375	0.01	Manning	P10.2	0.033	90	10	5	10
P10.3	1200x120(	31.698	3.97	50	P10.3 to F	P10.3	P10.4	21.585	30.488	30.337	0.7	RRJ3	525	0.01	Manning	P10.3	0.238	90	10	5	10
P10.4	1200x120(	31.694	1.26	50	P10.4 to F	P10.4	P10.5	19.583	30.317	30.18	0.7	RRJ3	600	0.01	Manning	P10.4	0.145	85	15	5	10
P10.5	1200x120(	31.716	0.79	50	P10.5 to F	P10.5	P10.6	18.316	30.097	29.969	0.7	RRJ3	750	0.01	Manning	P10.5	0.067	90	10	5	10
P10.6	1200x120(	31.816	0.39	50	P10.6 to F	P10.6	P10.7	22.008	29.949	29.839	0.5	RRJ3	900	0.01	Manning	P10.6	0.099	80	20	5	10
P10.7	1200x120(	31.832	0.39	50	P10.7 to F	P10.7	P10.8	14.749	29.819	29.745	0.5	RRJ3	900	0.01	Manning	P10.7	0.162	40	60	5	10
P10.8	1200x120(	31.985	1.4	80	P10.8 to F	P10.8	P10.9	5.1	29.725	29.699	0.5	RRJ3	900	0.01	Manning	P10.8		0	0	5	10
P10.9	1200x120(	32.079	0.26	80	P10.9 to F	P10.9	P10.10	27.867	29.679	29.54	0.5	RRJ3	900	0.01	Manning	P10.9		0	0	5	10
P10.10	1200x120(	32.003	1.61	80	P10.10 to	P10.10	P10.11	8.167	29.52	29.46	0.735	RRJ3	900	0.01	Manning	P10.10		0	0	5	10
P10.11	900x900 G	31.582														P10.11					
P11.1	900x900 G	31.985	8.7	50	P11.1 to F	P11.1	P11.2	11.945	30.855	30.735	1	RRJ3	375	0.01	Manning	P11.1	0.024	5	95	5	10
P11.2	900x900 G	31.907	2.09	80	P11.2 to F	P11.2	P10.8	4.541	30.715	30.67	1	RRJ3	375	0.01	Manning	P11.2		0	0	5	10
P10.8	1200x120(	31.985														P10.8					
P12.1	900x900 R	32.691	7.98	50	P12.1 to F	P12.1	P12.2	11.975	31.283	31.163	1	RRJ3	375	0.01	Manning	P12.1	0.182	100	0	5	10
P12.2	900x900 R	32.806	2.21	50	P12.2 to F	P12.2	P12.3	24.954	31.143	30.845	1.195	RRJ3	375	0.01	Manning	P12.2	0.128	100	0	5	10
P12.3	900x900 J.	31.94	2.09	80	P12.3 to F	P12.3	P10.6	12.766	30.77	30.642	1	RRJ3	450	0.01	Manning	P12.3		0	0	5	10
P10.6	1200x120(	31.816														P10.6					
P13.1	900x900 G	32.117	9.34	50	P13.1 to F	P13.1	P13.2	16.878	31.096	30.915	1.071	RRJ3	300	0.01	Manning	P13.1	0.026	100	0	5	10
P13.2	900x900 G	31.935	8.43	50	P13.2 to F	P13.2	P10.5	18.854	30.84	30.651	1	RRJ3	375	0.01	Manning	P13.2	0.031	100	0	5	10
P10.5	1200x120(	31.716														P10.5					
P20.1	900x900 G	35.75	9.44	50	P20.1 to F	P20.1	P20.2	5.513	34.532	34.338	3.522	RRJ3	450	0.01	Manning	P20.1	0.14	100	0	5	10
P20.2	900x900 G	35.551	2.03	50	P20.2 to F	P20.2	P20.3	24.5	34.263	34.14	0.5	RRJ3	525	0.01	Manning	P20.2	0.015	100	0	5	10
P20.3	900x900 G	35.551	0.79	50	P20.3 to F	P20.3	P20.4	24.5	34.12	33.998	0.5	RRJ3	525	0.01	Manning	P20.3	0.015	100	0	5	10
P20.4	900x900 G	35.551	1.21	50	P20.4 to F	P20.4	P20.5	24.5	33.978	33.855	0.5	RRJ3	525	0.01	Manning	P20.4	0.015	100	0	5	10
P20.5	900x900 G	35.551	0.72	50	P20.5 to F	P20.5	P20.6	24.5	33.78	33.658	0.5	RRJ3	600	0.01	Manning	P20.5	0.015	100	0	5	10
P20.6	900x900 G	35.55	0.61	50	P20.6 to F	P20.6	P20.7	24.5	33.638	33.515	0.5	RRJ3	600	0.01	Manning	P20.6	0.015	100	0	5	10
P20.7	900x900 G	35.501	0.55	50	P20.7 to F	P20.7	P20.8	24.5	33.495	33.373	0.5	RRJ3	600	0.01	Manning	P20.7	0.015	100	0	5	10
P20.8	900x900 G	35.451	0.41	50	P20.8 to F	P20.8	P20.9	24.5	33.298	33.175	0.5	RRJ3	675	0.01	Manning	P20.8	0.015	100	0	5	10
P20.9	900x900 G	35.5	0.38	50	P20.9 to F	P20.9	P20.10	24.5	33.155	33.033	0.5	RRJ3	675	0.01	Manning	P20.9	0.015	100	0	5	10
P20.10	900x900 G	35.5	0.63	50	P20.10 to	P20.10	P20.11	23.5	32.958	32.723	1	RRJ3	750	0.01	Manning	P20.10	0.015	100	0	5	10
P20.11	900x900 G	35.5	0.32	50	P20.11 to	P20.11	P20.12	46.252	32.703	31.012	3.655	RRJ3	750	0.01	Manning	P20.11	0.014	100	0	5	10
P20.12	900x900 G	32.592	0.77	80	P20.12 to	P20.12	P20.13	8.267	30.992	30.828	1.991	RRJ3	750	0.01	Manning	P20.12	0.022	100	0	5	10
P20.13	900x900 G	32.242														P20.13					
P21.1	900x900 G	32.2	9.55	80	P21.1 to F	P21.1	P10.8	8.693	31.154	31.067	1	RRJ3	300	0.01	Manning	P21.1	0.154	100	0	5	10
P10.8	1200x120(	31.985														P10.8					
P23.1	CAP&SEAI	35.75	9.32	80	P23.1 to F	P23.1	P20.3	5.5	34.782	34.587	3.541	RRJ3	(2x)225	0.01	Manning	P23.1	0.121	100	0	5	10
P20.3	900x900 G	35.551														P20.3					
P24.1	CAP&SEAI	35.75	9.3	80	P24.1 to F	P24.1	P20.4	5.5	34.782	34.587	3.543	RRJ3	(2x)225	0.01	Manning	P24.1	0.121	100	0	5	10
P20.4	900x900 G	35.551														P20.4					
P25.1	CAP&SEAI	35.75	9.32	80	P25.1 to F	P25.1	P20.5	5.5	34.782	34.587	3.544	RRJ3	(2x)225	0.01	Manning	P25.1	0.123	100	0	5	10
P20.5	900x900 G	35.551														P20.5					
P26.1	CAP&SEAI	35.75	9.26	80	P26.1 to F	P26.1	P20.6	5.504	34.782	34.587	3.544	RRJ3	(2x)225	0.01	Manning	P26.1	0.119	100	0	5	10
P20.6	900x900 G	35.55														P20.6					
P27.1	CAP&SEAI	35.75	9.36	80	P27.1 to F	P27.1	P20.7	5.502	34.757	34.512	4.449	RRJ3	(2x)225	0.01	Manning	P27.1	0.128	100	0	5	10
P20.7	900x900 G	35.501														P20.7					
P28.1	CAP&SEAI	35.75	9.31	80	P28.1 to F	P28.1	P20.8	5.5	34.734	34.439	5.359	RRJ3	(2x)225	0.01	Manning	P28.1	0.138	100	0	5	10
P20.8	900x900 G	35.451														P20.8					
P29.1	CAP&SEAI	35.75	9.28	80	P29.1 to F	P29.1	P20.9	5.502	34.757	34.512	4.455	RRJ3	(2x)225	0.01	Manning	P29.1	0.128	100	0	5	10
P20.9	900x900 G	35.5														P20.9					
P30.1	CAP&SEAI	35.75	9.42	80	P30.1 to F	P30.1	P20.10	5.513	34.757	34.512	4.443	RRJ3	(2x)225	0.01	Manning	P30.1	0.148	100	0	5	10
P20.10	900x900 G	35.5														P20.10					
P31.1	CAP&SEAI	35.75	9.1	80	P31.1 to F	P31.1	P20.11	5.501	34.757	34.512	4.458	RRJ3	(2x)225	0.01	Manning	P31.1	0.155	100	0	5	10
P20.11	900x900 G	35.5														P20.11					
PEX01.1	G.G.P. 2.4	34.02	0.97	80	PEX01.1 t	PEX01.1	PEX01.2	9.306	32.23	32.01	2.364	RRJ3	750	0.01	Manning	PEX01.1	0.054	70	30	5	10
PEX01.2	900x900 G	33.927	0.33	80	PEX01.2 t	PEX01.2	PEX01.3	23.455	32	31.78	0.938	RRJ3	750	0.01	Manning	PEX01.2	0.011	70	30	5	10
PEX01.3	G.G.P. 2.4	33.712	0.51	80	PEX01.3 t	PEX01.3	PEX01.4	9.305	31.781	31.683	1.06	RRJ3	750	0.01	Manning	PEX01.3	0.052	70	30	5	10
PEX01.4	G.G.P. 2.4	33.625	0.37	80	PEX01.4 t	PEX01.4	PEX01.5	16.302	31.663	31.49	1.06	RRJ3	750	0.01	Manning	PEX01.4	0.021	70	30	5	10
PEX01.5	G.G.P. 2.4	33.458	7.38	80	PEX01.5 t	PEX01.5	PEX01.6	22.622	31.46	31.25	0.928	RRJ3	900	0.01	Manning	PEX01.5	0.031	70	30	5	10
PEX01.6	G.G.P. 2.4	33.252	0.44	80	PEX01.6 t	PEX01.6	PEX01.7	34.398	31.23	30.89	0.988	RRJ3	900	0.01	Manning	PEX01.6	0.044	70	30	5	10
PEX01.7	G.G.P. 2.4	32.963	1.25	80	PEX01.7 t	PEX01.7	PEX01.8	70.778	30.87	30.07	1.13	RRJ3	1050	0.01	Manning	PEX01.7	0.066	70	30	5	10
PEX01.8	900x900 G	32.307														PEX01.8					
PEX02.1	CAP&SEAI	35	7.89	80	PEX02.1 t	PEX02.1	PEX01.1	13.265	32.383	32.25	1	RRJ3	750	0.01	Manning	PEX02.1	0.423	100	0	5	10
PEX01.1	G.G.P. 2.4	34.02														PEX01.1					
PRW01.1	900x900 G	34.542	7.38	80	PRW01.1	PRW01.1	PRW01.2	21.62	33.398	31.855	7.134	RRJ3	375	0.01	Manning	PRW01.1	0.185	100	0	5	10
PRW01.2	900x900 G	34.322	1.62	80	PRW01.2	PRW01.2	PRW01.3	11.636	31.835	31.719	1	RRJ3	375	0.01	Manning	PRW01.2	0.112	100	0	5	10
PRW01.3	900x900 G	34.127	0.9	80	PRW01.3	PRW01.3	PRW01.4	28.916	31.644	31.355	1	RRJ3	450	0.01	Manning	PRW01.3	0.071	100	0	5	10
PRW01.4	900x900 G	33.876	2.07	80	PRW01.4	PRW01.4	PRW01.5	7.192	31.335	31.263	1	RRJ3	450	0.01	Manning	PRW01.4	0.117	100	0	5	10
PRW01.5	900x900 G	33.585														PRW01.5					
PRW02.1	900x900 G	34.15	6.29	80	PRW02.1	PRW02.1	PRW02.2	15.96	33.133	32.974	1	RRJ3	300	0.01	Manning	PRW02.1	0.219	100	0	5	10
PRW02.2	900x900 G	34.177	0.66	80	PRW02.2	PRW02.2	PRW02.3	27.295	32.954	32.62	1.221	RRJ3	375	0.01	Manning	PRW02.2	0.071	100	0	5	10
PRW02.3	900x900 G	33.696	0.6	80	PRW02.3	PRW02.3	PRW01.4	23.513	32.464	32.229	1	RRJ3	450	0.01	Manning	PRW02.3	0.086	100	0	5	10
PRW01.4	900x900 G	33.876														PRW01.4					

RESULTS

Pit							Pipe					Overflow					
Pit Name	Approach Flow (m3/s)	Captured Flow (m3/s)	Bypass Flow (m3/s)	Max HGL (m)	Ponding Depth (m)	Pit Freeboarc (m)	Pipe Name	Max Flow (m3/s)	Max Velocity (m/s)	Max U/S HGL (m)	MAX D/S HGL (m)	From	To	Flow Width (m)	Flow Depth (m)	Flow Velocity (m/s)	VxD Ratio
P01.7												P01.7					
P01.1	0.007	0.014	0.011	35.593	0.028	0.059	P01.1 to F	0.019	0.59	35.579	35.561	P01.1	P01.2	3.133	0.028	0	0.01
P01.2	0.011	0.023	0.003	35.561	0.039	-0.039	P01.2 to F	0.043	1.09	35.503	35.388	P01.2	P01.3	3.562	0.039	0.05	0
P01.3	0.021	0.024	0	35.388	0.04	0.134	P01.3 to F	0.068	1.01	35.366	35.314	P01.3	P01.4	3.583	0.04	0.28	0.01
P01.4	0.032	0.019	0.018	35.314	0.034	0.308	P01.4 to F	0.086	1.22	35.242	35.186	P01.4	P01.5	3.507	0.034	0.45	0.02
P01.5	0.078	0.051	0.032	35.186	0.067	0.435	P01.5 to F	0.126	1.15	35.136	35.083	P01.5	P01.6	4.029	0.067	0.27	0.02
P01.6	0.024	0.082	0.078	35.083	0.091	0.54	P01.6 to F	0.193	1.75	34.919	34.841	P01.6	P01.7	4.436	0.091	0.38	0.03
P01.7	0	0	0.058	34.841	0.033	0.859	P01.7 to F	0.197	1.78	34.711	34.297	P01.7	P01.8	3.465	0.033	0.55	0.02
P01.8	0.034	0	0.159	34.297	0.061	0.701	P01.8 to F	0.202	1.83	34.144	33.801	P01.8	P01.9	3.941	0.061	0.96	0.06
P01.9	0.159	0.127	0.091	33.801	0.051	0.599	P01.9 to F	0.477	2.25	33.524	33.184	P01.9	P01.10	3.766	0.051	0.72	0.04
P01.10	0.091	0	0.147	33.184	0.06	0.778	P01.10 to	0.58	2.23	32.829	32.634	P01.10	P06.1	3.918	0.06	0.92	0.06
P01.11	0.137	0.11	0.037	32.634	0.031	0.854	P01.11 to	0.702	2.32	32.274	31.971	P01.11	PEX01.7	3.376	0.031	0.66	0.02
P01.12	0	0	0.005	31.953	0.014	1.353	P01.12 to	0.702	2.39	31.627	31.309	P01.12	PEX01.7	1.595	0.014	0	0.01
PEX01.7												PEX01.7					
P02.1	0.05	0.05		34.086	0	0.454	P02.1 to F	0.05	1.38	33.948	33.574	P02.1			0		
P02.2	0.03	0.03		33.526	0	1.023	P02.2 to F	0.089	1.98	33.45	33.184	P02.2			0		
P01.10												P01.10					
P03.1	0.033	0.026	0.064	33.205	0.049	0.898	P03.1 to F	0.026	1.08	33.117	32.741	P03.1	P03.2	3.736	0.049	0.53	0.03
P03.2	0.064	0	0.137	32.72	0.065	1.115	P03.2 to F	0.025	1.31	32.71	32.634	P03.2	P01.11	3.999	0.065	0.77	0.05
P01.11												P01.11					
P04.1	0.036	0.029	0.007	32.69	0.02	0.606	P04.1 to F	0.029	0.78	32.646	32.634	P04.1	LOST	2.249	0.02	0	0.01
P01.11												P01.11					
P05.1	0.187	0.187		34.644	0	1.089	P05.1 to F	0.187	1.87	34.367	33.933	P05.1			0		
P05.2	0	0		33.933	0	0.817	P05.2 to F	0.181	2.27	33.902	33.801	P05.2			0		
P01.9												P01.9					
P06.1	0.147	0.026	0.159	33.221	0.043	0.605	P06.1 to F	0.027	0.48	33.188	33.184	P06.1	P10.1	3.622	0.043	1.67	0.07
P01.10												P01.10					
P10.1	0.159	0.065	0.183	31.853	0.064	0.417	P10.1 to F	0.066	0.94	31.73	31.654	P10.1	P10.3	3.994	0.064	1.03	0.07
P10.2	0.019	0.015	0.046	31.654	0.041	0.182	P10.2 to F	0.08	0.75	31.621	31.598	P10.2	P10.3	3.593	0.041	0.51	0.02
P10.3	0.229	0.167	0.132	31.598	0.121	0.1	P10.3 to F	0.247	1.14	31.438	31.395	P10.3	P10.4	4.941	0.121	0.31	0.04
P10.4	0.132	0.144	0.005	31.395	0.109	0.299	P10.4 to F	0.393	1.39	31.289	31.24	P10.4	P10.5	4.751	0.109	0.19	0.01
P10.5	0.06	0.101	0.017	31.24	0.086	0.476	P10.5 to F	0.528	1.2	31.186	31.159	P10.5	P10.6	4.365	0.086	0.42	0.04
P10.6	0	0.034	0.042	31.159	0.041	0.657	P10.6 to F	0.733	1.15	31.138	31.114	P10.6	P10.7	3.6	0.041	0.28	0.01
P10.7	0.004	0.004	0	31.114	0.009	0.717	P10.7 to F	0.736	1.16	31.089	31.073	P10.7	P11.2	1.081	0.009	0	0
P10.8	0	0		31.073	0	0.912	P10.8 to F	0.827	1.3	30.96	30.953	P10.8			0		
P10.9	0	0		30.953	0	1.126	P10.9 to F	0.827	1.3	30.931	30.894	P10.9			0		
P10.10	0	0		30.894	0	1.109	P10.10 to	0.827	1.3	30.761	30.75	P10.10			0		
P10.11	0	0		30.75	0	-1.29						P10.11			0		
P11.1	0.01	0.007	0.003	31.087	0.017	0.898	P11.1 to F	0.014	0.56	31.084	31.079	P11.1	P11.2	1.928	0.017	0	0
P11.2	0.003	0.003		31.079	0.009	0.828	P11.2 to F	0.023	0.59	31.079	31.073	P11.2			0.009		
P10.8												P10.8					
P12.1	0.112	0.112		31.914	0	0.777	P12.1 to F	0.112	1.02	31.68	31.652	P12.1			0		
P12.2	0.078	0.078		31.652	0	1.154	P12.2 to F	0.192	1.9	31.432	31.178	P12.2			0		
P12.3	0	0		31.178	0	0.762	P12.3 to F	0.191	2.02	31.178	31.159	P12.3			0		
P10.6												P10.6					
P13.1	0.016	0.015	0.02	31.285	0.029	0.832	P13.1 to F	0.017	0.78	31.244	31.257	P13.1	P13.2	3.173	0.029	0	0.01
P13.2	0.02	0.016	0.023	31.257	0.03	0.678	P13.2 to F	0.04	0.73	31.248	31.24	P13.2	P10.5	3.285	0.03	0	0.01
P10.5												P10.5					
P20.1	0.086	0.086		34.862	0	0.888	P20.1 to F	0.086	1.07	34.638	34.55	P20.1			0		
P20.2	0.009	0.016	0.002	34.55	0.03	1.001	P20.2 to F	0.099	0.86	34.482	34.486	P20.2	P20.3	3.239	0.03	0	0
P20.3	0.002	0.01	0.001	34.486	0.023	1.064	P20.3 to F	0.179	1.07	34.438	34.429	P20.3	P20.4	2.491	0.023	0	0
P20.4	0.001	0.009	0	34.429	0.021	1.122	P20.4 to F	0.26	1.48	34.339	34.271	P20.4	P20.5	2.271	0.021	0	0
P20.5	0	0.009	0.001	34.271	0.02	1.28	P20.5 to F	0.34	1.45	34.215	34.184	P20.5	P20.6	2.216	0.02	0	0
P20.6	0.001	0.007	0.002	34.184	0.018	1.367	P20.6 to F	0.418	1.59	34.125	34.064	P20.6	P20.7	1.977	0.018	0	0
P20.7	0.002	0.008	0.003	34.064	0.019	1.437	P20.7 to F	0.499	1.92	33.995	33.874	P20.7	P20.8	2.171	0.019	0	0
P20.8	0.005	0.013	0	33.874	0.027	1.577	P20.8 to F	0.592	1.83	33.822	33.758	P20.8	P20.9	2.999	0.027	0	0
P20.9	0	0.007	0.002	33.758	0.017	1.742	P20.9 to F	0.67	2.17	33.698	33.518	P20.9	P20.10	1.893	0.017	0	0
P20.10	0	0.007	0.001	33.495	0.018	2.005	P20.10 to	0.761	2.67	33.447	33.109	P20.10	P20.11	1.971	0.018	0	0
P20.11	0	0.006	0.008	32.989	0.015	2.512	P20.11 to	0.854	3.84	32.889	31.718	P20.11	P20.12	1.661	0.015	0	0.01
P20.12	0.008	0	0.007	31.718	0.02	0.874	P20.12 to	0.854	2.55	31.568	31.166	P20.12	LOST	2.282	0.02	0	0.01
P20.13	0	0		31.166	0	-1.11						P20.13			0		
P21.1	0.094	0.094		31.731	0	0.469	P21.1 to F	0.094	1.51	31.472	31.26	P21.1			0		
P10.8												P10.8					
P23.1	0.074	0.074		35.049	0	0.701	P23.1 to F	0.074	1.24	34.848	34.677	P23.1			0		
P20.3												P20.3					
P24.1	0.074	0.074		35.051	0	0.699	P24.1 to F	0.074	1.24	34.85	34.677	P24.1			0		
P20.4												P20.4					
P25.1	0.075	0.075		35.054	0	0.696	P25.1 to F	0.075	1.26	34.854	34.677	P25.1			0		
P20.5												P20.5					
P26.1	0.073	0.073		35.044	0	0.706	P26.1 to F	0.073	1.23	34.842	34.676	P26.1			0		
P20.6												P20.6					
P27.1	0.078	0.078		35.013	0	0.737	P27.1 to F	0.078	1.32	34.813	34.599	P27.1			0		
P20.7												P20.7					
P28.1	0.084	0.084		34.988	0	0.762	P28.1 to F	0.084	1.43	34.79	34.525	P28.1			0		
P20.8												P20.8					
P29.1	0.079	0.079		35.015	0	0.735	P29.1 to F	0.078	1.33	34.815	34.599	P29.1			0		
P20.9												P20.9					
P30.1	0.091	0.091		35.075	0	0.675	P30.1 to F	0.09	1.5	34.88	34.606	P30.1			0		
P20.10												P20.10					
P31.1	0.095	0.095		35.096	0	0.654	P31.1 to F	0.095	1.56	34.902	34.609	P31.1			0		
P20.11												P20.11					
PEX01.1	0.029	0.023	0.011	32.541	0.024	1.479	PEX01.1 t	0.28	2	32.416	32.231	PEX01.1	PEX01.2	2.683	0.024	0	0.01
PEX01.2	0.011	0.009	0.029	32.231	0.034	1.696	PEX01.2 t	0.288	1.94	32.146	32.108	PEX01.2	PEX01.3	3.479	0.034	0.45	0.02
PEX01.3	0.029	0.024	0.016	32.108	0.028	1.604	PEX01.3 t	0.311	1.73	32.04	32	PEX01.3	PEX01.4	3.094	0.028	0	0.01
PEX01.4	0.016	0.013	0.019	32	0.029	1.625	PEX01.4 t	0.323	2.07	31.951	31.727	PEX01.4	PEX01.5	3.195	0.029	0	0.01
PEX01.5	0.019	0.015	0.027	31.7	0.033	1.758	PEX01.5 t	0.337	2.52	31.7	31.484	PEX01.5	PEX01.6	3.46	0.033	0.43	0.01
PEX01.6	0.027	0.021	0.022	31.468	0.071	1.785	PEX01.6 t	0.357	2.02	31.378	31.309	PEX01.6	PEX01.7	1.862	0.071	0.49	0.03
PEX01.7	0.063	0.044	0.019	31.309	0.029	1.654	PEX01.7 t	1.092	2.28	31.036	30.77	PEX01.7	LOST	3.175	0.029	0	0.01
PEX01.8	0	0		30.77	0	-0.7						PEX01.8			0		
PEX02.1	0.259	0.259		32.924	0	2.076	PEX02.1 t	0.258	1.03	32.695	32.541	PEX02.1			0		
PEX01.1												PEX01.1					
PRW01.1	0.113	0.113		33.619	0	0.923	PRW01.1	0.113	1.55	33.418	32.972	PRW01.1			0		
PRW01.2	0.069	0.069		32.972	0	1.35	PRW01.2	0.181	1.64	32.846	32.773	PRW01.2			0		
PRW01.3	0.043	0.043		32.773	0	1.354	PRW01.3	0.224	1.41	32.743	32.643	PRW01.3			0		
PRW01.4	0.072	0.072		32.643	0	1.233	PRW01.4	0.513	3.23	32.26	31.713	PRW01.4			0		
PRW01.5	0	0		29.263	0	0						PRW01.5			0		
PRW02.1	0.134	0.134		33.889	0	0.261	PRW02.1	0.133	1.9	33.671	33.256	PRW02.1			0		
PRW02.2	0.043	0.043		33.256	0	0.921	PRW02.2	0.176	2.11	33.157	32.852	PRW02.2			0		
PRW02.3	0.052	0.052		32.787	0	0.909	PRW02.3	0.26	2.07	32.708	32.643	PRW02.3			0		
PRW01.4												PRW01.4					

VERIFIER:

JOB MANAGER: J. GILLIGAN

DESIGNED: M. SANTIAGO

DRAWN: C. PASKE

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DEVELOPMENT APPLICATION	CP		MS	28.03.18
02	STORMWATER DRAINAGE AMENDMENT	CP		TB	16.07.18
03	ISSUED FOR COUNCIL APPROVAL	JO		TB	29.08.18

CLIENT

sydney business park

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

REIDCAMPBELL

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
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PROJECT

4 DARLING STREET,
MARSDEN PARK

DRAWING TITLE

CIVIL ENGINEERING WORKS
DEVELOPMENT APPLICATION

STORMWATER ANALYSIS
RESULTS

JOB NUMBER
172938

DRAWING NUMBER
DAC05.20

REVISION
03

DRAWING SHEET SIZE = A1

Appendix B – Site Survey Plan

NOTES:

- THE POSITION OF FEATURES ARE INDICATIVE ONLY.
- SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. PRIOR TO ANY EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR POSSIBLE LOCATION OF ANY OTHER SERVICES INCLUDING THOSE WHICH MAY BE UNDERGROUND.
- INDICATES EXISTING SURFACE LEVEL.
- CONTOURS SHOWN DEPICT THE GENERAL TOPOGRAPHY. THEY DO NOT REPRESENT EXACT LEVELS OTHER THAN AT SPOT LEVELS SHOWN.
- RELATIONSHIP OF IMPROVEMENTS TO BOUNDARIES IS DIAGRAMMATIC ONLY. WHERE OFFSETS ARE CRITICAL THEY SHOULD BE CONFIRMED BY FURTHER SURVEY.
- ONLY THE INDIVIDUAL STREET TREES WITHIN THE ROAD RESERVE ARE SHOWN. FURTHER FIELD INSPECTION SHOULD BE CARRIED OUT WHERE TREE DETAILS ARE CONSIDERED TO CRITICALLY AFFECT DESIGN. NO INDIVIDUAL TREES APART FROM AREAS OF TREES & BUSHLAND HAVE BEEN SHOWN.

NOTE:

THESE PLANS SHOULD BE READ IN CONJUNCTION WITH DIGITAL DATA ISSUED TO CLIENT. THE DIGITAL DATA CONTAINS NUMEROUS LAYERS OF INFORMATION WHICH ARE NOT SHOWN ON THESE PLANS FOR THE SAKE OF CLARITY.

PROPOSED LOT 3003

PROPOSED LOT 3004

PROPOSED LOT 3005
5.64 ha

LOT 306
DP 1213756
"AUSREO"
Factory

289.88
113.86
48.995
89.355
245.945
184.14

Retaining Wall
Top Ret Wall 37.47
Top Ret Wall 37.29
Top Ret Wall 36.11
Top Ret Wall 35.93
Top Ret Wall 37.71

Restriction on the use of land (DP1213756)
Easement for padmount substation 2.75 wide (DP1213756)
Electricity Substation
Easement For transmission Line 60.96 wide (J808737)
Transmission Tower

DENOTES TOP OF BANK
DENOTES BOTTOM OF BANK

DARLING STREET

DP 1213756

DP 1194052

DP 1213756

0 10 20 30 40 50m
1 : 500

DIAL BEFORE YOU DIG www.1100.com.au

Client: Marsden Park Developments LJMc	Project: PLAN OF LEVELS & CONTOURS OVER PROPOSED LOT 3005, BEING PART OF LOTS 303-305 IN DP 1213756 DARLING STREET, MARSDEN PARK	FREEBURN SURVEYING	MATTHEW FREEBURN LAND, ENGINEERING & MINING SURVEYOR SUITE 2, FIRST FLOOR, "SURVEYOR HOUSE" 2 CASTLEREAGH STREET PENRITH 2750	Telephone 02 4721 2289 Fax 02 4721 5646 email a.dean@freeburnsurveyors.com or matthew@freeburnsurveyors.com	Scale 1:500 | Datum: AHD | Contour: 0.5m Surveyor: CR/AF | Drawn By: LJMc | Checked: AF Date of Survey: April 2017 & Dec 2017 | Sheet 1 of 1 AUTOCAD | REVISION 01 15-12-17 | 33 444 - LOT 3005

A1 SHEET

Appendix C – Maintenance Schedule

4 Darling Street, Marsden Park

NORTHROP

Stormwater Maintenance Schedule

Prepared on 28.08.18

Site Description: The site is located on the eastern end of Darling Street
Site Area: 57,120 m2
Site Access: Direct access to the site via Darling Street

Inspected by: .....
Date of Inspection: .....
Next Inspection: .....

Items to be Inspected	Frequency	Performed by	Inspected		Maintenance		Mainenance Procedure	Initial
			Yes	No	Yes	No		
General								
Stormwater surface inlet pits	Four Monthly/Aftermajor Storm	Owner/Maintenance Contractor					Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter and vegetaion. (eg. Vacum/ eductor truck) Inspect and ensure grate is clear of sediment, debris, litter and vegetation. Ensure flush placement of grate on refitment.	
General inspection of complete stormwater drainage system (that's visible - including roof gutters)	Bi-annually	Owner/Maintenance Contractor					Inspect all drainage structure noting any dilapidatin, carry out required repairs.	
Rainwater Tank								
First flush Device	6 monthly	Owner/Maintenance Contractor					Inspect first flush device to ensure correct operation. Remove accumlated litter and debris. If device is not functioning properly repair or replace.	
Internal inspection	6 monthly	Owner/Maintenance Contractor					Check for evidence of access by animals, birds or insect including the presence of mosquito larvae. If present, identify access point and close. If evidence of algae growth, find and close points of light entry.	
Tank and Lids	6 monthly	Owner/Maintenance Contractor					Check structural intergrity of tank inlcuding roof and access covers. Any dilapidation including holes or gaps are to be noted and repaired.	
Depth of Sediment within Tank	Every 2 Years	Owner/Maintenance Contractor					De-sludge tank(s) by engaging professional cleaner	
Bio-rentention Basin								
Basin and contributing areas are clean of debris and domestic litter	6 Monthly	Owner / Maintenance Contractor					Remove litter and debris within basin and in areas that is obstructing flows into basin.	
Inflow points - sediment accumulation / sediment erosion	6 Monthly	Maintenance Contractor					Replace any top soil in eroded area and grade accordingly. Remove any sediment and debris accumulation if present.	
Embankments	6 Monthly	Maintenance Contractor					Inspect embankments show no visible deformity. Repair and regrade embankments. Replace any plants / vegetation if required.	
Basin vegetation condition	3 Monthly	Maintenance Contractor					Ensure vegetation is still in place. Remove and replace any plants that are dead or beyond a reasonable level of rehabilitation. Trim vegetation to a height that is suitable for the plant type.	
Pond Lining	3 Monthly	Maintenance Contractor					Inspect pond lining for any visible damage. Remove and replace with new lining if required.	
Check vegetation is fertilised	6 Monthly	Maintenance Contractor					Where required fertilise plants with appropriate fertiliser for plant type.	
Enviropod								
Enviropod Pit Inserts	Refer Manufacturers Manual	Maintenance/ Specialised Contractor					Refer to manufacturers operation and maintenance manual.	
Jellyfish Cartridge Filters								
Filter Cartridge sump	Refer Manufactures Manual	Maintenance / Specialised Contractor					Refer to manufactures operation and maintenance manual.	
Chamber filter screen, weir, lid, diversion chamber	Refer Manufactures Manual	Maintenance / Specialised Contractor					Refer to manufactures operation and maintenance manual.	