PLANS AND DOCUMENTS
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DEVELOPMENT APPROVAL

Approval no: DEV2021/1242

Date: 15 May 2023

Queensland Government

BURCHILLS
ENGINEERING SOLUTIONS

# 918 Greenbank Road, North Maclean

## Stormwater Management Plan

Client: Roubaix Properties Pty Ltd

Project No: BE160355

Document No: BE160355-RP-SMP-01

May 2017

# Document Control Record

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| Date: | 22.05.2017 |

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|---|---|
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| Date: | 22.05.2017 |

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# Executive Summary

Roubaix Properties are proposing to develop land described as Lot 2 on SP267252 located at 916 – 944 Greenbank Road, North Maclean, within the Logan City Council (LCC) area. The proposal is for the development of a commercial warehouse facility.

This report was prepared to address the stormwater management requirements of the various State and Local stormwater management policies and guidelines including:

- Construction phase stormwater management;
- External catchment management;
- Peak flow management; and
- Stormwater quality management.

**Construction Phase**

Construction phase stormwater controls have been designed in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008). The controls include physical and management measures to ensure erosion on the site is kept to a minimum and any eroded sediment is captured prior to discharge from site.

**External Catchment Management**

The 2,994 m² external catchment that drains into the subject site from the south will be directed towards Greenbank Road and Mount Lindesay Highway via a drainage channel to be constructed along the site boundary.

**Peak Flow Management**

The proposed development will result in an increase in runoff volume and peak flow rates from the subject site. It is proposed to mitigate this increase by providing a series of on-site detention basins designed to restrict peak flows from the 2, 5, 10, 20, 50, and 100 year ARI design storm events to within the pre-development peak flow rates for each event.

**Stormwater Quality Management**

Stormwater runoff quality will be managed through the inclusion of bioretention filters located in the base of the proposed detention basins. The proposed bioretention systems were modelled in MUSIC to ensure the pollutant load reduction targets set out in the State Planning Policy will be achieved for the development.

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# 1. Introduction

## 1.1 Background

This Stormwater Management Plan (SMP) has been prepared for Roubaix Properties Pty Ltd, the proponent of this development application, seeking Development Permit approval for a Material Change of Use (MCU) for the establishment of an industrial complex at 916-944 Greenbank Road, North Maclean (the subject site).

The subject site is situated within the Greater Flagstone Priority Development Area (PDA).

## 1.2 Regulatory Requirements and Technical Guidelines

The strategies proposed in this SMP have been developed to address the requirements of the Logan City Council Planning Scheme and Development Guidelines, and have also been prepared in accordance with the following guidelines:

- Logan City Council, Stormwater Quality and Flow Management Guidelines (LCC, 2013);
- *State Planning Policy July 2014* (DSPIP, 2014)*;*
- Queensland Urban Drainage Manual (QUDM) – Second Edition 2008 (DNRW, 2008);
- Australian Rainfall and Runoff – A Guide to Flood Estimation, Volume 1 (IEAust, 2003);
- Australian Rainfall and Runoff – A Guide to Flood Estimation, Volume 2 (IEAust, 1987);
- MUSIC Modelling Guidelines (Water By Design, 2010);
- Urban Stormwater Quality Planning Guidelines 2010 (DERM, 2010); and
- Best Practice Erosion and Sediment Control (IECA, 2008).

## 1.3 Objectives

The main objectives of this SMP have been established from the criteria set out in the Logan City Council Stormwater Quality and Flow Management Guidelines (LCC, 2013) and are summarised as follows:

- to protect receiving water quality by limiting the quantity of key pollutants discharged in stormwater from urban development;
- to prevent increased in-stream erosion downstream of urban areas by controlling the magnitude and duration of sediment-transporting flows; and
- to protect in-stream ecosystems from the significant effects of increased runoff frequency by capturing the initial portion of runoff from impervious areas.

## 1.4 Scope

To achieve the abovementioned objectives, this SMP details the following:

- Site description including:
  - Topography;
  - Soils; and
  - Vegetation.
- Erosion and Sediment;
  - Best Practice Erosion and Sediment Control Measures (IECA 2008) for the construction phase of the development;

- Stormwater Quantity:
    - Control measures to ensure no net increase in peak discharge from the subject site up to the 100 year Average Recurrence Interval (ARI) event;
- Stormwater Quality:
    - Methods to ensure quality objectives of the receiving waters are achieved, and the existing hydrological regime is maintained to an acceptable level.

To minimise the impact of the proposed development on the external environment and to avoid significant and/or sustained deterioration in downstream water quality, the proponent shall implement this SMP. This SMP may be amended as required, in response to the monitoring and maintenance program.

# 2. Site Details

## 2.1 Location

The subject site is located at 916-944 Greenbank Road, North Maclean and is comprised of a single lot. The lot is properly described as Lot 2 on SP267252 and covers a combined area of 25,310 m$^2$. The site is identified by the Logan City Council Planning Scheme as being within the Greater Flagstone PDA Zone. Figure 2.1 below identifies the location of the subject site.

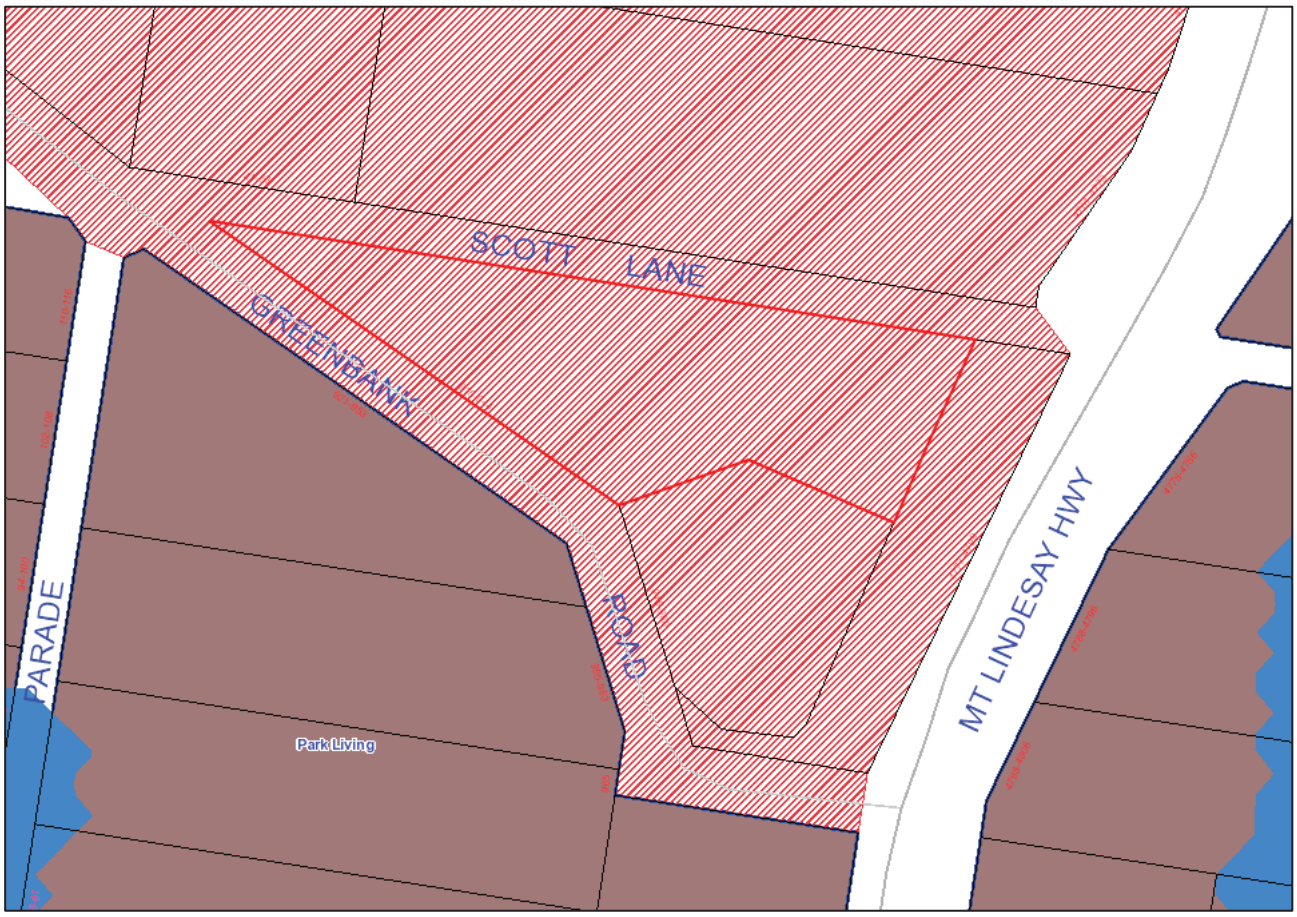


**Figure 2.1 Site Locality Plan (LCC, 2016)**

## 2.2 Topography

The existing topography of the proposed site is very flat with an average slope of < 0.5% across the site. Generally, the site slopes towards the northern boundary. There is a minor vegetated depression on the north-west corner of the subject site where parts of the site (approximately 20%) drains into. The remainder of the runoff generated from the site flows to the north-easterly corner where the existing topography is slightly lower and then discharging out of the site to the proposed road (Scott Lane).

For further details relating to the topography of the subject site and the delineation of catchments please refer to Appendix E.

## 2.3 Downstream Environment

As stated above, the subject site has a very flat overall slope (< 0.5%) and generally flows in a south to north direction where it then discharges as overland sheet flow to the undeveloped Scott Lane and further north to undeveloped heavily vegetated land. The Logan River is in the vicinity of the site approximately 1 km to the south.

## 2.4 Rainfall

Mean annual rainfall for the site has been estimated at 926 mm from the data set obtained from the nearest Bureau of Meteorology (BOM) station number 40542 at Maclean Bridge (BOM, 2017).

## 2.5 Description of Development

The proposal seeks to develop the existing lot, creating industrial warehousing and sheds which will deliver the following:

- 3 separate buildings containing 34 individual lots;
- 178 car parks; and
- construction of Scott Lane to the north of the site (excluded from this SMP).

The site will have three (3) access points. One access to Greenbank Road and two other access points onto Scott Lane.

For further details regarding the proposed layout, please refer to the complete site plan attached within Appendix A.

# 3. Stormwater Quantity Management Plan

## 3.1 Overview

The following section of this report outlines the measures required to meet the above-mentioned objective in regards to stormwater quantity. In order to meet these objectives, it is necessary to ensure that post development discharge from the site will not create a worse situation for downstream property owners than that which existed prior to the development (i.e. non-worsening) (DEWS; BCC; IPWEA, 2013).

Due to the increase in impervious areas within the proposed development, peak stormwater flow rates will increase. In order to mitigate these flow rates from the developed site it is proposed to implement an On Site Detention (OSD) system. OSD systems temporarily store stormwater runoff and release flows at a controlled rate that is no greater than the pre-developed peak rate.

## 3.2 Catchment Parameters

Drainage catchments have been delineated using site survey in the pre-development scenario, and development plans in the post developed scenario. Pre and post development catchment parameters are summarised in Table 3.1. Further catchment parameters used within the XP-SWMM model are included in Appendix C.

**Table 3.1 Catchment Parameters**

| Scenario | Catchment ID | Total Area (ha) | Impervious (%) | Catchment Slope (%) |
|---|---|---|---|---|
| **Pre-developed** | Pre A | 2.231 | 0 | 0.35 |
| | Ext A | 0.299 | 0 | 4 |
| **Post-developed** | Post A1 | 0.400 | 82 | 1 |
| | Post A2 | 0.225 | 86 | 1 |
| | Post A3 | 0.492 | 79 | 1 |
| | Post A4 | 0.384 | 93 | 1 |
| | Post A5 | 0.317 | 85 | 1 |
| | Post A6 | 0.413 | 85 | 1 |

## 3.3 XP-SWMM Analysis

XP-SWMM (version 2017) software was utilised to model the performance of the proposed stormwater quantity control measures. This modelling software is a link-node model capable of performing hydrology and hydraulics of stormwater drainage systems simultaneously.

Laurenson's Hydrology has been adopted as the runoff routing method within XP-SWMM. Sub-catchment routing in this method is carried out using the Muskingum procedure, which is a storage routing method based on the storage equation. Details of the assumptions and input parameters used within the XP-SWMM model inputs are included in Appendix C.

A comparison between the peak runoff values obtained using the Rational Method and the XP-SWMM model for the pre- and post-development scenarios during the 100 year ARI design storm event is contained in Table 3.2.

**Table 3.2 Rational Method vs XPSWMM Generated Peak Discharges**

| Scenario | Catchment ID | Rational ($m^3/s$) | XP-SWMM ($m^3/s$) | Difference (%) |
|---|---|---|---|---|
| **Pre-developed** | Pre A | 0.668 | 0.470 | -29.9 |
| **Post-developed** | Post A1 | 0.318 | 0.285 | -10.3 |
| | Post A2 | 0.179 | 0.168 | -6.0 |
| | Post A3 | 0.381 | 0.343 | -9.9 |
| | Post A4 | 0.294 | 0.300 | 1.9 |
| | Post A5 | 0.245 | 0.233 | -5.0 |
| | Post A6 | 0.321 | 0.301 | -6.3 |

The peak discharges generated by XP-SWMM are considered to be within an acceptable range of the values obtained from Rational Method calculations. Similar variations were observed for all other ARI events, and are therefore considered appropriate for subsequent hydraulic analysis. It should be noted that the Rational Method has not been used for the design of any mitigation measures.

## 3.4 Conveyance of Flows

In the post developed scenario, it is proposed to provide OSD with five (5) separate combined bioretention/detention basins that discharge to five (5) different locations. These discharge locations are located around the perimeter of the site. All runoff generated within the proposed development site will be conveyed to each of the proposed bioretention/detention basins as surface flow (i.e. no underground drainage is proposed).

The 2,994 m² external catchment that drains into the subject site from the south will be directed towards Greenbank Road and Mount Lindesay Highway via a drainage channel to be constructed along the site boundary.

## 3.5 Detention Modelling

### 3.5.1 Performance of OSD

To confirm the performance of the proposed OSD systems, a pre- and post-development model was constructed. These models compare the total runoff hydrographs for the 100, 50, 20, 10, 5, and 2 year ARI events.

A summary of the modelling results for different ARI events is contained in Table 3.3. Results of the modelling indicate the proposed system is capable of maintaining the pre-development peak site runoff flow rate for the all storm events up to the 100 year ARI event.

**Table 3.3 Pre-Development vs Post-Development (Mitigated) Peak Discharge**

| ARI Event | Peak Discharge ($m^3/s$) | |
|---|---|---|
| | Pre-Development | Post-Development |
| 100 year | 0.469 | 0.457 |
| 50 year | 0.403 | 0.383 |
| 20 year | 0.330 | 0.308 |
| 10 year | 0.272 | 0.255 |
| 5 year | 0.231 | 0.214 |
| 2 year | 0.165 | 0.164 |

A plot of the pre-development vs post-development (mitigated) hydrographs for the 100 year ARI event is included as Figure 3.1.

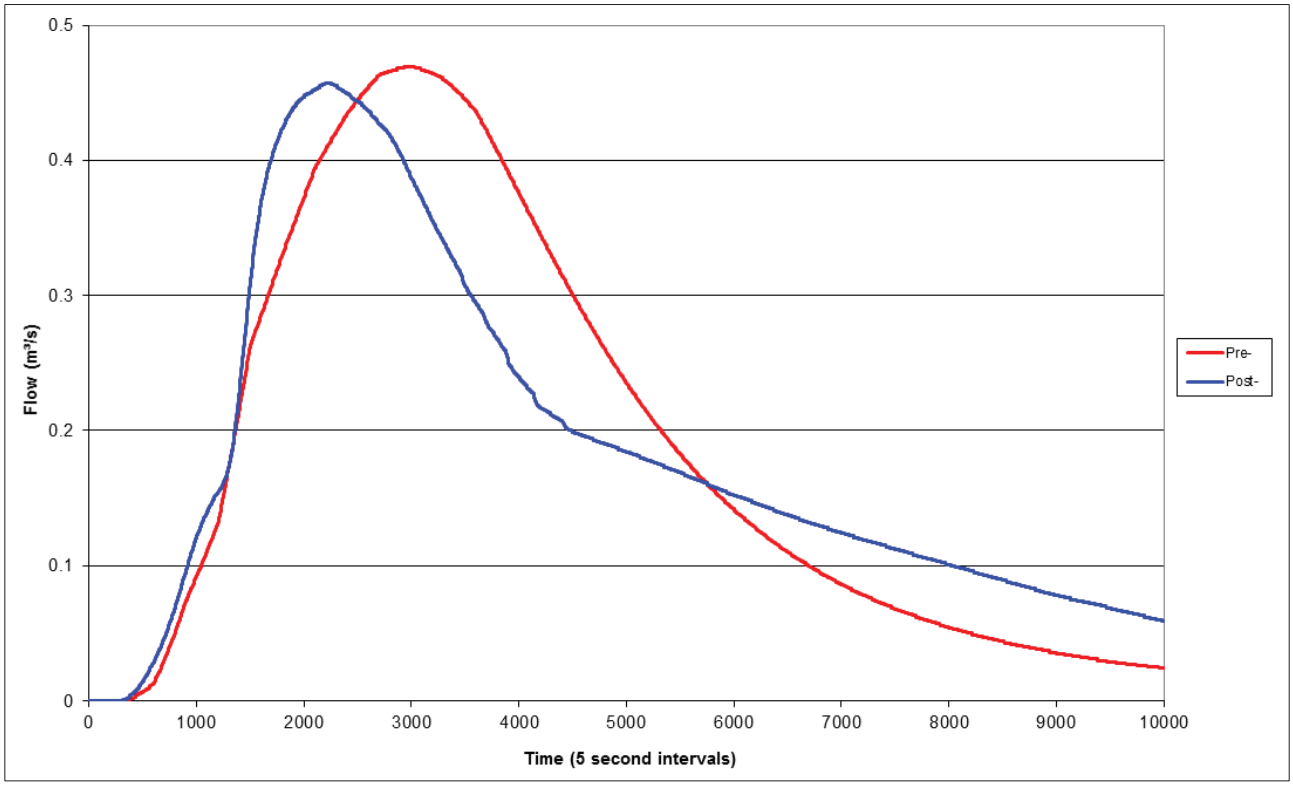


**Figure 3.1 Pre- versus Post-Development 100 year ARI total runoff hydrographs**

## 3.6 OSD Details

The proposed OSD systems are to be implemented to ensure a non-worsening of peak discharges at the LPDs. Table 3.4 below contains the details of the proposed OSD systems within the subject site.

**Table 3.4 OSD Details**

| Detention ID | Outlet Structures | | | 100yr Detention Volume (m3) | Total Volume (m3) |
|---|---|---|---|---|---|
| | Orifices | Riser | Outlet Pipe (s) | | |
| **Bio/Detention Basin 1+2** | 150x250mm orifice @ RL 27.7 | 0.6x0.6m Pit Crest @ R.L.28.12 | 375mm ø, 0.5% Grade | 321 | 329 |
| **Bio/Detention Basin 3** | 100x200mm orifice @ RL 27.7 | 0.6x0.6m Pit Crest@ RL 28.15 | 300mm ø, 0.5% Grade | 319 | 330 |
| **Bio/Detention Basin 4** | 100x200mm orifice @ RL 27.6 | 0.6x0.6m Pit Crest@ RL 28.25 | 300mm ø, 0.5% Grade | 234 | 243 |
| **Bio/Detention Basin 5** | 100x150mm orifice @ RL 27.6 | 0.6x0.6m Pit Crest@ RL 28.0 | 300mm ø, 0.5% Grade | 119 | 122 |
| **Bio/Detention Basin 6** | 150x200mm orifice @ RL 27.8 | 0.6x0.6m Pit Crest@ RL 28.18 | 375mm ø, 0.5% Grade | 135 | 137 |

# 4. Stormwater Quality Management Plan

## 4.1 Overview

The following section of this report outlines the measures required to meet the above-mentioned objective in regards to stormwater quality for both the construction and operational phase of the development.

## 4.2 Construction Phase Best Management Practices

Stormwater runoff quality during the construction phase of this development shall be managed in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008), which is the current recognised construction industry best management practice (BMP) for erosion and sediment control.

In order to meet Council requirements Erosion and Sediment Control (ESC) plans are to be implemented during the construction phase to minimise environmental harm to on-site stormwater treatment devices and downstream receiving waters.

Conceptual construction phase erosion and sediment control drawings are included in the stormwater management plan drawings in Appendix E of this report.

## 4.3 Permanent Water Quality Objective (WQO)

In accordance with the Logan City Council guidelines, the total effect of permanent water quality control measures is to achieve reductions in the mean annual load generated by the development site at a minimum of:

- 80% for Total Suspended solids (TSS);
- 60% for Total Phosphorus (TP); and
- 45% for Total Nitrogen (TN).
- 90% for Gross Pollutants (>5mm).

This will ensure the environmental values of the downstream receiving waters are maintained and have been chosen as the WQO for the development (LCC, 2013).

## 4.4 Treatment Train Modelling

Water quality modelling was carried out for the proposed treatment train using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software to demonstrate that the load based reduction targets can be achieved. Details of the MUSIC model input parameters used are included in Appendix D.

## 4.5 Bioretention Systems

Bio-retention systems operate by filtering stormwater runoff through a soil media prior to discharge into the drainage system. These systems remove pollutants through a number of processes including:

- Sedimentation in the extended detention storage;
- Filtration by the filter media;
- Nutrient uptake by biofilms;

- Nutrient adsorption and pollutant decomposition by soil bacteria; and
- Adsorption of metals and nutrients by filter particles (Somes & Crosby, 2007).

Water captured in the ponding area should be no more than 400 mm deep for a maximum of four (4) days to prevent anaerobic conditions, plant death and insect breeding.

The proposed development includes five (5) separate bioretention systems in the base of the proposed detention basins to treat all runoff from the developed site. Further details of the proposed bioretention systems are included in drawings N400 and N401 included in Appendix E of this report.

## 4.6 MUSIC Results

Results of the MUSIC modelling for the treatment train effectiveness are summarised in Table 4.1. The results indicate that the 80%, 60%, 45% and 90% reduction target for TSS, TP, TN and gross pollutants respectively are achieved for the rainfall data set simulated. A screen capture of the MUSIC modelling results is included as Figure 4.1.

**Table 4.1 Treatment Train Effectiveness**

| Pollutant | Inflows (kg/yr) | Outflows (kg/yr) | Reduction Achieved (%) | Water Quality Objective (%) |
|---|---|---|---|---|
| TSS | 3,010 | 538 | 82.1 | 80 |
| TP | 6.22 | 1.72 | 72.3 | 60 |
| TN | 41.0 | 22.3 | 45.6 | 45 |
| GP | 311 | 0 | 100 | 90 |

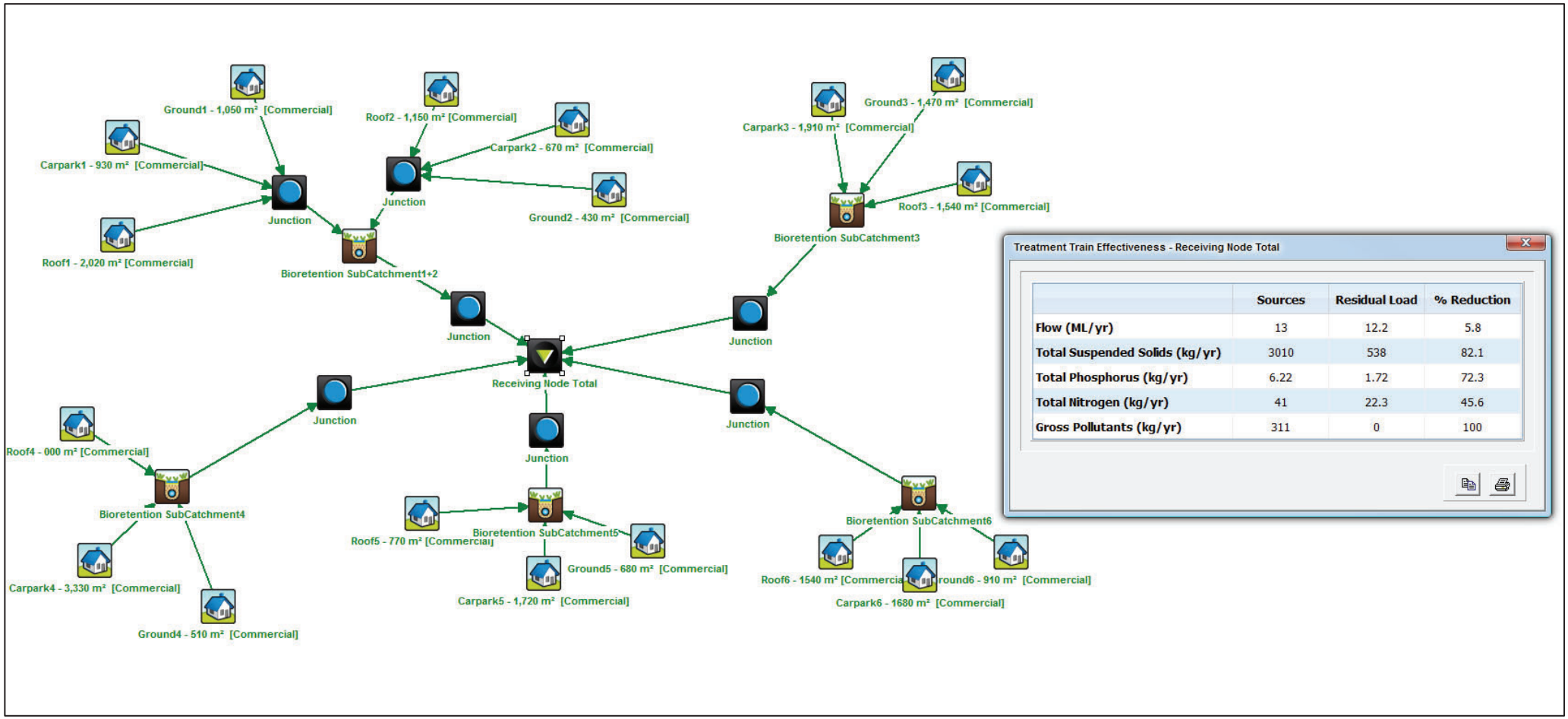


**Figure 4.1 Treatment Train Layout and MUSIC Results**

# 5. Conclusions

This study has reviewed the hydrology and hydraulics of the site for pre-development and post-development conditions and investigated the impact of the proposed development on the downstream environment.

Based on this study, the following conclusions have been drawn:

- Development of the subject site will result in an increase in stormwater runoff volume and peak flow rates.
- The increase in peak flow rates will be mitigated to within pre-development peak flow rates for the 2, 5, 10, 20, 50 and 100-year ARI design storm events through the inclusion of On Site Detention (OSD).
- All runoff from the developed areas of the site will be directed as surface flow to the five (5) proposed OSD basins before discharging under controlled conditions to the road side drainage systems in Greenbank Road, Mount Lindesay Highway, and Scott Lane.
- Construction phase stormwater quantity and quality shall be managed in accordance with *Best Practice Erosion and Sediment Control* (IECA, 2008).
- Stormwater quality improvement measures will be incorporated into the development in the form of bioretention filters located in the base of the proposed detention basins.
- The bioretention systems were sized in MUSIC to ensure the pollutant load reduction targets set out in the State Planning Policy are achieved.

Provided the stormwater management strategy described in this report is fully implemented, the proposed development shall not cause any adverse impacts on the downstream environment.

# 6. References

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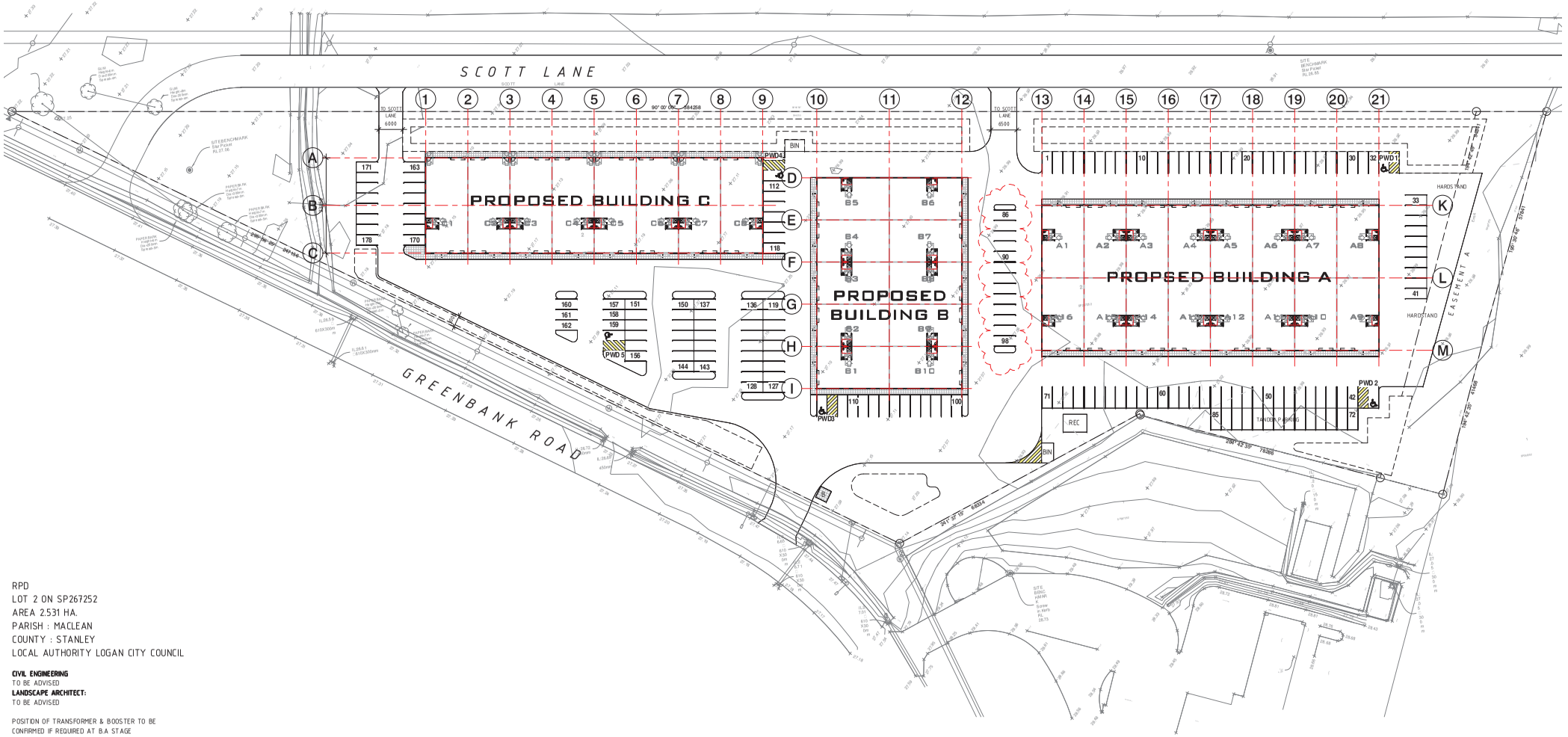
# Appendix A - Proposed Plans of Development




RPD
LOT 2 ON SP267252
AREA 2.531 HA.
PARISH : MACLEAN
COUNTY : STANLEY
LOCAL AUTHORITY LOGAN CITY COUNCIL

**CIVIL ENGINEERING**
TO BE ADVISED
**LANDSCAPE ARCHITECT:**
TO BE ADVISED

POSITION OF TRANSFORMER & BOOSTER TO BE CONFIRMED IF REQUIRED AT B.A STAGE
DRIVEWAY CROSS OVER TO COMPLY WITH LOGAN CITY COUNCIL STANDARDS

1 / 004 **SITE LAYOUT CONCEPT**
SCALE 1 : 500

| AREA CALCULATIONS | | |
|---|---|---|
| **ZONE** | **AREA m²** | **%** |
| TOTAL LANDSCAPING | 8163 | 32.2 |
| PROPOSED BUILDING AREA | 7043 | 27.8 |
| DRIVEWAY PARKING AREA | 10104 | 40 |
| TOTAL DEVELOPMENT SITE AREA | 25310 | 100 |

**ADDITIONAL CALCULATIONS**

| | |
|---|---|
| BUILDING A | 3084m² |
| BUILDING B | 1928m² |
| BUILDING C | 2031m² |
| TOTAL | 7043m² |
| CARPARKS | 178 |
| PWD CARPARKS | 5 |
| BIKE PARKS | TBA |

0 5 10 15 30

**GENERAL NOTES**

STRUCUTRAL SIZES OR DESIGN IF CHANGES OR ALTERATIONS ARE MADE TO PLAN DURING OR PRIOR TO CONSTRUCTION WITHOUT WRITTEN NOTICE AND APPROVAL.

DO NOT SCALE OFF PLAN FIGURED DIMENSIONS TAKE PREFERENCE

BUILDER TO VERIFY $A_{ll}$ DIMENSIONS AND LEVELS ON THE PLAN BEFORE COMMENCEMENT ON THE JOB AS NO RESPONSIBILITY TAKEN AFTER STARTING

ALL DIMENSIONS SHOWN ARE TO NOMINAL FRAME AND/OR BRICK DIMENSIONS AND DO NOT INCLUDE CLADDING THICKNESS UNLESS NOTED OTHERWISE

ELECTRONIC DRAWINGS ARE UNCONTROLLED DOCUMENTS AND ARE ISSUED FOR INFORMATION ONLY. ANY DIMENSIONS NOT NOMINATED MUST BE REFERRED TO THE BUILDING DESIGNER FOR CONFIRMATION

| revision | revision description | date |
|---|---|---|
| 2 | GENERAL REVISION | 22.03.17 |
| 3 | GENERAL REVISION | 02.05.2017 |
| 4 | GENERAL REVISIONS | 07.05.2017 |

**REAL PROPERTY DESCRIPTION**
**LOT** 2 ON SP267252
**PARISH** MACLEAN **SITE AREA** 2.531 HA.
**COUNTY** STANLEY **AUTHORITY** LOGAN CITY COUNCIL



Kevin R. Smith
PO BOX 369 STONE CORNER QLD 4120
ph 0418 870 175
kevin@krsmithassociates.com.au
QBCC Lic No - 47543

PROJECT NAME
PROPOSED INDUSTRIAL BUILDINGS
PROJECT ADDRESS
918-980 GREENBANK Rd. NORTH MACLEAN
CLIENT ROUBAIX PROPERTIES

| | | | |
|---|---|---|---|
| COMP FILE NO. | | REV | DWG NO |
| DATE DRAWN | 24.07.2016 | 4 | 001 |
| DRAWN BY | KRS | PROJECT NUMBER | |
| SHEET NO | | 01-2017 | |

DRAWING TITLE
SITE PLAN

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# Appendix B - Time of Concentration and Rational Method Calculations

## Pre-Development Hydrology

The natural hydrology of the site has been assessed in accordance with QUDM 2008 Section 4.06.3. The time of concentration for all catchments has been determined using Friend's Equation as per QUDM Table 4.06.3, combined with a channel time flow calculation.

*Friend's Equation* $tc = (107nL^{0.333})/S^{0.2}$

Table B.1 presents a summary of the catchment parameters used within Friend's Equation and the calculated time of concentration for the pre-development scenario.

**Table B.1 Time of Concentration for Pre-Development Scenario**

| **Catchment ID** | **Ext A** | **Pre A** |
|---|---|---|
| **Standard Inlet Time** | **-** | **-** |
| **Overland Flow** | | |
| Estimated Sheet flow Length (Table 4.06.3) | 45m | 50m |
| Horton's Roughness Value | 0.035 | 0.035 |
| Slope (%) | 4 | 0.35 |
| tc (minutes) | 10.08 | 17.00 |
| **Minor Concentrated Flow** | | |
| Length of channel flow (m) | - | 170 |
| Velocity (m/s) | - | 0.3 |
| tc (minutes) | - | 9.44 |
| **TOTAL tc (minutes)** | **10.08** | **26.44** |

## Post-Development Hydrology – Unmitigated

The total time of concentration calculated for the subject site contains a standard inlet time of 5 minutes. Table B.2 presents a summary of the catchment parameters used for the calculated time of concentration for the post-development scenario.

**Table B.2 Time of Concentration for Post-Development Scenario**

| **Catchment ID** | **Post A1** | **Post A2** | **Post A3** | **Post A4** | **Post A5** | **Post A6** |
|---|---|---|---|---|---|---|
| **Standard Inlet Time** | 5 | 5 | 5 | 5 | 5 | 5 |
| **Channel Flow** | | | | | | |
| Length of channel flow (m) | 35 | 35 | 60 | 70 | 60 | 55 |
| Velocity (m/s) | 1 | 1 | 1 | 1 | 1 | 1 |
| tc (minutes) | 0.58 | 0.58 | 1.00 | 1.17 | 1.00 | 0.92 |
| **TOTAL tc (minutes)** | **5.58** | **5.58** | **6.00** | **6.17** | **6.00** | **5.92** |

Design storm event flows across the site were derived using the Rational Method as per the above-mentioned manuals. This involved:

- Determination of a C10 value (derived in accordance with QUDM Table 4.05.3(b) and Council guidelines). Values of 0.60-0.70 were applied to the pre-development catchments and values varying between 0.85-0.88 were applied to the post-development catchment;
- Adoption of design rainfall using BOM IFD data; and
- Calculation of design flows through the site for Q100, Q50, Q20, Q10, Q5, Q2, Q1 and $Q3_{month}$, where $Q3_{month}$ is deemed to be 50% of Q1.

Summaries of the hydrologic calculations are contained in Table B.3 and Table B.4 for pre and post-development (un-mitigated) scenarios respectively.

**Table B.3 Pre-Development Hydrology**

| Catch. | Area (ha) | tc (min) | $I_{100}$ (mm/hr) | C | $Q_{100}$ ($m^3/s$) | $I_{50}$ (mm/hr) | C | $Q_{50}$ ($m^3/s$) | $I_{20}$ (mm/hr) | C | $Q_{20}$ ($m^3/s$) | $I_{10}$ (mm/hr) | C | $Q_{10}$ ($m^3/s$) | $I_5$ (mm/hr) | C | $Q_5$ ($m^3/s$) | $I_2$ (mm/hr) | C | $Q_2$ ($m^3/s$) | $I_1$ (mm/hr) | C | $Q_{3month}$ ($m^3/s$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ext A | 0.299 | 10.08 | 228.76 | 0.84 | 0.160 | 205.87 | 0.81 | 0.138 | 176.08 | 0.74 | 0.107 | 153.74 | 0.70 | 0.089 | 137.32 | 0.67 | 0.076 | 109.54 | 0.60 | 0.054 | 85.59 | 0.56 | 0.020 |
| Pre A | 2.231 | 26.44 | 149.68 | 0.72 | 0.668 | 134.49 | 0.69 | 0.575 | 114.80 | 0.63 | 0.448 | 99.97 | 0.60 | 0.372 | 89.09 | 0.57 | 0.315 | 70.73 | 0.51 | 0.224 | 55.20 | 0.48 | 0.082 |

**Table B.4 Un-Mitigated Post-Development Hydrology**

| Catch. | Area (ha) | tc (min) | $I_{100}$ (mm/hr) | C | $Q_{100}$ ($m^3/s$) | $I_{50}$ (mm/hr) | C | $Q_{50}$ ($m^3/s$) | $I_{20}$ (mm/hr) | C | $Q_{20}$ ($m^3/s$) | $I_{10}$ (mm/hr) | C | $Q_{10}$ ($m^3/s$) | $I_5$ (mm/hr) | C | $Q_5$ ($m^3/s$) | $I_2$ (mm/hr) | C | $Q_2$ ($m^3/s$) | $I_1$ (mm/hr) | C | $Q_{3month}$ ($m^3/s$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Post A1 | 0.400 | 5.58 | 286.08 | 1.00 | 0.318 | 257.66 | 0.98 | 0.280 | 220.66 | 0.89 | 0.219 | 192.87 | 0.85 | 0.182 | 172.57 | 0.81 | 0.155 | 137.99 | 0.72 | 0.111 | 107.92 | 0.68 | 0.041 |
| Post A2 | 0.225 | 5.58 | 286.08 | 1.00 | 0.179 | 257.66 | 0.99 | 0.159 | 220.66 | 0.90 | 0.125 | 192.87 | 0.86 | 0.104 | 172.57 | 0.82 | 0.088 | 137.99 | 0.73 | 0.063 | 107.92 | 0.69 | 0.023 |
| Post A3 | 0.492 | 6.00 | 278.67 | 1.00 | 0.381 | 250.95 | 0.98 | 0.335 | 214.85 | 0.89 | 0.262 | 187.76 | 0.85 | 0.218 | 167.93 | 0.81 | 0.185 | 134.23 | 0.72 | 0.133 | 104.96 | 0.68 | 0.049 |
| Post A4 | 0.384 | 6.17 | 275.88 | 1.00 | 0.294 | 248.43 | 1.00 | 0.265 | 212.67 | 0.92 | 0.210 | 185.84 | 0.88 | 0.174 | 166.20 | 0.84 | 0.148 | 132.82 | 0.75 | 0.106 | 103.85 | 0.70 | 0.039 |
| Post A5 | 0.317 | 6.00 | 278.67 | 1.00 | 0.245 | 250.95 | 0.99 | 0.219 | 214.85 | 0.90 | 0.171 | 187.76 | 0.86 | 0.142 | 167.93 | 0.82 | 0.121 | 134.23 | 0.73 | 0.086 | 104.96 | 0.69 | 0.032 |
| Post A6 | 0.413 | 5.92 | 280.10 | 1.00 | 0.321 | 252.25 | 0.99 | 0.286 | 215.97 | 0.90 | 0.224 | 188.74 | 0.86 | 0.186 | 168.83 | 0.82 | 0.158 | 134.95 | 0.73 | 0.113 | 105.53 | 0.69 | 0.042 |

# Appendix C - XP-SWMM Input Parameters

## Rainfall Parameters

Logan City temporal patterns and IFD data has been utilised. The IFD data used in the hydrologic analysis for a range of storm events is presented in Table C.1.

**Table C.1 Adopted Intensity Frequency Duration Data (mm/hr)**

| Storm Duration (minutes) | Average Recurrence Interval - Years | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
| 5 | 113.00 | 144.00 | 180.00 | 201.00 | 230.00 | 268.00 | 298.00 |
| 10 | 85.90 | 110.00 | 138.00 | 154.00 | 177.00 | 207.00 | 230.00 |
| 15 | 72.37 | 92.65 | 116.32 | 130.32 | 149.39 | 174.76 | 194.27 |
| 20 | 63.40 | 81.20 | 102.00 | 114.00 | 131.00 | 154.00 | 171.00 |
| 25 | 56.81 | 72.78 | 91.64 | 102.81 | 118.04 | 138.26 | 153.86 |
| 30 | 51.70 | 66.20 | 83.50 | 93.70 | 108.00 | 126.00 | 140.00 |
| 45 | 41.07 | 52.69 | 66.64 | 74.93 | 86.20 | 101.19 | 112.78 |
| 60 | 34.40 | 44.20 | 56.00 | 63.00 | 72.60 | 85.30 | 95.10 |
| 90 | 26.31 | 33.82 | 42.98 | 48.45 | 55.86 | 65.74 | 73.40 |
| 120 | 21.50 | 27.70 | 35.20 | 39.70 | 45.90 | 54.00 | 60.40 |
| 180 | 16.00 | 20.60 | 26.30 | 29.70 | 34.30 | 40.50 | 45.30 |

To input the IFD information into XP-SWMM, rainfall multipliers are generated to represent the depth of rainfall for a given storm event and storm duration. The rainfall multipliers are then applied to the temporal patterns within XP-SWMM to generate hydrographs for use within the hydraulic analysis.

**Table C.2 Rainfall Multipliers Applied to Temporal Patterns (mm)**

| Storm Duration (minutes) | Average Recurrence Interval - Years | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
| 5 | 9.42 | 12.00 | 15.00 | 16.75 | 19.17 | 22.33 | 24.83 |
| 10 | 14.32 | 18.33 | 23.00 | 25.67 | 29.50 | 34.50 | 38.33 |
| 15 | 18.09 | 23.16 | 29.08 | 32.58 | 37.35 | 43.69 | 48.57 |
| 20 | 21.13 | 27.07 | 34.00 | 38.00 | 43.67 | 51.33 | 57.00 |
| 25 | 23.67 | 30.33 | 38.18 | 42.84 | 49.18 | 57.61 | 64.11 |
| 30 | 25.85 | 33.10 | 41.75 | 46.85 | 54.00 | 63.00 | 70.00 |
| 45 | 30.81 | 39.52 | 49.98 | 56.19 | 64.65 | 75.89 | 84.59 |
| 60 | 34.40 | 44.20 | 56.00 | 63.00 | 72.60 | 85.30 | 95.10 |
| 90 | 39.46 | 50.73 | 64.46 | 72.67 | 83.78 | 98.61 | 110.11 |
| 120 | 43.00 | 55.40 | 70.40 | 79.40 | 91.80 | 108.00 | 120.80 |
| 180 | 48.00 | 61.80 | 78.90 | 89.10 | 102.90 | 121.50 | 135.90 |

### Laurenson Routing Parameters

In this study, the "Laurenson" routing method was applied to XP-SWMM for hydrograph generation. To enable this method to be used, each catchment must be split into pervious (undeveloped) and impervious (developed) portions. Adopted parameters for the Laurenson routing method included:

The fraction impervious has been determined by analysis of aerial photographs and the proposed development layout;

- Manning Roughness coefficient (n):
  - Pervious portion: 0.035; and
  - Impervious portion: 0.015.

Initial Loss (IL) and Continuing Losses (CL) have been applied to the hydrologic model. Details of IL and CL parameters applied in the XP-SWMM model are presented in Table C.3.

**Table C.3 Adopted Initial & Continuing Losses**

| Impervious Area | | Pervious Area | |
|---|---|---|---|
| IL (mm) | CL (mm/hr) | IL (mm) | CL (mm/hr) |
| 0.0 | 0.0 | 5.0 | 2.0 |

Analysis of the catchment has been undertaken to determine the average slope, with the results of this being applied to the model.

**Table C.4 Pre-Development Catchment Parameters**

| Catchment | Impervious Area | | | Pervious Area | | |
|---|---|---|---|---|---|---|
| | Area (ha) | Fraction Impervious (%) | Slope (%) | Area (ha) | Fraction Impervious (%) | Slope (%) |
| Pre A | 0.001 | 100 | 0.35 | 2.231 | 0 | 0.35 |
| Ext A | 0.001 | 100 | 4 | 0.299 | 0 | 4 |

**Table C.5 Post-Development Catchment Parameters**

| Catchment | Impervious Area | | | Pervious Area | | |
|---|---|---|---|---|---|---|
| | Area (ha) | Fraction Impervious (%) | Slope (%) | Area (ha) | Fraction Impervious (%) | Slope (%) |
| Post A1 | 0.327 | 100 | 1 | 0.074 | 0 | 1 |
| Post A2 | 0.194 | 100 | 1 | 0.031 | 0 | 1 |
| Post A3 | 0.389 | 100 | 1 | 0.103 | 0 | 1 |
| Post A4 | 0.357 | 100 | 1 | 0.027 | 0 | 1 |
| Post A5 | 0.269 | 100 | 1 | 0.048 | 0 | 1 |
| Post A6 | 0.349 | 100 | 1 | 0.064 | 0 | 1 |

### OSD Depth Area

XP-SWMM requires a depth area relationship to be defined when modelling onsite detention (OSD). A summary of the total depth-area relationship applied to the storage nodes of the XP-SWMM model in the post-development (mitigated) scenario is contained in Table C.6.

**Table C.6 Depth - Area Relationship Adopted for OSD**

| OSD ID | RL (m AHD) | Depth (m) | Surface Area (ha) |
|---|---|---|---|
| Det 1+2 | 27.7 | 0 | 0.025 |
| | 27.75 | 0.05 | 0.026856 |
| | 27.8 | 0.1 | 0.040954 |
| | 27.85 | 0.15 | 0.04592 |
| | 27.9 | 0.2 | 0.065417 |
| | 27.95 | 0.25 | 0.071611 |
| | 28 | 0.3 | 0.077848 |
| | 28.05 | 0.35 | 0.084129 |
| | 28.1 | 0.4 | 0.090453 |
| | 28.15 | 0.45 | 0.09682 |
| | 28.2 | 0.5 | 0.103249 |
| Det 3 | 27.7 | 0 | 0.02 |
| | 27.75 | 0.05 | 0.030498 |
| | 27.8 | 0.1 | 0.044894 |
| | 27.85 | 0.15 | 0.060606 |
| | 27.9 | 0.2 | 0.065707 |
| | 27.95 | 0.25 | 0.070842 |
| | 28 | 0.3 | 0.076011 |
| | 28.05 | 0.35 | 0.081214 |
| | 28.1 | 0.4 | 0.086451 |
| | 28.15 | 0.45 | 0.091721 |
| | 28.2 | 0.5 | 0.097017 |
| Det 4 | 27.6 | 0 | 0.034 |
| | 27.65 | 0.05 | 0.034295 |
| | 27.7 | 0.1 | 0.034375 |
| | 27.75 | 0.15 | 0.034455 |
| | 27.8 | 0.2 | 0.034534 |
| | 27.85 | 0.25 | 0.034614 |
| | 27.9 | 0.3 | 0.034694 |
| | 27.95 | 0.35 | 0.034774 |
| | 28 | 0.4 | 0.034853 |
| | 28.05 | 0.45 | 0.034933 |
| | 28.1 | 0.5 | 0.035013 |
| | 28.15 | 0.55 | 0.035092 |
| | 28.2 | 0.6 | 0.035172 |

| | | | |
|---|---|---|---|
| | 28.25 | 0.65 | 0.035252 |
| | 28.3 | 0.7 | 0.035331 |
| **Det 5** | 27.6 | 0 | 0.017 |
| | 27.65 | 0.05 | 0.01772 |
| | 27.7 | 0.1 | 0.019186 |
| | 27.75 | 0.15 | 0.020717 |
| | 27.8 | 0.2 | 0.022358 |
| | 27.85 | 0.25 | 0.024156 |
| | 27.9 | 0.3 | 0.026117 |
| | 27.95 | 0.35 | 0.028199 |
| | 28 | 0.4 | 0.030074 |
| | 28.05 | 0.45 | 0.031543 |
| | 28.1 | 0.5 | 0.032871 |
| **Det 6** | 27.8 | 0 | 0.0215 |
| | 27.85 | 0.05 | 0.022552 |
| | 27.9 | 0.1 | 0.023748 |
| | 27.95 | 0.15 | 0.024961 |
| | 28 | 0.2 | 0.02619 |
| | 28.05 | 0.25 | 0.027435 |
| | 28.1 | 0.3 | 0.028697 |
| | 28.15 | 0.35 | 0.029975 |
| | 28.2 | 0.4 | 0.03127 |
| | 28.25 | 0.45 | 0.032581 |
| | 28.3 | 0.5 | 0.033908 |

# Appendix D - MUSIC Input Parameters

## Rainfall and Evapotranspiration Parameters

MUSIC modelling was based on 6-minute interval data obtained from the Bureau of Meteorology (BOM) for rainfall station 40659 Greenbank Thompson Rd, as summarised in Table D.1.

**Table D.1 Meteorological and Rainfall Runoff Data Reporting Table**

| Input | Data Used in Modelling |
|---|---|
| Rainfall station | 40659 Greenbank Thompson Rd |
| Time step | 6 minute |
| Modelling period | 01/01/1980 to 31/12/1989 (10 years) |
| Mean annual rainfall (mm) | 745 |
| Evapotranspiration | 1427 |
| Rainfall runoff parameters | Commercial |
| Pollutant export parameters | Commercial |

## Catchment Parameters

Based on the proposed land uses within the development, the subject site has been modelled as commercial/industrial land use as detailed in Table D.2. The site has been divided into 6 sub catchments and each of these catchments divided in roof and ground level source nodes as per the architectural drawings included in Appendix A.

**Table D.2 Land Use Parameters**

| Catchment ID | Area (ha) | Land use | Total Impervious (%) |
|---|---|---|---|
| Roof 1 | 0.202 | Commercial Roof | 100 |
| Carpark 1 | 0.093 | Commercial Carpark | 80 |
| Ground 1 | 0.105 | Commercial Ground | 20 |
| Roof 2 | 0.115 | Commercial Roof | 100 |
| Carpark 2 | 0.067 | Commercial Carpark | 80 |
| Ground 2 | 0.043 | Commercial Ground | 20 |
| Roof 3 | 0.154 | Commercial Roof | 100 |
| Carpark 3 | 0.191 | Commercial Carpark | 80 |
| Ground 3 | 0.147 | Commercial Ground | 20 |
| Roof 4 | 0.001 | Commercial Roof | 100 |
| Carpark 4 | 0.333 | Commercial Carpark | 80 |
| Ground 4 | 0.051 | Commercial Ground | 20 |
| Roof 5 | 0.077 | Commercial Roof | 100 |
| Carpark 5 | 0.172 | Commercial Carpark | 80 |
| Ground 5 | 0.068 | Commercial Ground | 20 |
| Roof 6 | 0.154 | Commercial Roof | 100 |

| | | | |
|---|---|---|---|
| Carpark 6 | 0.168 | Commercial Carpark | 80 |
| Ground 6 | 0.091 | Commercial Ground | 20 |

The MUSIC catchment plan with full breakdown of roof and ground areas is presented in Appendix E. The pollutant loads and runoff parameters for each source node have been based on the data from the Water by Design MUSIC Modelling Guidelines (2010), as summarised in

Table D.3 and Table D.4.

**Table D.3 Rainfall Runoff Parameters**

| Parameter | All Nodes |
|---|---|
| Landuse | Commercial |
| Rainfall threshold (mm) | 1 |
| Soil storage capacity (mm) | 18 |
| Initial storage (% capacity) | 10 |
| Field capacity (mm) | 80 |
| Infiltration capacity coefficient a | 243 |
| Infiltration capacity exponent b | 0.6 |
| Initial depth (mm) | 50 |
| Daily recharge rate (%) | 0 |
| Daily baseflow rate (%) | 31 |
| Daily deep seepage rate (%) | 0 |

**Table D.4 Pollutant Load Parameters**

| Urban Residential | Total Suspended Solids (log mg/L) | | Total Phosphorous (log mg/L) | | Total Nitrogen (log mg/L) | |
|---|---|---|---|---|---|---|
| | Mean | Std Dev. | Mean | Std Dev. | Mean | Std Dev. |
| Storm Flow Concentration | 1.30(1)<br>2.43(2)<br>2.16(3) | 0.38 | -0.89(1)<br>-0.30(2)<br>-0.39(3) | 0.34 | 0.37 | 0.34 |
| Base Flow Concentration | 0.78 (2,3) | 0.39 (2,3) | -0.60 (2,3) | 0.50 (2,3) | 0.32 (2,3) | 0.30 (2,3) |

NOTE: (1) Values applied to “Roof” areas
(2) Values applied to “Carpark” areas
(3) Values applied to “Ground” areas

# Appendix E - Stormwater Management Plan Drawings

| PROJECT No.: | DRAWING No. : | VERSION: |
|---|---|---|
| BE160355 | N000 | A |

DATE : 03.05.17

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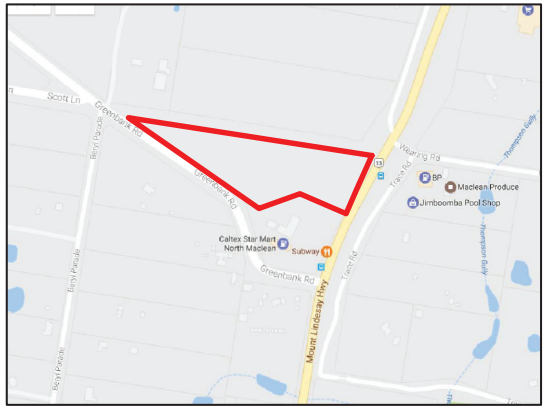
## CONCEPTUAL STORMWATER MANAGEMENT DRAWINGS




LOCALITY PLAN

| SCHEDULE OF DRAWINGS | |
|---|---|
| Drawing No. | Drawing Title |
| N000 | LOCALITY AND DRAWING INDEX PLAN |
| N200 | PRE-DEVELOPMENT CATCHMENT PLAN |
| N201 | POST-DEVELOPMENT CATCHMENT PLAN |
| N202 | MUSIC CATCHMENT PLAN |
| N300 | EROSION & SEDIMENT CONTROL PLAN |
| N301 | EROSION & SEDIMENT CONTROL TYPICAL CROSS SECTION |
| N400 | OPERATIONAL CONTROL PLAN |
| N401 | OPERATIONAL CONTROL TYPICAL CROSS SECTION - 1 |
| N402 | OPERATIONAL CONTROL TYPICAL CROSS SECTION - 2 |

PREPARED FOR

ROUBAIX PROPERTIES PTY LTD

PREPARED BY

BURCHILLS
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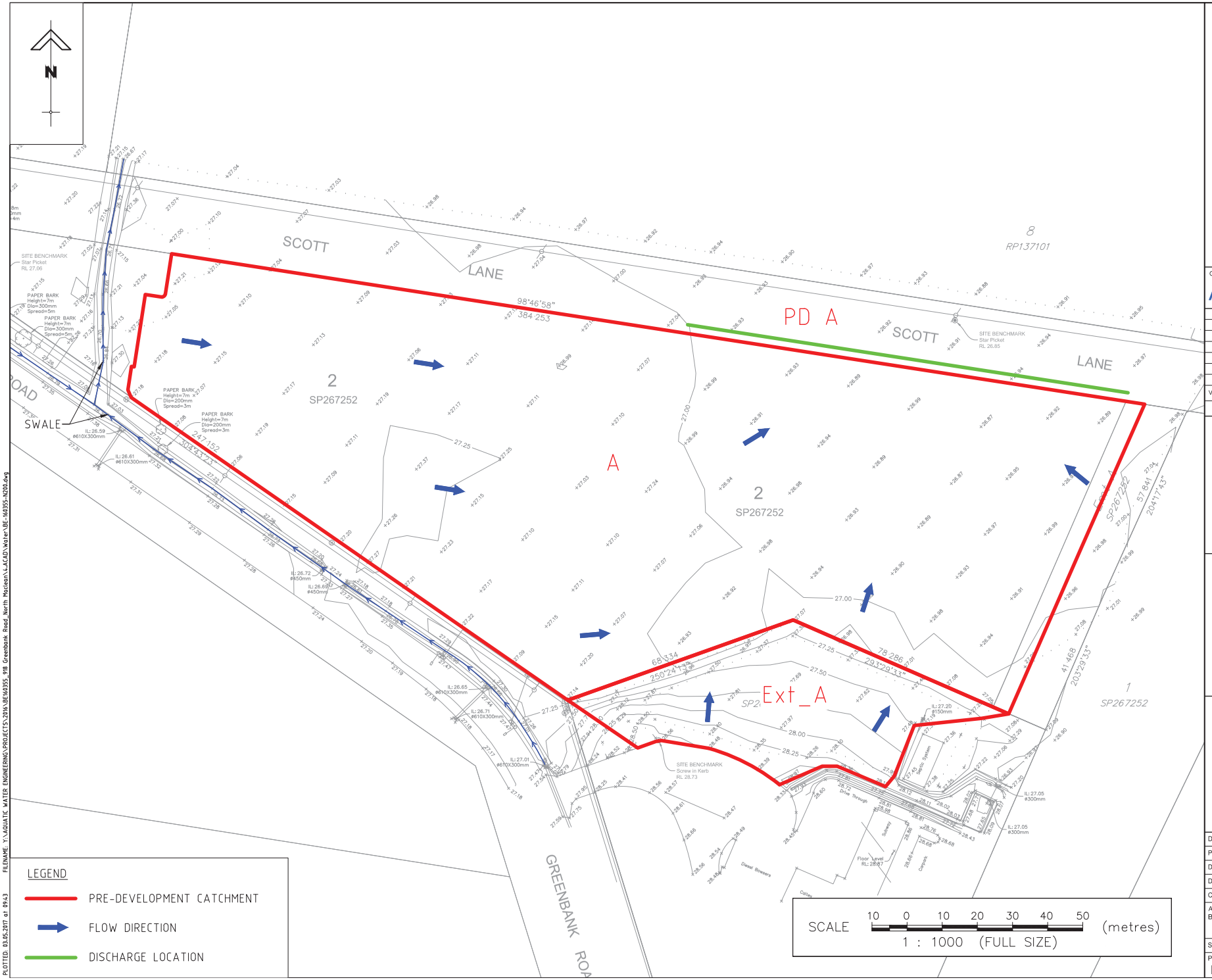
ABN 76 166 942 365

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**Coote Burchills Engineering Pty Ltd**
ABN 76 166 942 365


DRAWING TITLE :

## PRE-DEVELOPMENT CATCHMENT PLAN

| | |
|---|---|
| DEVEL. APPLIC. No. : | DATE : 03.05.17 |
| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
| RPEQ No. : | |
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| PROJECT No.: BE160355 | DRAWING No. : N200 / VERSION: A |

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## POST-DEVELOPMENT CATCHMENT PLAN

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|---|---|
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| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
| RPEQ No. : | |
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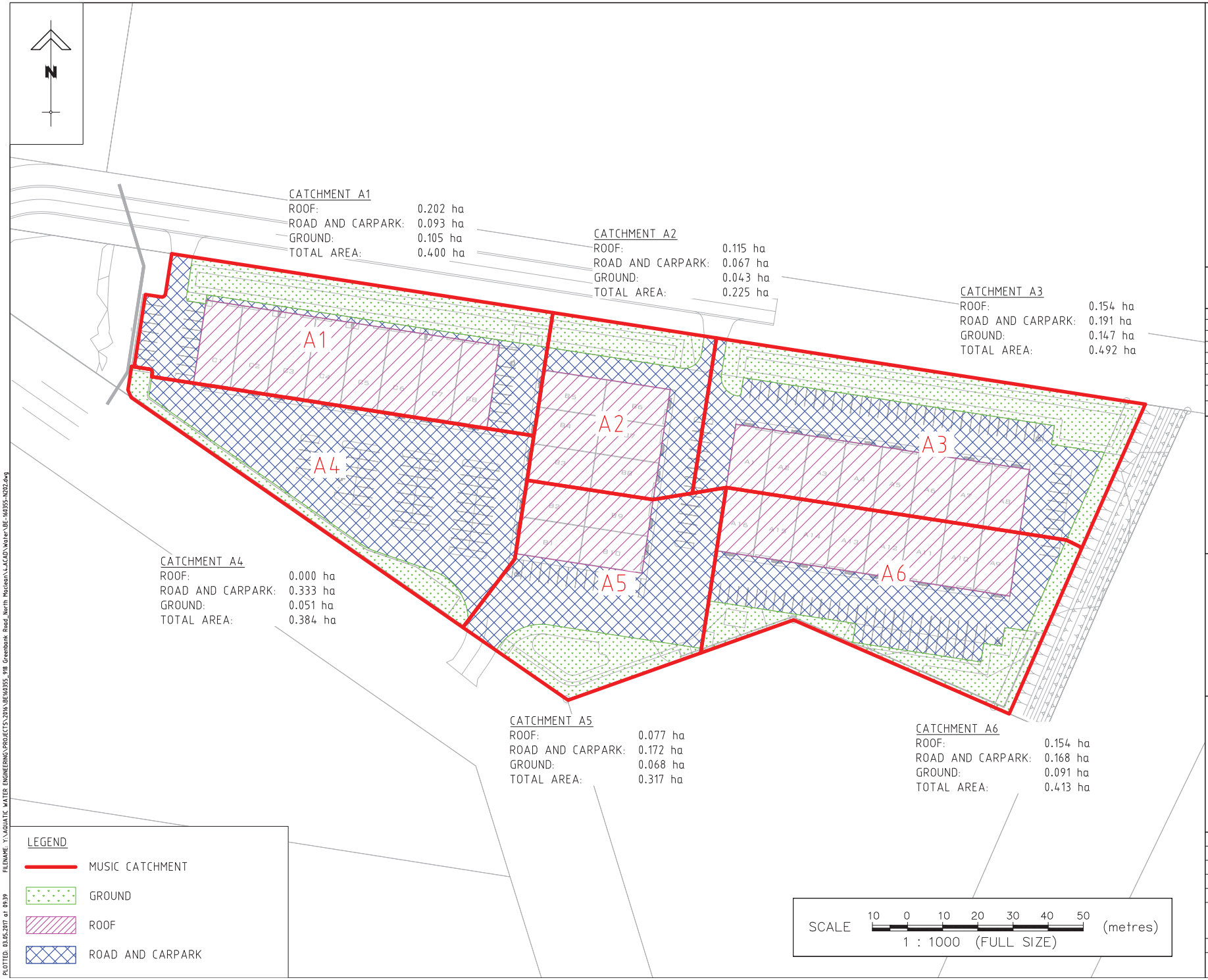


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NORTH MACLEAN,
LOGAN CITY

FOR

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DRAWING TITLE :

MUSIC CATCHMENT PLAN

| | |
|---|---|
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| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
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DRAWING TITLE :

## EROSION & SEDIMENT CONTROL PLAN

| | |
|---|---|
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| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
| RPEQ No. : | |
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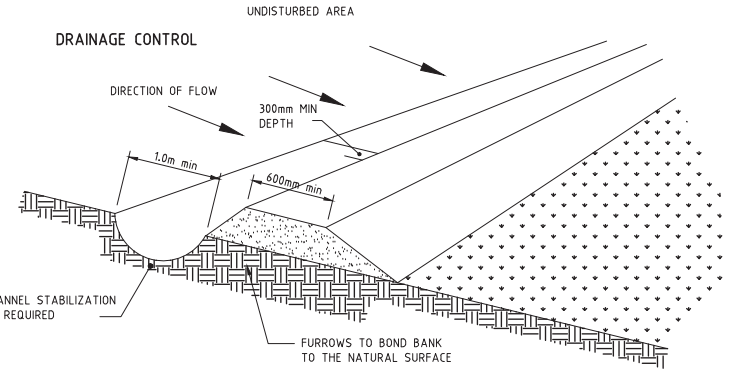
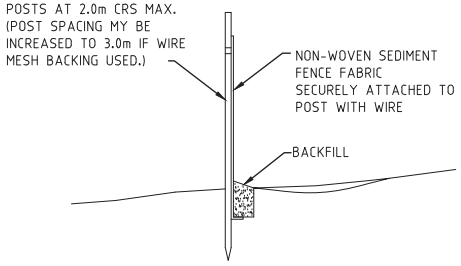


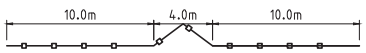

CLEAN WATER DIVERSION CHANNEL (TYPICAL)

N.T.S.




SEDIMENT FENCE DETAIL

N.T.S.

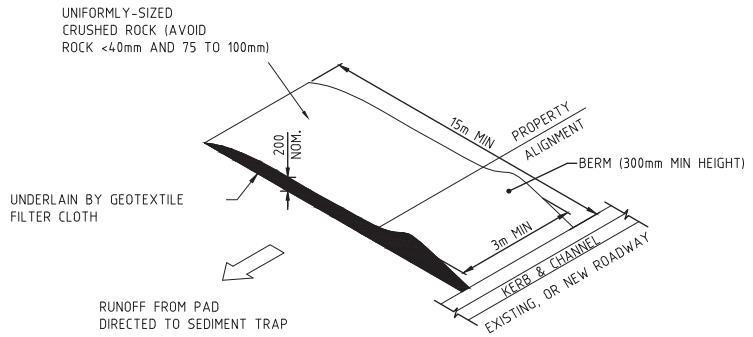



SEDIMENT FENCE SETOUT DETAIL

N.T.S.

## GENERAL NOTES:

1. THESE EROSION AND SEDIMENT CONTROL PLANS TO BE READ IN CONJUNCTION WITH THE APPROVED STORMWATER MANAGEMENT PLAN.
2. PRIOR TO THE COMMENCEMENT OF SITE WORKS, THE LOCATION OF THE SITE ACCESS POINT MUST BE VERIFIED WITH THE LOCAL AUTHORITY.
3. SITE EXIT POINTS MUST BE APPROPRIATELY MANAGED TO MINIMISE THE RISK OF SEDIMENT BEING TRACKED ONTO SEALED, PUBLIC ROADWAYS.
4. STOCKPILES OF ERODIBLE MATERIAL THAT HAS THE POTENTIAL TO CAUSE ENVIRONMENTAL HARM IF DISPLACED MUST BE APPROPRIATELY PROTECTED FROM WIND, RAIN, CONCENTRATED SURFACE FLOW AND EXCESSIVE UP-SLOPE STORMWATER SURFACE FLOWS.
5. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTROL AND MINIMISE EROSION AND DOWNSTREAM SEDIMENTATION DURING ALL STAGES OF CONSTRUCTION INCLUDING THE MAINTENANCE PERIOD.
6. THE CONTRACTOR IN CONJUNCTION WITH THE ENVIRONMENTAL ENGINEER IS TO MAINTAIN A WATER QUALITY LOG IN ACCORDANCE WITH THE APPROVED STORMWATER MANAGEMENT PLAN. THE LOG SHALL NOMINATE DATE, TESTS UNDERTAKEN, RESULTS, NOTES AND CORRECTIVE ACTIONS UNDERTAKEN. THE LOG SHALL ALSO CONTAIN RELEVANT INFORMATION RELATING TO CHEMICAL FLOCCULATION RATES, RESIDENCE TIME ETC, IF USED ON THE SITE.
7. PLANS AND ALL CALCULATIONS HAVE BEEN CONDUCTED IN ACCORDANCE WITH THE INTERNATIONAL EROSION CONTROL ASSOCIATION (IECA) BEST PRACTICE EROSION AND SEDIMENT CONTROL GUIDELINES, NOVEMBER 2008.
8. ALL DRAINAGE CONTROL MEASURES INCLUDING DIVERSION BUNDS AND CATCH DRAIN HAVE BEEN DESIGNED TO INCLUDE 150mm FREEBOARD FOR THE 5 YEAR ARI EVENT.
9. SUITABLE ALL-WEATHER MAINTENANCE ACCESS MUST BE PROVIDED TO ALL SEDIMENT CONTROL DEVICES.
10. ALL SEDIMENT CONTROL DEVICES MUST BE DE-SILTED AND MADE FULLY OPERATIONAL AS SOON AS REASONABLE AND PRACTICABLE AFTER A SEDIMENT PRODUCING EVENT, WHETHER NATURAL OR ARTIFICIAL, IF THE DEVICE'S SEDIMENT RETENTION CAPACITY FALLS BELOW 75% OF ITS DESIGN RETENTION CAPACITY.
11. ALL UNSTABLE OR DISTURBED SOIL SURFACES MUST BE ADEQUATELY STABILISED AGAINST EROSION (MINIMUM 70%) PRIOR TO COMMENCEMENT OF USE, OR SURVEY PLAN ENDORSEMENT.




ROCK CONSTRUCTION EXIT

N.T.S.

# LOT 2 ON SP267252, 918 GREENBANK ROAD, NORTH MACLEAN, LOGAN CITY

FOR

ROUBAIX PROPERTIES PTY LTD

ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

| VER. | DESCRIPTION | APPR. | DATE |
|---|---|---|---|
| A | ORIGINAL ISSUE | | 03.05.17 |

REVISIONS



BURCHILLS ENGINEERING SOLUTIONS

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Fax: +61 7 5509 6411
Email: admin@burchills.com.au
**Coote Burchills Engineering Pty Ltd**
ABN 76 166 942 365

DRAWING TITLE :

## EROSION & SEDIMENT CONTROL PLAN TYPICAL CROSS SECTION

| | |
|---|---|
| DEVEL. APPLIC. No. : | DATE : 03.05.17 |
| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
| RPEQ No. : | |
| SCALE : N.T.S | DATUM : / FULL SIZE : A3 |
| PROJECT No.: BE160355 | DRAWING No. : N301 / VERSION: A |

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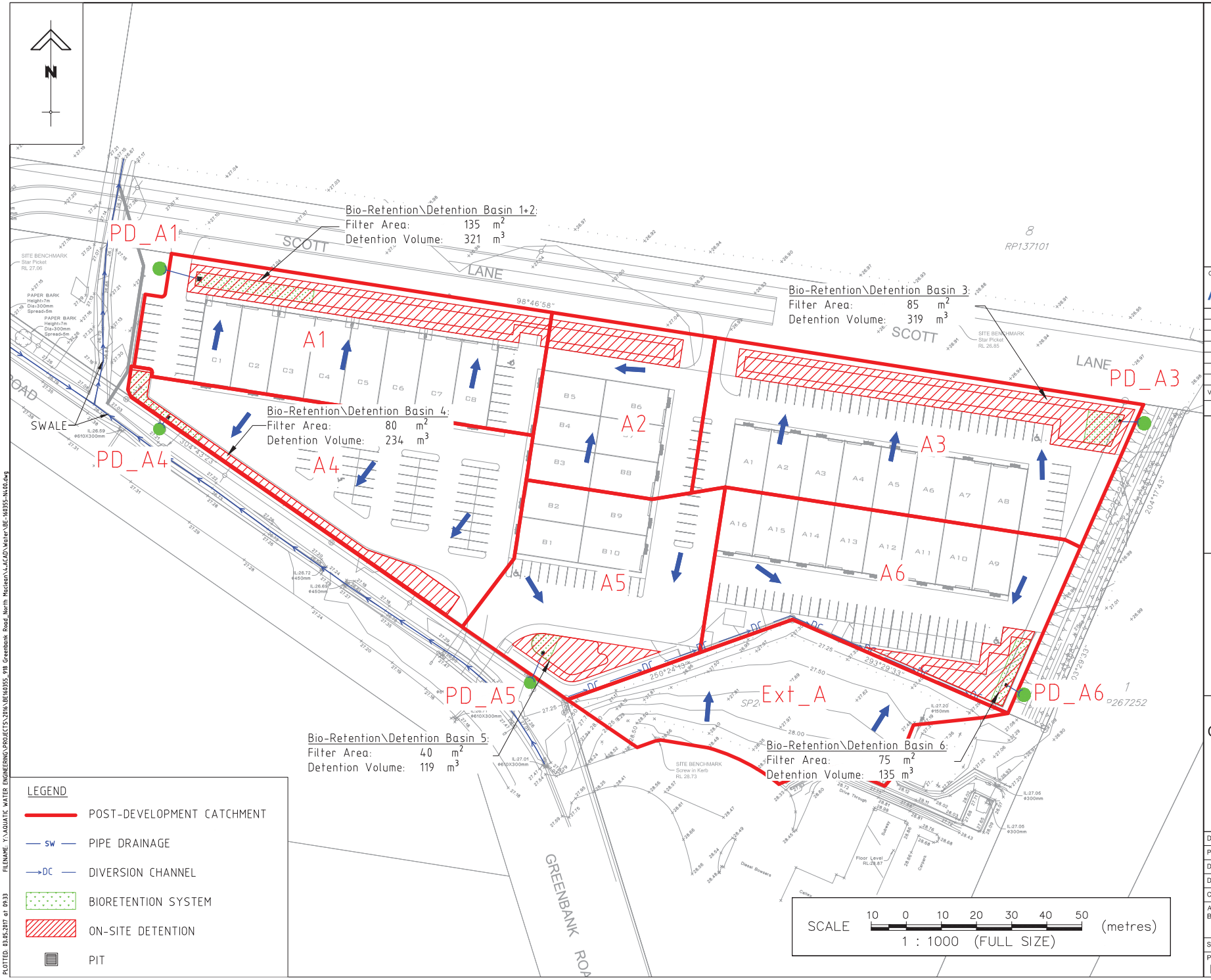


# LOT 2 ON SP267252, 918 GREENBANK ROAD, NORTH MACLEAN, LOGAN CITY

FOR

ROUBAIX PROPERTIES PTY LTD

ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

| VER. | DESCRIPTION | APPR. | DATE |
|---|---|---|---|
| A | ORIGINAL ISSUE | | 03.05.17 |

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Email: admin@burchills.com.au
**Coote Burchills Engineering Pty Ltd**
ABN 76 166 942 365

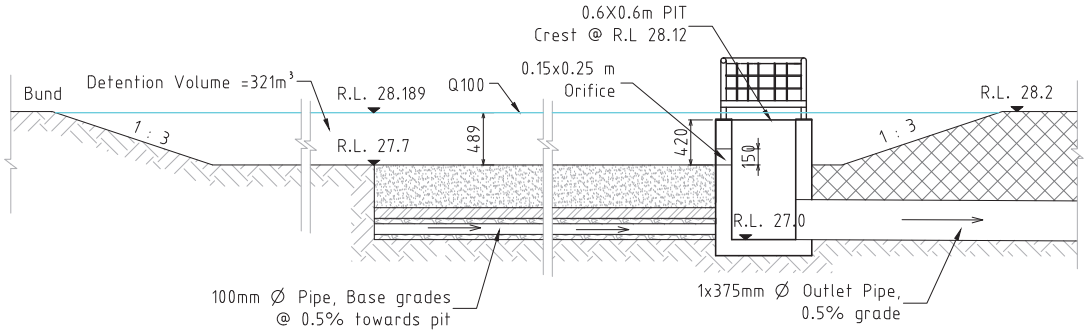

DRAWING TITLE :

## OPERATIONAL CONTROL PLAN

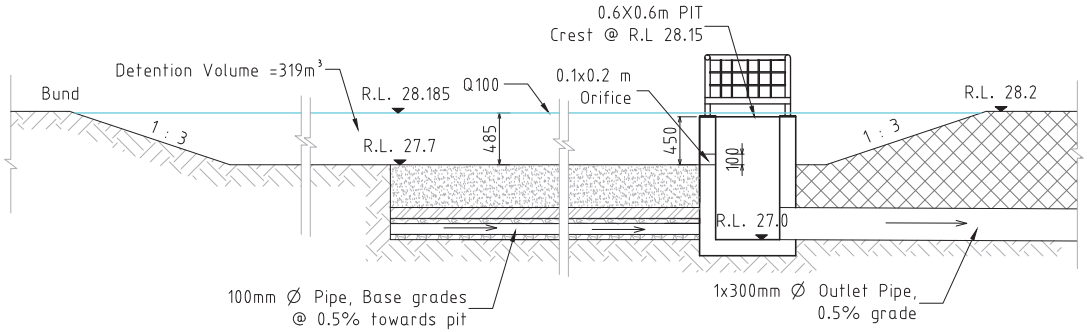
| | |
|---|---|
| DEVEL. APPLIC. No. : | DATE : 03.05.17 |
| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
| RPEQ No. : | |
| SCALE : 1:1000 | DATUM : FULL SIZE : A3 |
| PROJECT No.: BE160355 | DRAWING No. : N400 VERSION: A |

FILENAME: Y:\AQUATIC WATER ENGINEERING\PROJECTS\2016\BE160355_918 Greenbank Road_North Maclean\4-ACAD\Water\BE-160355-N400.dwg

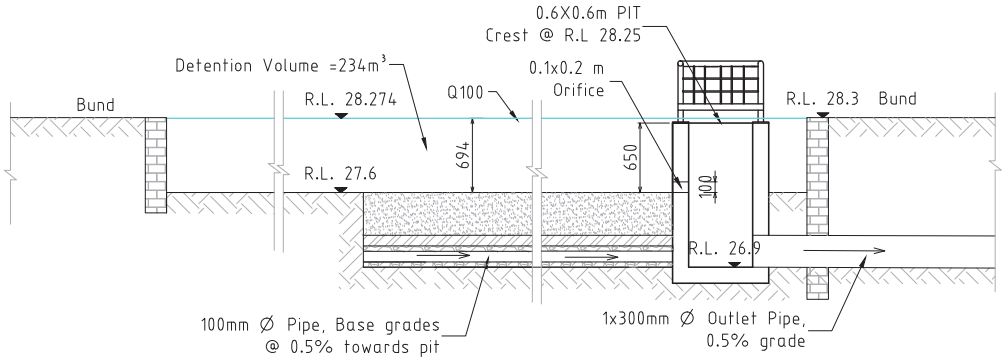
PLOTTED: 03.05.2017 at 09:33




## CROSS SECTION BASIN 1+2




## CROSS SECTION BASIN 3




## CROSS SECTION BASIN 4

SCALES 0.5 0 0.5 1.0 1.5 2.0 2.5 (metres)

1 : 50 (FULL SIZE)

LOT 2 ON SP267252,
918 GREENBANK ROAD,
NORTH MACLEAN,
LOGAN CITY

FOR

ROUBAIX PROPERTIES
PTY LTD

ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

| VER. | DESCRIPTION | APPR. | DATE |
|---|---|---|---|
| A | ORIGINAL ISSUE | | 03.05.17 |

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**Coote Burchills Engineering Pty Ltd**
ABN 76 166 942 365

DRAWING TITLE :

OPERATIONAL CONTROL PLAN
TYPICAL CROSS SECTION - 1

| | |
|---|---|
| DEVEL. APPLIC. No. : | DATE : 03.05.17 |
| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 | |
| RPEQ No. : | |
| SCALE : 1:50 | DATUM : FULL SIZE : A3 |
| PROJECT No.: BE160355 | DRAWING No. : N401 VERSION: A |

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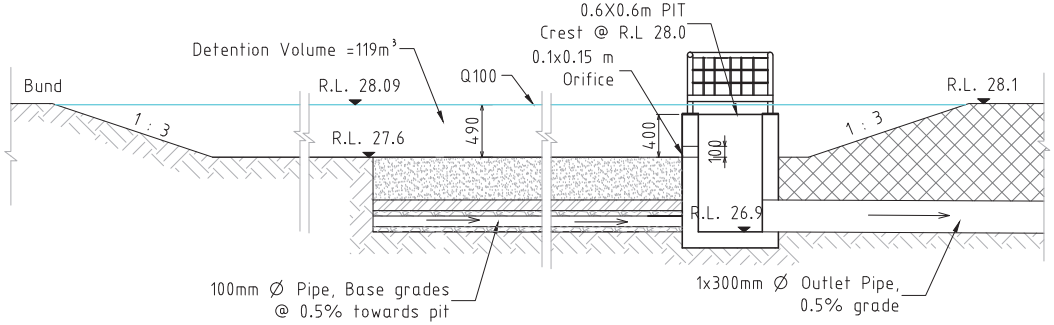
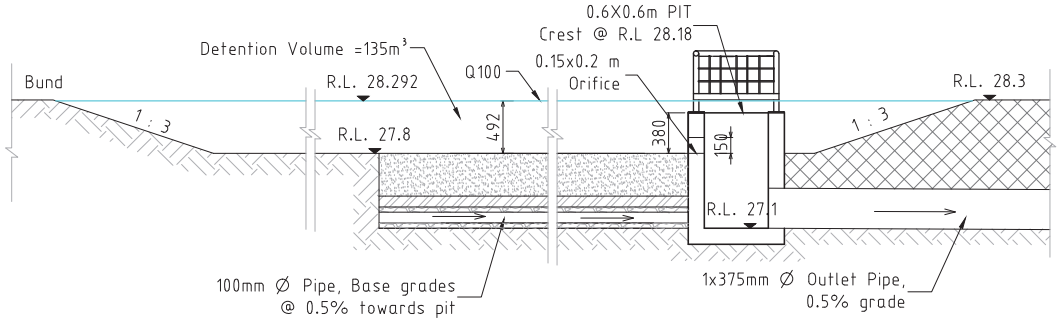



CROSS SECTION BASIN 5




CROSS SECTION BASIN 6

SCALES 0.5 0 0.5 1.0 1.5 2.0 2.5 (metres)

1 : 50 (FULL SIZE)

LOT 2 ON SP267252,
918 GREENBANK ROAD,
NORTH MACLEAN,
LOGAN CITY

FOR

ROUBAIX PROPERTIES
PTY LTD

ORIGINAL SCALE BEFORE REDUCTION

A3 0 10 20 30 40mm.

| VER. | DESCRIPTION | APPR. | DATE |
|---|---|---|---|
| A | ORIGINAL ISSUE | | 03.05.17 |

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**Coote Burchills Engineering Pty Ltd**
ABN 76 166 942 365

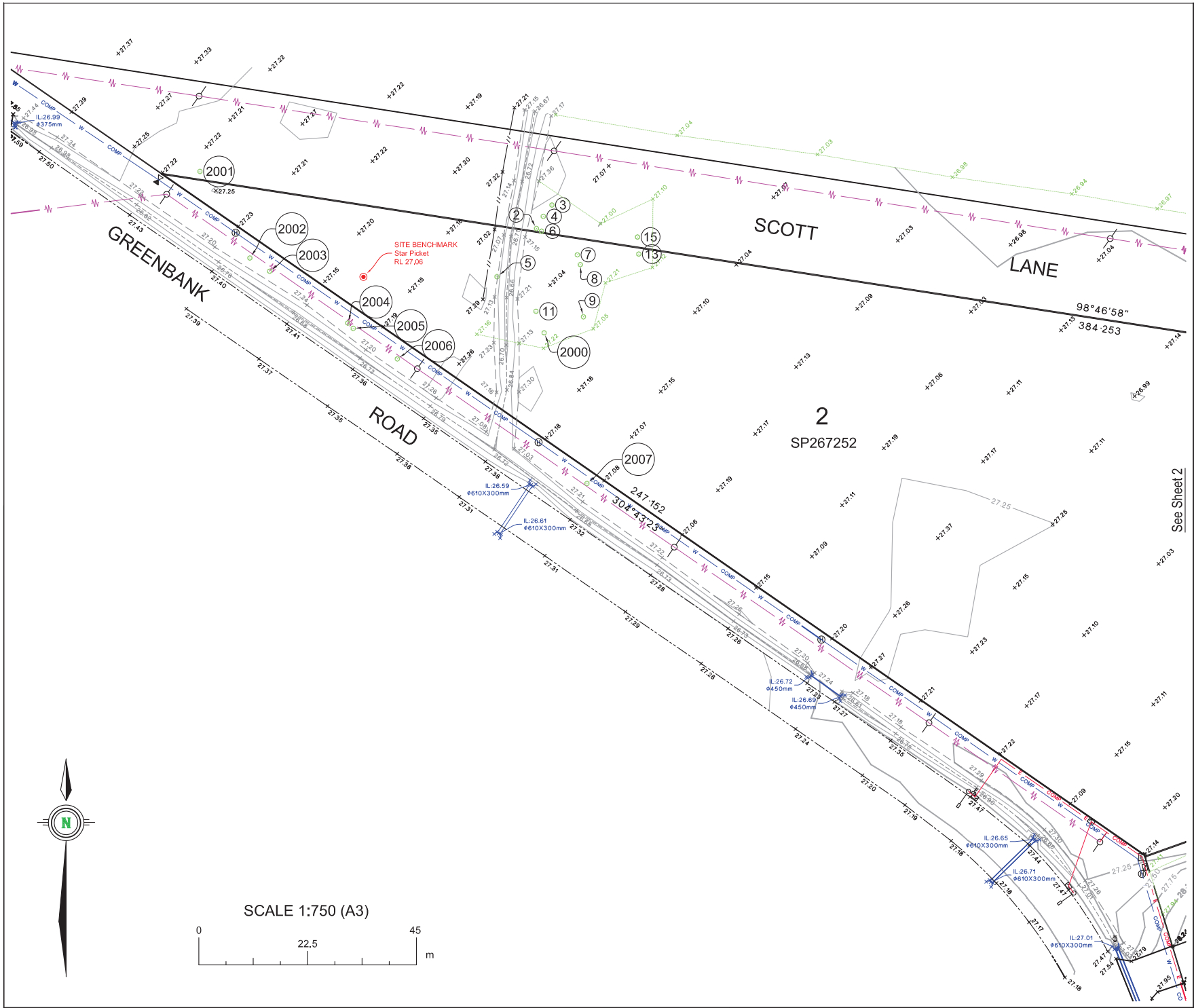
DRAWING TITLE :

# OPERATIONAL CONTROL PLAN
# TYPICAL CROSS SECTION - 2

| | |
|---|---|
| DEVEL. APPLIC. No. : | DATE : 03.05.17 |
| PROJECT LEADER : JF | |
| DESIGNER : TB/TP | |
| DRAFTSPERSON : TP / HN | |
| CHECKED : TB | |
| APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 RPEQ No. : | |
| SCALE : 1:50 | DATUM : FULL SIZE : A3 |
| PROJECT No.: BE160355 | DRAWING No. : N402 VERSION: A |

PLOTTED: 03.05.2017 at 09:37 FILENAME: Y:\AQUATIC WATER ENGINEERING\PROJECTS\2016\BE160355_918 Greenbank Road_North Maclean\4-ACAD\Water\BE-160355-N402.dwg

# Appendix F - Site Survey




Client

**Maclean Bridge Pty Ltd**

Project

# Detail Survey of 914 Greenbank Road, North Maclean

Described as
Lot 2 on SP267252

**Scale: 1:750 at A3**

Datum: AHD vide CORS — Locality: North Maclean
RL: x.xxx — LGA: Logan C. C.
Contour Int: 0.25m — Cadfile: RBX-304.DET.01

| Issue | Description | Drw | Date | Appd |
|---|---|---|---|---|
| C | Detail Extension to Culvert | FEW | 21.02.17 | MP |
| B | Trees located by Ecologist. | FEW | 02.02.17 | MP |
| A | INITIAL ISSUE | FEW | 29.06.16 | MP |

NOTES The title boundaries shown hereon were not marked at the time of survey and have been compiled from previous survey. Services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

LEGEND

| | | |
|---|---|---|
| BB | Bottom of bank | |
| DCL | Drain centreline | D |
| EBT | Edge of bitumen | |
| EBX | Electricity Box | E |
| ECM | Electricity cable marker | |
| EDT | Edge of trees | |
| ELP | Light Pole | |
| EMH | Electricity Pit | |
| EP | Electricity Pole | |
| FHY | Fire Hydrant | H |
| FNC | Fence | |
| TB | Top of Bank | |
| TEP | Telstra Pit | |
| TW | Top of wall | |
| WV | Water Valve | |

UNDERGROUND SERVICES COMPILED

| | |
|---|---|
| Sewer main | S — COMP |
| Stormwater drainage | SW — COMP |
| Water main | W — COMP |
| Telstra supply | T — COMP |
| Gas supply | GAS COMP — GAS COMP |
| Electricity supply | E — COMP |


FOCUS ON SURVEYING
w www.focussurvey.com.au
e info@focussurvey.com.au ph 3338 5095
a Suite 6, 214 Waterworks Road . Ashgrove . QLD . 4060


| Sheet No. | Surveyed By: | Date Surveyed: |
|---|---|---|
| 1 of 2 | FEW | 21.02.17 |

Dwg. No. — Issue

**RBX-304.DET.01 C**


Client

**Maclean Bridge Pty Ltd**

Project

## Detail Survey of 914 Greenbank Road, North Maclean

Described as
Lot 2 on SP267252

**Scale: 1:750 at A3**

Datum: AHD vide CORS — Locality: North Maclean
RL: x.xxx — LGA: Logan C. C.
Contour Int: 0.25m — Cadfile: RBX-304.DET.01

| Issue | Description | Drw | Date | Appd |
|---|---|---|---|---|
| C | Detail Extension to Culvert | FEW | 21.02.17 | MP |
| B | Trees located by Ecologist. | FEW | 02.02.17 | MP |
| A | INITIAL ISSUE | FEW | 29.06.16 | MP |

NOTES The title boundaries shown hereon were not marked at the time of survey and have been compiled from previous survey. Services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

LEGEND

| | | |
|---|---|---|
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| DCL | Drain centreline | D |
| EBT | Edge of bitumen | |
| EBX | Electricity Box | E |
| ECM | Electricity cable marker | E |
| EDT | Edge of trees | |
| ELP | Light Pole | |
| EMH | Electricity Pit | |
| EP | Electricity Pole | |
| FHY | Fire Hydrant | H |
| FNC | Fence | |
| TB | Top of Bank | |
| TEP | Telstra Pit | |
| TW | Top of wall | |
| WV | Water Valve | |

UNDERGROUND SERVICES COMPILED

| | | |
|---|---|---|
| Sewer main | S | COMP |
| Stormwater drainage | SW | COMP |
| Water main | W | COMP |
| Telstra supply | T | COMP |
| Gas supply | GAS COMP | GAS COMP |
| Electricity supply | E | COMP |


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a Suite 6, 214 Waterworks Road . Ashgrove . QLD . 4060


| Sheet No. | Surveyed By: | Date Surveyed: |
|---|---|---|
| 2 of 2 | FEW | 21.02.17 |

Dwg. No. — Issue
**RBX-304.DET.01 C**