NORTHROP

CIVIL

Concept Stormwater Management Plan

for

46 Fitzroy Street, Carrington

for Port of Newcastle

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Contents

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		Date
Prepared by	GW	09/04/2021
Checked by	BC	09/04/2021
Admin	BBR	09/04/2021

1. Introduction

1.1. General

Northrop Consulting Engineers have been engaged by Port of Newcastle to prepare a Stormwater Management Plan for the proposed development at 46 Fitzroy Street, Carrington. The development proposes construction of a four-storey commercial development accessed from both Fitzroy Street and Denison Street.

This report has been prepared for submission to the Department of Planning, Industry and Environment to convey the philosophy adopted by the proposed Stormwater Management Plan. The report should be read in conjunction with the engineering drawings provided in Appendix A.

1.2. Site Description

The proposal encompasses the development of Lot 33 DP1078910 herein known as 'the site'. The site has a total area of 8,684m^2 and is relatively flat, falling to the north east with an average grade of approximately 1% (Figure 1). The site is vacant and cleared, with a concrete slab covering the eastern half of the site. Stormwater runoff currently sheets across the site in a north easterly direction towards Denison street and the neighbouring lot to the north, with no formal easement present.

Figure 1 – Proposed Development Site

1.3. Proposed Development

The development proposes construction of a four-storey commercial development accessed from both Fitzroy Street and Denison Street, with both undercover and outdoor parking proposed.

2. Stormwater Management Strategy

2.1. General Requirements

The site is a part of the Newcastle Port Authority lease area and as such consent is governed by the Department of Planning, Industry and Environment. In accordance with State Environmental Planning Policy (Three Ports) 2013 (Three Ports SEPP) the proposed development is permitted with consent and the Minister for Planning and Open Spaces (or his delegate) is the consent authority.

The stormwater management system to be adopted on site has been developed in consideration of the following:

- CoN's 2012 Development Control Plan, in particular:
  - Section 7.06 Stormwater.
- CoN's 2019 Stormwater and Water Efficiency for Development Technical Manual.
- The relevant Australian Standards.
- NSW Music Modelling Guidelines.

Whilst consideration has been given to CoN's DCP, this report has been prepared for submission to the Department of Planning, Industry and Environment with the Minister for Planning and Public Spaces being the consent authority.

2.2. Point of Discharge

Stormwater runoff from majority of the site is to discharge to the existing kerb inlet pit in Denison Street with an invert level of 0.78m AHD. The proposed stormwater system servicing the remainder of the site is to discharge to the existing kerb inlet pit in Fitzroy Street with an invert level of 0.78m AHD.

2.3. Proposed Development Stormwater Philosophy

The stormwater philosophy adopted onsite for the proposed development can be summarised as follows:

- Roof runoff is to be directed to an above ground rainwater tank with a minimum volume of 16kL. Harvested rainwater is to be reused internally through toilet connections on all floors and externally for landscape irrigation. Tank overflows are to be directed to the proposed detention tank via the pit and pipe network in the carpark.
- Carpark runoff is to be directed to proposed rain gardens within the landscaped areas of the eastern and western external carpark areas.
- Treated runoff in the western carpark is to discharge to Council's existing kerb inlet pit in Fitzroy Street.
- Treated runoff in the eastern carpark is to be directed to an underground detention tank designed to attenuate post developed flows to pre-developed rates in accordance with CoN's requirements. A minimum detention volume of 190m^3 is proposed.
- Overflow from the detention tank is to be piped to Council's existing kerb inlet pit in Denison Street.
- A small portion of the site will bypass the treatment train and detention storage. This has been accounted for in the water quality and quantity modelling.

2.4. Site Area Summary

- Total site area = 8,684m^2
- Total Impervious Fraction = 65% (5,624m^2)
    - Total roof area = 2,145m^2
    - Total hardstand area = 3,479m^2
- Total Pervious Fraction = 35% (3,060m^2)

2.5. Onsite Stormwater Detention

To minimise the potential impact of local and downstream flooding, onsite detention is to be provided. Roof water and most of the carpark runoff is to be collected and directed to an underground storage tank. The tank has been designed to ensure no net increase in peak flows during storm events up to the 1% Annual Exceedance Probability (AEP).

Modelling was undertaken using the computer software package DRAINS utilising the ILSAX hydrological method. A type 3 soil was assigned with a grassed depression storage of 5mm and impervious depression storage of 1mm. Rainfall data for the model was obtained from the Bureau of Meteorology using AR&R2019 intensity data.

Through runoff routing using DRAINS a detention tank with a minimum storage capacity of 190m^3 has been deduced. Results from the DRAINS model for the peak storm events have been summarised below in Table 1. We note the DRAINS model can be provided upon request.

Table 1 – Peak Storm Event Site Discharge Flow Rates

AEP (%)	Outlet Flow Rate (m^3/s)		
	Pre-Developed Site Discharge (100% Pervious, No detention)	Developed Scenario Site Discharge (65% Impervious, No detention)	Developed Scenario Site Discharge (65% Impervious, 190m^3 detention)
20	0.130	0.274	0.130
10	0.186	0.380	0.184
5	0.256	0.458	0.256
2	0.341	0.558	0.333
1	0.434	0.654	0.390

As summarised, the 190m^3 detention tank will effectively attenuate runoff up to the 1% AEP peak flow and is therefore considered to effectively mitigate the effects of the development on stormwater quantity, generally in accordance with the intent of the DCP. Further details on the proposed tank have been provided within the engineering drawings.

If contamination is found to be an issue at detailed design stage, there may be an opportunity to transfer a small portion of the detention volume in above ground storage within the carpark, in order to minimise excavation. In this case, it is recommended that only the extreme storm events are to be detained in above ground storage to ensure adequate usability and amenity of the carpark in the more frequent events.

2.6. Stormwater Quality

In order to minimise any adverse impacts upon the ecology of the downstream watercourses; stormwater treatment devices have been incorporated into the design of the development. The stormwater quality reduction targets outlined within Council's DCP have been summarised below in Table 2.

Table 2 – CoN Water Quality Reduction Targets

Pollutant Criteria	Reduction Target %
Total Suspended Solids (TSS)	85
Total Phosphorous (TP)	65
Total Nitrogen (TN)	45
Gross Pollutants (GP)	90

The performance of the proposed stormwater management strategy was assessed against these targets using the conceptual software MUSIC (Version 6). The MUSIC model was developed using recommended parameters presented in the 2015 NSW MUSIC Guidelines and the CoN's MUSIC Link. A schematic of the MUSIC model is shown in Figure 2.

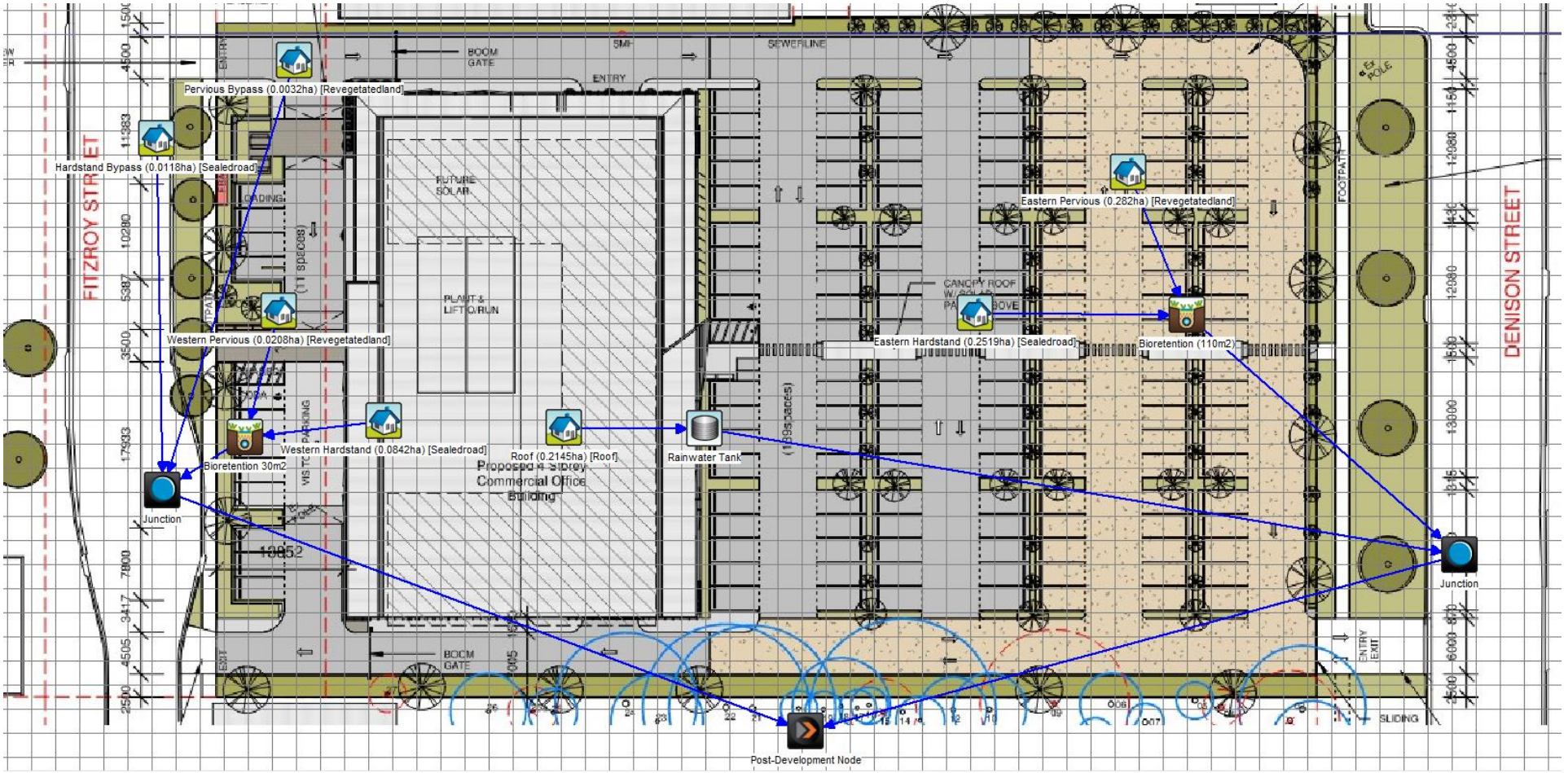

Figure 2 – MUSIC Model Schematic

The following is a summary of the water quality treatment devices that have been utilised within the design:

- Rainwater reuse tanks – runoff from the proposed roof area is to be directed to above ground reuse tanks with a minimum volume of 16kL which are to be fitted with proprietary first flush devices. Capturing the first portion of runoff from the roof, the first flush devices will effectively remove sediment and attached pollutants. Runoff collected in the tanks is to be reused internally for toilet flushing on all floors and externally for irrigation. Reuse rates for the harvesting tanks have been based on the rates published within the 2015 NSW MUSIC Guidelines. These rates in conjunction with the roof catchment area were used to find the optimal storage capacity whilst ensuring a demand efficiency of 80% was met.
- Bioretention rain gardens - to attain the stormwater quality targets, rain gardens are to be located within the landscaping areas of the eastern and western carparks. Stormwater runoff in the carpark areas will be directed to the bioretention trench where, through infiltration, it will collect and treat stormwater runoff from the proposed development, before piping treated stormwater to the proposed detention tank. The bioretention gardens have been modelled with a filter area of 110m^2 in the eastern carpark and 30m^2 in the western carpark, with a filter depth of 0.3m and an extended detention depth of 0.1m. Parameters for the bioretention basin were adopted in accordance with the "NSW MUSIC Modelling Guidelines" (BMT WBM, 2015) and CoN's 2019 Stormwater and Water Efficiency for Development Technical Manual for shallow bioretention rain gardens.

2.7. Stormwater Quality Modelling Results

The proposed treatment train resulted in the reduction percentages outlined in Table 3. The MUSIC Link report with full result details has been provided in Appendix B and the MUSIC model can be provided upon request.

Table 3 – MUSIC Modelling Results

Pollutant	Sources	Residual Load	% Reduction
Total Suspended Solids (kg/yr)	1350	153	88.7
Total Phosphorus (kg/yr)	2.55	0.718	71.9
Total Nitrogen (kg/yr)	14.9	7.98	46.5
Gross Pollutants (kg/yr)	159	14.4	90.9

Table 3 shows that the proposed stormwater quality management strategy is predicted to achieve the load reduction targets set out in CoN's DCP, as estimated by MUSIC.

3. Conclusion

The proposed Stormwater Management Strategy effectively considers the objectives of the CoN's DCP and is therefore recommended for adoption. The proposal will minimise the potential impact of local and downstream flooding by ensuring no net increase in peak flows during events up to the 1% AEP storm. Further to this through the adoption of water sensitive urban design principles the effects of urbanisation on water quality will be mitigated in accordance with the pollutant load reduction targets.

We trust this meets with the Department of Planning, Industry and Environment's requirements, however, should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Prepared By

Gemma Wood
Civil | Environmental Engineer
BEng (Environmental)

Appendix A – Engineering Drawings

CIVIL ENGINEERING PACKAGE

46 FITZROY STREET, CARRINGTON, NSW 2294
PROPOSED COMMERCIAL DEVELOPMENT

LOCALITY PLAN

IMAGE SOURCE : SIXMAPS

DRAWING LIST

DWG NO	DWG TITLE
DA-C01.01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
DA-C02.01	EROSION AND SEDIMENT CONTROL PLAN
DA-C02.02	EROSION AND SEDIMENT CONTROL DETAILS
DA-C04.01	CIVIL WORKS PLAN
DA-C09.01	CIVIL DETAILS

DRAWN: B. DUGGAN DESIGNED: G. WOOD JOB MANAGER: B. CLARK VERIFIER: B. CLARK

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PROJECT: 46 FITZROY STREET CARRINGTON, NSW 2294

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
COVER SHEET, DRAWING LIST AND LOCALITY PLAN

JOB NUMBER: NL202453

DRAWING NUMBER: DA-C01.01

REVISION: 2

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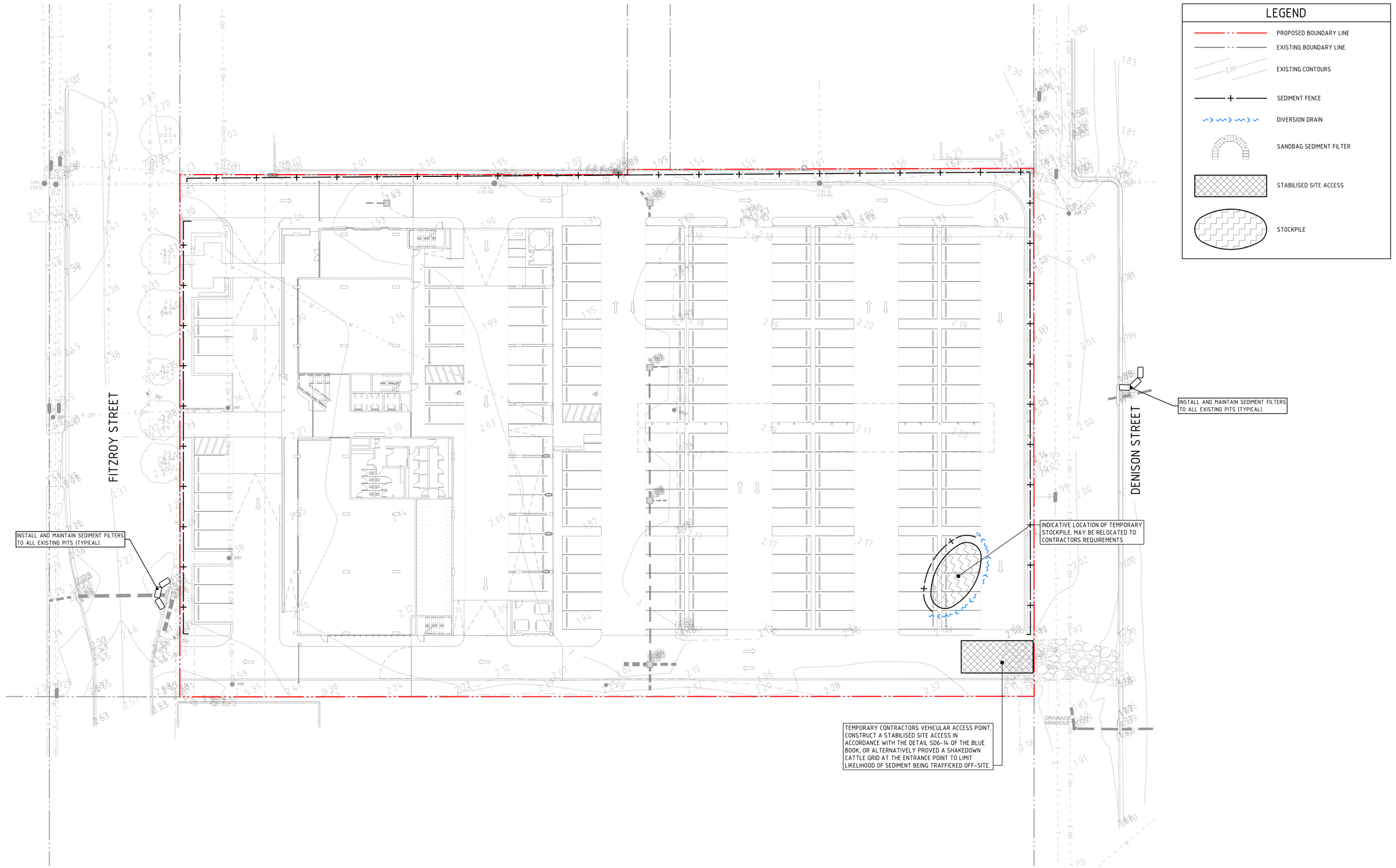

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SCALE 1:250@A1 0 2 4 6 8 10m

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DRAWING TITLE
CIVIL ENGINEERING PACKAGE

EROSION AND SEDIMENT CONTROL PLAN

JOB NUMBER **NL202453**

DRAWING NUMBER **DA-C02.01**

REVISION **2**

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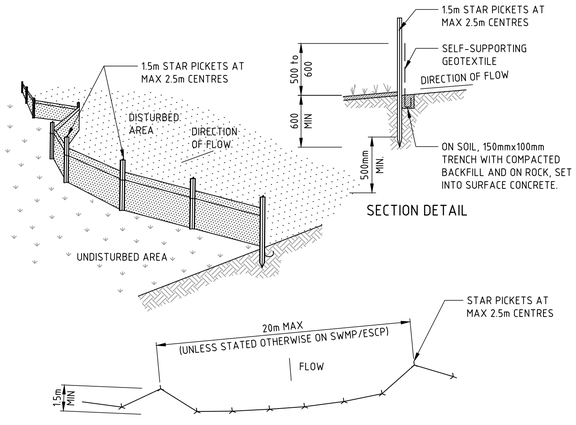
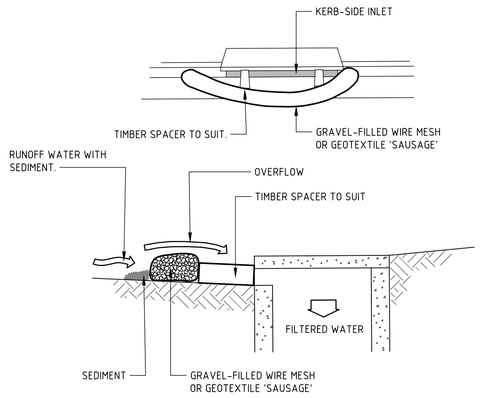


CONSTRUCTION NOTES

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 (SD 6-8)



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

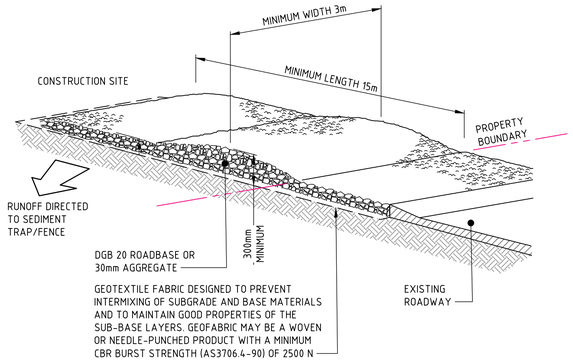
CONSTRUCTION NOTES

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 (SD 6-11)

EROSION AND SEDIMENTATION CONTROL NOTES:

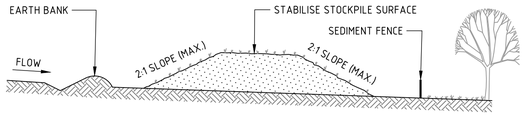
1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION. LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
6. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
11. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
12. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
13. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.



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 (SD 6-14)



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 (SD 4-1)

DRAWN: B. DUGGAN
DESIGNED: G. WOOD
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

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EROSION AND SEDIMENT CONTROL DETAILS

JOB NUMBER: NL202453
DRAWING NUMBER: DA-C02.02
REVISION: 2
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DRIVEWAY CROSSING TO BE CONSTRUCTED IN ACCORDANCE WITH AS2890.1 AND CoN'S STANDARD DRAWING, A1300. LOCALLY GRADE TURF VERGE AS REQUIRED TO MATCH BACK INTO EXISTING EITHER SIDE OF CROSSING.

ROOF RUNOFF TO BE DIRECTED TO A REUSE TANK WITH MINIMUM 16kL VOLUME. HARVESTED RUNOFF TO REUSED INTERNALLY THROUGH TOILET CONNECTIONS ON ALL FLOORS AND EXTERNALLY FOR LANDSCAPE IRRIGATION. TANK OVERFLOW TO DISCHARGE TO PROPOSED PIT AND PIPE NETWORK.

LANDSCAPE WALL/LOW HEIGHT RETAINING WALL. MAX HEIGHT 550mm.

PROPOSED STORMWATER SYSTEM TO DISCHARGE TO EXISTING KERB INLET PIT IN DENISON STREET. INVERT LEVEL 0.78m AHD TO BE CONFIRMED ONSITE PRIOR TO COMMENCEMENT OF CONSTRUCTION.

ABANDONED WATER LINE TO BE LOCATED ONSITE AND REMOVED.

PROPOSED STORMWATER SYSTEM TO DISCHARGE TO EXISTING KERB INLET PIT IN FITZROY STREET. INVERT LEVEL 0.78m AHD TO BE CONFIRMED ONSITE PRIOR TO COMMENCEMENT OF CONSTRUCTION.

EXISTING SERVICES TO BE LOCATED ON SITE VIA POT HOLING PRIOR TO COMMENCEMENT OF CONSTRUCTION. ANY CONFLICTS TO BE REFERRED TO DESIGN ENGINEER.

DRIVEWAY CROSSING TO BE CONSTRUCTED IN ACCORDANCE WITH AS2890.1 AND CoN'S STANDARD DRAWING, A1300. LOCALLY GRADE TURF VERGE AS REQUIRED TO MATCH BACK INTO EXISTING EITHER SIDE OF CROSSING.

BIORETENTION GARDENS WITH MINIMUM FILTER MEDIA AREA OF 30m². MEDIA TO BE PROVIDED TO TREAT STORMWATER RUNOFF BEFORE DISCHARGING INTO UNDERGROUND DETENTION TANK.

EXISTING STORMWATER LINE TO BE LOCATED ONSITE AND REMOVED.

BIORETENTION GARDENS WITH MINIMUM FILTER MEDIA AREA OF 110m². MEDIA TO BE PROVIDED TO TREAT STORMWATER RUNOFF BEFORE DISCHARGING INTO UNDERGROUND DETENTION TANK.

UNDERGROUND ONSITE DETENTION TANK WITH MINIMUM STORAGE VOLUME OF 190kL TO ATTENUATE POST DEVELOPED FLOWS TO PRE-DEVELOPED RATES.

FFL 2.70

OSD

RWT

FITZROY STREET

DENISON STREET

EX KIP CL 1.88 IL 0.78

EX KIP CL 2.26 IL 0.78

LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- EXISTING CONTOURS
- EXISTING GRATED INLET PIT
- EXISTING KERB INLET PIT
- EXISTING STORMWATER PIPE
- E-OH — EXISTING ELECTRICITY (OVERHEAD)
- G — EXISTING GAS
- T — EXISTING TELSTRA
- W — EXISTING WATER
- S — EXISTING SEWER
- VC — VEHICULAR CROSSING
- ROOF AREA
- BIORETENTION GARDEN FILTER AREA
- LANDSCAPED AREA
- PERMEABLE PARKING AREA
- 300 DIA — PROPOSED STORMWATER PIPE / DIAMETER
- PROPOSED JUNCTION PIT / GRATED INLET PIT
- LANDSCAPE WALL / RETAINING WALL
- FFL 2.70 — FINISHED FLOOR LEVEL
- eRL2.30+ — EXISTING SPOT HEIGHT
- +RL2.15 — PROPOSED SPOT HEIGHT
- FALL — DIRECTION OF FALL
- OSD — DETENTION TANK. REFER TO C09.01 FOR DETAILS.
- RWT — RAINWATER HARVESTING TANK

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: G. WOOD
DRAWN: B. DUGGAN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	BD		GW	12.03.21
2	ISSUED FOR DA APPROVAL	BD	BC	GW	09.04.21

CLIENT: PORT of NEWCASTLE
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: RAINSFORD ARCHITECTURE + DESIGN (RAD)

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
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SCALE 1:250@ A1 — 0 2 4 6 8 10m

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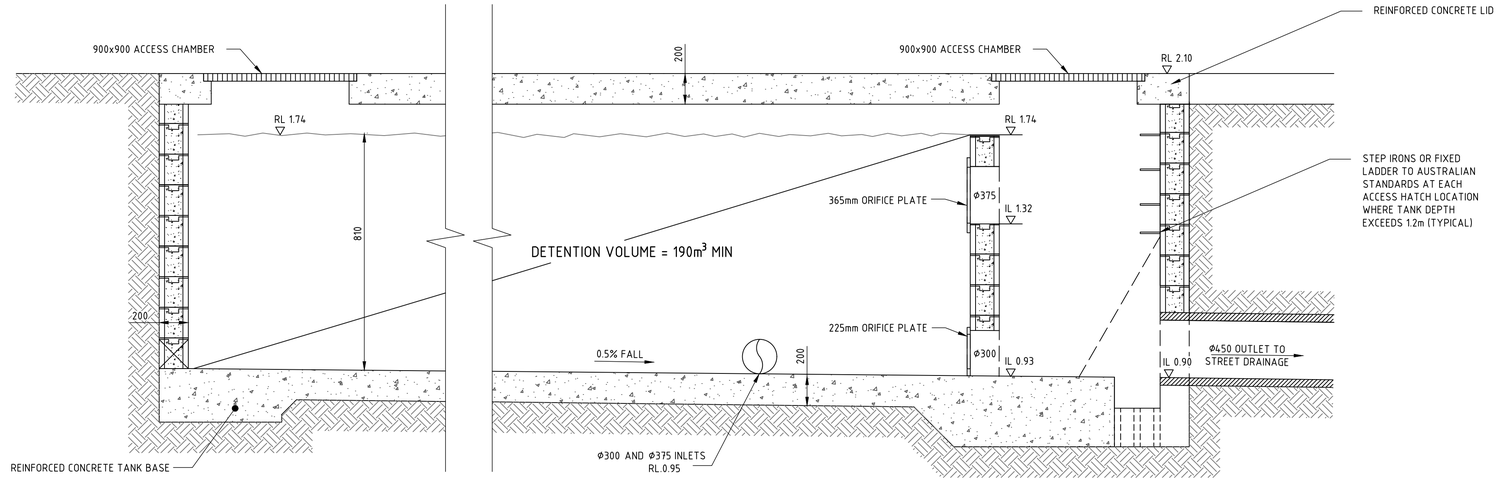
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: 46 FITZROY STREET CARRINGTON, NSW 2294

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL WORKS PLAN

JOB NUMBER: NL202453
DRAWING NUMBER: DA-C04.01
REVISION: 2
DRAWING SHEET SIZE = A1



OSD TANK DETAIL

DRAWN: B. DUGGAN DESIGNED: G. WOOD JOB MANAGER: B. CLARK VERIFIER: B. CLARK

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	BD		GW	12.03.21
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ABN 81 094 433 100

PROJECT
46 FITZROY STREET CARRINGTON, NSW 2294

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

CIVIL DETAILS

JOB NUMBER **NL202453**

DRAWING NUMBER **DA-C09.01**

REVISION **2**

DRAWING SHEET SIZE = A1

Appendix B – MUSIC Link Report

THE CITY OF NEWCASTLE

MUSIC-*link* Report

Project Details		Company Details	
Project:	NL202453	**Company:**	Northrop Consulting Engineers
Report Export Date:	12/03/2021	**Contact:**	Gemma Wood
Catchment Name:	NL202453_Denison St_DA_GW_V02	**Address:**	Level 1/215 Old Pacific Hwy, Charlestown NSW 2290
Catchment Area:	0.869ha	**Phone:**	4943 1777
Impervious Area*:	64.78%	**Email:**	gwood@northrop.com.au
Rainfall Station:	61078 WILLIAMTOWN		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1995 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	1125mm		
Evapotranspiration:	1735mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Newcastle		
Scenario:	Newcastle		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness

Node: Post-Development Node	Reduction
Flow	12.3%
TSS	88.7%
TP	71.9%
TN	46.5%
GP	90.9%

Treatment Nodes

Node Type	Number
Rain Water Tank Node	1
Bio Retention Node	2

Source Nodes

Node Type	Number
Urban Source Node	7

Comments

The bioretention basin filter depth modelled was outside the allowable range for City of Newcastle. A filter depth of 0.3m was adopted to more accurately model the proposed shallow bioretention gardens within the carpark, as specified in CoN's 2019 Stormwater and Water Efficiency for Development Technical Manual.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention (110m2)	Hi-flow bypass rate (cum/sec)	None	None	0.2
Bio	Bioretention (110m2)	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention 30m2	Hi-flow bypass rate (cum/sec)	None	None	0.2
Bio	Bioretention 30m2	PET Scaling Factor	2.1	2.1	2.1
Post	Post-Development Node	% Load Reduction	None	None	12.3
Post	Post-Development Node	GP % Load Reduction	90	None	90.9
Post	Post-Development Node	TN % Load Reduction	45	None	46.5
Post	Post-Development Node	TP % Load Reduction	65	None	71.9
Post	Post-Development Node	TSS % Load Reduction	85	None	88.7
Rain	Rainwater Tank	% Reuse Demand Met	70	None	81.9893
Urban	Eastern Hardstand (0.2519ha)	Area Impervious (ha)	None	None	0.252
Urban	Eastern Hardstand (0.2519ha)	Area Pervious (ha)	None	None	0
Urban	Eastern Hardstand (0.2519ha)	Total Area (ha)	None	None	0.252
Urban	Eastern Pervious (0.282ha)	Area Impervious (ha)	None	None	0
Urban	Eastern Pervious (0.282ha)	Area Pervious (ha)	None	None	0.282
Urban	Eastern Pervious (0.282ha)	Total Area (ha)	None	None	0.282
Urban	Hardstand Bypass (0.0118ha)	Area Impervious (ha)	None	None	0.012
Urban	Hardstand Bypass (0.0118ha)	Area Pervious (ha)	None	None	0
Urban	Hardstand Bypass (0.0118ha)	Total Area (ha)	None	None	0.012
Urban	Pervious Bypass (0.0032ha)	Area Impervious (ha)	None	None	0
Urban	Pervious Bypass (0.0032ha)	Area Pervious (ha)	None	None	0.003
Urban	Pervious Bypass (0.0032ha)	Total Area (ha)	None	None	0.003
Urban	Roof (0.2145ha)	Area Impervious (ha)	None	None	0.215
Urban	Roof (0.2145ha)	Area Pervious (ha)	None	None	0
Urban	Roof (0.2145ha)	Total Area (ha)	None	None	0.215
Urban	Western Hardstand (0.0842ha)	Area Impervious (ha)	None	None	0.084
Urban	Western Hardstand (0.0842ha)	Area Pervious (ha)	None	None	0
Urban	Western Hardstand (0.0842ha)	Total Area (ha)	None	None	0.084
Urban	Western Pervious (0.0208ha)	Area Impervious (ha)	None	None	0
Urban	Western Pervious (0.0208ha)	Area Pervious (ha)	None	None	0.021
Urban	Western Pervious (0.0208ha)	Total Area (ha)	None	None	0.021

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention (110m2)	Filter depth (m)	0.4	1	0.3
Bio	Bioretention 30m2	Filter depth (m)	0.4	1	0.3

Only certain parameters are reported when they pass validation