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Engineering

Working Beyond Expectations

Stormwater Management Report

Proposed Woolworths Local Shopping Centre & 1 into 6 Lot Torrens Title Subdivision

Property:
309 George Booth Drive, Cameron Park
Lot 901 DP 1222132

Applicant:
Fabcot Pty Ltd

Date:
February 2018

Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
A	Draft	20/06/17	Mark Littlefield	Mark Kelly
B	ESCP updates	20/02/18	Rexx Brown	Mark Kelly

Table of Contents

APPENDICES

1.0 Introduction

ADW Johnson Pty Ltd has been commissioned by Fabcot Pty Ltd to prepare a Stormwater Management Plan (SWMP) to accompany a Development Application (DA) for a proposed Woolworths Local Shopping Centre development and one (1) into six (6) lot Torrens Title Subdivision at Lot 901 DP 1222132, 309 George Booth Drive, Cameron Park. The proposed development is to be known as Cameron Park Village.

2.0 Site Description

The subject site is located within the Cameron Grove Residential Estate at Cameron Park, approved under DA 2433/2004. This subdivision approval included creation of the subject site to facilitate commercial development.

The subject site has an area of 5.652ha and frontages to Portland Drive, Northridge Drive, Tramway Drive and George Booth Drive.

In accordance with the abovementioned subdivision approval, substantial works have been undertaken including site vegetation clearing, earthworks, servicing infrastructure, drainage controls and road construction. Construction of the major intersection on George Booth Drive is well advanced.

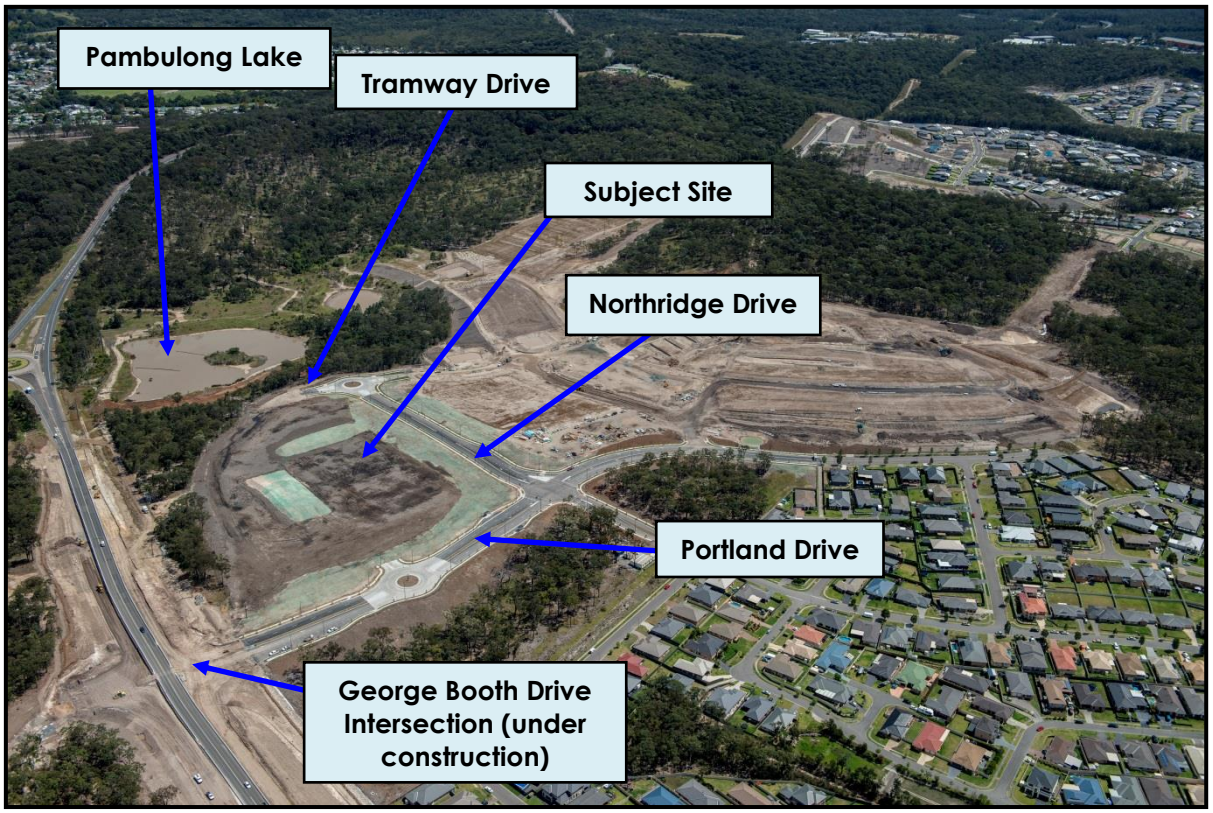

Figure 1: Aerial Image of Subject Site (October 2016)

Major stormwater infrastructure has already been constructed to serve the eastern portion of the site in accordance with the Cameron Grove subdivision approval (DA 2433/2004). Engineering plans for this existing infrastructure prepared by Brown Consulting are shown in **Appendix F.**

A stormwater and water control quality pond "Pambulong Lake" has been previously established to the west of the site (as seen above) and will provide the major storm water management including water quality and detention for the site in accordance with DA 2433/2004.

The subject site is not identified as containing potential contamination, and has been previously approved by Council to facilitate commercial use as part of the broader subdivision under DA 2433/2004.

The subject site is not identified on the Lake Macquarie LEP 2014 Acid Sulphate Soils map as containing potential Acid Sulphate Soils (ASS).

3.0 Proposed Development

The proponent is seeking to establish a local shopping centre with Woolworths as the anchor tenant. The development is to be known as Cameron Park Village.

Specific details of the proposal can be seen in the Statement of Environmental Effects prepared by ADW Johnson including architectural plans.

The figure below shows the proposed site layout.

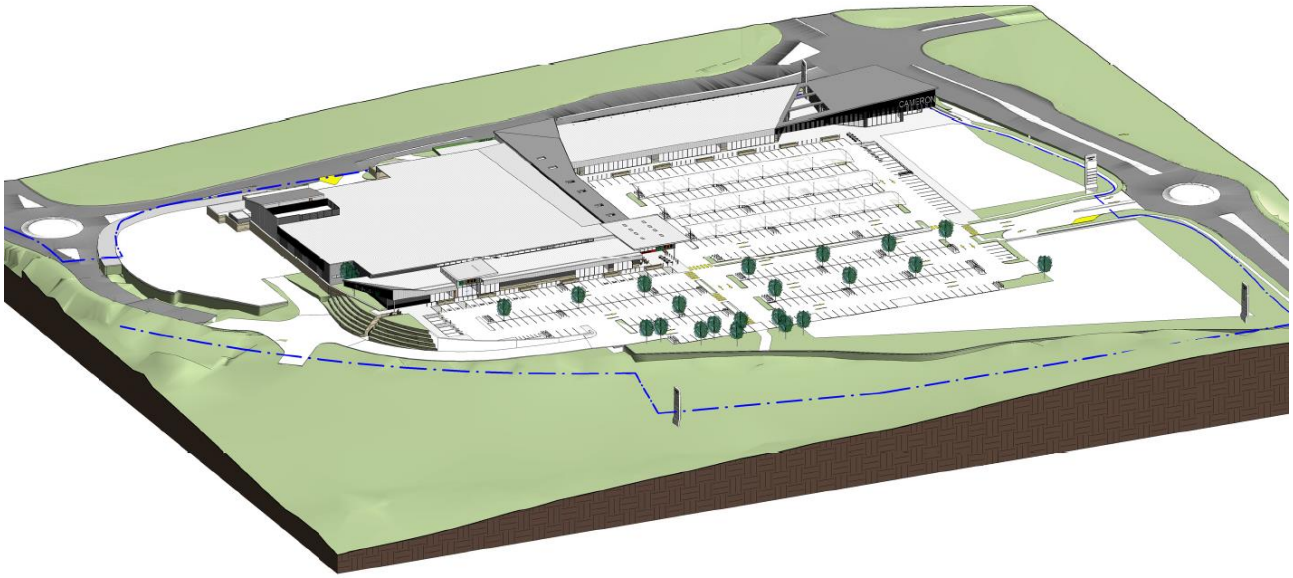

Figure 2: Indicative Proposed Development

4.0 Requirements

4.1 COUNCIL REQUIREMENTS

From Part 2.5 – Stormwater Management, Infrastructure and On-Site Services of Council's Development Control Plan No. 1 (DCP No. 1), the proposed development is described as that which: *"involve(s) water flows exceeding the equivalent water demand of 50 persons or more."* This triggers the requirement for a comprehensive water cycle strategy to be prepared as an acceptable solution to mitigate potential stormwater impacts from the proposed development.

The stormwater management system is to minimise environmental impact of urban runoff. Typically, this is addressed by modelling simulation of water quality controls to target objectives. For this proposed development, the above has been addressed generally in the report prepared by Brown Consulting, "Stormwater Masterplan Lot 104, Pambulong Forest, Estelville" – January 2004. Additional controls above that specified in the report by Brown consulting are detailed within this report.

From Part 2.1.11 – Erosion Prevention & Sediment Control of Council's DCP No. 1, the proposed development is described as Category 3 – greater than 2,500m^2 (of disturbance). This triggers the requirement for a Soil and Water Management Plan (SWMP) to be prepared to mitigate potential stormwater impacts during construction of the proposed development. General requirements for the preparation of the SWMP are described by Council guidelines and the Soils and Construction – Volume 1, 4th Edition 'Blue Book' - (reprinted July 2006). Full details of the SWMP are described in **Section 5.4**.

4.2 SPECIFIC SITE REQUIREMENTS

Plans approved by Brown Consulting for Portland Drive (Project Ref L05016.014) have specified flows generated from the eastern portion of the site for both the minor (10 year) and major (100 year) events that are to be discharged through an adjoining development. It is therefore critical that these flows are not exceeded and detention measures provided if necessary.

5.0 Stormwater Management Strategy

The proposed strategy for the commercial development is in accordance with the approved strategy for the entire catchment. The strategy for water quality improvement utilises the existing "Pambulong Lake" for stormwater management for the western portion of the site, a smaller proposed basin for management of the eastern portion of the site and also includes end of line controls prior to discharge from the proposed development site in the form of GPT's. The overall strategy is shown in **Appendix A.**

5.1 OVERALL SYSTEM

There are five (5) controlled discharge points proposed from the site, with two (2) of these locations specified as significant points of discharge. These locations can be seen in Appendix A. The treatment elements selected for the improvement of stormwater quality prior to discharge from the proposed development site from the two (2) major discharge locations are:

- Gross Pollutant Traps (litter baskets may be substituted if accepted by Council);
- Rainwater tanks where appropriate; and
- "Pambulong Lake" (Western Portion of site), "Proposed Basin No.1" (Eastern Portion of site).

'Pambulong Lake" has been shown to provide adequate treatment for the western portion of the site. Downstream treatment measures have been designed and constructed for the eastern portion of the site in accordance with the report prepared by Brown Consulting, "Stormwater Masterplan Lot 104, Pambulong Forest, Estelville" – January 2004, which was approved as part of the Cameron Grove subdivision (DA 2433/2004). The proposed basin has been provided to ensure peak flow rates determined in the approved plans in both the minor and major storm are not exceeded. Although the basin has been placed to ensure peak flow rates are managed there will also be a treatment benefit in terms of reducing sediment, suspended solids and target nutrients.

Conventional piped street drainage will be used for the control of stormwater runoff from the roads and carpark. This system will convey the stormwater to the treatment elements outlined above.

5.2 WATER QUANTITY - MODELLING, BASE PARAMETERS & CATCHMENTS

The subcatchments were defined by concept design and site grading to distribute stormwater flows to the two (2) discharge locations described in **Section 5.1.** These catchments have been simplified into two (2) parts, namely Catchment East (Discharging to Portland Drive) and Catchment West (Discharging to "Pambulong Lake"). It has been determined that as flows for Catchment East connect to the existing drainage network on Portland Drive that the design flows approved under the Construction Certificate must not be exceeded by the current proposal. The discharge location for Catchment East is shown in Appendix A as well as in the figures below.

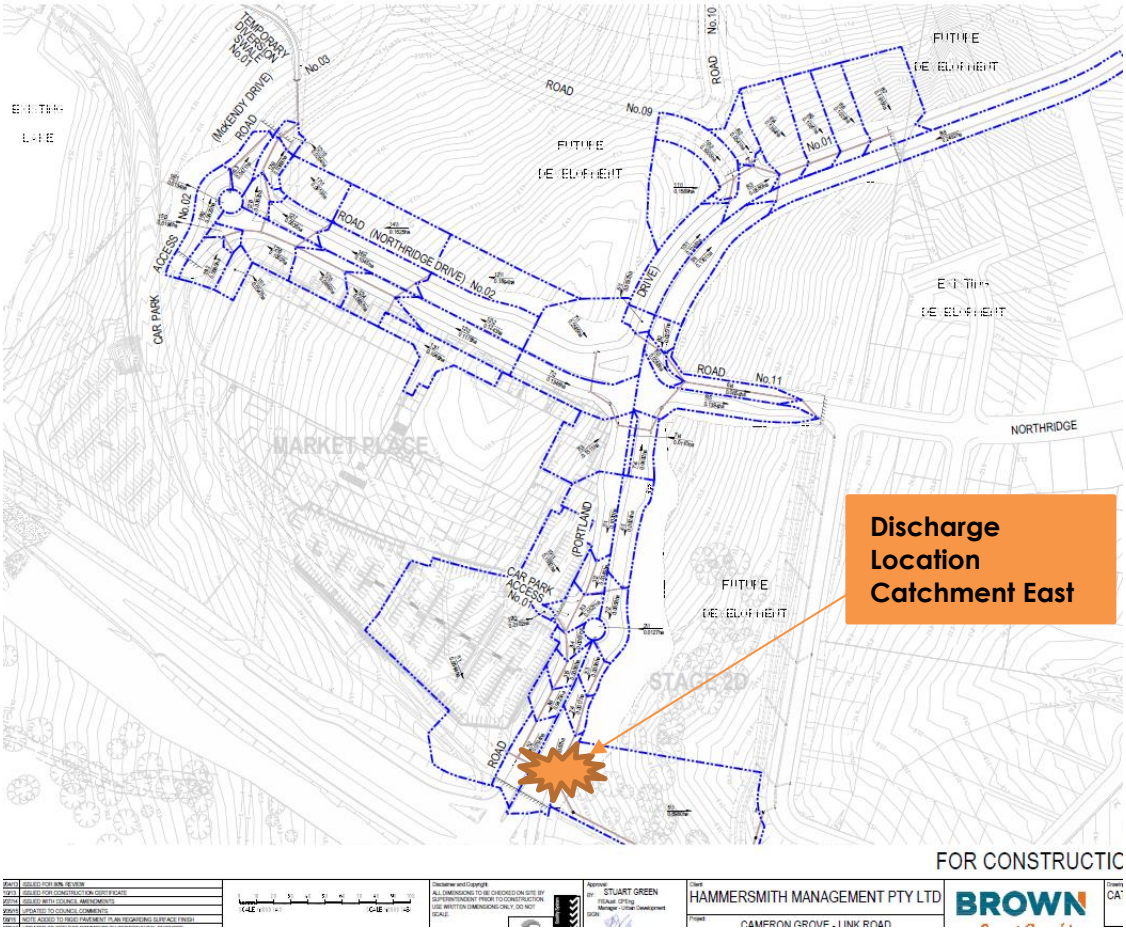

Figure 3: DA 2433/2004 Approved Catchment Plan (BROWN Consulting)

Based on the latest proposed Woolworths development the contributing catchment to Portland Drive has been modified and is shown below.

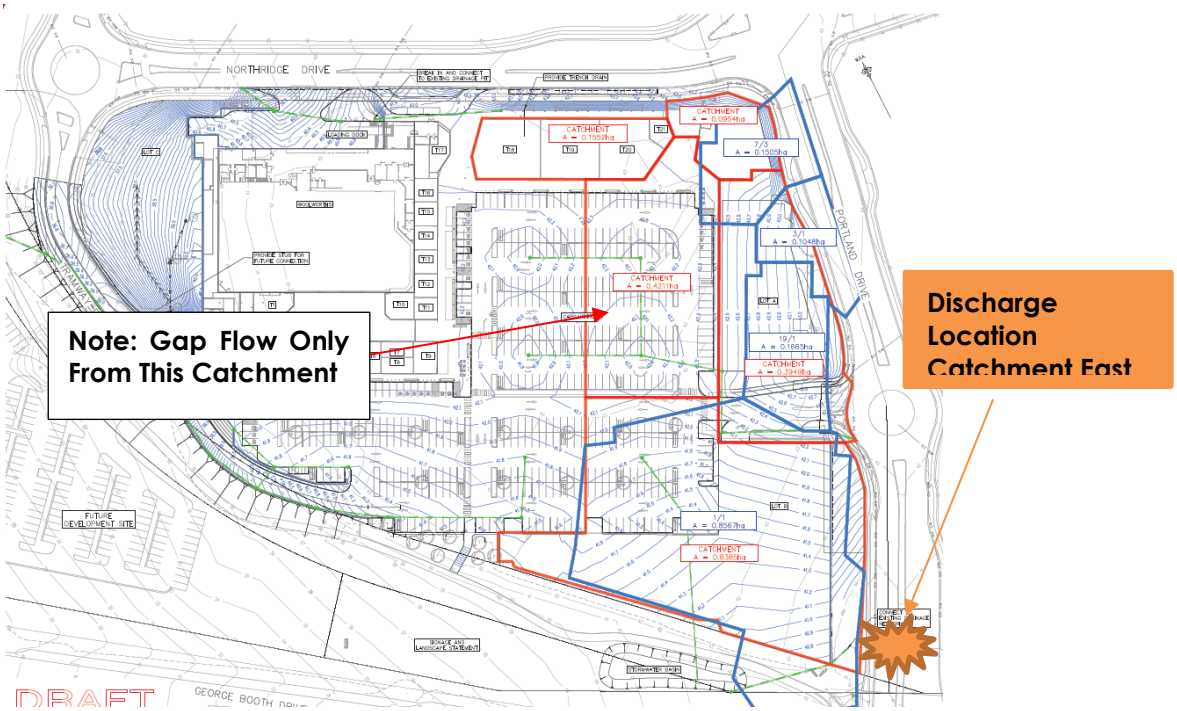

Figure 4: DA 2433/2004 Approved Catchments (Blue) overlayed with proposed catchments (Red)

To determine the peak design flows at the point of discharge a DRAINS storm water routing model was used. DRAINS uses the time-area method to estimate runoff hydrographs for pervious and impervious surfaces.

The Rainfall Intensity Frequency Duration (IFD) data used in the model was sourced from LMCC Handbook of Drainage Design Criteria.

Table 2 –Catchment East Analysis – Approved Catchment allowance off proposed site, Based off BROWNS plans

CATCHMENT	AREA (ha)	IMPERVIOUS (%)	PERVIOUS (%)	10 Yr ARI Peak Q (l/s)	100 Yr ARI Peak Q (l/s)
EAST A	1.01	80%	20%	401	578

Table 3 –Catchment East Analysis – Updated Catchment from proposed site

CATCHMENT	AREA (ha)	IMPERVIOUS (%)	PERVIOUS (%)	10 Yr ARI Peak Q (l/s)	100 Yr ARI Peak Q (l/s)
EAST B	1.63*	80%	20%	465	792*

*0.42ha of this is contributing gap flow only (Major storm flow – Minor storm flow)

An analysis of the peak flows from the site based on the original approved plans of the surrounding road network against the proposed development has determined that detention is now required to limit flows back to the peak flows approved.

To achieve this reduction in flows for the proposed development a detention basin has been modelled within DRAINS at the south end of the site. Details of the basin can be seen in **Appendix A.**

Table 4 – Catchment East with Detention

ARI Storm Event (yr)	Approved Development Peak Flow (l/s)	Post Development Peak Flow (l/s) with updated catchments	Post Development Peak Flow With Detention (l/s)
10	401	465	303
100	578	792	547

It can be seen that through the utilisation of the proposed detention basin flows generated from the development are less than that approved to be discharged within the plans prepared by Browns Consulting for Portland Drive.

5.3 WATER QUALITY STRATEGY

Gross Pollutant Traps (GPTs) are an essential element to the treatment train for water quality improvement. The traps are to collect heavy sediment and litter and provide a regulated location for maintenance, improving the ongoing function of the stormwater controls. There are two (2) GPT's proposed for the proposed development. The locations of the proposed GPT's can be seen in **Appendix A.**

A rainwater tank is proposed for the buildings. The rainwater tank will collect stormwater runoff from roof areas. The tank is to have appropriate first flush controls for maintenance purposes. Details for these controls will be specified with detailed design for the Construction Certificate.

The stormwater captured in the rainwater tanks will be used for toilet flushing and irrigation of landscaped areas. Harvesting rainwater tank water is a significant benefit in potable mains water reduction to the proposed development. Refer to **Appendix A** for rainwater tank locations.

The existing "Pambulong Lake" will provide effective detention for peak flows and retention of nutrients for the western portion of the site as well as be aesthetically pleasing. Details can be seen in the report "Stormwater Master plan, Lot 104 Pambulong Forest, Estelville" prepared by Brown Consulting (Refer Appendix F).

The proposed detention basin located at the south eastern corner of the site is included as a means to reduce peak flows but will also have an additional benefit of retaining nutrients before overflows are discharged through the catchment wide WSUD strategy described in the report "Stormwater Master Plan, Lot 104 Pambulong Forest, Estelville" prepared by Brown Consulting.

5.4 SOIL & WATER MANAGEMENT

A concept Soil and Water Management Plan has been prepared. This plan is to outline the temporary control measures for the protection of the downstream receiving waters during construction. Sediment fencing will be installed to boundaries of work areas. Stockpiles will be protected by sediment fencing. These measures need to be installed prior to commencement of earthworks. All controls need to be designed in accordance with *'Managing Urban Stormwater – Soils & Construction Volume 1'* (Landcom, 2004) – 'Blue Book'. Refer to **Appendix B.**

Correspondence from LMCC has indicated the soils encountered are likely to be of type F/D which include dispersible particles. Standard monitoring techniques for Total Suspended Solids will be required during construction however the sediment basins are likely to require aided flocculation prior to pump-out/discharge.

Sediment basin sizing has been undertaken in accordance with the 'Blue Book', allowing for full site disturbance. Preliminary sizing indicates that utilising the proposed basins as temporary sediment basins with the following minimum volumes will satisfy the guidelines:

- Sediment Basin 1 – 874m^3;
- Sediment Basin 2 – 364m^3.

Refer to **Appendix D** for temporary sediment basin sizing calculations and **Appendix A** for temporary sediment basin locations.

6.0 Key Compliance

The key compliance requirements for stormwater strategy including the comprehensive water cycle and soil and water management requirements are shown below in **Tables 6** and **7**.

Table 6 – Comprehensive Water Cycle Requirements

Issue Description	Section Reference/ Comment
Site conditions, catchment context and land capability	Section 2.0
Estimates of all water flows	Section 5.2
Objectives and strategies for improving water efficiency, water quality, discharge volumes, concentrations, flood protection and aquatic environments	Section 5.3 – GPT's, rainwater tanks for irrigation and utilisation of existing downstream basins and proposed basins
The provision of integrated water infrastructure systems	Section 5.3 – Stormwater harvesting for irrigation of landscaping areas and other uses is an integrated system
Proposed layout and street design measures to minimise disturbance to natural landscape features and incorporate stormwater source controls in street reserves	Section 5.3 – GPT are included as at source controls
Proposed landscape design measures to protect natural features, improve water quality, provide recreation opportunities and satisfy safety requirements	Section 5.3 – Stormwater controls will be integrated as landscape features and not pose a risk in terms of safety
Proposed landscape practices to retain or restore natural landscape features, manage and treat stormwater runoff and reduce demand for water, fertilisers and herbicides	Section 5.3 – A rainwater tank for irrigation of landscaping areas and other non-potable uses located on site will reduce potable water demand to the development.
Provision of water tanks, infiltration devices and other on-site stormwater infrastructure at the subdivision stage including aquifer storage and harvesting of stormwater	Section 5.3 – GPT's, rainwater tanks for irrigation and basins
Wastewater reuse	None specified
Erosion, sediment and pollution control maintenance, monitoring and performance evaluation	Section 5.5

Table 7 – Soil and Water Management Requirements - Category 3

Issue Description	Section Reference/ Comment
Locality Details	Section 2.0
North point and scale	Appendix A
Property boundaries and adjoining roads	Appendix A, B
Existing land contours	Appendix C
Location of existing trees and vegetation	Appendix C
Location of existing significant landscape features	None present
Existing watercourses and drains flowing through, or adjacent to, the site	"Pambulong lake"
Outline of proposed building/structures and disturbed areas	Appendix A, B
Proposed vehicular access	Appendix A, B
Extent of vegetation to be cleared	Landscape Plan
Extent of earthworks and limits of cut and fill	Appendix B
Location of proposed stockpiles	Appendix B
Location of proposed temporary and permanent site drainage	No temporary drains proposed, Permanent are shown Appendix A
Location of proposed temporary erosion prevention and sediment control measures	Appendix B
Location of temporary and permanent revegetation areas	See landscape plans
An explanation of any changes to the erosion prevention and sediment controls as the works proceed	No change required
Supplementary notes covering inspection and maintenance requirements	Appendix F
SWMP's shall include detailed calculations to determine the soil loss and the size of any sediment basins that may be required on the site.	Appendix E
The location of lots, public open space, stormwater drainage systems, schools, shopping centres/community centres – (if nearby)	Appendix A, B
The location of land designated or zoned for special uses	N/A
Location and diagrams of all erosion and sediment site controls used	Appendix B
Locations, calculations and engineering details of any sediment basins	Appendix B, E
Location and details of other stormwater management structures such as; constructed wetlands, gross pollutant traps, trash racks or separators.	Appendix A

7.0 Conclusion

The key compliance requirements for stormwater management and soil and water management for the proposed Woolworths Shopping Centre have been met. The permanent controls for the site include Gross Pollutant Traps at each major outlet, rainwater tanks for stormwater harvesting and irrigation of the landscaped areas, and a detention basin. Further treatment measures have been implemented further downstream including "Pambulong Lake" and several significant stormwater basins east of the site.

Peak flows being discharged through adjoining development east of the site has been modelled and the use of a detention basin has ensured approved flow rates from the site have not been exceeded.

The site is well elevated above regional 1:100 year ARI peak flood levels. Standard temporary sediment controls of sediment fencing will apply to the site during construction.

Appendix A

STORMWATER MANAGEMENT PLAN

239402-REP-001

900
D.P.1222132

NORTHRIDGE DRIVE

CONNECT TO EXISTING STORMWATER NETWORK

BREAK IN AND CONNECT TO EXISTING DRAINAGE PIT

PROPOSED RAINWATER TANK TO BE DETAILED AT CONSTRUCTION CERTIFICATE STAGE

PROVIDE TRENCH DRAIN AT BASE OF STAIRS

PROPOSED RAINWATER TANK TO BE DETAILED AT CONSTRUCTION CERTIFICATE STAGE

LOADING DOCK

LOT C

PROPOSED RAINWATER TANKS TO BE DETAILED AT CONSTRUCTION CERTIFICATE STAGE

TO PAMBULONG LAKE

PROVIDE GPT. DETAILS TO BE PROVIDED AT CONSTRUCTION CERTIFICATE STAGE

WOOLWORTHS
RL 42.3

FUTURE STORMWATER CONNECTION FOR LOT C

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22

CARPARKING

LOT A

PORTLAND DRIVE

TRAMWAY DRIVE

FUTURE ROAD CONNECTION

FUTURE DEVELOPMENT SITE

LOT B

CONNECT TO EXISTING STORMWATER NETWORK

REFER PLANS PREPARED BY BROWNS CONSULTANTS REF. L05016.018 FOR EXISTING DRAINAGE DETAILS

PROVIDE STUB FOR FUTURE CONNECTION OF LOT B

CONNECT TO EXISTING DRAINAGE NETWORK

FUTURE CYCLEWAY (BY OTHERS)

SCOUR PROTECTION TO BE DETAILED AT CONSTRUCTION CERTIFICATE STAGE

CONSTRUCT 600 x 600 RGSIP. PROVIDE 0.15H x 0.4W OPENING AT R.L. 39. TOP OF GRATE R.L. 39.80

PROVIDE GPT. DETAILS TO BE PROVIDED AT CONSTRUCTION CERTIFICATE STAGE

GPT ACCESS TO BE DETAILED AT CONSTRUCTION CERTIFICATE STAGE

902
D.P.1222132

901
D.P.1222132

GEORGE BOOTH DRIVE

M.G.A.

LEGEND:

- 42.00 DESIGN CONTOURS (0.1m INTERVAL)
- 42.00 WORK AS EXECUTED CONTOURS (1.0m INTERVAL)
- EXTENT OF WORKS
- BATTER EXTENTS
- PROPOSED STORMWATER DRAINAGE
- PROPOSED RETAINING WALL
- FS FS FUTURE SEWER MAIN
- S S EXISTING SEWER MAIN
- W W EXISTING WATER MAIN
- ex sw EXISTING STORMWATER DRAINAGE
- SW SW FUTURE STORMWATER DRAINAGE
- DETENTION BASIN

NOTE: SEE SHEET 401 & 402 FOR STORMWATER CATCHMENT DETAILS.

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	20.06.17	INITIAL ISSUE	MF	ML	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:

STORMWATER MANAGEMENT PLAN

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-REP-001

client: Woolworths — Australia's fresh food people

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Appendix B

CONCEPT ENGINEERING INCLUDING EROSION AND SEDIMENT CONTROL PLAN

CAMERON PARK, LAKE MACQUARIE
D.P.1222132
DEVELOPMENT APPLICATION
CIVIL DESIGN PLANS

LOCALITY PLAN
N.T.S.

INDEX OF DRAWINGS

DRAWING	NAME
239402-DA-001	TITLE SHEET, DRAWING INDEX AND LOCALITY PLAN
239402-DA-002	SITE LAYOUT PLAN
239402-DA-101	DETAIL PLAN - SHEET 1
239402-DA-102	DETAIL PLAN - SHEET 2
239402-DA-103	ACCESS ROAD LONGITUDINAL SECTION
239402-DA-201	EARTHWORKS PLAN
239402-DA-301	SITE SECTIONS - SHEET 1
239402-DA-302	SITE SECTIONS - SHEET 2
239402-DA-401	STORMWATER DRAINAGE PLAN - SHEET 1
239402-DA-402	STORMWATER DRAINAGE PLAN - SHEET 2
239402-DA-451	INDICATIVE ROOF CATCHMENT AND DOWNPIPE PLAN
239402-DA-501	EROSION & SEDIMENT CONTROL PLAN - SHEET 1
239402-DA-502	EROSION & SEDIMENT CONTROL PLAN - SHEET 2
239402-DA-511	EROSION & SEDIMENT CONTROL DETAILS - SHEET 1
239402-DA-512	EROSION & SEDIMENT CONTROL DETAILS - SHEET 2
239402-DA-513	EROSION & SEDIMENT CONTROL NOTES
239402-DA-551	TYPICAL RETAINING WALL DETAILS & SECTIONS
239402-DA-601	SERVICES PLAN - SHEET 1
239402-DA-602	SERVICES PLAN - SHEET 2

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: N/A	NOT TO SCALE	

drawing title:
TITLE SHEET,
DRAWING INDEX &
LOCALITY PLAN

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-001

client: Woolworths — Australia's fresh food people

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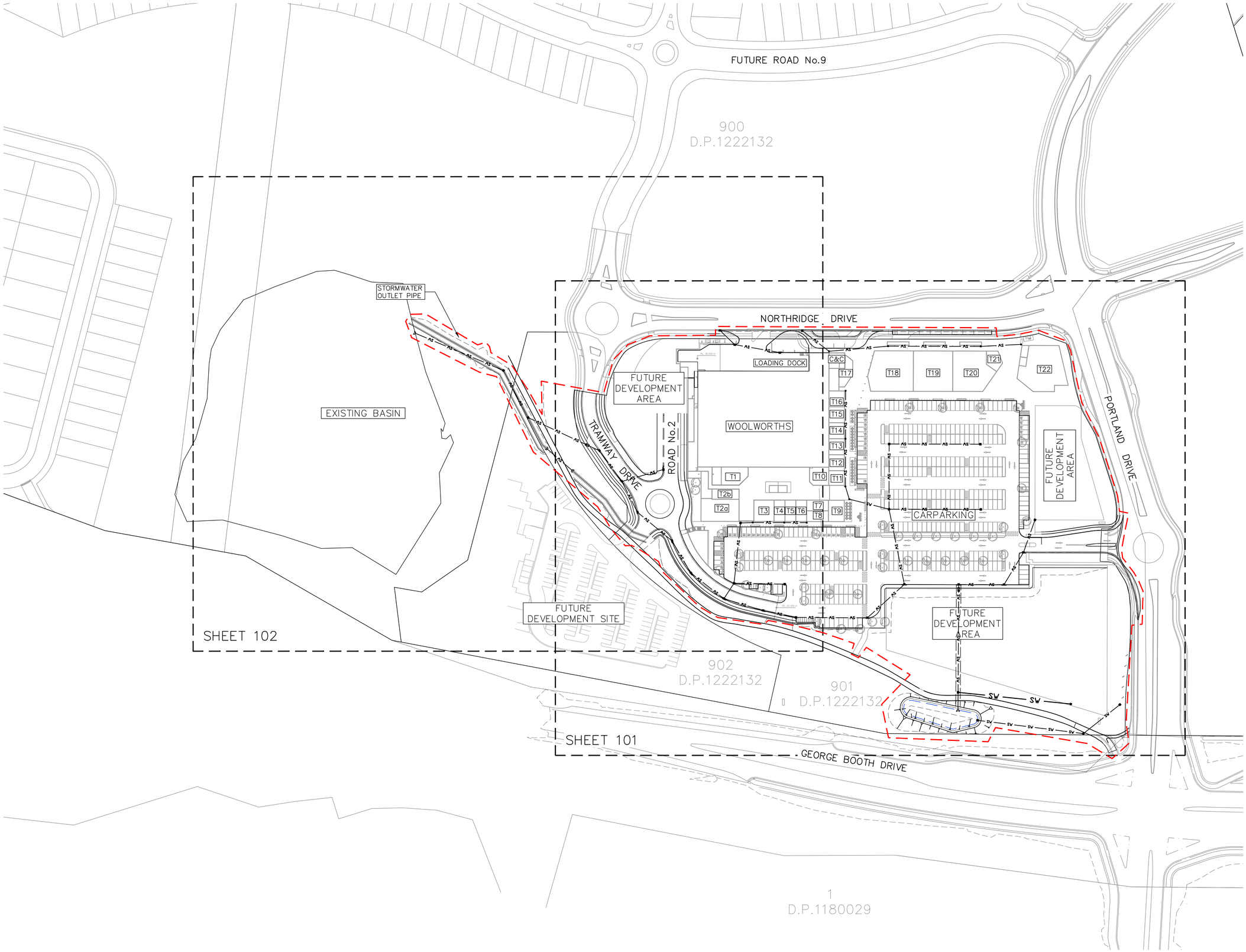
239402-DA-002-SITE_LAYOUT_PLAN



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drawing title:

SITE LAYOUT PLAN

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-002

client: woolworths Australia's fresh food people

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• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design

Plotted By: Dean Woodbridge Plot Date: 20/02/18 10:32:28AM Cad File: S:\239402\DRAWINGS\PLANNING\DA\WOOLWORTHS DA\239402-DA-002-SITE_LAYOUT_PLAN.DWG

239402-DA-101-DETAIL_PLAN

REFER SHEET 102 FOR CONTINUATION

REMOVE EXISTING LINTEL, INSTALL V-GRATE TO SUIT DISH CROSSING

CONSTRUCT NEW DISH CROSSINGS AT 'CLICK & COLLECT' ENTRY/EXIT TO CONVEY FLOWS FROM NORTHRIDGE DRIVE. ENSURE SMOOTH TIE-IN WITH EXISTING

PROVIDE CARPARKING AND PEDESTRIAN ACCESS

NORTHRIDGE DRIVE

CONSTRUCT NEW PIT AND LINTEL OVER EXISTING STORMWATER LINE

PROVIDE TRENCH DRAIN AT EDGE OF PLANTER

TRENCH DRAIN

LOADING DOCK

C&C

T17

T18

T19

T20

T21

T22

FUTURE DEVELOPMENT AREA

3.0m

RAMP ACCESS TO LOADING DOCK

1 IN 4 INTERFACE (MAX)

RETAINING WALL TO FUTURE DEVELOPMENT AREA. REFER ELEVATION ON SHEET 551

WOOLWORTHS RL 42.3

T16

T15

T14

T13

T12

T11

T10

T1

T2b

T2a

T3

T4

T5

T6

T7

T8

T9

PROVIDE GPT AND HARDSTAND BAY FOR MAINTENANCE ACCESS

PROVIDE CAPPED STUB FOR FUTURE STORMWATER CONNECTION FOR FUTURE DEVELOPMENT AREA

ROAD No.2

TRAMWAY DRIVE

CARPARKING

EXISTING BUS STOP

PROVIDE PEDESTRIAN ACCESS TO EXISTING BUS STOP

PORTLAND DRIVE

FUTURE DEVELOPMENT AREA

PROVIDE GRADED PAD FOR FUTURE DEVELOPMENT

ADJUST EXISTING STORMWATER LINTEL TO SUIT NEW KERB ALIGNMENT

ADJUST EXISTING STORMWATER LINTEL TO SUIT NEW KERB ALIGNMENT

REALIGN EXISTING KERB AND PROVIDE NEW PAVEMENT WHERE REQUIRED

TIERED LANDSCAPE WALL. REFER TO DETAIL ON SHEET 551

FUTURE ROAD CONNECTION

5 302

TIERED LANDSCAPE WALL. REFER TO DETAIL ON SHEET 551

4 302

DEMOLISH AND REMOVE EXISTING STORMWATER PIT AND PIPE

PROVIDE GPT AND HARDSTAND BAY FOR MAINTENANCE ACCESS

FUTURE DEVELOPMENT SITE

FUTURE DEVELOPMENT AREA

SPLIT FACE BLOCKWORK RETAINING WALL. REFER TO DETAIL ON SHEET 551

1 IN 4 (MAX) INTERFACE TO EXISTING

SPLIT FACE BLOCKWORK RETAINING WALL. REFER TO DETAIL ON SHEET 551

1 301

FUTURE CYCLEWAY (BY OTHERS)

EASEMENT FOR STORMWATER

PROVIDE STUB FOR FUTURE CONNECTION OF FUTURE DEVELOPMENT AREA

902 D.P.1222132

901 D.P.1222132

ALLOW FOR CONNECTIVITY TO FUTURE CYCLEWAY

CONNECT TO EXISTING DRAINAGE NETWORK

STORMWATER BASIN REFER SWMP

2 301

DISCHARGE TO STORMWATER BASIN. PROVIDE HEADWALL AND SCOUR PROTECTION

CONSTRUCT 600 x 600 RGSIP. PROVIDE 0.15H x 0.4W OPENING AT R.L. 39. TOP OF GRATE R.L. 39.80

GEORGE BOOTH DRIVE

LEGEND:

- 42.00 — DESIGN CONTOURS (0.1m INTERVAL)
- 42.00 — WORK AS EXECUTED CONTOURS (1.0m INTERVAL)
- EXTENT OF WORKS
- BATTER EXTENTS
- PROPOSED STORMWATER DRAINAGE
- PROPOSED RETAINING WALL
- FS — FS — FUTURE SEWER MAIN
- ex s — EXISTING SEWER MAIN
- ex w — EXISTING WATER MAIN
- ex SW — EXISTING STORMWATER DRAINAGE
- SW — SW — FUTURE STORMWATER DRAINAGE

M.G.A.

NOTE:
1. ALL SIGNAGE AND LINEMARKING SHALL BE UNDERTAKEN IN ACCORDANCE WITH ARCHITECTURAL DRAWINGS AND DETAILS.
2. ALL LANDSCAPING AND PLANTING SHALL BE UNDERTAKEN IN ACCORDANCE WITH ARCHITECTURAL DOCUMENTATION PACKAGE.
3. CONTRACTOR TO ENSURE ALL WORKS DO NOT ENCROACH ON FUTURE CYCLEWAY ALIGNMENT

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:

DETAIL PLAN SHEET 1

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-101

client: Woolworths — Australia's fresh food people

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239402-DA-102-DETAIL_PLAN

LEGEND:

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- EXTENT OF WORKS
- BATTER EXTENTS
- PROPOSED STORMWATER DRAINAGE
- PROPOSED RETAINING WALL
- FS — FS — FUTURE SEWER MAIN
- ex s — EXISTING SEWER MAIN
- ex w — EXISTING WATER MAIN
- ex SW — EXISTING STORMWATER DRAINAGE
- SW — SW — FUTURE STORMWATER DRAINAGE

NOTE:
1. ALL SIGNAGE AND LINEMARKING SHALL BE UNDERTAKEN IN ACCORDANCE WITH ARCHITECTURAL DRAWINGS AND DETAILS.
2. ALL LANDSCAPING AND PLANTING SHALL BE UNDERTAKEN IN ACCORDANCE WITH ARCHITECTURAL DOCUMENTATION PACKAGE.
3. CONTRACTOR TO ENSURE ALL WORKS DO NOT ENCROACH ON FUTURE CYCLEWAY ALIGNMENT

M.G.A.

900
D.P.1222132

DISCHARGE TO EXISTING DRAINAGE CHANNEL. PROVIDE HEADWALL AND SCOUR PROTECTION.

CONSTRUCT NEW DISH CROSSING AT LOADING DOCK ENTRY TO CONVEY FLOWS FROM NORTHRIDGE DRIVE. ENSURE SMOOTH TIE–IN WITH EXISTING

NORTHRIDGE DRIVE

REFER SHEET 101 FOR CONTINUATION

EXISTING BASIN

TIE IN NEW PAVEMENT WORKS, KERB ALIGNMENT AND FOOTPATH SMOOTHLY WITH EXISTING

FUTURE CYCLEWAY (BY OTHERS)

3 / 302

LOADING DOCK

FUTURE DEVELOPMENT AREA

3.0m

RAMP ACCESS TO LOADING DOCK

1 IN 4 INTERFACE (MAX)

WOOLWORTHS
RL 42.3

RETAINING WALL TO FUTURE DEVELOPMENT AREA. REFER ELEVATION ON SHEET 551

PROVIDE CAPPED STUB FOR FUTURE STORMWATER CONNECTION FOR FUTURE DEVELOPMENT AREA

TRAMWAY DRIVE

FUTURE ROAD No.2

PROVIDE GPT AND HARDSTAND BAY FOR MAINTENANCE ACCESS

PROVIDE SWALE TO CONVEY 100yr FLOWS AND STORMWATER OVERFLOW TO EXISTING BASIN

1 IN 4 (MAX) INTERFACE TO EXISTING

TIERED LANDSCAPE WALL. REFER TO DETAIL ON SHEET 551

FUTURE ROAD CONNECTION

5 / 302

T1 T10 T2b T2a T3 T4 T5 T6 T7 T8

TIERED LANDSCAPE WALL. REFER TO DETAIL ON SHEET 551

SPLIT FACE BLOCKWORK RETAINING WALL. REFER TO DETAIL ON SHEET 551

FUTURE DEVELOPMENT SITE

1 IN 4 (MAX) INTERFACE TO EXISTING

SPLIT FACE BLOCKWORK RETAINING WALL. REFER TO DETAIL ON SHEET 551

902
D.P.1222132

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:

DETAIL PLAN SHEET 2

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-102

client: Woolworths — Australia's fresh food people

adw johnson
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
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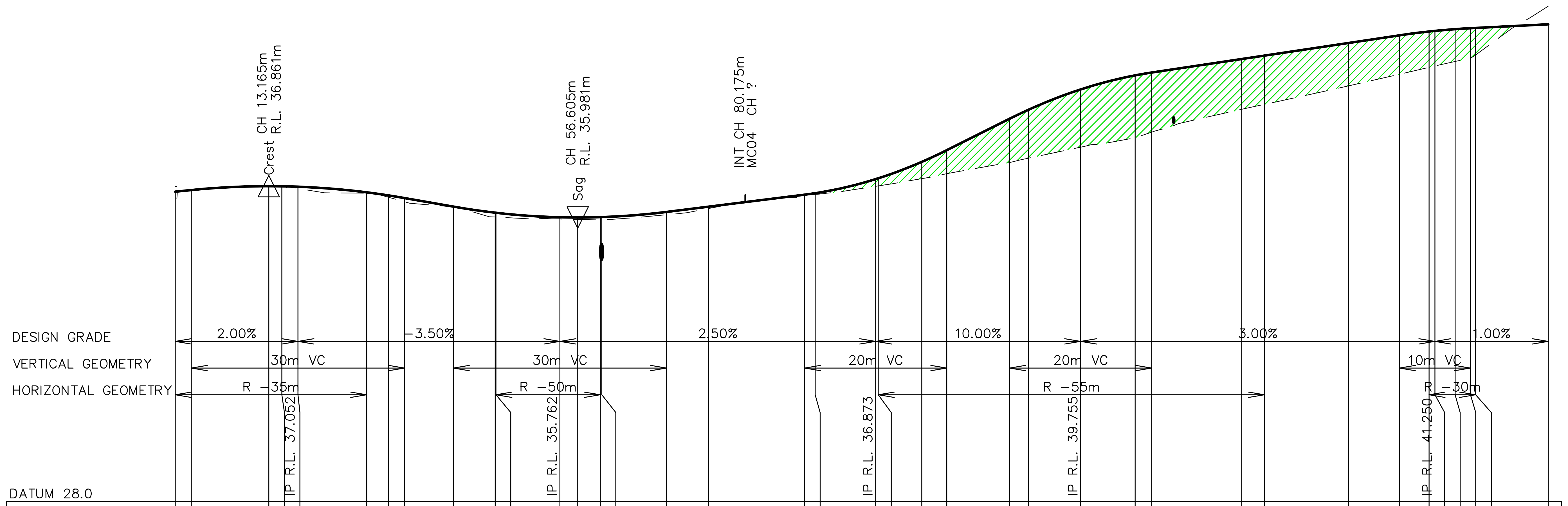
239402-DA-103-ROAD_LONGSECTION



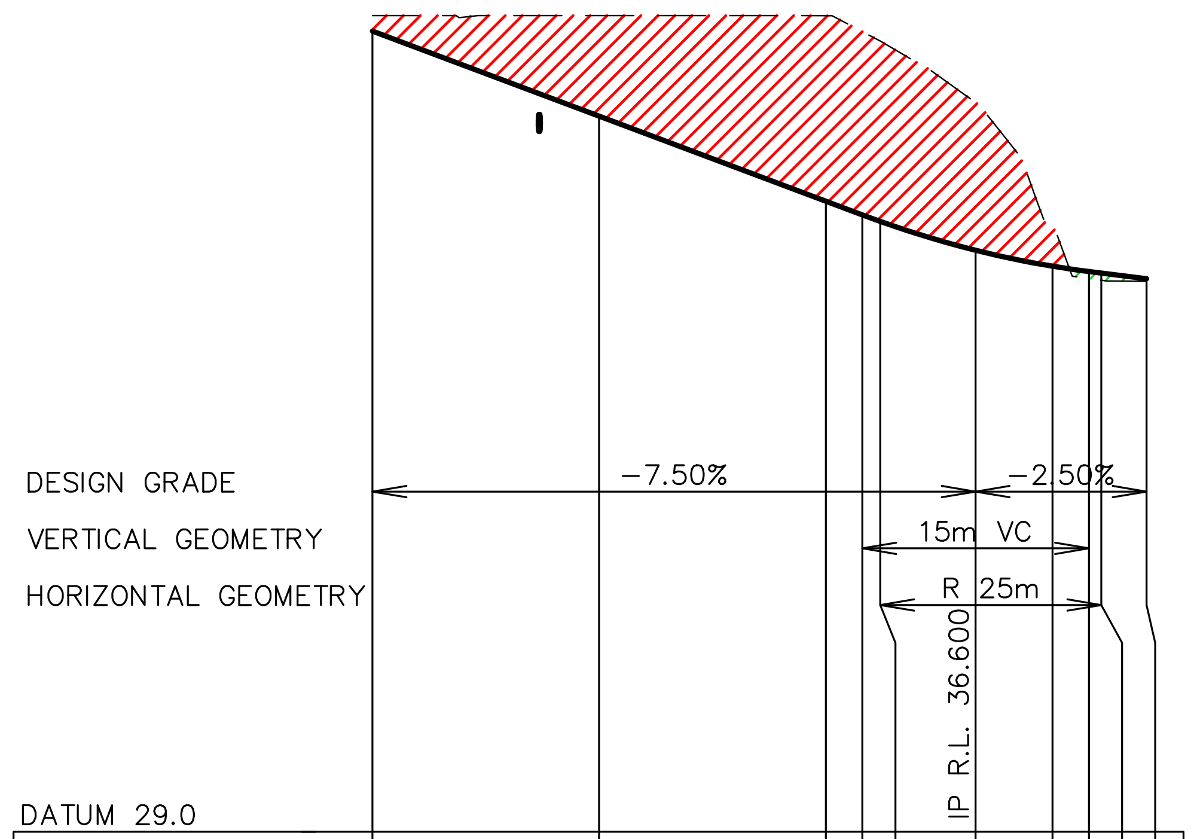
DESIGN LEVEL	36.71	36.75	36.86	36.86	36.85	36.69	36.6	36.53	36.29	36.12	36.11	35.99	35.98
EXISTING SURFACE	36.85	36.75	36.86	36.85	36.8	36.66	36.55	36.42	36.28	35.99	35.99	35.94	35.92
CUT\FILL	-0.14	0.01	0.01	0.01	0.05	0.02	0.05	0.1	0.01	0.12	0.12	0.05	0.06
CHAINAGE	0	2.26	13.16	15	17.26	26.93	30	32.26	39.1	45	45.1	54.1	56.6

DESIGN LEVEL	35.99	35.99	36.14	36.28	36.62	36.66	37.06	37.08	37.54	37.87	38.76	39.01	39.58
EXISTING SURFACE	35.91	35.91	36.06	36.23	36.6	36.63	36.86	36.87	37.07	37.21	37.53	37.65	37.96
CUT\FILL	0.08	0.08	0.08	0.05	0.03	0.03	0.2	0.21	0.47	0.66	1.23	1.36	1.62
CHAINAGE	59.78	60	69.1	75	88.51	90	98.51	98.87	105	108.51	117.34	120	127.34

DESIGN LEVEL	39.98	40.06	40.44	40.53	40.89	41.1	41.21	41.22	41.27	41.3	41.31	41.41
EXISTING SURFACE	38.22	38.36	39.02	39.16	39.68	40	40.2	40.24	40.37	40.46	40.55	41.92
CUT\FILL	1.75	1.69	1.41	1.37	1.21	1.1	1.01	0.99	0.91	0.84	0.76	-0.51
CHAINAGE	135	137.34	150	153.2	165	172.16	176.34	177.16	180	182.16	182.89	193.11

LONGITUDINAL SECTION – TRAMWAY DRIVE

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



DESIGN LEVEL	39.59	38.47	37.34	37.16	37.08	36.69	36.48	36.41	36.39	36.32
EXISTING SURFACE	39.8	39.8	39.8	39.59	39.46	38.65	36.97	36.32	36.3	36.28
CUT\FILL	-0.21	-1.33	-2.45	-2.42	-2.39	-1.96	-0.49	0.09	0.09	0.03
CHAINAGE	0	15	30	32.41	33.6	39.91	45	47.41	48.23	51.23

LONGITUDINAL SECTION – ROAD No.2

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
E	16/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	0 12.5 25.0m SCALE: 1:500 (FULL)	0 2.5 5.0m SCALE: 1:100 (FULL)

drawing title:
ACCESS ROAD
LONGITUDINAL SECTION

location: WOOLWORTHS
CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-103

client:

adw johnson
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
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Plotted By: Dean Woodbridge Plot Date: 20/02/18 10:32:57AM Cad File: S:\239402\DRAWINGS\PLANNING\DA\WOOLWORTHS DA\239402-DA-103-ROAD_LONGSECTION.DWG

239402-DA-201-EARTHWORKS_PLAN

NORTHRIDGE DRIVE

PORTLAND DRIVE

TRAMWAY DRIVE

GEORGE BOOTH DRIVE

REFER INSET

STORMWATER BASIN

M.G.A.

5 302

4 302

1 301

2 301

3 302

INSET

LEGEND:

Lower value		Upper value		Colour
6	to	3	m	
3	to	2	m	
2	to	1.5	m	
1.5	to	1	m	
1	to	0.75	m	
0.75	to	0.5	m	
0.5	to	0.25	m	
0.25	to	0.05	m	
0.05	to	0	m	
0	to	−0.05	m	
−0.05	to	−0.25	m	
−0.25	to	−0.5	m	
−0.5	to	−0.75	m	
−0.75	to	−1	m	
−1	to	−1.5	m	
−1.5	to	−2	m	
−2	to	−3	m	
−3	to	−6	m	

VOLUMES:
CUT – 17750m³
FILL – 13800m³
EXPORT – 3950m³

NOTES:
1: CUT FILL VOLUMES ARE FROM WORK AS EXECUTED SURFACE TO FINAL DESIGN SURFACE.
2: NO INCLUSION HAS BEEN MADE FOR SITE STRIPPING
3: NO INCLUSION HAS BEEN MADE FOR BOXING VOLUMES

42.00 DESIGN CONTOURS (0.1m INTERVAL)
42.00 WORK AS EXECUTED CONTOURS (0.2m INTERVAL)
EXTENT OF WORKS
BATTER EXTENTS

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:

EARTHWORKS PLAN

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-201

client: Woolworths — Australia's fresh food people

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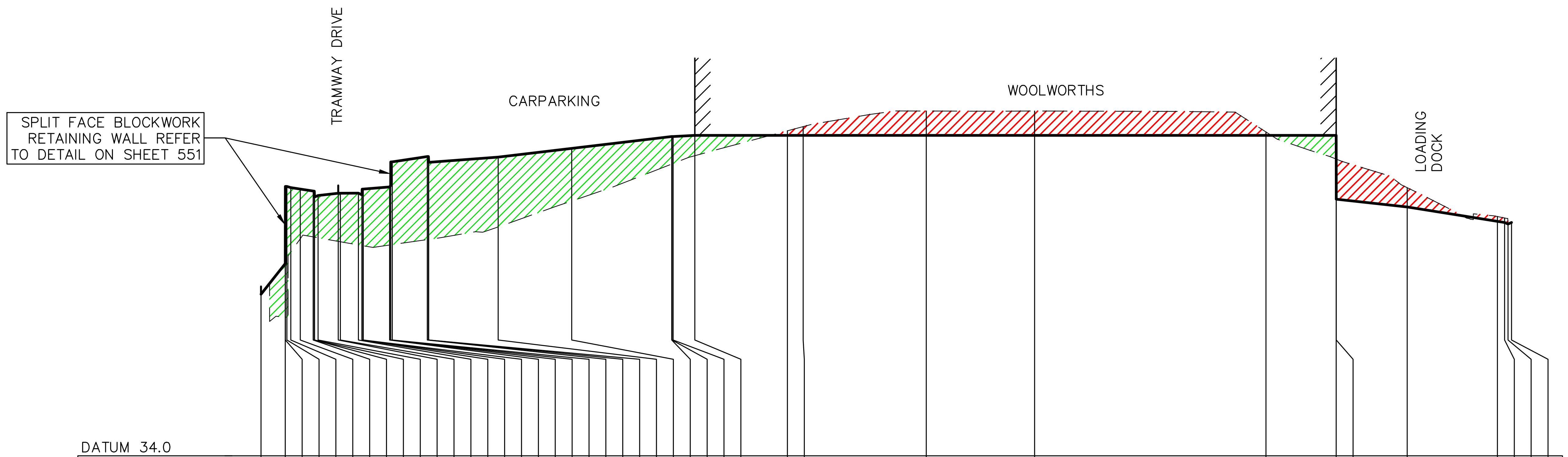
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
www.adwjohnson.com.au

working beyond expectations



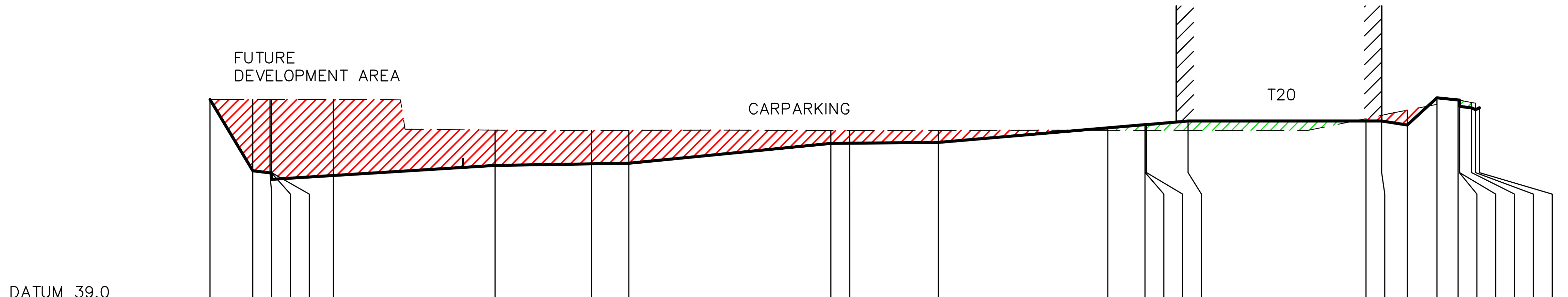
DATUM 34.0

DESIGN LEVEL	38.19	38.98	40.98	40.98	40.95	40.91	40.86	40.85	40.7	40.74	40.8	40.8	40.8	40.76
EXISTING SURFACE		38.98	40.98	40.98	40.95	40.91	40.86	40.85	40.7	40.74	40.8	40.8	40.8	40.76
CHAINAGE	19.72	22.86	22.87	23.07	23.58	24.81	26.47	26.63	26.65	27.11	29.73	30	32.34	32.8

DESIGN LEVEL	40.91	40.91	40.96	41	41.61	41.61	41.75	41.75	41.6	41.74	41.96	42.27	42.27	42.27
EXISTING SURFACE	40.91	40.91	40.96	41	41.61	41.61	41.75	41.75	41.6	41.74	41.97	42.27	42.27	42.27
CHAINAGE	32.83	32.98	36.39	36.52	36.53	36.74	41.28	41.43	41.46	50.46	60	72.96	72.99	73.14

DESIGN LEVEL	42.3	42.3	42.3	42.3	42.3	42.3	42.3	40.65	40.44	40.07	40.04	40	40.04
EXISTING SURFACE	42.3	42.3	42.3	42.3	42.3	42.3	42.3	40.65	40.44	40.07	40.04	40	40.04
CHAINAGE	75.96	87.96	90	105.96	120	150	159.1	159.11	168.31	180	180.93	181.38	181.83

1
101
SITE SECTION 1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



DATUM 39.0

DESIGN LEVEL	43.7	42.04	41.99	41.99	41.84	41.93	42.17	42.2	42.22	42.68	42.68	42.7	43.04
EXISTING SURFACE	43.7	42.04	41.99	41.99	41.84	41.9	42.17	42.2	42.22	42.68	42.68	42.7	43.04
CHAINAGE	75.66	80.63	82.63	82.78	82.81	90	108.78	120	124.34	147.82	150	160.31	180

DESIGN LEVEL	43.12	43.12	43.12	43.2	43.2	43.2	43.11	43.74	43.69	43.69	43.54	43.5	43.46	43.5
EXISTING SURFACE	43.12	43.12	43.12	43.2	43.2	43.2	43.11	43.74	43.69	43.69	43.54	43.5	43.46	43.5
CHAINAGE	184.32	184.35	184.5	189.32	210	211.82	214.8	218.25	220.7	220.85	220.88	222.28	222.73	223.18

2
101
SITE SECTION 2
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

Plotted By: Dean Woodbridge Plot Date: 20/02/18 10:33:17AM Cad File: S:\239402\DRAWINGS\PLANNING\DA\WOOLWORTHS DA\239402-DA-301-SITE SECTIONS.DWG

working beyond expectations

drawing title:
SITE SECTIONS
SHEET 1

location: WOOLWORTHS
CAMERON PARK

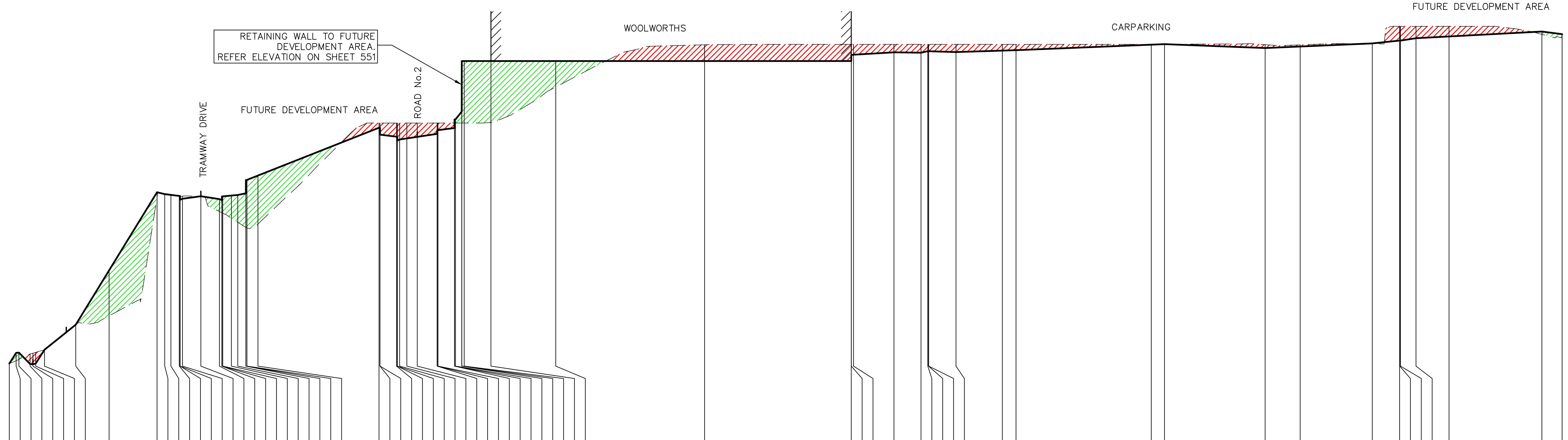
council: LAKE MACQUARIE

dwg ref: 239402-DA-301

client:
Woolworths
Australia's fresh food people

adw
johnson

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	0 12.5 25.0m SCALE: 1:500 (FULL)	0 2.5 5.0m SCALE: 1:100 (FULL)



DATUM 27.0

DESIGN LEVEL	30.1	30.53	30.54	30.09	30.07	30.11	30.66	31.67	33.86	37.01	36.93	36.9	36.86	36.86	36.71	36.75	36.85
EXISTING SURFACE	30.1	30.53	30.54	30.09	30.07	30.11	30.66	31.67	33.87	37.01	36.94	36.9	36.86	36.86	36.73	36.75	36.85
CHAINAGE	9.9	11.27	11.83	14.09	14.66	15.22	16.98	23.29	30	39.67	41.21	42.46	44.14	44.3	44.32	44.79	48.5

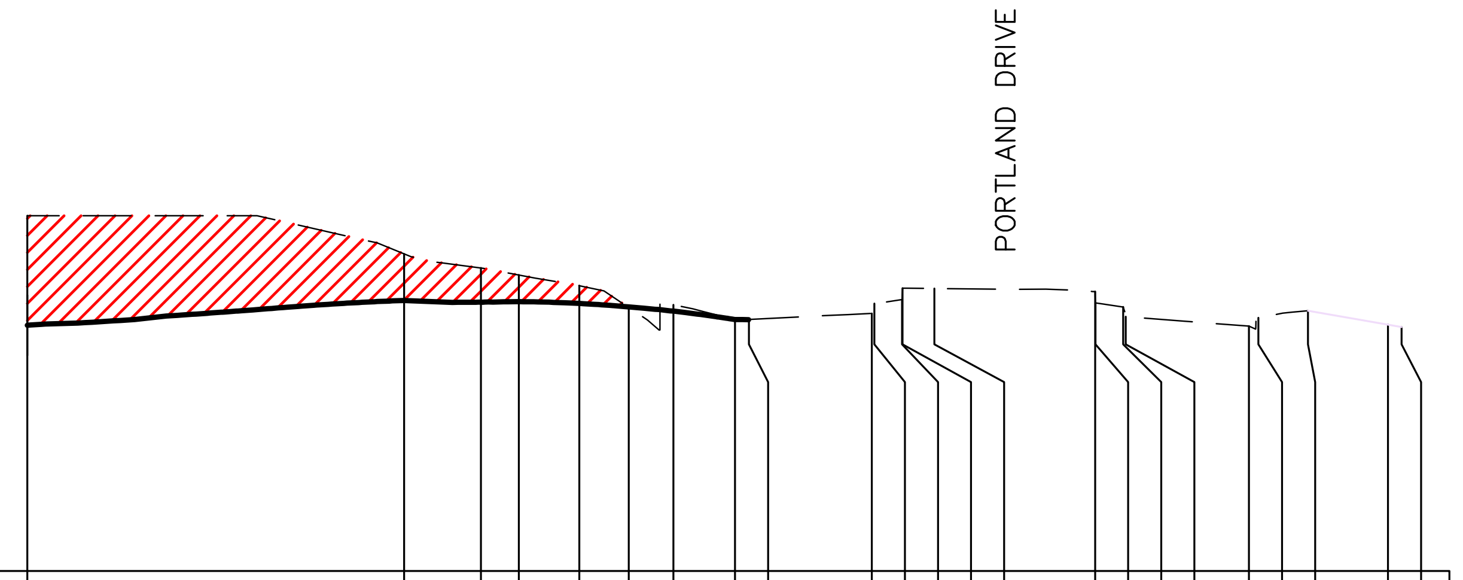
DESIGN LEVEL	36.73	36.69	36.84	36.84	36.88	36.9	36.97	37.5	37.51	37.68	39.61	39.61	39.33	39.25	39.25	39.1	39.14
EXISTING SURFACE	36.73	36.69	36.84	36.84	36.88	36.9	36.97	37.39	37.51	37.69	39.61	39.61	39.33	39.25	39.25	39.1	39.14
CHAINAGE	52.24	52.72	52.75	52.91	54.65	55.94	57.57	57.58	57.78	60	84.4	84.59	84.6	87.92	88.07	88.1	88.55

DESIGN LEVEL	39.18	39.24	39.37	39.52	39.52	39.6	39.95	39.95	40.26	42.3	42.3	42.3	42.3	42.3	42.3	42.55	42.56
EXISTING SURFACE	39.18	39.24	39.37	39.52	39.52	39.6	39.95	39.95	40.26	42.3	42.3	42.3	42.3	42.3	42.3	42.55	42.56
CHAINAGE	90	92.1	96.1	96.13	96.28	99.6	99.61	99.8	101.06	101.07	101.56	106.95	120	150	179.55	179.56	180

DESIGN LEVEL	42.65	42.64	42.7	42.7	42.7	42.66	42.72	42.74	42.96	42.98	42.82	42.89	43.01	43.13	43.13	43.13	43.22	43.29	43.49	43.39
EXISTING SURFACE	42.65	42.64	42.7	42.7	42.7	42.66	42.72	42.74	42.96	42.98	42.82	42.88	43.01	43.13	43.13	43.13	43.22	43.29	43.49	43.39
CHAINAGE	188.15	193.6	194.97	195.12	195.15	200.65	210	212.75	240	242.67	262.95	270	284.54	290.04	290.07	290.22	293.34	300	318.71	322.78

3/101 SITE SECTION 3

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

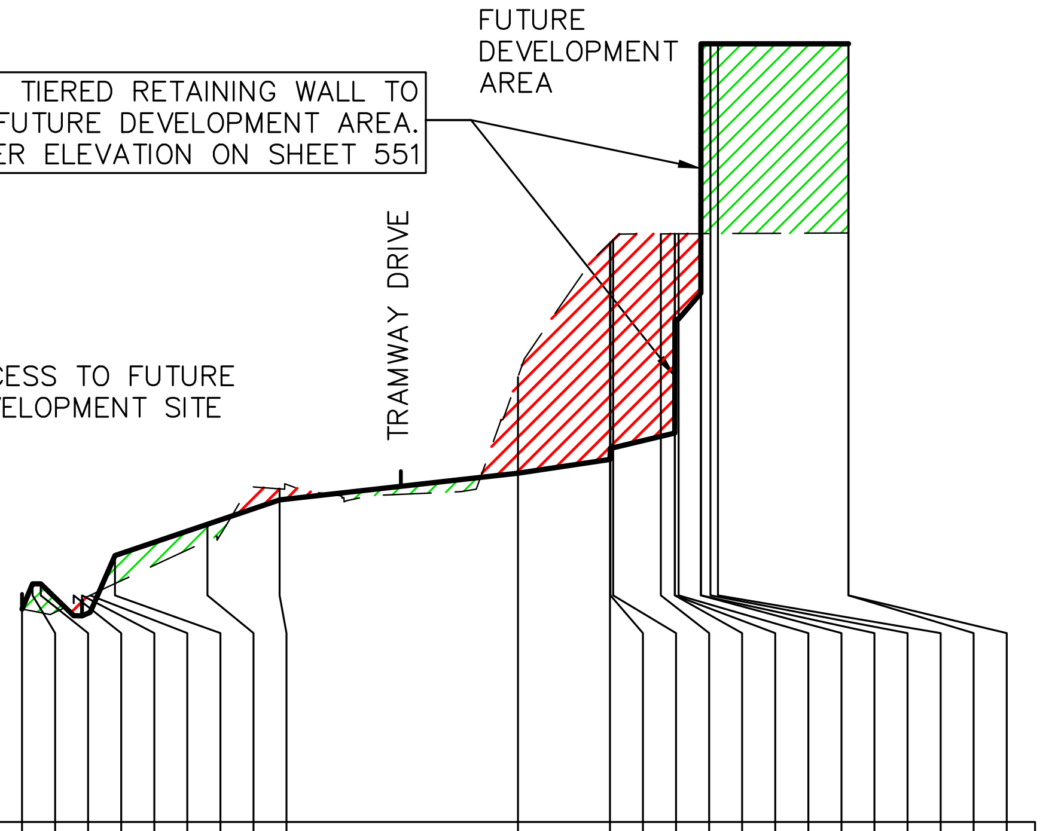


DATUM 39.0

DESIGN LEVEL	42.25	42.58	42.57	42.56	42.54	42.5	42.44	42.33	42.33													
EXISTING SURFACE	42.25	42.58	42.56	42.56	42.54	42.5	42.44	42.33														
CHAINAGE	0	24.92	30	32.51	36.51	39.78	42.74	46.81	47.73	55.86	56.03	57.86	57.89	60	70.63	70.66	72.49	72.66	80.81	81.43	84.71	90	90.9

4/101 SITE SECTION 4

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



DATUM 32.0

DESIGN LEVEL	34.82	35.15	35.15	34.73	34.73	34.77	35.53	35.94	36.26	36.62	36.8	36.95	36.95	37.1	37.15	38.65	38.66	39	42.3	42.3	42.3	42.3	42.3
EXISTING SURFACE	34.82	35.15	35.15	34.73	34.73	34.77	35.53	35.95	36.26	36.62	36.8	36.92	36.95	37.1	37.15	37.76	38.66	39	42.3	42.3	42.3	42.3	42.3
CHAINAGE	17.74	18.44	18.97	21.16	21.7	22.25	23.89	30	34.78	50.54	56.63	56.66	56.84	60	60.92	60.93	61.17	62.64	62.65	63.28	63.77	72.4	72.41

5/101 SITE SECTION 5

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

drawing title:
SITE SECTIONS
SHEET 2

location: WOOLWORTHS
CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-302

client: Woolworths
Australia's fresh food people

adw johnson

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ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	0 12.5 25.0m SCALE: 1:500 (FULL) 0 2.5 5.0m SCALE: 1:100 (FULL)	

• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design

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Plotted By: Dean Woodbridge Plot Date: 20/02/18 10:33:19AM Cad File: S:\239402\DRAWINGS\PLANNING\DA\WOOLWORTHS DA\239402-DA-302-SITE SECTIONS.DWG

239402-DA-401-STORMWATER_PLAN

REFER SHEET 402 FOR CONTINUATION

NORTHRIDGE DRIVE

REMOVE EXISTING LINTEL, INSTALL V-GRATE TO SUIT DISH CROSSING

CONSTRUCT NEW DISH CROSSINGS AT 'CLICK & COLLECT' ENTRY/EXIT TO CONVEY FLOWS FROM NORTHRIDGE DRIVE. ENSURE SMOOTH TIE-IN WITH EXISTING

EXISTING PIT TO BE UTILISED FOR FUTURE DEVELOPMENT AREA

CONSTRUCT NEW PIT AND LINTEL OVER EXISTING STORMWATER LINE

PROVIDE TRENCH DRAIN AT EDGE OF PLANTER

SUBCATCHMENT D-1
A = 0.1475ha

SUBCATCHMENT C-1
A = 0.1257ha

CATCHMENT C
A = 0.377ha

SUBCATCHMENT C-3
A = 0.0954ha

SUBCATCHMENT C-2
A = 0.1552ha

TRENCH DRAIN

LOADING DOCK

C&C

T17

T18

T20

T21

T22

CATCHMENT E
A = 0.1455ha

FUTURE DEVELOPMENT AREA

CATCHMENT D
A = 0.7106ha

WOOLWORTHS

SUBCATCHMENT D-2
A = 0.5635ha

PROVIDE GPT AND HARDSTAND BAY FOR MAINTENANCE ACCESS

PROVIDE CAPPED STUB FOR FUTURE STORMWATER CONNECTION FOR FUTURE DEVELOPMENT AREA

ROAD No.2

TRAMWAY DRIVE

T16

T15

T14

T13

T12

T11

T10

T1

T2b

T2a

T5

T6

T7

T8

T9

SUBCATCHMENT A-3
A = 0.0968ha

SUBCATCHMENT A-2
A = 0.9792ha

CARPARKING

FUTURE DEVELOPMENT AREA

PORTLAND DRIVE

ADJUST EXISTING STORMWATER LINTEL TO SUIT NEW KERB ALIGNMENT

CATCHMENT C
A = 0.1352ha

CATCHMENT A
A = 2.129ha

SUBCATCHMENT A-1
A = 1.051ha

DEMOLISH AND REMOVE EXISTING STORMWATER PIT AND PIPE

PROVIDE GPT AND HARDSTAND BAY FOR MAINTENANCE ACCESS

CATCHMENT B
A = 1.1365ha

FUTURE DEVELOPMENT AREA

FUTURE DEVELOPMENT SITE

STORMWATER BASIN

CONNECT TO EXISTING DRAINAGE NETWORK

GEORGE BOOTH DRIVE

DISCHARGE TO STORMWATER BASIN. PROVIDE HEADWALL AND SCOUR PROTECTION

LEGEND:

- 42.00 DESIGN CONTOURS (0.1m INTERVAL)
- 42.00 WORK AS EXECUTED CONTOURS (1.0m INTERVAL)
- CATCHMENT AREA BOUNDARY
- SUBCATCHMENT AREA BOUNDARY
- PROPOSED STORMWATER DRAINAGE
- ex sw EXISTING STORMWATER DRAINAGE
- OVERLAND FLOW PATH

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:
STORMWATER DRAINAGE PLAN SHEET 1

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-401

client: Woolworths — Australia's fresh food people

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www.adwjohnson.com.au

working beyond expectations

239402-DA-402-STORMWATER_PLAN

LEGEND:

- 42.00 — DESIGN CONTOURS (0.1m INTERVAL)
- 42.00 — WORK AS EXECUTED CONTOURS (1.0m INTERVAL)
- CATCHMENT AREA BOUNDARY
- SUBCATCHMENT AREA BOUNDARY
- PROPOSED STORMWATER DRAINAGE
- ex sw — EXISTING STORMWATER DRAINAGE
- OVERLAND FLOW PATH

M.G.A.

EXISTING BASIN

DISCHARGE TO EXISTING DRAINAGE CHANNEL. PROVIDE HEADWALL AND SCOUR PROTECTION.

PROVIDE GPT AND HARDSTAND BAY FOR MAINTENANCE ACCESS

PROVIDE SWALE TO CONVEY 100yr FLOWS AND STORMWATER OVERFLOW TO EXISTING BASIN

EXISTING PIT TO BE UTILISED FOR FUTURE DEVELOPMENT AREA

CONSTRUCT NEW DISH CROSSINGS AT 'CLICK & COLLECT' ENTRY/EXIT TO CONVEY FLOWS FROM NORTHRIDGE DRIVE. ENSURE SMOOTH TIE-IN WITH EXISTING

REMOVE EXISTING LINTEL, INSTALL V-GRATE TO SUIT DISH CROSSING

CONSTRUCT NEW PIT AND LINTEL OVER EXISTING STORMWATER LINE

NORTHRIDGE DRIVE

IRAMWAY DRIVE

ROAD No.2

FUTURE DEVELOPMENT AREA

FUTURE DEVELOPMENT SITE

WOOLWORTHS

PROVIDE CAPPED STUB FOR FUTURE STORMWATER CONNECTION FOR FUTURE DEVELOPMENT AREA

TRENCH DRAIN

LOADING DOCK

CATCHMENT E
A = 0.1455ha

SUBCATCHMENT D-1
A = 0.1475ha

CATCHMENT D
A = 0.7106ha

SUBCATCHMENT D-2
A = 0.5635ha

SUBCATCHMENT A-3
A = 0.0968ha

CATCHMENT A
A = 2.2121ha

SUBCATCHMENT A-1
A = 1.13431ha

REFER SHEET 401 FOR CONTINUATION

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:
STORMWATER DRAINAGE PLAN SHEET 2

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-402

client: Woolworths — Australia's fresh food people

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239402-DA-451-ROOF CATCHMENT_PLAN

NORTHRIDGE DRIVE

FUTURE DEVELOPMENT AREA

WOOLWORTHS

LOADING DOCK

C&C

ROAD No.2

TRAMWAY DRIVE

CARPARKING

FUTURE DEVELOPMENT AREA

PORTLAND DRIVE

FUTURE DEVELOPMENT SITE

FUTURE DEVELOPMENT AREA

GEORGE BOOTH DRIVE

RL. 39.550 m

RL. 42.300 m

T1 T2a T2b T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22

FALL

DP

ex SW

SW

M.G.A.

LEGEND:

- PROPOSED STORMWATER DRAINAGE
- EXISTING STORMWATER DRAINAGE
- CATCH DRAIN
- GUTTER FLOW DIRECTION
- ROOF FALL DIRECTION
- APPROXIMATE DOWNPIPE LOCATION

NOTE:
1. ROOF CATCHMENTS AND DOWNPIPE LOCATIONS ARE INDICATIVE ONLY AND ARE SUBJECT TO FURTHER DETAIL DESIGN
2. ROOF AND GUTTERS IN ACCORDANCE WITH ARCHITECTURAL PLANS

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
B	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:
INDICATIVE ROOF CATCHMENT AND DOWNPIPE PLAN

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-451

client: Woolworths — Australia's fresh food people

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Plotted By: Dean Woodbridge Plot Date: 20/02/18 10:33:54AM Cad File: S:\239402\DRAWINGS\PLANNING\DA\WOOLWORTHS DA\239402-DA-451-ROOF CATCHMENT_PLAN.DWG

239402-DA-501-EROS_&_SED_PLAN

REFER SHEET 502 FOR CONTINUATION

NORTHRIDGE DRIVE

LOADING DOCK

FUTURE DEVELOPMENT AREA

STABILISE BANK IMMEDIATELY UPON COMPLETION OF GRADING OPERATIONS WITH 100mm TOPSOIL, GRASS AND BITUMEN STABILISED MULCH.

WOOLWORTHS

ROAD No.2

TRAMWAY DRIVE

CARPARKING

FUTURE DEVELOPMENT AREA

PROPOSED STOCKPILE LOCATION

PORTLAND DRIVE

SITE ACCESS & TRUCK WASH DOWN AREA

PROPOSED STOCKPILE LOCATION

DIRECT RUNOFF FROM CATCH DRAIN TO TEMPORARY SEDIMENT BASIN

BASIN 1

FUTURE DEVELOPMENT SITE

FUTURE DEVELOPMENT AREA

TEMPORARY SEDIMENT BASINS TO BE FLOCCED AS APPROPRIATE FOR TYPE D SOILS. CONTRACTOR TO SUBMIT METHODOLOGY FOR APPROVAL

SIGNAGE AND LANDSCAPE STATEMENT – REFER ARCHITECTURAL DRAWINGS FOR DETAILS

STORMWATER BASIN

T1 T2a T2b T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 C&C

LEGEND:

- 42.00 DESIGN CONTOURS (0.1m INTERVAL)
- 42.00 WORK AS EXECUTED CONTOURS (1.0m INTERVAL)
- ex sw EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- SEDIMENT FENCE, REFER SD6–8
- SITE BARRIER FENCING
- EARTH BANK – GEOTEXTILE LINED, REFER SD5–5
- MESH AND GRAVEL INLET FILTER, REFER SD6–11
- GEOTEXTILE INLET FILTER, REFER SD6–12
- TRUCK WASH DOWN AREA
- SITE ACCESS GATE
- STRAW BALES FILTER, REFER SD6–7
- TEMPORARY SEDIMENT BASIN, REFER SD6–4
- STOCKPILE LOCATION, REFER SD4–1
- BASIN 1 CATCHMENT
- BASIN 2 CATCHMENT

Revised Universal Soil Loss Equation (RUSLE) - Basin No.1

Catchment Area (A)	3	ha
Settling Zone		
Runoff Coefficient (Cv)	0.64	
80th %, 5 day Rainfall Event (R)	38.9	
Settling Zone Volume	**746.88**	**m^3**
Sediment Zone		
Disturbed Site Area (hectares)	3	ha
2 year, 6-hour Rainfall	10.89	mm/hr
Rainfall Erosivity Factor, R	**2578**	
Soil Erodibility Factor, K	0.07	
Slope Length Gradient Factor, LS	0.52	
Erosion Control Practice Factor, P	1.3	
Cover Factor, C	1	
Sediment Zone Volume	**48**	**m^3**
Total Storage Required (Settling + Sediment + 10%)	**874**	**m^3**

Revised Universal Soil Loss Equation (RUSLE) - Basin No. 2

Catchment Area (A)	1.25	ha
Settling Zone		
Runoff Coefficient (Cv)	0.64	
80th %, 5 day Rainfall Event (R)	38.9	
Settling Zone Volume	**311.2**	**m^3**
Sediment Zone		
Disturbed Site Area (hectares)	1.25	ha
2 year, 6-hour Rainfall	10.89	mm/hr
Rainfall Erosivity Factor, R	**2578**	
Soil Erodibility Factor, K	0.07	
Slope Length Gradient Factor, LS	0.52	
Erosion Control Practice Factor, P	1.3	
Cover Factor, C	1	
Sediment Zone Volume	**20**	**m^3**
Total Storage Required (Settling + Sediment + 10%)	**364**	**m^3**

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:
EROSION & SEDIMENT CONTROL PLAN - SHEET 1

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-501

client: Woolworths – Australia's fresh food people

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239402-DA-502-EROS_&_SED_PLAN

Plotted By: Dean Woodbridge Plot Date: 20/02/18 10:34:30AM Cad File: S:\239402\DRAWINGS\PLANNING\DA\WOOLWORTHS DA\239402-DA-502-EROS_&_SED_PLAN.DWG

M.G.A.

NORTHRIDGE DRIVE

TRAMWAY DRIVE

ROAD No.2

BASIN 2

TEMPORARY SEDIMENT BASINS TO BE FLOCCED AS APPROPRIATE FOR TYPE D SOILS. CONTRACTOR TO SUBMIT METHODOLOGY FOR APPROVAL

EXISTING BASIN

PIPED CROSSING TO BE CONSTRUCTED TO CONNECT CATCH DRAINS

FUTURE DEVELOPMENT AREA

LOADING DOCK

STABILISE BANK IMMEDIATELY UPON COMPLETION OF GRADING OPERATIONS WITH 100mm TOPSOIL, GRASS AND BITUMEN STABILISED MULCH.

WOOLWORTHS

T1 T10 T2b T2a T3 T4 T5 T6 T7 T8

PROPOSED STOCKPILE

BASIN 1

FUTURE DEVELOPMENT SITE

REFER SHEET 501 FOR CONTINUATION

LEGEND:

- 42.00 — DESIGN CONTOURS (0.1m INTERVAL)
- 42.00 — WORK AS EXECUTED CONTOURS (1.0m INTERVAL)
- ex sw — EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- SEDIMENT FENCE, REFER SD6-8
- SITE BARRIER FENCING
- EARTH BANK – GEOTEXTILE LINED, REFER SD5-5
- MESH AND GRAVEL INLET FILTER, REFER SD6-11
- GEOTEXTILE INLET FILTER, REFER SD6-12
- TRUCK WASH DOWN AREA
- SITE ACCESS GATE
- STRAW BALES FILTER, REFER SD6-7
- TEMPORARY SEDIMENT BASIN, REFER SD6-4
- STOCKPILE LOCATION, REFER SD4-1
- BASIN 1 CATCHMENT
- BASIN 2 CATCHMENT

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: 0.1m	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:
EROSION & SEDIMENT CONTROL PLAN - SHEET 2

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-502

client: Woolworths — Australia's fresh food people

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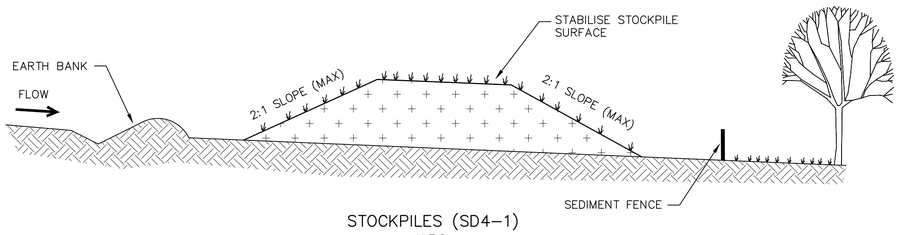
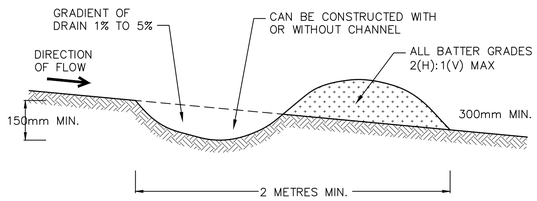


STOCKPILES (SD4–1)
N.T.S.

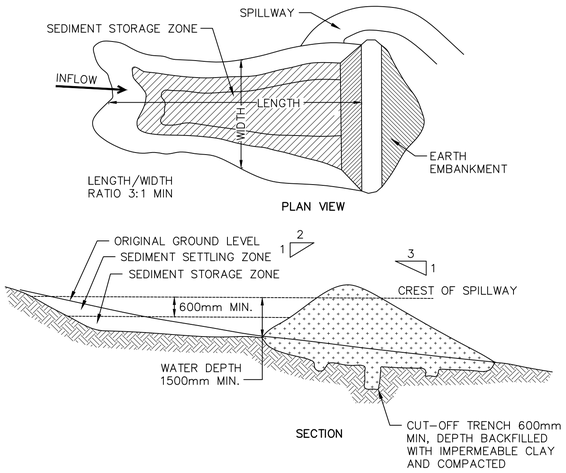
CONSTRUCTION NOTES:
1. PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT.
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 UPSLOP SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6–8) 1 TO 2 METRES DOWNSLOPE.



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

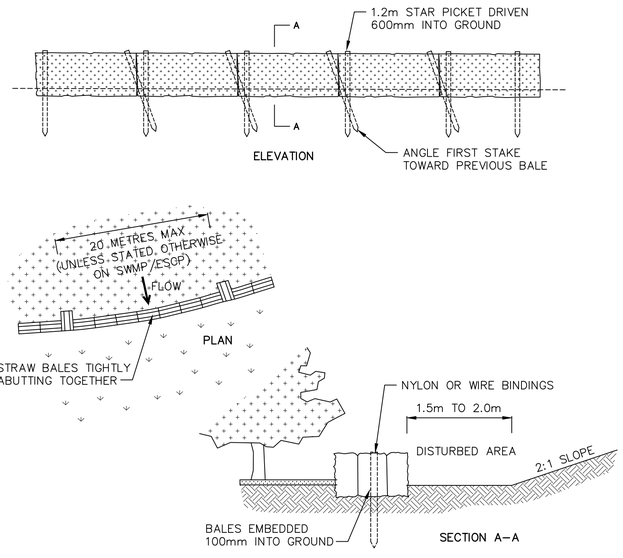
EARTH BANK (SD5–5)
N.T.S.

CONSTRUCTION NOTES:
1. BUILD WITH GRADIENTS BETWEEN 1 PERCENT 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.



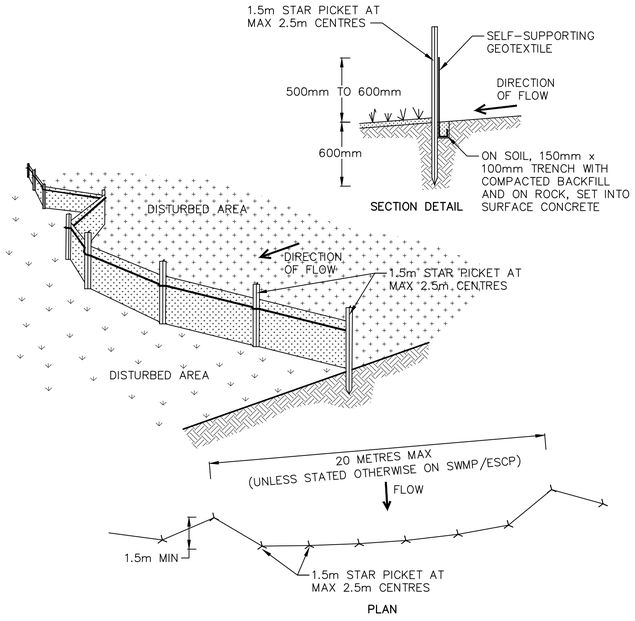
WET EARTH BASIN (SD6–4)
(APPLIES TO 'TYPE D' SOILS ONLY)
N.T.S.

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 PERCENT STANDARD PROCTOR DENSITY.
4. SELECT FILL ACCORDING TO THE SWMP THAT IS FREE FROM ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND THE 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.



STRAW BALE FILTER (SD6–7)
N.T.S.

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 1.2m STAR PICKETS OR STAKES. ANGLE THE FIRST STAR PICKET OR STAKE IN EACH BALE TOWARDS THE PREVIOUSLY LAID BALE. DRIVE THEM 600mm IN 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 PLACES 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.



SEDIMENT FENCE (SD6–8)
N.T.S.

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 1.5m LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT 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.

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	NOT TO SCALE	

drawing title:
EROSION & SEDIMENT CONTROL DETAILS - SHEET 1

location: WOOLWORTHS CAMERON PARK
council: LAKE MACQUARIE
dwg ref: 239402-DA-511
client: Woolworths – Australia's fresh food people

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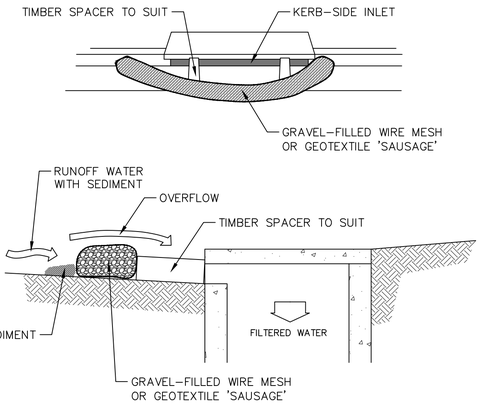


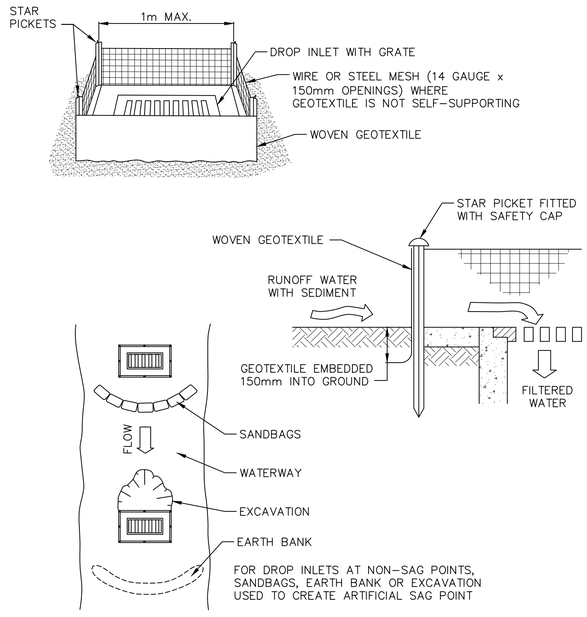
NOTE: THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN AN APPROVED SWMP/ESCP.

MESH AND GRAVEL INLET FILTER (SD6–11)

N.T.S.

CONSTRUCTION NOTES:

1. INSTALL FILTERS TO KERB INLETS ONLY 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.

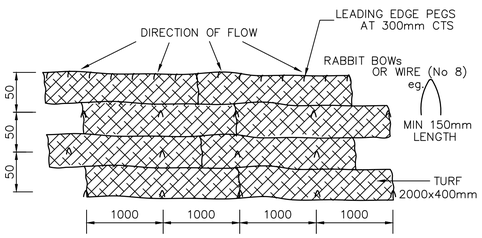


GEOTEXTILE INLET FILTER (SD6–12)

N.T.S.

CONSTRUCTION NOTES:

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. REFER STANDARD DRAWINGS 6–7 & 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.



TURF LAYING CONFIGURATION

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	NOT TO SCALE	

• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design

drawing title:
EROSION &
SEDIMENT CONTROL
DETAILS - SHEET 2

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-512

client: Woolworths — Australia's fresh food people

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239402-DA-513-EROS_&_SED_CONTROLS

GENERAL

1. ESCP REFERS TO EROSION AND SEDIMENT CONTROL PLAN OR A SOIL AND WATER MANAGEMENT PLAN (SWMP).
2. ESC REFERS TO EROSION AND SEDIMENT CONTROL.
3. SEDIMENT, INCLUDES, BUT IS NOT LIMITED TO, CLAY, SILT, SAND, GRAVEL, SOIL, MUD, CEMENT, AND CERAMIC WASTE.
4. ANY REFERENCE TO THE BLUE BOOK REFERS TO MANAGING URBAN STORMWATER – SOILS AND CONSTRUCTION. LANDCOM, 2004.
5. ANY REFERENCE TO THE IECA WHITE BOOKS (2008) REFERS TO IECA 2008. BEST PRACTICE EROSION AND SEDIMENT CONTROL. BOOKS 1–6.INTERNATIONAL EROSION CONTROL ASSOCIATION (AUSTRALASIA). PICTON NSW.
6. ANY MATERIAL DEPOSITED IN ANY CONSERVATION AREA FROM WORKS ASSOCIATED WITH THE DEVELOPMENT SHALL BE REMOVED IMMEDIATELY BY MEASURES INVOLVING MINIMAL GROUND AND/OR VEGETATION DISTURBANCE AND NO MACHINERY, OR FOLLOWING DIRECTIONS BY COUNCIL AND/OR WITHIN A TIMEFRAME ADVISED BY COUNCIL.

THE ESCP

7. THE ESCP AND ITS ASSOCIATED ESC MEASURES SHALL BE CONSTANTLY MONITORED, REVIEWED, AND MODIFIED AS REQUIRED TO CORRECT DEFICIENCIES. COUNCIL HAS THE RIGHT TO DIRECT CHANGES IF, IN ITS OPINION, THE MEASURES THAT ARE PROPOSED OR HAVE BEEN INSTALLED ARE INADEQUATE TO PREVENT POLLUTION.
8. PRIOR TO ANY ACTIVITIES ONSITE, THE RESPONSIBLE PERSON(S) IS TO BE NOMINATED. THE RESPONSIBLE PERSON(S) SHALL BE RESPONSIBLE FOR THE ESC MEASURES ONSITE. THE NAME, ADDRESS AND 24 HOUR CONTACT DETAILS OF THE PERSON(S) SHALL BE PROVIDED TO COUNCIL IN WRITING. COUNCIL SHALL BE ADVISED WITHIN 48 HOURS OF ANY CHANGES TO THE RESPONSIBLE PERSON(S), OR THEIR CONTACT DETAILS, IN WRITING.
9. AT LEAST 14 DAYS BEFORE THE NATURAL SURFACE IS DISTURBED IN ANY NEW STAGE, THE CONTRACTOR SHALL SUBMIT TO THE CERTIFIER, A PLAN SHOWING ESC MEASURES FOR THAT STAGE. THE DEGREE OF DESIGN DETAIL SHALL BE BASED ON THE DISTURBED AREA.
10. AT ANY TIME DURING CONSTRUCTION, THE ESC MEASURES ONSITE SHALL BE APPROPRIATE FOR THE AREA OF DISTURBANCE AND ITS CHARACTERISTICS INCLUDING SOILS (IN ACCORDANCE WITH THOSE REQUIRED FOR THE SITE AS PER DCP).
11. THE IMPLEMENTATION OF THE ESCP SHALL BE SUPERVISED BY PERSONNEL WITH APPROPRIATE QUALIFICATIONS AND/OR EXPERIENCE IN ESC ON CONSTRUCTION SITES.
12. THE APPROVED ESCP SHALL BE AVAILABLE ON–SITE FOR INSPECTION BY COUNCIL OFFICERS WHILE WORK ACTIVITIES ARE OCCURRING.
13. THE APPROVED ESCP SHALL BE UP TO DATE AND SHOW A TIMELINE OF INSTALLATION, MAINTENANCE AND REMOVAL OF ESC MEASURES.
14. ALL ESC MEASURES SHALL BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ONSITE, IN ACCORDANCE WITH THE BLUE BOOK, IECA WHITE BOOKS OR OTHER CURRENT RECOGNISED INDUSTRY STANDARD FOR ESC FOR AUSTRALIAN CONDITIONS.
15. ADEQUATE SITE DATA, INCLUDING SOIL DATA FROM A NATA APPROVED LABORATORY, SHALL BE OBTAINED TO ALLOW THE PREPARATION OF AN APPROPRIATE ESCP, AND ALLOW THE SELECTION, DESIGN AND SPECIFICATION OF REQUIRED ESC MEASURES.
16. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE APPROVED ESCP (AS AMENDED FROM TIME TO TIME) UNLESS CIRCUMSTANCES ARISE WHERE:
    a) COMPLIANCE WITH THE ESCP WOULD INCREASE THE POTENTIAL FOR ENVIRONMENTAL HARM; OR
    b) CIRCUMSTANCES CHANGE DURING CONSTRUCTION AND THOSE CIRCUMSTANCES COULD NOT HAVE BEEN FORESEEN; OR
    c) COUNCIL DETERMINES THAT UNACCEPTABLE OFF–SITE SEDIMENTATION IS OCCURRING AS A RESULT OF A LAND–DISTURBING ACTIVITY. IN EITHER CASE, THE PERSON(S) RESPONSIBLE MAY BE REQUIRED TO TAKE ADDITIONAL, OR ALTERNATIVE PROTECTIVE ACTION, AND/OR UNDERTAKE REASONABLE RESTORATION WORKS WITHIN THE TIMEFRAME SPECIFIED BY THE COUNCIL.
17. ADDITIONAL ESC MEASURES SHALL BE IMPLEMENTED, AND A REVISED ESCP SUBMITTED FOR APPROVAL TO THE CERTIFIER (WITHIN FIVE BUSINESS DAYS OF ANY SUCH AMENDMENTS) IN THE EVENT THAT:
    a) THERE IS A HIGH PROBABILITY THAT SERIOUS OR MATERIAL ENVIRONMENTAL HARM MAY OCCUR AS A RESULT OF SEDIMENT LEAVING THE SITE; OR
    b) THE IMPLEMENTED WORKS FAIL TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES SPECIFIED IN THESE CONDITIONS; OR
    c) SITE CONDITIONS SIGNIFICANTLY CHANGE; OR
    d) SITE INSPECTIONS INDICATE THAT THE IMPLEMENTED WORKS ARE FAILING TO ACHIEVE THE "OBJECTIVE" OF THE ESCP.
18. A COPY OF ANY AMENDED ESCP SHALL BE FORWARDED TO AN APPROPRIATE COUNCIL OFFICER, WITHIN FIVE BUSINESS DAYS OF ANY SUCH AMENDMENTS.

SITE ESTABLISHMENT INCLUDING CLEARING AND MULCHING

19. NO LAND CLEARING SHALL BE UNDERTAKEN UNLESS PRECEDED BY THE INSTALLATION OF ADEQUATE DRAINAGE AND SEDIMENT CONTROL MEASURES, UNLESS SUCH CLEARING IS REQUIRED FOR THE PURPOSE OF INSTALLING SUCH MEASURES, IN WHICH CASE, ONLY THE MINIMUM CLEARING REQUIRED TO INSTALL SUCH MEASURES SHALL OCCUR.
20. BULK TREE CLEARING AND GRUBBING OF THE SITE SHALL BE IMMEDIATELY FOLLOWED BY SPECIFIED TEMPORARY EROSION CONTROL MEASURES (E.G. TEMPORARY GRASSING OR MULCHING) PRIOR TO COMMENCEMENT OF EACH STAGE OF CONSTRUCTION WORKS.
21. TREES AND VEGETATION CLEARED FROM THE SITE SHALL BE MULCHED ONSITE WITHIN 7 DAYS OF CLEARING.
22. APPROPRIATE MEASURES SHALL BE UNDERTAKEN TO CONTROL ANY DUST ORIGINATING DUE TO THE MULCHING OF VEGETATION ONSITE.
23. ALL OFFICE FACILITIES AND OPERATIONAL ACTIVITIES SHALL BE LOCATED SUCH THAT ANY EFFLUENT, INCLUDING WASH–DOWN WATER, CAN BE TOTALLY CONTAINED AND TREATED WITHIN THE SITE.
24. ALL REASONABLE AND PRACTICABLE MEASURES SHALL BE TAKEN TO ENSURE STORMWATER RUNOFF FROM ACCESS ROADS AND STABILISED ENTRY/EXIT SYSTEMS, DRAINS TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.
25. SITE EXIT POINTS SHALL BE APPROPRIATELY MANAGED TO MINIMISE THE RISK OF SEDIMENT BEING TRACKED ONTO SEALED, PUBLIC ROADWAYS.
26. STORMWATER RUNOFF FROM ACCESS ROADS AND STABILISED ENTRY/EXIT POINTS SHALL DRAIN TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.
27. THE APPLICANT SHALL ENSURE AN ADEQUATE SUPPLY OF ESC, AND APPROPRIATE POLLUTION CLEAN–UP MATERIALS ARE AVAILABLE ON–SITE AT ALL TIMES.
28. ALL TEMPORARY EARTH BANKS, FLOW DIVERSION SYSTEMS, AND SEDIMENT BASIN EMBANKMENTS SHALL BE MACHINE–COMPACTED, SEEDED AND MULCHED WITHIN TEN (10) DAYS OF FORMATION FOR THE PURPOSE OF ESTABLISHING A VEGETATIVE COVER, OR LINED APPROPRIATELY.
29. SEDIMENT DEPOSITED OFF SITE AS A RESULT OF ON–SITE ACTIVITIES SHALL BE COLLECTED AND THE AREA CLEANED/REHABILITATED AS SOON AS REASONABLE AND PRACTICABLE.
30. CONCRETE WASTE AND CHEMICAL PRODUCTS, INCLUDING PETROLEUM AND OIL–BASED PRODUCTS, SHALL BE PREVENTED FROM ENTERING ANY INTERNAL OR EXTERNAL WATER BODY, OR ANY EXTERNAL DRAINAGE SYSTEM, EXCLUDING THOSE ON–SITE WATER BODIES SPECIFICALLY DESIGNED TO CONTAIN AND/OR TREAT SUCH MATERIAL. APPROPRIATE MEASURES SHALL BE INSTALLED TO TRAP THESE MATERIALS ONSITE.
31. BRICK, TILE OR MASONRY CUTTING SHALL BE CARRIED OUT ON A PERVIOUS SURFACE (E.G. GRASS OR OPEN SOIL) AND IN SUCH A MANNER THAT ANY RESULTING SEDIMENT–LADEN RUNOFF IS PREVENTED FROM DISCHARGING INTO A GUTTER, DRAIN OR WATER. APPROPRIATE MEASURES SHALL BE INSTALLED TO TRAP THESE MATERIALS ONSITE.
32. NEWLY SEALED HARD–STAND AREAS (E.G. ROADS, DRIVEWAYS AND CAR PARKS) SHALL BE SWEPT THOROUGHLY AS SOON AS PRACTICABLE AFTER SEALING/SURFACING TO MINIMISE THE RISK OF COMPONENTS OF THE SURFACING COMPOUND ENTERING STORMWATER DRAINS.
33. STOCKPILES OF ERODIBLE MATERIAL SHALL BE PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER (SYNTHETIC OR ORGANIC) IF THE MATERIALS ARE LIKELY TO BE STOCKPILED FOR MORE THAN 10 DAYS.
34. STOCKPILES, TEMPORARY OR PERMANENT, SHALL NOT BE LOCATED IN AREAS IDENTIFIED AS NO–GO ZONES (INCLUDING, BUT NOT LIMITED TO, RESTRICTED ACCESS AREAS, BUFFER ZONES, OR AREAS OF NON–DISTURBANCE) ON THE ESCP.
35. NO MORE THAN 150M OF A STORMWATER, SEWER LINE OR OTHER SERVICE TRENCH SHALL TO BE OPEN AT ANY ONE TIME.
36. SITE SPOIL SHALL BE LAWFULLY DISPOSED OF IN A MANNER THAT DOES NOT RESULT IN ONGOING SOIL EROSION OR ENVIRONMENTAL HARM.
37. WHEREVER REASONABLE AND PRACTICABLE, STORMWATER RUNOFF ENTERING THE SITE FROM EXTERNAL AREAS, AND NON–SEDIMENT LADEN (CLEAN) STORMWATER RUNOFF ENTERING A WORK AREA OR AREA OF SOIL DISTURBANCE, SHALL BE DIVERTED AROUND OR THROUGH THAT AREA IN A MANNER THAT MINIMISES SOIL EROSION AND THE CONTAMINATION OF THAT WATER FOR ALL DISCHARGES UP TO THE SPECIFIED DESIGN STORM DISCHARGE.

SITE MANAGEMENT INCLUDING DUST

38. PRIORITY SHALL BE GIVEN TO THE PREVENTION, OR AT LEAST THE MINIMISATION, OF SOIL EROSION, RATHER THAN THE TRAPPING OF DISPLACED SEDIMENT. SUCH A CLAUSE SHALL NOT REDUCE THE RESPONSIBILITY TO APPLY AND MAINTAIN, AT ALL TIMES, ALL NECESSARY ESC MEASURES.
39. MEASURES USED TO CONTROL WIND EROSION SHALL BE APPROPRIATE FOR THE LOCATION AND PREVENT SOIL EROSION AT ALL TIMES, INCLUDING WORKING HOURS, OUT OF HOURS, WEEKENDS, PUBLIC HOLIDAYS, AND DURING ANY OTHER SHUTDOWN PERIODS.
40. THE APPLICATION OF LIQUID OR CHEMICAL–BASED DUST SUPPRESSION MEASURES SHALL ENSURE THAT SEDIMENT–LADEN RUNOFF RESULTING FROM SUCH MEASURES DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD.
41. ALL CUT AND FILL EARTH BATTERS LESS THAN 3M IN ELEVATION SHALL BE TOPSOILED, AND GRASS SEEDED/HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF GRADING IN CONSULTATION WITH COUNCIL.
42. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALISED IN A SECTION, ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE STABILISED IN ACCORDANCE WITH TIME LINES IN THE BLUE BOOK.
43. ALL REASONABLE AND PRACTICABLE MEASURES SHALL BE TAKEN TO PREVENT, OR AT LEAST MINIMISE, THE RELEASE OF SEDIMENT FROM THE SITE.
44. SUITABLE ALL–WEATHER MAINTENANCE ACCESS SHALL BE PROVIDED TO ALL SEDIMENT CONTROL DEVICES.
45. SEDIMENT CONTROL DEVICES, OTHER THAN SEDIMENT BASINS, SHALL 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.
46. ALL EROSION AND SEDIMENT CONTROL MEASURES, INCLUDING DRAINAGE CONTROL MEASURES, SHALL BE MAINTAINED IN PROPER WORKING ORDER AT ALL TIMES DURING THEIR OPERATIONAL LIVES.
47. WASHING/FLUSHING OF SEALED ROADWAYS SHALL ONLY OCCUR WHERE SWEEPING HAS FAILED TO REMOVE SUFFICIENT SEDIMENT AND THERE IS A COMPELLING NEED TO REMOVE THE REMAINING SEDIMENT (E.G. FOR SAFETY REASONS). IN SUCH CIRCUMSTANCES, ALL REASONABLE AND PRACTICABLE SEDIMENT CONTROL MEASURES SHALL BE USED TO PREVENT, OR AT LEAST MINIMISE, THE RELEASE OF SEDIMENT INTO RECEIVING WATERS. ONLY THOSE MEASURES THAT WILL NOT CAUSE SAFETY AND PROPERTY FLOODING ISSUES SHALL BE EMPLOYED. SEDIMENT REMOVED FROM ROADWAYS SHALL BE DISPOSED OF IN A LAWFUL MANNER THAT DOES NOT CAUSE ONGOING SOIL EROSION OR ENVIRONMENTAL HARM.
48. SEDIMENT REMOVED FROM SEDIMENT TRAPS AND PLACES OF SEDIMENT DEPOSITION SHALL BE DISPOSED OF IN A LAWFUL MANNER THAT DOES NOT CAUSE ONGOING SOIL EROSION OR ENVIRONMENTAL HARM.

SEDIMENT BASINS – INSTALLATION, MAINTENANCE AND REMOVAL INCLUDING SEDIMENT TRAPS

49. AS–CONSTRUCTED PLANS SHALL BE PREPARED FOR ALL CONSTRUCTED SEDIMENT BASINS AND ASSOCIATED EMERGENCY SPILLWAYS. SUCH PLANS SHALL VERIFY THE BASIN'S DIMENSIONS, LEVELS AND VOLUMES COMPLY WITH THE APPROVED DESIGN DRAWINGS. THESE PLANS MAY BE REQUESTED BY THE CERTIFIER OR COUNCIL.
50. SEDIMENT BASINS SHALL BE CONSTRUCTED AND FULLY OPERATIONAL PRIOR TO ANY OTHER SOIL DISTURBANCE IN THEIR CATCHMENT.
51. INSTALL AN INTERNAL GATED VALVE, OR SIMILAR, IN ANY OUTLET PIPE ONCE PIPES INSTALLED, OR INSTALL A SACRIFICIAL PIPE FROM BASIN THROUGH WALL TO EXTERNAL OUTLET POINT. THE VALVE SHALL BE CONNECTED TO A RISER MADE FROM SLOTTED PIPE IN THE BASIN. THE VALVE MAY BE OPENED ONCE CAPTURED WATER MEETS WATER QUALITY REQUIREMENTS. THE FINAL SETUP FOR TEMPORARY INTERNAL OUTLET STRUCTURES TO BE CONFIRMED PRIOR TO CONSTRUCTION WITH COUNCIL. THIS SETUP WILL ENABLE DISCHARGE OF TREATED WATER FROM SITE WITHOUT NEED FOR PUMPING.
52. A SEDIMENT STORAGE LEVEL MARKER POST SHALL BE WITH A CROSS MEMBER SET JUST BELOW THE TOP OF THE SEDIMENT STORAGE ZONE (AS SPECIFIED ON THE APPROVED ESCP). AT LEAST A 75MM WIDE POST SHALL BE FIRMLY SET INTO THE BASIN FLOOR.
53. THE SITE MANAGER SHALL OBTAIN THE RELEVANT APPROVALS FROM THE RELEVANT ORGANISATIONS TO DISCHARGE TREATED WATER FROM ANY EXISTING BASINS. ORGANISATIONS MAY INCLUDE, BUT NOT BE LIMITED TO, HUNTER WATER, AND COUNCIL.
54. WHERE MORE THAN ONE STAGE IS TO BE DEVELOPED AT ONE TIME, OR BEFORE THE PRECEDING STAGE IS COMPLETE, THE SEDIMENT BASIN(S) FOR THESE STAGES SHALL HAVE SUFFICIENT CAPACITY TO CATER FOR ALL AREA DIRECTED TO THE BASIN(S).
55. PRIOR TO ANY FORECAST WEATHER EVENT LIKELY TO RESULT IN RUNOFF, ANY BASINS/TRAPS SHALL BE DEWATERED TO PROVIDE SUFFICIENT CAPACITY TO CAPTURE SEDIMENT LADEN WATER FROM THE SITE.
56. SUFFICIENT QUANTITIES OF CHEMICALS/AGENTS TO TREAT CAPTURED WATER SHALL BE PLACED SUCH THAT WATER ENTERING THE BASIN MIXES WITH THE CHEMICAL/AGENTS AND IS CARRIED INTO THE BASIN TO SPEED UP CLARIFICATION.
57. ANY BASIN SHALL BE DEWATERED WITHIN THE X–DAY RAINFALL DEPTH USED TO CALCULATE THE CAPACITY OF THE BASIN, AFTER A RAINFALL EVENT.
58. SUFFICIENT QUANTITIES OF CHEMICALS/AGENTS TO TREAT TURBID WATER SHALL BE SECURELY STORED ON–SITE TO PROVIDE FOR AT LEAST THREE COMPLETE TREATMENTS OF ALL BASINS REQUIRING CHEMICALLY TREATMENT ONSITE.
59. PRIOR TO THE CONTROLLED DISCHARGE (E.G. DE–WATERING ACTIVITIES) FROM EXCAVATIONS AND/OR SEDIMENT BASINS, THE FOLLOWING WATER QUALITY OBJECTIVES SHALL BE ACHIEVED:
    a) TOTAL SUSPENDED SOLIDS (TSS) TO A MAXIMUM 50mg/L;
    b) WATER PH BETWEEN 6.5 AND 8.5, UNLESS OTHERWISE REQUIRED BY THE COUNCIL;
    c) TURBIDITY (MEASURED IN NTUS) TO A MAXIMUM OF 60 NTU); AND
    d) EC LEVELS NO GREATER THAN BACKGROUND LEVELS.
60. THE DEVELOPMENT APPROVAL MAY REQUIRE TESTING OF ADDITIONAL WATER QUALITY ELEMENTS PRIOR TO DISCHARGE. E.G. HEAVY METALS.
61. A SAMPLE OF THE RELEASED TREATED WATER SHALL BE KEPT ONSITE IN A CLEAR CONTAINER WITH THE SAMPLE DATE RECORDED ON IT.
62. WATER QUALITY SAMPLES SHALL BE TAKEN AT A DEPTH NO LESS THAN 200MM BELOW THE WATER SURFACE OF THE BASIN.
63. NO ALUMINIUM BASED PRODUCTS MAY BE USED TREAT CAPTURED WATER ONSITE WITHOUT THE PRIOR WRITTEN PERMISSION FROM AN APPROPRIATE COUNCIL OFFICER. THE APPLICANT SHALL HAVE A DEMONSTRATED ABILITY TO USE SUCH PRODUCTS CORRECTLY AND WITHOUT ENVIRONMENTAL HARM PRIOR TO ANY APPROVAL.
64. THE CHEMICAL/AGENT USED IN TYPE D AND TYPE F BASINS TO TREAT CAPTURED WATER CAPTURED IN THE BASIN SHALL BE APPLIED IN CONCENTRATIONS SUFFICIENT TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES WITHIN THE X–DAY RAINFALL DEPTH USED TO CALCULATE THE CAPACITY OF THE BASIN, AFTER A RAINFALL EVENT.
65. ALL MANUFACTURERS' INSTRUCTIONS SHALL BE FOLLOWED FOR ANY CHEMICALS/AGENTS USED ONSITE, EXCEPT WHERE APPROVED BY THE RESPONSIBLE PERSON OR AN APPROPRIATE COUNCIL OFFICER.
66. THE APPLICANT SHALL ENSURE THAT ON EACH OCCASION A TYPE F OR TYPE D BASIN WAS NOT DE–WATERED PRIOR TO BEING SURCHARGED BY A FOLLOWING RAINFALL EVENT, A REPORT IS PRESENTED TO AN APPROPRIATE COUNCIL OFFICER WITHIN 5 DAYS IDENTIFYING THE CIRCUMSTANCES AND PROPOSED AMENDMENTS, IF ANY, TO THE BASIN'S OPERATING PROCEDURES.
67. SETTLED SEDIMENT SHALL BE REMOVED AS SOON AS REASONABLE AND PRACTICABLE FROM ANY SEDIMENT BASIN IF:
    a) IT IS ANTICIPATED THAT THE NEXT STORM EVENT IS LIKELY TO CAUSE SEDIMENT TO SETTLE ABOVE THE BASIN'S SEDIMENT STORAGE ZONE; OR
    b) THE ELEVATION OF SETTLED SEDIMENT IS ABOVE THE TOP OF THE BASIN'S SEDIMENT STORAGE ZONE; OR
    c) THE ELEVATION OF SETTLED SEDIMENT IS ABOVE THE BASINS SEDIMENT MARKER LINE.
68. SCOUR PROTECTION MEASURES PLACED ON SEDIMENT BASIN EMERGENCY SPILLWAYS SHALL APPROPRIATELY PROTECT THE SPILLWAY CHUTE AND ITS SIDE BATTERS FROM SCOUR, AND SHALL EXTEND A MINIMUM OF 3M BEYOND THE DOWNSTREAM TOE OF THE BASIN'S EMBANKMENT.
69. SUITABLE ALL–WEATHER MAINTENANCE ACCESS SHALL BE PROVIDED TO ALL SEDIMENT CONTROL DEVICES.
70. MATERIALS, WHETHER LIQUID OR SOLID, REMOVED FROM ANY ESC MEASURES DURING MAINTENANCE OR DECOMMISSIONING, SHALL BE DISPOSED OF IN A MANNER THAT DOES NOT CAUSE ONGOING SOIL EROSION OR ENVIRONMENTAL HARM.
71. ALL SEDIMENT BASINS SHALL REMAIN FULLY OPERATIONAL AT ALL TIMES UNTIL THE BASIN'S DESIGN CATCHMENT ACHIEVES 70% GROUND COVER OR SURFACE STABILISATION ACCEPTABLE TO COUNCIL.
72. THE ESC MEASURES INSTALLED DURING THE DECOMMISSIONING AND REHABILITATION OF A SEDIMENT BASIN SHALL COMPLY WITH SAME STANDARDS SPECIFIED FOR THE NORMAL CONSTRUCTION WORKS.
73. A SEDIMENT BASIN SHALL NOT BE DECOMMISSIONED UNTIL ALL UP–SLOPE SITE STABILISATION MEASURES HAVE BEEN IMPLEMENTED AND ARE APPROPRIATELY WORKING TO CONTROL SOIL EROSION AND SEDIMENT RUNOFF..
74. IMMEDIATELY PRIOR TO THE CONSTRUCTION OF THE PERMANENT STORMWATER TREATMENT DEVICE, APPROPRIATE FLOW BYPASS CONDITIONS SHALL BE ESTABLISHED TO PREVENT SEDIMENT–LADEN WATER ENTERING THE DEVICE.

REVEGETATION/STABILISATION

75. TEMPORARY STABILISATION MAY BE ATTAINED USING VEGETATION, NON REWETTABLE SOIL POLYMERS, OR PNEUMATICALLY APPLIED EROSION CONTROLS.
76. ALL CUT AND FILL EARTH BATTERS LESS THAN 3M IN ELEVATION SHALL BE TOPSOILED, AND GRASS SEEDED/HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF GRADING IN CONSULTATION WITH COUNCIL.
77. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALISED IN A SECTION, ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE STABILISED IN ACCORDANCE WITH TIME LINES IN THE BLUE BOOK.
78. THE LMCC SEED MIX SHALL BE USED UNLESS STATED ON THE ESCP/SWMP.
79. THE PH LEVEL OF TOPSOIL SHALL BE APPROPRIATE TO ENABLE ESTABLISHMENT AND GROWTH OF SPECIFIED VEGETATION PRIOR TO INITIATING THE ESTABLISHMENT OF VEGETATION.
80. NON REWETTABLE BINDER SHALL BE USED IN ALL HYDROMULCH/HYDROSEED/POLYMER MIXES ON SLOPES OR WORKS ADJACENT TO A WATER COURSE.
81. SOIL AMELIORANTS SHALL BE ADDED TO THE SOIL IN ACCORDANCE WITH AN APPROVED LANDSCAPE PLAN, VEGETATION MANAGEMENT PLAN, AND/OR SOIL ANALYSIS.
82. SURFACE SOIL DENSITY, COMPACTION AND SURFACE ROUGHNESS SHALL BE ADJUSTED PRIOR TO SEEDING/PLANTING IN ACCORDANCE WITH AN APPROVED LANDSCAPE PLAN, VEGETATION MANAGEMENT PLAN, AND/OR SOIL ANALYSIS.
83. PROCEDURES FOR INITIATING A SITE SHUTDOWN, WHETHER PROGRAMMED OR UN–PROGRAMMED, SHALL INCORPORATE REVEGETATION OF ALL SOIL DISTURBANCES UNLESS OTHERWISE APPROVED BY COUNCIL. THE STABILISATION WORKS SHALL NOT RELY UPON THE LONGEVITY OF NON–VEGETATED EROSION CONTROL BLANKETS, OR TEMPORARY SOIL BINDERS.

SITE MONITORING AND MAINTENANCE

84. THE APPLICANT SHALL ENSURE THAT APPROPRIATE PROCEDURES AND SUITABLY QUALIFIED PERSONNEL ARE ENGAGED TO PLAN AND CONDUCT SITE INSPECTIONS AND WATER QUALITY MONITORING THROUGHOUT THE CONSTRUCTION AND MAINTENANCE PHASE.
85. ALL ESC MEASURES SHALL BE INSPECTED AND ANY MAINTENANCE UNDERTAKEN IMMEDIATELY:
    a) AT LEAST DAILY (WHEN WORK IS OCCURRING ON–SITE); AND
    b) AT LEAST WEEKLY (WHEN WORK IS NOT OCCURRING ON–SITE); AND
    c) WITHIN 24HRS OF EXPECTED RAINFALL; AND
    d) WITHIN 18HRS OF A RAINFALL EVENT THAT CAUSES RUNOFF ON THE SITE.
86. WRITTEN RECORDS SHALL BE KEPT ONSITE OF ESC MONITORING AND MAINTENANCE ACTIVITIES CONDUCTED DURING THE CONSTRUCTION AND MAINTENANCE PERIODS, AND BE AVAILABLE TO COUNCIL OFFICERS ON REQUEST.
87. ALL ENVIRONMENTALLY RELEVANT INCIDENTS SHALL BE RECORDED IN A FIELD LOG THAT SHALL REMAIN ACCESSIBLE TO ALL RELEVANT REGULATORY AUTHORITIES.
88. ALL WATER QUALITY DATA, INCLUDING DATES OF RAINFALL, DATES OF TESTING, TESTING RESULTS AND DATES OF WATER RELEASE, SHALL BE KEPT IN AN ON–SITE REGISTER. THE REGISTER IS TO BE MAINTAINED UP TO DATE FOR THE DURATION OF THE APPROVED WORKS AND BE AVAILABLE ON–SITE FOR INSPECTION BY [INSERT NAME OF REGULATORY AUTHORITY] ON REQUEST.
89. AT NOMINATED INSTREAM WATER MONITORING SITES, A MINIMUM OF 3 WATER SAMPLES SHALL BE TAKEN AND ANALYSED, AND THE AVERAGE RESULT USED TO DETERMINE QUALITY.

INSTREAM WORKS

90. ALL INSTREAM WORKS (INCLUDING IN OR ADJACENT TO WATERCOURSES NATURAL OR MANMADE, FLOWING OR NOT) SHALL BE CARRIED OUT IN ACCORDANCE WITH THE IECA WHITE BOOKS.

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	NOT TO SCALE	

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drawing title:
EROSION & SEDIMENT CONTROL NOTES

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-513

client: Woolworths — Australia's fresh food people

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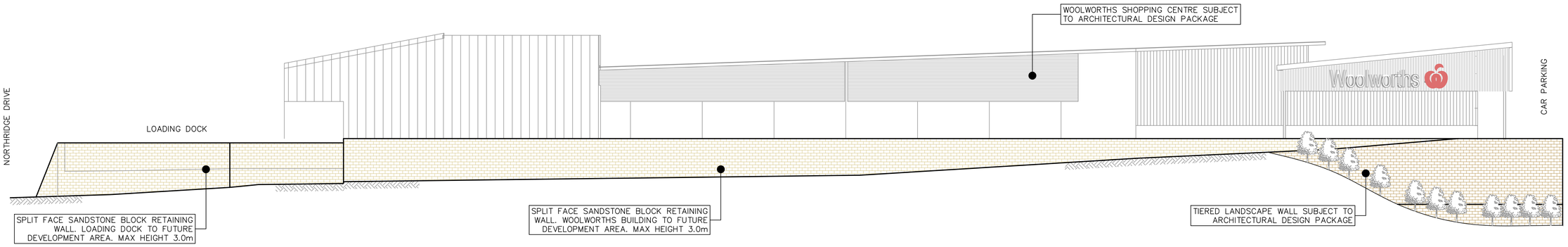
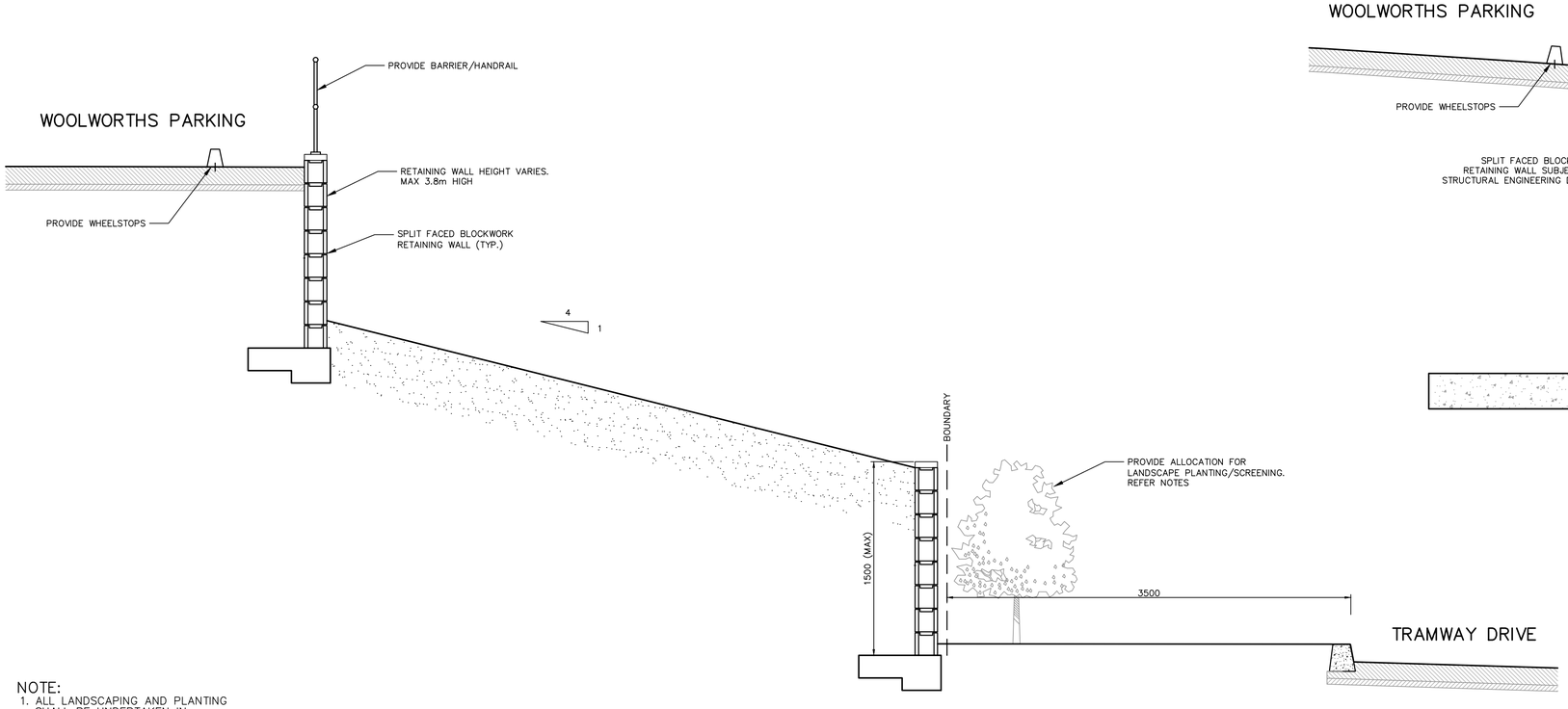
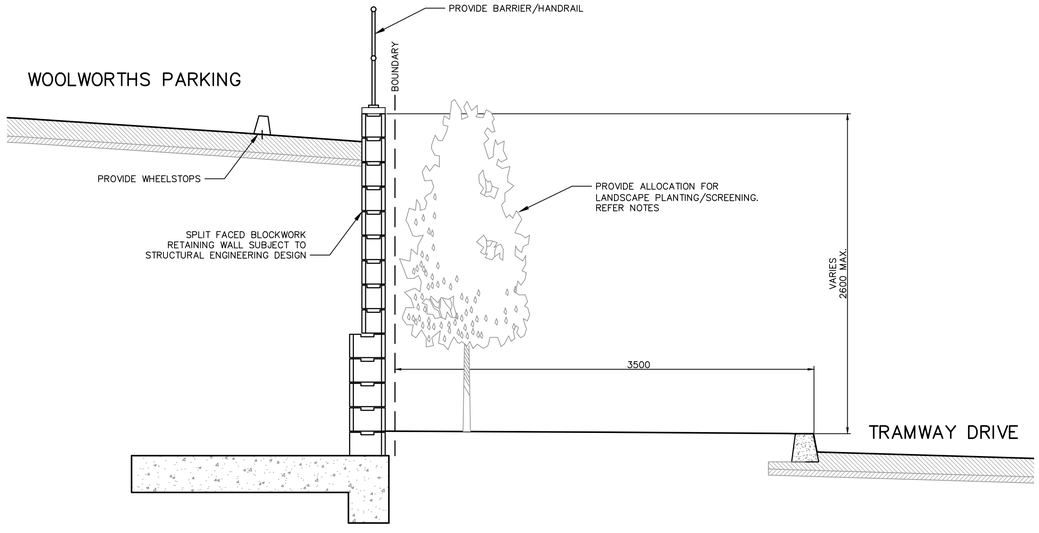


INDICATIVE WESTERN ELEVATION
RETAINING WALL TO TRAMWAY DRIVE AND FUTURE DEVELOPMENT AREA
SCALE 1:150



NOTE:
1. ALL LANDSCAPING AND PLANTING SHALL BE UNDERTAKEN IN ACCORDANCE WITH ARCHITECTURAL DOCUMENTATION PACKAGE.

TYPICAL SECTION THROUGH TIERED LANDSCAPE WALL
SCALE 1:25



TYPICAL SECTION THROUGH RETAINING WALL
SCALE 1:25

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
E	16/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: N/A CONTOUR INTERVAL: N/A	0 3.0 6.0 7.5m SCALE: 1:150 (FULL)	0 0.25 0.50 0.75 1.00 1.25m SCALE: 1:25 (FULL)

drawing title:
TYPICAL RETAINING WALL DETAILS AND SECTIONS

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-551

client: Woolworths — Australia's fresh food people

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239402-DA-601-SERVICES_PLAN

REFER SHEET 602 FOR CONTINUATION

NORTHRIDGE DRIVE

PIT-009 | PIT-031 | PIT-010 | PIT-017 | PIT-018 | PIT-019 | PIT-006 | PIT-007 | PIT-008 | PIT-005 | PIT-004 | PIT-026 | PIT-027 | PIT-028 | PIT-029

RL. 39.550 m

LOADING DOCK

C&C

T16 T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3 T2a T2b T1 T17 T18 T19 T20 T21 T22

WOOLWORTHS

CARPARKING

FUTURE DEVELOPMENT AREA

CONNECT TO EXISTING SEWER MANHOLE

ROAD No.2

TRAMWAY DRIVE

PORTLAND DRIVE

PROVIDE STUB AND CAP FOR FUTURE SEWER CONNECTION

M.C.A.

RL. 42.300 m

FUTURE DEVELOPMENT SITE

FUTURE DEVELOPMENT AREA

STORMWATER BASIN

GEORGE BOOTH DRIVE

LEGEND:

- EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- PROPOSED SEWER MAIN
- FUTURE STORMWATER DRAINAGE
- EXISTING NBN
- EXISTING SL ELECTRICITY
- EXISTING LOW VOLTAGE ELECTRICITY
- EXISTING HIGH VOLTAGE ELECTRICITY
- EXISTING WATER MAIN
- EXISTING SEWER MAIN
- FUTURE SEWER MAIN

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: N/A	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:

SERVICES PLAN
SHEET 1

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-601

client: Woolworths — Australia's fresh food people

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239402-DA-602-SERVICES_PLAN

LEGEND:

- ex sw — EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- S — PROPOSED SEWER MAIN
- EXISTING NBN
- SL — SL — EXISTING SL ELECTRICITY
- LV — EXISTING LOW VOLTAGE ELECTRICITY
- HV — EXISTING HIGH VOLTAGE ELECTRICITY
- ex w — EXISTING WATER MAIN
- ex s — EXISTING SEWER MAIN
- FS — FUTURE SEWER MAIN

M.G.A.

EXISTING BASIN

NORTHRIDGE DRIVE

PIT-009

FDH-X9

PIT-008

PIT-007

PIT-006

PIT-014

RL. 39.550 m

LOADING DOCK

FUTURE DEVELOPMENT AREA

WOOLWORTHS

TRAMWAY DRIVE

ROAD No.2

T1

T10

T2b

T2a

T3

T4

T5

T6

T7

T8

RL. 42.300 m

FUTURE DEVELOPMENT SITE

REFER SHEET 601 FOR CONTINUATION

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
F	20/2/18	ISSUE FOR DEVELOPMENT APPLICATION	DW	MK	DATUM: AHD CONTOUR INTERVAL: N/A	0 12.5 25.0m SCALE: 1:500 (FULL)	

drawing title:

SERVICES PLAN
SHEET 2

location: WOOLWORTHS CAMERON PARK

council: LAKE MACQUARIE

dwg ref: 239402-DA-602

client: Woolworths — Australia's fresh food people

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Appendix C

EXISTING SITE

239402-DET-001-B

5088

ME□UM

□E□S□□□

S□A□E 5

WARNING
UNDERGROUND
ELECTRICITY LINES

(B)
(E)

RCP 375mmØ

PIT

STREET
SIGN

297° 00' 45"
22.0□

7°47'35"-7.47

221° 34' 35"
□2.1

180° 37' 40"
25□

306°27'20"
1□□□

(C)
(D)

WARNING
OPTICAL FIBRE
IN AREA

316°26'20"-16.965

9°04'45"-3.03

ELEC.
PIT

BUS STOP

9°04'45"-3.115

357°46'10"-13.465

9°□4'
2.□4

45"

119°24'2.835

18.085

29° 24'

299°24'-4.78

355°33'20"-8.7

27°15'45"
10.□

27°15'45"
1.17

WARNING
UNDERGROUND
ELECTRICITY LINES

901

D.P.1222132

5.652 ha.

□02

SHORT LINE TABLE

No.	BEARING	DISTANCE	ARC	RADIUS
2	30°28'00"	23.59	23.60	211.00
3	30°28'00"	21.13	21.14	189.00
5	21°22'25"	11.59	11.61	56.50
6	5°31'10"	6.40	6.43	18.50
8	327°28'40"	4.705	4.9	5
9	74°19'55"	7.08	7.865	5
10	29°15'50"	5.86	–	–
11	15°56'35"	13.505	13.54	56.50
12	3°25'30"	3.645	3.65	18.50
14	14°49'05"	20.7	20.73	103.50
15	14°49'05"	9.30	9.32	46.50
16	290°02'15"	26.78	26.84	111.00
17	281°37'25"	21.23	21.485	40.00
18	254°41'55"	4.20	–	–
19	229°00'30"	24.805	25.055	50.825
20	30°56'50"	9.62	9.63	70.48
21	18°21'50"	15.57	15.655	44.305
22	159°04'45"	184.75	189.18	251.47

(B) RIGHT OF ACCESS VARIABLE WIDTH (DP.1222132)
(C) RIGHT OF ACCESS VARIABLE WIDTH (DP.1222132)
(D) EASEMENT FOR SERVICES VARIABLE WIDTH (DP.1222132)
(E) EASEMENT FOR SERVICES VARIABLE WIDTH (DP.1222132)

219° 29' 10"
□1.8□

127° 37' 00"
□5.15

117° 15' 40"
1□2.8□5

□E□□□E

□□□□□

□□□□E

□□□□LA□□

NOTES:-

1. BOUNDARIES HAVE BEEN DETERMINED BY PLAN DIMENSIONS ONLY, AND HAVE NOT BEEN SURVEYED. ALL BEARINGS, DIMENSIONS, AREAS AND EASEMENTS ARE SUBJECT TO FINAL SURVEY.
2. SERVICES HAVE BEEN LOCATED WHERE VISIBLE ONLY. PRIOR TO EXCAVATION OR CONSTRUCTION ALL SERVICES ARE TO BE LOCATED BY THE RELEVANT AUTHORITY.
3. SPOT LEVELS AND CONTOURS SHOWN HEREON ARE FOR DESIGN PURPOSES ONLY AND ARE TO BE CONFIRMED ON SITE PRIOR TO ANY EXCAVATION OR CONSTRUCTION.
4. THIS PLAN HAS BEEN PREPARED FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANYTHING OTHER THAN THAT PURPOSE.
5.

N

DOWNJOHNSON

S□A□E 2□

LEGEND

- STATE SURVEY MARK
- BENCH MARK
- E□□□ ELECTRICAL PIT
- SL STREET LIGHT
- HYDRANT
- S□ STOP VALVE
- □□□ STORMWATER PIT
- F□ DRAINAGE FLUSH POINT
- SM□ SEWER MAN HOLE
- EL COMMUNICATION PIT
- □AS NATURAL GAS METER
- TRAFFIC SIGNAL LIGHTS
- BOUNDARY LINE
- ADJACENT BOUNDARY
- EASEMENT
- E ELECTRICAL LINE
- FENCE LINE
- □AS GAS LINE
- □ TELSTRA LINE
- □□□□ OPTICAL FIBRE
- □□□ OVERHEAD POWER LINE
- S SEWER LINE
- □M SEWER RISING MAIN
- □ WATER LINE (DOMESTIC)
- STORMWATER PIPE
- MINOR CONTOUR LINE
- MAJOR CONTOUR LINE
- TOP & TOE OF BANKS

working beyond expectations

ver.	date	comment	surveyed	drawn	checked	pm
B	28/10/16	UPDATE DETAIL SURVEY	LB	RC	TC	TC

co-ordinate information
CO-ORDINATE SYSTEM: MGA 56
ORIGIN OF CO-ORDINATES: SSM 190440
DATE OF SURVEY 12/10/16

level information
DATUM: A.H.D.
ORIGIN OF LEVELS: SSM 190440
CONTOUR INTERVAL: 0.5m

scale (A1 original size)
0 12.5 25.0m
SCALE: 1:500 (FULL)

page: 1 OF 1

drawing title:
DETAIL SURVEY
PLAN OF LOT 901
D.P.1222132

location: PORTLAND DRIVE, CAMERON PARK
council: NEWCASTLE
dwg ref: 239402-DET-001-B
client: Woolworths the fresh food people

adw johnson
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
www.adwjohnson.com.au

• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design

Plotted By: Robert Cromarty Plot Date: 01/11/16 11:24:54AM Cad File: N:\239402\DRAWINGS\SURVEY\239402-DET-001-B.DWG

Appendix D

SEDIMENT BASIN SIZING CALCULATIONS

Revised Universal Soil Loss Equation (RUSLE) – BASIN 1

Catchment Area (A)	3	ha	
Settling Zone			
Runoff Coefficient (Cv)	0.64		
85th %, 5 day Rainfall Event (R)	38.9		Table 6.3a, pg 6-24
Settling Zone Volume	**746.88**	**m3**	
Sediment Zone			
Disturbed Site Area (hectares)	3	ha	
Rainfall Erosivity Factor, R	2578		
Soil Erodibility Factor, K	0.07		Table C17
Slope Length Gradient Factor, LS	0.52	Approx 150m@2%	Table A1, pg A-9
Erosion Control Practice Factor, P	1.3		Table A2, pg A-11
Cover Factor, C	1		Figure A5, pg A-12
Sediment Zone Volume	**48**	**m3**	

Total Storage Required (Settling + Sediment + 10%)	**874**	**m3**	

Revised Universal Soil Loss Equation (RUSLE) – BASIN 2

Catchment Area (A)	1.25	ha	
Settling Zone			
Runoff Coefficient (Cv)	0.64		
75th %, 5 day Rainfall Event (R)	38.9		Table 6.3a, pg 6-24
Settling Zone Volume	**311.2**	**m3**	
Sediment Zone			
Disturbed Site Area (hectares)	1.25	ha	
Rainfall Erosivity Factor, R	2578		
Soil Erodibility Factor, K	0.07		Table C17
Slope Length Gradient Factor, LS	0.52	Approx 150m@2%	Table A1, pg A-9
Erosion Control Practice Factor, P	1.3		Table A2, pg A-11
Cover Factor, C	1		Figure A5, pg A-12
Sediment Zone Volume	**20**	**m3**	

Total Storage Required (Settling + Sediment + 10%)	**364**	**m3**	

Appendix E

BASIN MAINTENANCE CHECKLIST

WOOLWORTHS, CAMERON PARK – MAINTENANCE FORM

Location	Cameron park
Description	Constructed ponds and associated infrastructure

SITE VISIT DETAILS

Site visit date: _____

Site visit by: _____

Weather: _____

Purpose of the site visit	Tick Box	Complete Sections
Routine inspection	0	Section 1 only
Routine maintenance	0	Section 1 and 2
Cleanout of sediment	0	Section 1, 2 and 3
Annual inspection	0	Section 1, 2, 3 and 4

SECTION 1 - INSPECTION

Gross pollutant load cleanout required? Yes/No - If yes please see Ecosol Maintenance Schedule

Depth of sediment in forebay: _____m

Cleanout required if depth of sediment >1.0m Yes/No

Any weeds or litter in basin (if Yes, complete Section 2 – Maintenance)	Yes No
Any visible damage to basin? (If Yes, complete Section 4 –Condition)	Yes/No

Inspection comments:

SECTION 2 – GENERAL MAINTENANCE

Were the weeds removed this site visit? Yes/No

Is there litter in the lake or forebay? Yes/No

Was the litter collected this site visit? Yes/No

SECTION 3a – CLEANOUT OF GROSS POLLUTANTS

Have the following been notified of cleanout date?	Yes	No
Coordinator – open space and/or drainage	0	0
Local residents	0	0
Other (specify .....)	0	0
Method of cleaning (excavator or eductor)		
Volume of gross pollutant and sediment removed (approximate estimate)	m^3	
Any visible damage to wetland or SW tailouts? (If yes, complete Section 4 – Condition)	Yes/No	

SECTION 3b – CLEANOUT OF SEDIMENT

Have the following been notified of cleanout date?	Yes	No
Coordinator – open space and/or drainage	0	0
Local residents	0	0
Other (specify.....)	0	0
Method of cleaning (excavator or educator)		
Volume of sediment removed (approximate estimate)	m^3	
Any visible damage to wetland or sediment forebay? (If yes, complete Section 4 – Condition)	Yes/No	

SECTION 4 – CONDITION ASSESSMENT

Component	Checked?		Condition OK?		Remarks
	Yes	No	Yes	No	
Inlet structures					
Outlet structures					
Spillway and spillway channel					
Littoral zone vegetation					
Banks and batter slopes					
Retarding basin embankment					
Surrounding landscaping					

Comments:

Appendix F

EXTRACT FROM "CAMERON GROVE" PLANS, BROWNS CONSULTING

FOR CONTINUATION REFER TO DRAWING 102

NOTE:
- BULK EARTHWORKS TO BE CARRIED OUT BY OTHERS PRIOR TO COMMENCEMENT OF WORKS.
- REFER MARKET PLACE DESIGN BY MOTT MACDONALD DWG. No. 295891C - EWC01.

N

MARKET PLACE

CAR PARK ACCESS No.01

(PORTLAND ROAD)

CONSTRUCT BUS SHELTERS TO COUNCIL STANDARD DWG'S.

PROVIDE 1.2m WIDE CONCRETE FOOTPATH TO COUNCIL STANDARD

LIMIT OF CONSTRUCTION AT KTP 23.664. PROVIDE POST AND CABLE FENCING IN ACCORDANCE WITH COUNCIL'S ENGINEERING GUIDELINES STANDARD DRAWINGS EGSD-601.

FOR ROUNDABOUT ANNULUS DETAIL, SEE DWG 401

CAP PIPE FOR FUTURE CONNECTION

FUTURE DEVELOPMENT

STAGE 2D

GEORGE BOOTH DRIVE

PROVIDE 1.2m WIDE CONCRETE FOOTPATH TO COUNCIL STANDARD

CAP PIPE FOR FUTURE CONNECTION

TRANSITION EXISTING 2.5m SHARED PATH TO 1.2m WIDE CONCRETE FOOTPATH TO COUNCIL STANDARD.

TRANSITION EXISTING 2.5m SHARED PATH TO 1.2m WIDE CONCRETE FOOTPATH TO COUNCIL STANDARD.

LIMIT OF CONSTRUCTION AT W.A.D. CH 41.841. MAKE SMOOTH CONNECTION TO EXISTING PAVEMENT.

CAP PIPE FOR FUTURE CONNECTION

CONNECT PIT 1/9 TO EXISTING PIPELINE

REFER TO GEORGE BOOTH DRIVE INTERSECTION DESIGN PREPARED BY BROWN CONSULTING. REF: X08116_01, DATED: 08/06/2012

FOR CONSTRUCTION CERTIFICATE

Revisions							
00	AW	DD	CB	TT	12/04/13	ISSUED FOR 80% REVIEW
01	AW	DD	CB	SG	2/10/13	ISSUED FOR CONSTRUCTION CERTIFICATE
02	VP	JP	SG		16/07/14	ISSUED WITH COUNCIL AMENDMENTS
03	BL	BL	PF	SAG	25/05/15	UPDATED TO COUNCIL COMMENTS
04	BL	BL	PF	SAG	5/08/15	NOTE ADDED TO RIGID PAVEMENT PLAN REGARDING SURFACE FINISH
05	BL	BL	PF		02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER
First Issue	AW	DD	CB	TT	12/04/13	Revision Details
	Drawn	Design	Check	Appd.	Date	

SCALE 1:500 (A1) SCALE 1:1000 (A3)

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE:

Client: HAMMERSMITH MANAGEMENT PTY LTD

Project: CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN Smart Consulting

Drawing Title: CIVIL ENGINEERING PLAN
SHEET 01 OF 03

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	101	05

NOTE:
- BULK EARTHWORKS TO BE CARRIED OUT BY OTHERS PRIOR TO COMMENCEMENT OF WORKS.

- REFER MARKET PLACE DESIGN BY MOTT MACDONALD DWG. No. 295891C - EWC01.

FOR CONTINUATION REFER TO DRAWING 103

FUTURE DEVELOPMENT

FUTURE DEVELOPMENT

EXISTING DEVELOPMENT

MARKET PLACE

STAGE 2D

NORTHRIDGE DRIVE

ROAD No.09 (PORTLAND DRIVE)

ROAD No.01

ROAD No.02 (NORTHRIDGE DRIVE)

ROAD No.11

LIMIT OF CONSTRUCTION AT KTP 19.857. PROVIDE POST AND CABLE FENCING IN ACCORDANCE WITH COUNCIL'S ENGINEERING GUIDELINES STANDARD DRAWINGS EGSD-601.

CAP PIPE FOR FUTURE CONNECTION

CAP, SEAL & BURY FOR FUTURE CONNECTION

PROVIDE 1.2m WIDE CONCRETE FOOTPATH TO COUNCIL STANDARD

CONNECT PIPE TO EXISTING PIT 8/7

LIMIT OF CONSTRUCTION AT CH 510.00 MAKE SMOOTH CONNECTION TO EXISTING PAVEMENT.

CONNECT PIT 6/5 TO EXISTING PIPELINE

LIMIT OF CONSTRUCTION AT CH 108.750 MAKE SMOOTH CONNECTION TO EXISTING PAVEMENT.

CONSTRUCT BUS SHELTERS TO COUNCIL STANDARD DWG'S EDSD-801

FOR CONTINUATION REFER TO DRAWING 101

FOR CONSTRUCTION CERTIFICATE

Rev	First Issue	Drawn	Design	Check	Appd.	Date	Revision Details
00	AW	DD	CB	TT		12/04/13	ISSUED FOR 80% REVIEW
01	AW	DD	CB	SG		2/10/13	ISSUED FOR CONSTRUCTION CERTIFICATE
02	VP	JP	SG			16/07/14	ISSUED WITH COUNCIL AMENDMENTS
03	BL	BL	PF	SAG		25/05/15	UPDATED TO COUNCIL COMMENTS
04	BL	BL	PF	SAG		5/08/15	NOTE ADDED TO RIGID PAVEMENT PLAN REGARDING SURFACE FINISH
05	BL	BL	PF			02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER

SCALE 1:500 (A1) SCALE 1:1000 (A3)

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:

DATE:

Client: HAMMERSMITH MANAGEMENT PTY LTD

Project: CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN Smart Consulting

Drawing Title: CIVIL ENGINEERING PLAN
SHEET 02 OF 03

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	102	05

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NOTE:
- BULK EARTHWORKS TO BE CARRIED OUT BY OTHERS PRIOR TO COMMENCEMENT OF WORKS.

- REFER MARKET PLACE DESIGN BY MOTT MACDONALD DWG. No. 295891C - EWC01.

N

EXISTING

LAKE

FUTURE DEVELOPMENT

ROAD No.09

TEMPORARY DIVERSION SWALE No.01

EXISTING POWERLINES TO BE REMOVED BY OTHERS PRIOR TO COMMENCEMENT OF WORKS.

DIVERSION SWALE No.01. REFER TO DETAIL ON DWG. No.511.

PROVIDE MONOWILS STYLE POST AND TWO RAIL GALVANISED FENCING TO TEMPORARY HEADWALL.

TEMPORARY LINE & HEADWALL

(McKENDY DRIVE) ROAD No.03

LIMIT OF CONSTRUCTION AT KTP 48.381. PROVIDE POST AND CABLE FENCING IN ACCORDANCE WITH COUNCIL'S ENGINEERING GUIDELINES STANDARD DRWAINGS EGSD-601

PROVIDE 1.2m WIDE CONCRETE FOOTPATH TO COUNCIL STANDARD

CAP PIPE FOR FUTURE CONNECTION

FOR ROUNDABOUT ANNULUS DETAIL, SEE DWG 401

CAR PARK ACCESS No.02

ROAD No.02 (NORTHRIDGE DRIVE)

LIMIT OF CONSTRUCTION AT KTP 41.468. PROVIDE REFLECTORIED GUIDEPOSTS AT 1.5m CENTRES.

MARKET PLACE

FOR CONTINUATION REFER TO DRAWING 102

FOR CONSTRUCTION CERTIFICATE

Revisions							
00	AW	DD	CB	TT	12/04/13	ISSUED FOR 80% REVIEW
01	AW	DD	CB	SG	2/10/13	ISSUED FOR CONSTRUCTION CERTIFICATE
02	VP	JP	SG		16/07/14	ISSUED WITH COUNCIL AMENDMENTS
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05	BL	BL	PF		02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER
First Issue	AW	DD	CB	TT	12/04/13	Revision Details
	Drawn	Design	Check	Appd.	Date	

SCALE 1:500 (A1) — SCALE 1:1000 (A3)

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE:

Client: HAMMERSMITH MANAGEMENT PTY LTD

Project: CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN Smart Consulting

Drawing Title: CIVIL ENGINEERING PLAN
SHEET 03 OF 03

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	103	05

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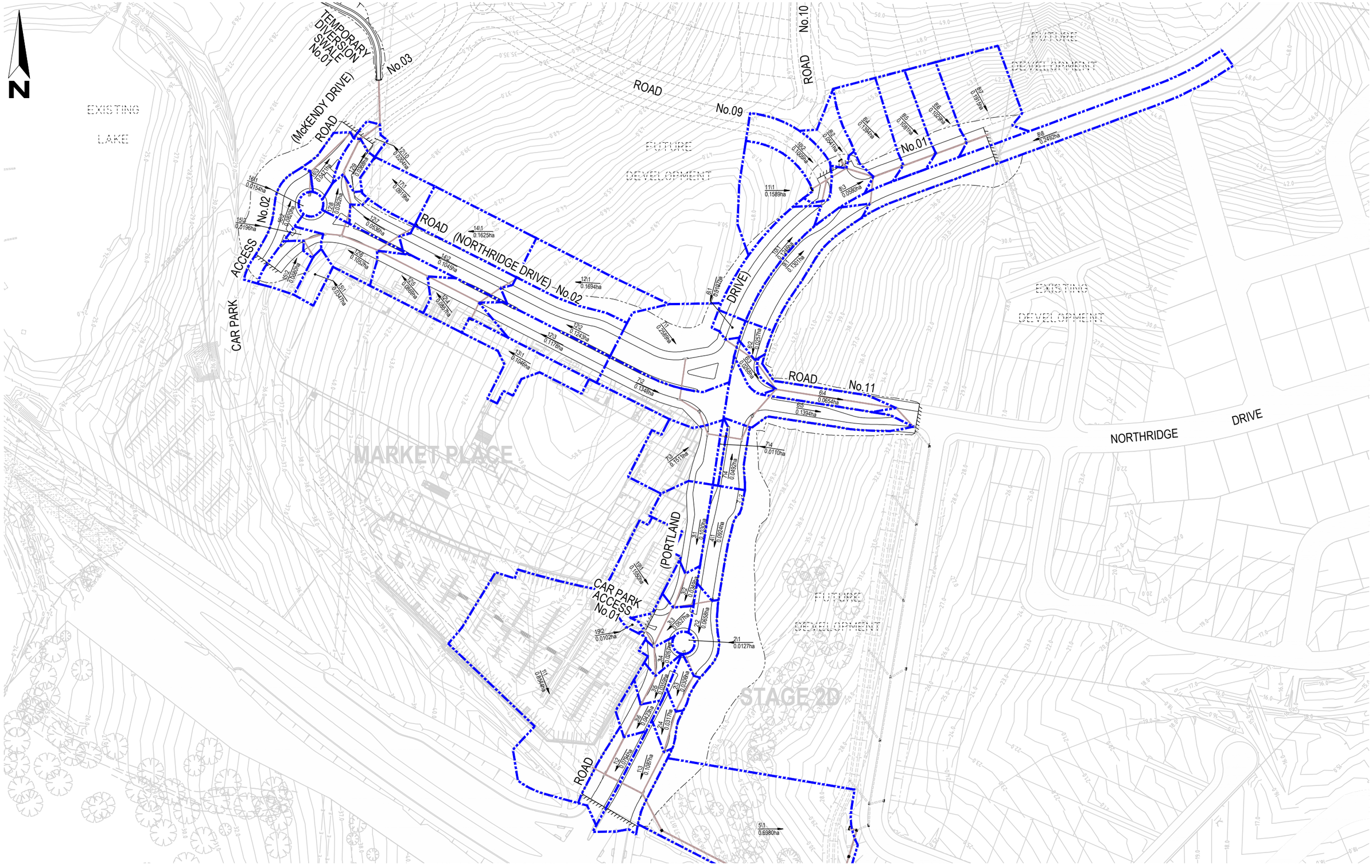

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Revisions							
00	AW	DD	CB	TT	12/04/13	ISSUED FOR 80% REVIEW
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05	BL	BL	PF		02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER
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	Drawn	Design	Check	Appd.	Date	

SCALE 1:1000 (A1) SCALE 1:2000 (A3)

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE: 8/9/15

Client: HAMMERSMITH MANAGEMENT PTY LTD

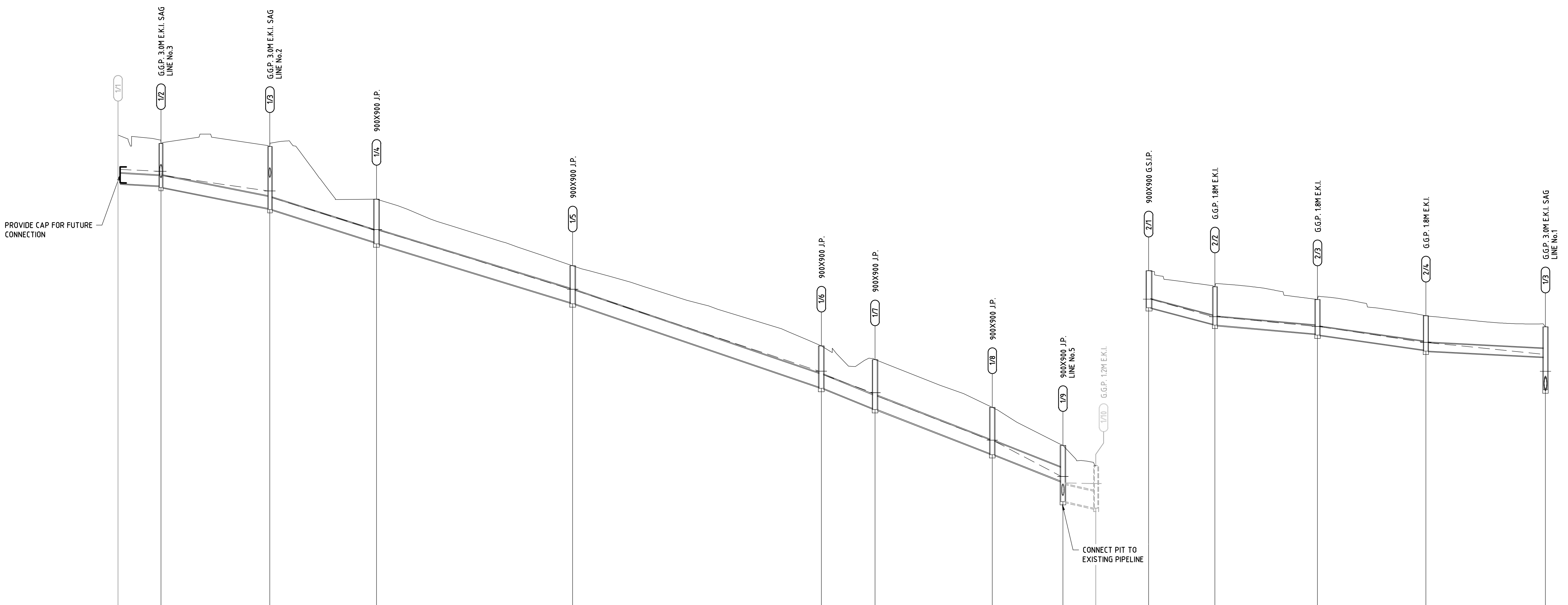
Project: CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN Smart Consulting

Drawing Title: CATCHMENT PLAN

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	501	05

NOTE:
- ALL DRAINAGE PITS TO BE TO COUNCIL STANDARDS UNLESS OTHERWISE SPECIFIED.



LINE No.1

DATUM R.L 13.0

Pipe	PART FULL VELOCITY (m/s)	FULL PIPE VELOCITY (m/s)	DISCHARGE (cu.m/s)	PIPE SIZE (mm) & CLASS	DESIGN GRADE	DEPTH TO INVERT	H.G.L. LEVEL	INVERT LEVEL	SURFACE LEVEL	ROAD CHAINAGE	PIPE CHAINAGE
1/1						2.153	39.204	38.574	40.727		0
1/1 – 1/2	2.29	1.896	0.302	450RRJ2	1%	1.88	39.121	38.479			9.521
1/2						1.955	38.929	38.404	40.358	58.478	9.521
1/2 – 1/3	4.45	2.302	0.498	525RRJ2	3.84%	2.747	38.25	37.476			24.157
1/3						2.797	37.951	37.426	40.223	58.478	33.678
1/3 – 1/4	5.50	2.668	0.578	525RRJ2	6.12%	1.905	36.535	35.979			23.647
1/4						1.98	36.504	35.904	37.884		57.325
1/4 – 1/5	5.43	2.025	0.573	600RRJ2	6%	1.636	33.884	33.294			43.503
1/5						1.686	33.844	33.244	34.93		100.828
1/5 – 1/6	5.63	1.988	0.562	600RRJ2	6.71%	1.832	30.251	29.543			55.131
1/6						1.882	30.093	29.493	31.375		155.958
1/6 – 1/7	5.83	1.936	0.547	600RRJ2	7.5%	2.164	29.293	28.6			11.906
1/7						2.214	29.15	28.55	30.764		167.865
1/7 – 1/8	5.82	1.925	0.544	600RRJ2	7.5%	2.043	27.187	26.6			26
1/8						2.093	27.15	26.55	28.643		193.865
1/8 – 1/9	5.80	1.901	0.537	600RRJ2	7.5%	1.584	25.593	25.376			15.659
1/9						2.493	25.294	24.467	26.96		209.524
1/9 – 1/10 (EXISTING WORKS)	4.96	1.711	0.756	750RRJ2	4%	1.891		24.175			7.3
1/10						1.891	25.266	24.175	26.066		216.824

LINE No.1

LINE No.2

DATUM R.L 21.0

Pipe	PART FULL VELOCITY (m/s)	FULL PIPE VELOCITY (m/s)	DISCHARGE (cu.m/s)	PIPE SIZE (mm) & CLASS	DESIGN GRADE	DEPTH TO INVERT	H.G.L. LEVEL	INVERT LEVEL	SURFACE LEVEL	ROAD CHAINAGE	PIPE CHAINAGE
2/1						1.637	41.444	41.069	42.706	140.874	0
2/1 – 2/2	1.33	0.041	0.004	375RRJ2	4.95%	1.657	40.669	40.342			14.687
2/2						1.707	40.667	40.292	41.999	130.908	14.687
2/2 – 2/3	1.56	0.255	0.028	375RRJ2	1.7%	1.527	40.239	39.906			22.769
2/3						1.577	40.231	39.856	41.433	108.603	37.456
2/3 – 2/4	2.04	0.349	0.039	375RRJ2	2.75%	1.513	39.532	39.194			24.028
2/4						1.563	39.519	39.144	40.708	85	61.484
2/4 – 1/3	1.50	0.443	0.049	375RRJ2	1%	1.344	39.005	38.879			26.522
1/3						2.797	37.951	37.426	40.223	58.478	88.006

LINE No.2

FOR CONSTRUCTION CERTIFICATE

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02	VP	JP	SG		16/07/14	ISSUED WITH COUNCIL AMENDMENTS
03	BL	BL	PF	SAG	25/05/15	UPDATED TO COUNCIL COMMENTS
04	BL	BL	PF	SAG	5/08/15	NOTE ADDED TO RIGID PAVEMENT PLAN REGARDING SURFACE FINISH
05	BL	BL	PF		02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER
First Issue	AW	DD	CB	TT	12/04/13	

0 5 10 15 20 25 30 35 40 45 50
SCALE 1:500 (A1) SCALE 1:1000 (A3)
0 1 2 3 4 5 6 7 8 9 10
SCALE 1:100 (A1) SCALE 1:200 (A3)

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ALL DIMENSIONS TO BE CHECKED ON SITE BY SUPERINTENDENT PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.

CONSULT AUSTRALIA Member Firm
Quality System Quality Endorsed Company

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE: 2.9.15

Client:
HAMMERSMITH MANAGEMENT PTY LTD

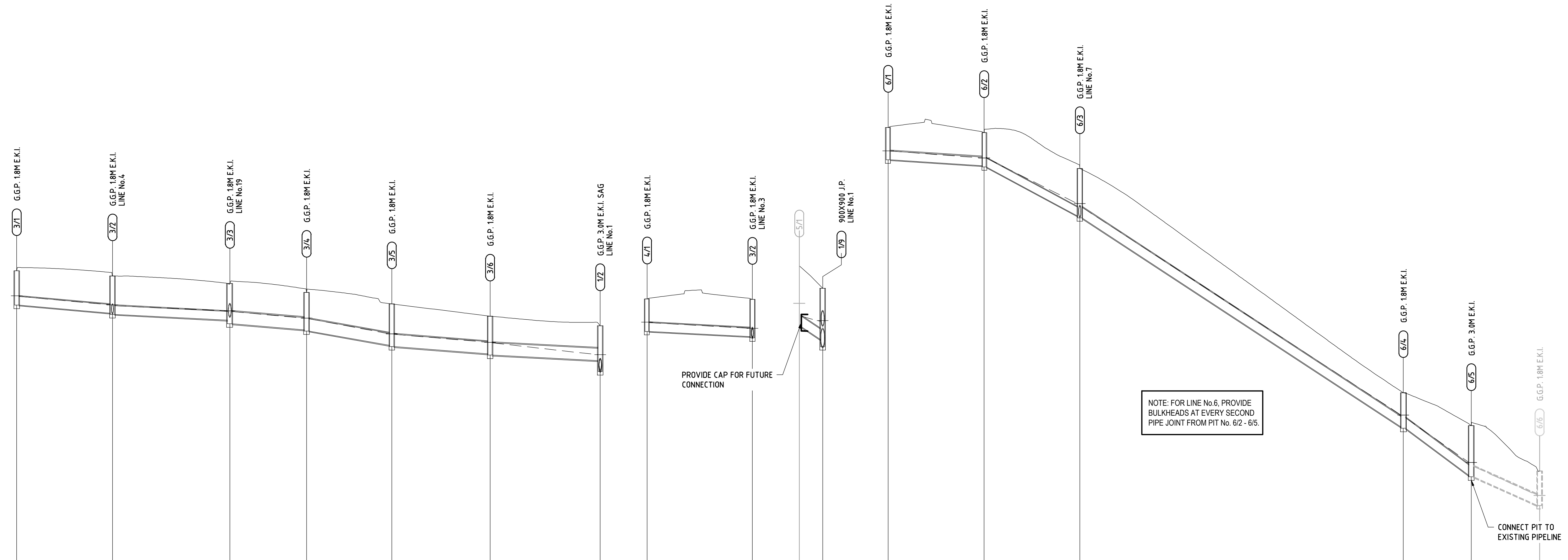
Project:
CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN
Smart Consulting

Drawing Title:
DRAINAGE LONGITUDINAL SECTIONS
LINE No.1-2

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	502	05

NOTE:
- ALL DRAINAGE PITS TO BE TO COUNCIL STANDARDS UNLESS OTHERWISE SPECIFIED.



NOTE: FOR LINE No.6, PROVIDE BULKHEADS AT EVERY SECOND PIPE JOINT FROM PIT No. 6/2 - 6/5.

PART FULL VELOCITY (m/s)	1.66	1.71	2.36	3.17	2.39	2.10	
FULL PIPE VELOCITY (m/s)	0.319	0.721	0.711	0.747	0.798	0.858	
DISCHARGE (cu.m/s)	0.035	0.08	0.154	0.162	0.173	0.186	
PIPE SIZE (mm) & CLASS	375RRJ2	375RRJ2	525RRJ2	525RRJ2	525RRJ2	525RRJ2	
DESIGN GRADE	1.69%	1%	1.57%	3.39%	1.49%	1%	
DATUM R.L	22.0						
DEPTH TO INVERT	1.464 1.59	1.64 1.571	1.721 1.596	1.646 1.774	1.824 1.613	1.663 1.488	1.955
H.G.L. LEVEL	41.615 41.249	41.219 40.993	40.969 40.679	40.661 40.012	39.994 39.652	39.63 39.121	38.929
INVERT LEVEL	41.24 40.894	40.844 40.594	40.444 40.186	40.136 39.519	39.469 39.155	39.105 38.87	38.404
SURFACE LEVEL	42.705	42.484	42.165	41.781	41.293	40.768	40.358
ROAD CHAINAGE	184.811	164.536	137.32	121.315	103	82	58.478
PIPE CHAINAGE	0 20.459	20.459 25.062	45.521 16.4	61.921 18.201	80.122 21	101.122 23.522	124.645

LINE No.3

PART FULL VELOCITY (m/s)	1.34	
FULL PIPE VELOCITY (m/s)	0.289	
DISCHARGE (cu.m/s)	0.032	
PIPE SIZE (mm) & CLASS	375RRJ2	
DESIGN GRADE	1%	
DATUM R.L	23.0	
DEPTH TO INVERT	1.382 1.59	1.64
H.G.L. LEVEL	41.494 41.249	41.219
INVERT LEVEL	41.119 40.894	40.844
SURFACE LEVEL	42.502	42.484
ROAD CHAINAGE	172	164.536
PIPE CHAINAGE	0 22.508	22.508

LINE No.4

PART FULL VELOCITY (m/s)	5.53	
FULL PIPE VELOCITY (m/s)	1.549	
DISCHARGE (cu.m/s)	0.246	
PIPE SIZE (mm) & CLASS	450RRJ2	
DESIGN GRADE	11%	
DATUM R.L	7.0	
DEPTH TO INVERT	2.6 2.193	2.493
H.G.L. LEVEL	25.767 25.544	25.294
INVERT LEVEL	25.317 24.767	24.467
SURFACE LEVEL	27.917	26.96
ROAD CHAINAGE		
PIPE CHAINAGE	0 5	5

LINE No.5

					EXISTING WORKS	
PART FULL VELOCITY (m/s)	0.93	2.51	5.75	6.00	5.21	
FULL PIPE VELOCITY (m/s)	0.063	0.143	1.431	1.519	1.793	
DISCHARGE (cu.m/s)	0.007	0.016	0.228	0.242	0.285	
PIPE SIZE (mm) & CLASS	375RRJ2	375RRJ2	450RRJ2	450RRJ2	450RRJ2	
DESIGN GRADE	1.24%	10.28%	12.94%	13.94%	8.38%	
DATUM R.L	17.0					
DEPTH TO INVERT	1.382 1.409	1.459 2.032	2.107 1.468	1.518 2.132	2.182 1.472	1.472
H.G.L. LEVEL	42.824 42.523	42.52 40.568	40.42 31.54	31.432 29.517	29.357	28.117
INVERT LEVEL	42.449 42.195	42.145 40.045	39.97 31.032	30.982 28.957	28.907 27.685	27.685
SURFACE LEVEL	43.831	43.604	42.077	32.5	31.089	29.157
ROAD CHAINAGE	318.825	311.917	26.949	96	107.424	
PIPE CHAINAGE	0 20.496	20.496 20.434	40.931 69.091	110.021 14.522	124.544 14.581	139.125

LINE No.6

FOR CONSTRUCTION CERTIFICATE

Revisions						
00	AW	DD	CB	TT	12/04/13	ISSUED FOR 80% REVIEW
01	AW	DD	CB	SG	2/10/13	ISSUED FOR CONSTRUCTION CERTIFICATE
02	VP	JP	SG		16/07/14	ISSUED WITH COUNCIL AMENDMENTS
03	BL	BL	PF	SAG	25/05/15	UPDATED TO COUNCIL COMMENTS
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05	BL	BL	PF		02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER
First Issue	AW	DD	CB	TT	12/04/13	Revision Details
	Drawn	Design	Check	Appd.	Date	

0 5 10 15 20 25 30 35 40 45 50
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Quality System Quality Endorsed Company

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE: 2.9.15

Client:
HAMMERSMITH MANAGEMENT PTY LTD

Project:
CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN
Smart Consulting

Drawing Title:
DRAINAGE LONGITUDINAL SECTIONS
LINE No.3-6

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	503	05

FILE: H:\L05\L05016 - PAMBULONG\L05016.014 - LINK ROAD\DRAWINGS\CIVIL\L05016_014_LD_CC-503.DWG PRINTED: 9/2/15 USER: BENJAMIN LAWRENCE

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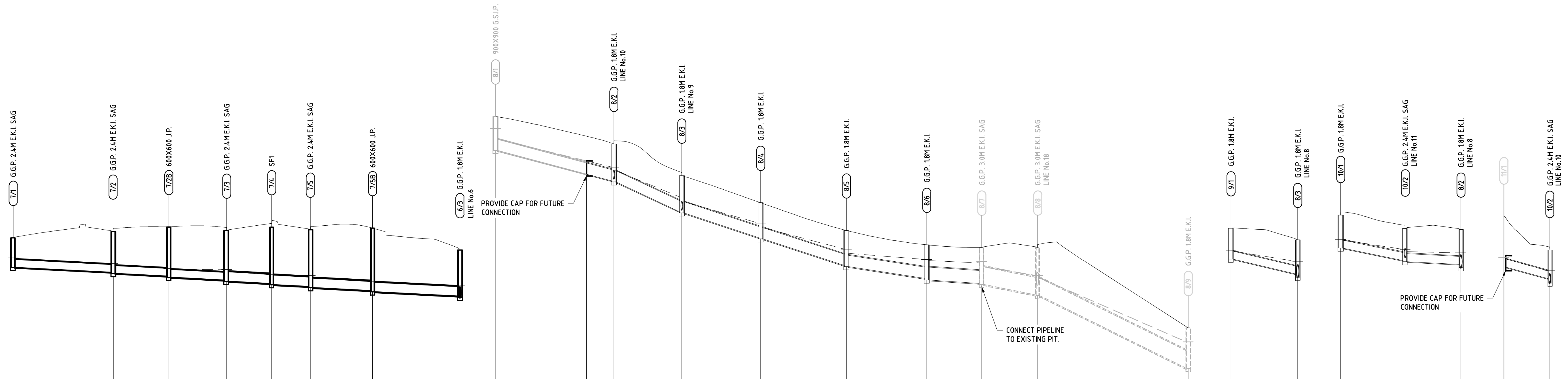

PART FULL VELOCITY (m/s)	1.69		1.80		1.80		2.01		2.02		2.06		2.06		
FULL PIPE VELOCITY (m/s)	0.688		0.894		0.889		0.98		0.996		1.08		1.075		
DISCHARGE (cu.m/s)	0.076		0.099		0.098		0.156		0.158		0.172		0.171		
PIPE SIZE (mm) & CLASS	375RRJ2		375RRJ2		375RRJ2		450RRJ2		450RRJ2		450RRJ2		450RRJ2		
DESIGN GRADE	1%		1%		1%		1%		1%		1%		1%		
DATUM R.L	23.0														
DEPTH TO INVERT	1.381	1.906	1.956	2.3	2.35	2.315	2.365	2.632	2.682	2.655	2.705	2.922	2.972	2.149	2.199
H.G.L. LEVEL	41.646	41.438	41.363	41.217	41.198	41.164	41.073	40.933	40.918	40.884	40.778	40.597	40.582	40.412	40.328
INVERT LEVEL	41.271	41.038	40.988	40.858	40.808	40.673	40.623	40.518	40.468	40.378	40.328	40.182	40.132	39.928	39.878
SURFACE LEVEL	42.652		42.944		43.158		42.988		43.149		43.033		43.104		42.077
ROAD CHAINAGE	28.252		25.774				265.278		265.278		265.278				26.949
PIPE CHAINAGE	0	23.286	23.286	13.031	36.317	13.529	49.846	10.5	60.346	9	69.346	14.538	83.884	20.394	104.278

LINE No.7

	FUTURE WORKS														EXISTING WORKS			
PART FULL VELOCITY (m/s)		4.43	5.97		5.43		5.51		4.16		3.01		4.70		7.27		
FULL PIPE VELOCITY (m/s)		1.475	2.147		2.427		2.612		2.768		2.227		1.295		1.812		
DISCHARGE (cu.m/s)		0.319	0.465		0.525		0.565		0.599		0.63		0.692		0.969		
PIPE SIZE (mm) & CLASS		525RRJ2	525RRJ2		525RRJ2		525RRJ2		525RRJ2		600RRJ2		825RRJ2		825RRJ2		
DESIGN GRADE		5.13%	8.81%		6.3%		6.23%		2.93%		1.24%		3.77%		9.65%		
DATUM R.L	17.0																
DEPTH TO INVERT	1.588	1.728	1.778	1.693	1.743	1.634	1.684	1.64	1.69	1.567	1.642	1.672	1.722	2.212	2.237	1.88	1.88
H.G.L. LEVEL	41.253	39.95	39.786	38.554	38.338	37.334	37.129	36.124	35.928	35.641	35.591	35.483	35.3	34.9	34.785		31.797
INVERT LEVEL	40.728	39.311	39.261	37.863	37.813	36.654	36.604	35.358	35.308	34.76	34.685	34.525	34.475	33.985	33.96	30.565	30.565
SURFACE LEVEL	42.316		41.039		39.556		38.288		36.998		36.326		36.197		36.197		32.445
ROAD CHAINAGE	42.713		17.353		441.908		460		480		498.75		511.6		511.35		
PIPE CHAINAGE	0	27.643	27.643	15.863	43.505	18.409	61.915	20	81.915	18.75	100.665	12.85	113.515	13.002	126.517	35.178	161.695

LINE No.8

PART FULL VELOCITY (m/s)	2.52		
FULL PIPE VELOCITY (m/s)	0.401		
DISCHARGE (cu.m/s)	0.044		
PIPE SIZE (mm) & CLASS	375RRJ2		
DESIGN GRADE	4.46%		
DATUM R.L	20.0		
DEPTH TO INVERT	1.439	1.593	1.743
H.G.L. LEVEL	39.033	38.554	38.338
INVERT LEVEL	38.658	37.963	37.813
SURFACE LEVEL	40.096		39.556
ROAD CHAINAGE	433.985		441.908
PIPE CHAINAGE	0	15.579	15.579

LINE No.9

PART FULL VELOCITY (m/s)	2.36		1.93		
FULL PIPE VELOCITY (m/s)	0.383		1.202		
DISCHARGE (cu.m/s)	0.042		0.133		
PIPE SIZE (mm) & CLASS	375RRJ2		375RRJ2		
DESIGN GRADE	3.88%		1%		
DATUM R.L	21.0				
DEPTH TO INVERT	1.542	1.496	1.546	1.628	1.778
H.G.L. LEVEL	40.551	40.114	40.008	39.95	39.786
INVERT LEVEL	40.176	39.591	39.541	39.411	39.261
SURFACE LEVEL	41.718		41.087		41.039
ROAD CHAINAGE	409.456		16.736		17.353
PIPE CHAINAGE	0	15.068	15.068	13.015	28.083

LINE No.10

PART FULL VELOCITY (m/s)	2.81		
FULL PIPE VELOCITY (m/s)	0.508		
DISCHARGE (cu.m/s)	0.056		
PIPE SIZE (mm) & CLASS	375RRJ2		
DESIGN GRADE	5%		
DATUM R.L	22.0		
DEPTH TO INVERT	2.365	1.331	1.542
H.G.L. LEVEL	40.663	40.114	40.008
INVERT LEVEL	40.288	39.752	39.541
SURFACE LEVEL	42.654		41.083
ROAD CHAINAGE			16.736
PIPE CHAINAGE	0	10.728	10.728

LINE No.11

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BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE: 2.9.15

Client:
HAMMERSMITH MANAGEMENT PTY LTD

Project:
CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN
Smart Consulting

Drawing Title:
DRAINAGE LONGITUDINAL SECTIONS
LINE No.7-11

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	504	05

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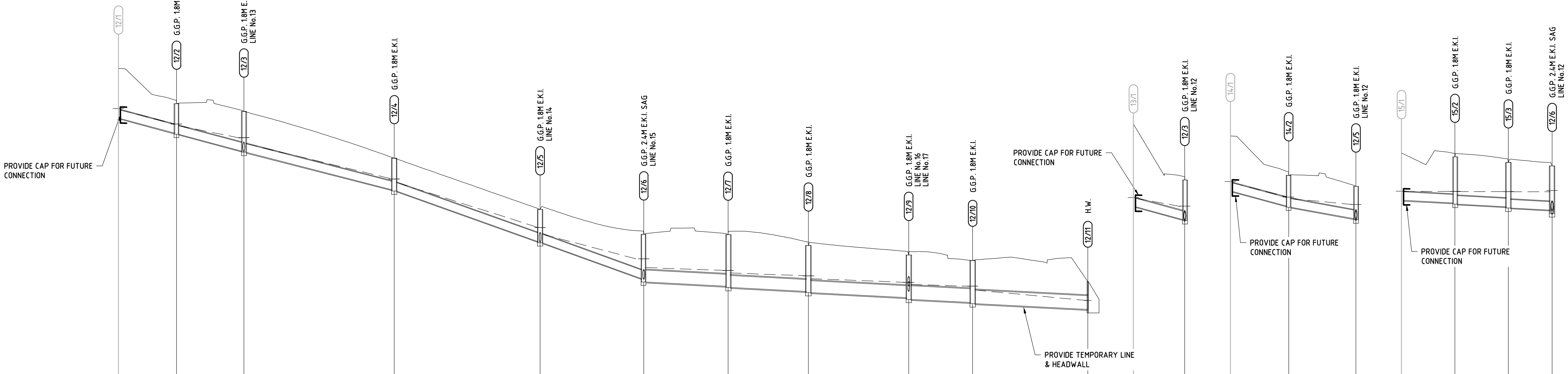

PART FULL VELOCITY (m/s)	2.86	3.30	3.83	4.48	5.01	2.48	2.49	2.50	2.64	2.65	
FULL PIPE VELOCITY (m/s)	0.541	0.912	1.595	1.842	2.916	1.814	1.888	1.929	1.78	1.792	
DISCHARGE (cu.m/s)	0.06	0.101	0.176	0.203	0.322	0.393	0.409	0.417	0.503	0.507	
PIPE SIZE (mm) & CLASS	375RRJ2	375RRJ2	375RRJ2	375RRJ2	375RRJ2	525RRJ2	525RRJ2	525RRJ2	600RRJ2	600RRJ2	
DESIGN GRADE	5%	5%	5%	6.92%	6.93%	1%	1%	1%	1%	1%	
DATUM R.L	19.0										
DEPTH TO INVERT	2.196 1.291	1.341 1.737	1.787 1.391	1.441 1.415	1.465 1.941	2.091 2.265	2.315 2.012	2.062 1.873	1.948 1.835	1.885 1.22	1.22
H.G.L. LEVEL	41.268 40.659	40.581 40.026	39.793 38.246	38.093 36.123	35.829 34.682	34.363 34.241	34.128 34.003	33.879 33.715	33.622 33.547	33.383	32.914
INVERT LEVEL	40.893 40.256	40.206 39.468	39.418 37.768	37.718 35.504	35.454 33.879	33.729 33.544	33.494 33.318	33.268 33.048	32.973 32.833	32.783 32.53	32.53
SURFACE LEVEL	43.089	41.546	41.204	39.159	36.919	35.82	35.809	35.33	34.921	34.668	33.75
ROAD CHAINAGE		144	151	184	216	238.796	241.802	24.077	46.25	61	
PIPE CHAINAGE	0 12.753	12.753 14.765	27.518 33	60.518 32	92.518 22.741	115.259 18.487	133.745 17.645	151.39 21.988	173.378 14.021	187.399 25.27	212.67

LINE No.12

PART FULL VELOCITY (m/s)	2.49	
FULL PIPE VELOCITY (m/s)	0.334	
DISCHARGE (cu.m/s)	0.037	
PIPE SIZE (mm) & CLASS	375RRJ2	
DESIGN GRADE	5%	
DATUM R.L	22.0	
DEPTH TO INVERT	2.605 1.737	1.787
H.G.L. LEVEL	40.406 40.026	39.793
INVERT LEVEL	40.031 39.468	39.418
SURFACE LEVEL	42.636	41.204
ROAD CHAINAGE		151
PIPE CHAINAGE	0 11.275	11.275

LINE No.13

PART FULL VELOCITY (m/s)	2.82	2.83	
FULL PIPE VELOCITY (m/s)	0.519	0.861	
DISCHARGE (cu.m/s)	0.057	0.095	
PIPE SIZE (mm) & CLASS	375RRJ2	375RRJ2	
DESIGN GRADE	5%	3.43%	
DATUM R.L	18.0		
DEPTH TO INVERT	2.437 1.349	1.399 1.415	1.465
H.G.L. LEVEL	37.074 36.454	36.385 36.123	35.829
INVERT LEVEL	36.699 36.06	36.01 35.504	35.454
SURFACE LEVEL	39.136	37.409	36.919
ROAD CHAINAGE		209	216
PIPE CHAINAGE	0 12.779	12.779 14.765	27.544

LINE No.14

PART FULL VELOCITY (m/s)	1.02	1.34	1.42	
FULL PIPE VELOCITY (m/s)	0.111	0.294	0.355	
DISCHARGE (cu.m/s)	0.012	0.033	0.039	
PIPE SIZE (mm) & CLASS	375RRJ2	375RRJ2	375RRJ2	
DESIGN GRADE	1%	1%	1%	
DATUM R.L	16.0			
DEPTH TO INVERT	2.074 2.025	2.075 1.95	2 1.941	2.091
H.G.L. LEVEL	34.705 34.705	34.696 34.692	34.686 34.682	34.363
INVERT LEVEL	34.309 34.192	34.142 34.025	33.975 33.879	33.729
SURFACE LEVEL	36.384	36.218	35.974	35.82
ROAD CHAINAGE		18.907	247.739	238.796
PIPE CHAINAGE	0 11.716	11.716 11.733	23.449 9.582	33.032

LINE No.15

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Revisions	Drawn	Design	Check	Appd.	Date	Revision Details
00	AW	DD	CB	TT	12/04/13	ISSUED FOR 80% REVIEW
01	AW	DD	CB	SG	2/10/13	ISSUED FOR CONSTRUCTION CERTIFICATE
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First Issue	AW	DD	CB	TT	12/04/13	

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SCALE 1:500 (A1) SCALE 1:1000 (A3)
0 1 2 3 4 5 6 7 8 9 10
SCALE 1:100 (A1) SCALE 1:200 (A3)

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Quality System Quality Endorsed Company

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE: 2.9.15

Client:
HAMMERSMITH MANAGEMENT PTY LTD

Project:
CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN
Smart Consulting

Drawing Title:
DRAINAGE LONGITUDINAL SECTIONS
LINE No.12-15

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	505	05

NOTE:
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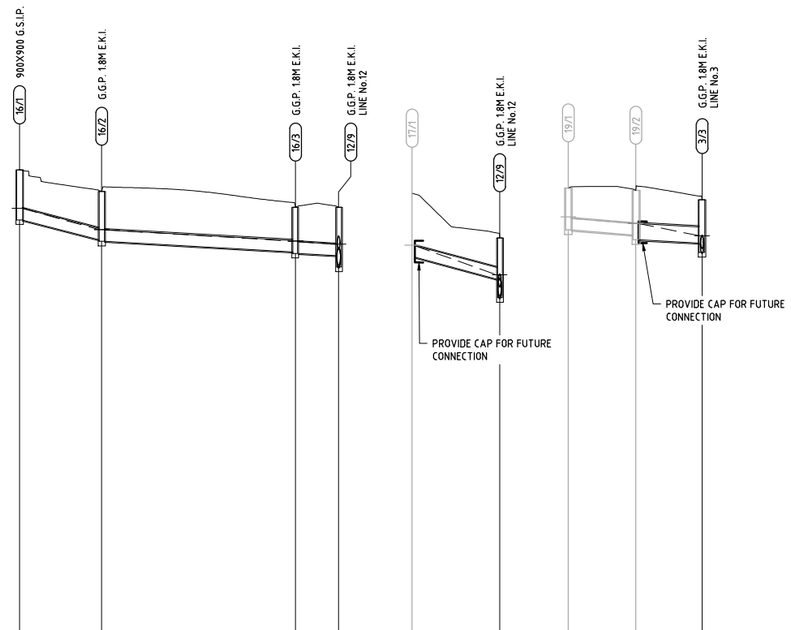

	LINE No.16							LINE No.17			LINE No.19			
PART FULL VELOCITY (m/s)	1.39		1.41			1.51		2.40			1.81		1.53	
FULL PIPE VELOCITY (m/s)	0.049		0.308			0.453		0.294			0.495		0.268	
DISCHARGE (cu.m/s)	0.005		0.034			0.05		0.032			0.055		0.058	
PIPE SIZE (mm) & CLASS	375RRJ2		375RRJ2			375RRJ2		375RRJ2			375RRJ2		525RRJ2	
DESIGN GRADE	4.83%		1.1%			1%		5%			1.51%		1%	
DATUM R.L	15.0							16.0			22.0			
DEPTH TO INVERT	1.626	1.578	1.628		1.455	1.505	1.576	2.082		1.342	1.37	1.461	1.611	1.41	1.721
H.G.L. LEVEL	34.883	34.19	34.187		33.812	33.79	33.715	34.668		33.715	43.554	43.393	43.387	40.993	40.969
INVERT LEVEL	34.508	33.862	33.812		33.465	33.415	33.365	34.293		33.578	43.179	43.012	40.862	40.754	40.444
SURFACE LEVEL	36.135	35.44			34.921		34.921	36.375		34.921	42.55	42.473		42.165	42.165
ROAD CHAINAGE	4.217	15.803			46.387		46.25			46.25	24.664	24.175		137.32	137.32
PIPE CHAINAGE	0 13.398	13.398	31.633		45.031	7.028	52.059	0 14.289		14.289	-11 11.011	0.011	10.799	10.809	

FOR CONSTRUCTION CERTIFICATE

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DATE:

Client: HAMMERSMITH MANAGEMENT PTY LTD

Project: CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN Smart Consulting

Drawing Title: DRAINAGE LONGITUDINAL SECTIONS LINE No.16, 17 & 19

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	506	05

12D MODEL - HYDROLOGICAL DESIGN SHEET

MINOR 10 YEAR STORM EVENT

Pit Name (-)	Pit Type (-)	Setout Easting * (m)	Setout Northing * (m)	Setout RL (m)	Grate RL (m)	Road Name (-)	Road Chainage (m)	Catch ID (-)	Time Tc (min)	Intensity I (mm/hr)	Runoff C (-)	Area A (ha)	Full CA (ha)	Full Sum CA (ha)	Full Qc=CIA (L/s)	Partial CA (ha)	Partial Sum CA (ha)	Partial Qc=CIA (L/s)	Catchment Flow Qc (L/s)	Approach Flow Qa (L/s)	Road Capacity (L/s)	Flooded Depth (m)	Flooded Width (m)	Flooded Vel.Dep (sq.m/s)	Road Grade (%)	Road Xfall (%)	Max Pond Depth (m)	Inlet Flow Qg (L/s)	Bypass Flow Qb (L/s)	Bypass Pit (-)
1\1	900x900 G.S.I.P.	368905.23	6356950.12	40.73	40.73			1P	6	149	0.43	0.0854	0.0365	0.7286	301.5	0.0365	0.7286	301.5	301.5	301.5								301.5		1\2
								1I	6	149	0.9	0.769	0.6921			0.6921														
1\2	G.G.P. 3.0m E.K.I. SAG	368914.04	6356945.38	40.36	40.36	ROAD No 1	58.48	1P	6	149	0.43	0.0079	0.0034	0.0677	28	0.0034	0.0677	28	28	28	510.1	0.031					0.18	28		1\3
								1I	6	149	0.9	0.0714	0.0643			0.0643														
1\3	G.G.P. 3.0m E.K.I. SAG	368934.66	6356934.75	40.22	40.22	ROAD No 1	58.48	1P	6	149	0.43	0.0109	0.0046	0.0927	38.4	0.0046	0.0927	38.4	38.4	38.4	488.4	0.038					0.175	38.4		LOST
								1I	6	149	0.9	0.0979	0.0881			0.0881														
1\4	900x900 J.P.	368946.03	6356913.57	37.88	37.88																									-
1\5	900x900 J.P.	368984.71	6356893.66	34.93	34.93																									-
1\6	900x900 J.P.	369034	6356868.96	31.38	31.38																									-
1\7	900x900 J.P.	369044.86	6356873.83	30.76	30.76																									-
1\8	900x900 J.P.	369052.36	6356898.72	28.64	28.64																									-
1\9	900x900 J.P.	369056.88	6356913.72	26.96	26.96																									-
1\10	G.G.P. 1.2m E.K.I.	369063.89	6356916.49	26.07	26.07																									-
2\1	900x900 G.S.I.P.	368957.92	6357015.41	42.53	42.53	ROAD No 1	140.87	1P	6	149	0.43	0.0013	0.0005	0.0109	4.5	0.0005	0.0109	4.5	4.5	4.5					48.8			4.5		2\2
								1I	6	149	0.9	0.0115	0.0103			0.0103														
2\2	G.G.P. 1.8m E.K.I.	368963.91	6357001.77	42	42	ROAD No 1	130.91	1P	6	149	0.43	0.0066	0.0028	0.0561	23.2	0.0028	0.0561	23.2	23.2	24.7					1.8	1.9		24.3	0.4	2\3
								1I	6	149	0.9	0.0592	0.0533			0.0533														
2\3	G.G.P. 1.8m E.K.I.	368953.62	6356981.37	41.43	41.43	ROAD No 1	108.6	1P	6	149	0.43	0.0031	0.0013	0.0261	10.8	0.0013	0.0261	10.8	10.8	11.2	2110.8	0.05	0.79	0.04	2.5	3		11.2		2\4
								1I	6	149	0.9	0.0275	0.0248			0.0248														
2\4	G.G.P. 1.8m E.K.I.	368946.81	6356958.33	40.71	40.71	ROAD No 1	85	1P	6	149	0.43	0.0032	0.0014	0.027	11.2	0.0014	0.027	11.2	11.2	11.2	2077	0.05	0.78	0.04	2.5	3		11.2		1\3
								1I	6	149	0.9	0.0285	0.0256			0.0256														
3\1	G.G.P. 1.8m E.K.I.	368959.87	6357059.46	42.7	42.7	ROAD No 1	184.81	1P	6	149	0.43	0.0103	0.0044	0.0878	36.3	0.0044	0.0878	36.3	36.3	36.3	4779.8	0.081	1.85	0.05	1	3		34	2.4	3\2
								1I	6	149	0.9	0.0927	0.0834			0.0834														
3\2	G.G.P. 1.8m E.K.I.	368952.89	6357040.05	42.48	42.48	ROAD No 1	164.54	1P	6	149	0.43	0.0035	0.0015	0.0298	12.3	0.0015	0.0298	12.3	12.3	14.7	1146.6	0.06	1.58	0.03	1.2	2.1		14.7		3\3
								1I	6	149	0.9	0.0314	0.0283			0.0283														
3\3	G.G.P. 1.8m E.K.I.	368942.03	6357017.79	42.16	42.16	ROAD No 1	137.32	1P	6	149	0.43	0.0026	0.0011	0.0462	19.1	0.0011	0.0462	19.1	19.1	19.1	9050.2	0.062	1.53	0.04	1.7	0.9		19.1		3\4
								1I	6	149	0.9	0.0501	0.0451			0.0451														
3\4	G.G.P. 1.8m E.K.I.	368942.81	6357001.24	41.78	41.78	ROAD No 1	121.31	1P	6	149	0.43	0.0027	0.0011	0.0227	9.4	0.0011	0.0227	9.4	9.4	9.4	7986	0.047	0.67	0.03	2.3	2.4		9.4		3\5
								1I	6	149	0.9	0.024	0.0216			0.0216														
3\5	G.G.P. 1.8m E.K.I.	368934.43	6356984.96	41.29	41.29	ROAD No 1	103	1P	6	149	0.43	0.0036	0.0015	0.0306	12.7	0.0015	0.0306	12.7	12.7	12.7	11665.4	0.052	0.86	0.04	2.5	3		12.7		3\6
								1I	6	149	0.9	0.0323	0.0291			0.0291														
3\6	G.G.P. 1.8m E.K.I.	368924.81	6356966.29	40.77	40.77	ROAD No 1	82	1P	6	149	0.43	0.0042	0.0018	0.0361	14.9	0.0018	0.0361	14.9	14.9	14.9	2968.4	0.055	0.95	0.04	2.5	3		14.9		1\2
								1I	6	149	0.9	0.0381	0.0343			0.0343														
4\1	G.G.P. 1.8m E.K.I.	368974.24	6357044.19	42.5	42.5	ROAD No 1	172	1P	6	149	0.43	0.0092	0.0039	0.0788	32.6	0.0039	0.0788	32.6	32.6	32.6	1307.3	0.079	1.76	0.05	1	3		31.1	1.5	2\2
								1I	6	149	0.9	0.0831	0.0748			0.0748														
5\1	900x900 G.S.I.P.	369052.09	6356915.16	27.92	27.92			1P	6	149	0.43	0.0698	0.0298	0.5952	246.3	0.0298	0.5952	246.3	246.3	246.3								246.3		-
								1I	6	149	0.9	0.6282	0.5654			0.5654														
6\1	G.G.P. 1.8m E.K.I.	368982.58	6357192.42	43.84	43.84	ROAD No 1	318.83	1P	6	149	0.43	0.002	0.0008	0.0168	6.9	0.0008	0.0168	6.9	6.9	6.9	3508.1	0.049	0.76	0.02	1	2.9		6.9		7\1
								1I	6	149	0.9	0.0177	0.0159			0.0159														
6\2	G.G.P. 1.8m E.K.I.	368998.58	6357181.01	43.61	43.61	ROAD No 1	311.92	1P	6	149	0.43	0.0026	0.0011	0.0219	9.1	0.0011	0.0219	9.1	9.1	9.1	2210.6	0.049	0.77	0.03	1.6	3		9.1		6\3
								1I	6	149	0.9	0.0232	0.0208			0.0208														
6\3	G.G.P. 1.8m E.K.I.	369010.96	6357163.93	42.08	42.08	ROAD No 11	26.95	1P	6	149	0.43	0.0027	0.0011	0.0228	9.4	0.0011	0.0228	9.4	9.4	9.4	5001	0.035	0.4	0.05	9	3		9.4		6\4
								1I	6	149	0.9	0.0241	0.0217			0.0217														
6\4	G.G.P. 1.8m E.K.I.	369079.22	6357153.23	32.5	32.5	ROAD No 11	96	1P	6	149	0.43	0.0065	0.0028	0.0558	23.1	0.0028	0.0558	23.1	23.1	23.1	1153.2	0.048	0.74	0.08	13.1	3		23.1		LOST
								1I	6	149	0.9	0.0588	0.053			0.053														
6\5	G.G.P. 3.0m E.K.I.	369089.21	6357143.47	31.09	31.09	ROAD No 11	107.42	1P	6	149	0.43	0.0139	0.0059	0.1189	49.2	0.0059	0.1189	49.2	49.2	49.2	1502.7	0.065	1.06	0.12	11.7	3		48.9	0.3	LOST
								1I	6	149	0.9	0.1255	0.113			0.113														
6\6	G.G.P. 1.8m E.K.I.	369098.51	6357131.62	29.16	29.16																									-
7\1	G.G.P. 2.4m E.K.I. SAG	368959.63	6357181.13	42.65	42.65	ROAD No 2	28.25	1P	6	149	0.43	0.0259	0.011	0.2207	91.4	0.011	0.2207	91.4	91.4	91.4	326.7	0.069					0.15	91.4		7\2
								1I	6	149	0.9	0.233	0.2097			0.2097														
7\2	G.G.P. 2.4m E.K.I. SAG	368956.31	6357158.97	42.94	42.94	ROAD No 2	25.77	1P	6	149	0.43	0.0135	0.0058	0.1149	47.6	0.0058	0.1149	47.6	47.6	47.6	47.4	0.047					0.047	47.4	0.2	7\3
								1I	6	149	0.9	0.1213	0.1092			0.1092														
7/2B	600x600 J.P.	368967.25	6357151.61	43.16	43.16																									-
7\3	G.G.P. 2.4m E.K.I. SAG	368972.57	6357138.92	42.99	42.99	ROAD No 1	265.28	1P	6	149	0.43	0.0151	0.0064	0.1289	53.3	0.0064	0.1289	53.3	53.3	53.5	326.7	0.051					0.15	53.5		7\4
								1I	6	149	0.9	0.136	0.1224			0.1224														
7\4	SF1	368982.49	6357137.34	43.15	43.15	ROAD No 1	265.28	1P	6	149	0.43	0.0011	0.0005	0.0094	3.9	0.0005	0.0094	3.9	3.9	3.9	27	0.019					0.1	3.9		7\5
								1I	6	149	0.9	0.0099	0.0089			0.0089														
7\5	G.G.P. 2.4m E.K.I. SAG	368990.94	6357135.99	42.85	43.03	ROAD No 1	265.28	1P	6	149	0.43	0.0049	0.0021	0.042	17.4	0.0021	0.042	17.4	17.4	17.4	326.7	0.026					0.15	17.4		6\5
								1I	6	149	0.9	0.0443	0.0399			0.0399														
7/5B	600x600 J.P.	368997.53	6357149.09	43.1	43.1																									-
8\1	900x900 G.S.I.P.	369033.94	6357311.49	42.32	42.32	ROAD No 9	42.71	1P	6	149	0.43	0.0905	0.0386	0.7712	319.2	0.0386	0.7712	319.2	319.2	319.2					4.6	3		319.2		8\2
								1I	6	149	0.9	0.8141	0.7327			0.7327														
8\2	G.G.P. 1.8m E.K.I.	369050.61	6357289.65	41.04	41.04	ROAD No 9	17.35	1P	6	149	0.43	0.0054	0.0023	0.0461	19.1	0.0023	0.0461	19.1	19.1	19.1	2025.1	0.053	0.89	0.06	5	3		19.1		8\3
								1I	6	149	0.9	0.0487	0.0438			0.0438														
8\3	G.G.P. 1.8m E.K.I.	369066.34	6357284.77	39.56	39.56	ROAD No 1	441.91	1P	6	149	0.43	0.0058	0.0025	0.0494	20.5	0.0025	0.0494	20.5	20.5	23.8	926	0.05	1.35	0.05	6.7	3		23.6	0.1	8\4
								1I	6	149	0.9	0.0522	0.047			0.047														
8\4	G.G.P. 1.8m E.K.I.	369083.56	6357291.24	38.29	38.29	ROAD No 1	460	1P	6	149	0.43	0.0139	0.0059	0.1189	49.2	0.0059	0.1189	49.2	49.2	49.4	2346.7	0.067	1.38	0.1	7	3		45.2	4.1	8\5
								1I	6	149	0.9	0.1255	0.1129			0.1129														
8\5	G.G.P. 1.8m E.K.I.	369102.33	6357298.12	37	37	ROAD No 1	480	1P	6	149	0.43	0.0108	0.0046	0.0921	38.1	0.0046	0.0921	38.1	38.1	42.3	2063.8	0.067	1.36	0.08	5.4	3		39.4	2.8	8\6
								1I	6	149	0.9	0.0972	0.0875			0.0875														
8\6	G.G.P. 1.8m E.K.I.	369119.94	6357304.57	36.33	36.33	ROAD No 1	498.75	1P	6	149	0.43	0.0103	0.0044	0.0877	36.3	0.0044	0.0877	36.3	36.3	39.2	1317.3	0.075	1.62	0.06	2.3	3		36.1	3	8\7
								1I	6	149	0.9	0.0926	0.0834			0.0834														
8\7	G.G.P. 3.0m E.K.I. SAG	369132	6357308.99	36.2	36.2	ROAD No 1	511.6	1P	6	149	0.43	0.0192	0.0082	0.1633	67.6	0.0082	0.1633	67.6	67.6	72.3	302.4	0.054					0.129	72.3		LOST
								1I	6	149	0.9	0.1724	0.1552			0.1552														
8\8	G.G.P. 3.0m E.K.I. SAG	369135.93	6357297.55	36.2	36.2	ROAD No 1	511.35	1P	6	149	0.43	0.0249	0.0106	0.2125	88	0.0106	0.2125	88	88	91.2	382.6	0.062					0.15	91.2		LOST
								1I	6	149	0.9	0.2243	0.2019			0.2019														
8\9	G.G.P. 1.8m E.K.I.	369149.57	6357264.63	31.27	32.45																									-
9\1	G.G.P. 1.8m E.K.I.	369064.36	6357270.09	40.1	40.1	ROAD No 1	433.98	1P	6	149	0.43	0.013	0.0055	0.1109	45.9	0.0055	0.1109	45.9	45.9	45.9	3388.8	0.066	1.24	0.1	7.3	3		42.7	3.2	8\8
								1I	6	149	0.9	0.1171	0.1054			0.1054														
10\1	G.G.P. 1.8m E.K.I.	369036.87	6357268.22	41.72	41.72	ROAD No 1	409.46	1P	6	149	0.43	0.0125	0.0053	0.1062	44	0.0053	0.1062	44	44	44	10911.8	0.067	1.38	0.09	5.4	2.5		40.6	3.3	8\3
								1I	6	149	0.9	0.1121	0.1009			0.1009														
10\2	G.G.P. 2.4m E.K.I. SAG	369040.15	6357283.53	41.09	41.09	ROAD No 9	16.74	1P	6	149	0.43	0.01	0.0043	0.0857	35.5	0.0043	0.0857	35.5	35.5	35.5	52.4	0.041					0.05	35.5		8\3
								1I	6	149	0.9	0.0904	0.0814			0.0814														
11\1	900x900 G.S.I.P.	369030.64	6357277.65	42.67	42.67			1P	6	149	0.43	0.0159	0.0068	0.1355	56.1	0.0068	0.1355	56.1	56.1	56.1								56.1		10\2
								1I	6	149	0.9	0.143	0.1287			0.1287														
12\1	900x900 G.S.I.P.	368865.43	6357228.23	43.11	43.11			1P	6	149	0.43	0.0169	0.0072	0.1444	59.8	0.0072	0.1444	59.8	59.8	59.8								59.8		12\2
								1I	6	149	0.9	0.1525	0.1372			0.1372														
12\2	G.G.P. 1.8m E.K.I.	368854.16	6357221.49	41.55	41.55	ROAD No 2	144	1P	6	149	0.43	0.0124	0.0053	0.106	43.9	0.0053	0.106	43.9	43.9	43.9	1909	0.037	0.44	0.2	4.6	3		39.8	4	14\2
								1I	6	149	0.9	0.1119	0.1007			0.1007														
12\3	G.G.P. 1.8m E.K.I.	368842.43	6357213.89	41.2	41.2	ROAD No 2	151	1P	6	149	0.43	0.0118	0.005	0.1004	41.6	0.005	0.1004	41.6	41.6	41.6	22	0.01	2.91	0.03	5	3		38.9	2.6	12\4
								1I	6	149	0.9	0.106	0.0954			0.0954														
12\4	G.G.P. 1.8m E.K.I.	368813.03	6357228.87	39.16	39.16	ROAD No 2	184	1P	6	149	0.43	0.0086	0.0037	0.0731	30.2	0.0037	0.0731	30.2	30.2	32.9	2396.1	0.059	1.11	0.08	7	3		32.2	0.7	12\5
								1I	6	149	0.9	0.0771	0.0694			0.0694														
12\5	G.G.P. 1.8m E.K.I.	368784.52	6357243.41	36.92	36.92	ROAD No 2	216	1P	6	149	0.43	0.0087	0.0037	0.0741	30.7	0.0037	0.0741	30.7	30.7	31.3	9357.6	0.059	1.08	0.08	7	3		30.9	0.4	12\6
								1I	6	149	0.9	0.0782	0.0704			0.0704														
12\6	G.G.P. 2.4m E.K.I. SAG	368763.39	6357252.15	35.82	35.82	ROAD No 2	238.8	1P	6	149	0.43	0.0105	0.0045	0.0897	37.1	0.0045	0.0897	37.1	37.1	37.6	343.6	0.042					0.155	37.6		12\7
								1I	6	149	0.9	0.0947	0.0852			0.0852														
12\7	G.G.P. 1.8m E.K.I.	368768.6	6357269	35.81	35.81	ROAD No 2	241.8	1P	6	149	0.43	0.0054	0.0023	0.0457	18.9	0.0023	0.0457	18.9	18.9	20.9					1.8	1.6		20.8	0.1	12\8
								1I	6	149	0.9	0.0482	0.0434			0.0434														
12\8	G.G.P. 1.8m E.K.I.	368764.54	6357286.65	35.33	35.33	ROAD No 3	24.08	1P	6	149	0.43	0.0036	0.0015	0.0309	12.8	0.0015	0.0309	12.8	12.8	12.8	2506.3	0.051	0.99	0.04	3	1.1		12.8		12\9
								1I	6	149	0.9	0.0326	0.0293			0.0293														
12\9	G.G.P. 1.8m E.K.I.	368774.32	6357306.49	34.92	34.92	ROAD No 3	46.25	1P	6	149	0.43	0.0037	0.0016	0.0314	13	0.0016	0.0314	13	13	13	4815	0.017	0.44	0.06	1.3	3		13		12\10
								1I	6	149	0.9	0.0331	0.0298			0.0298														
12\10	G.G.P. 1.8m E.K.I.	368785.49	6357315.11	34.67	34.67	ROAD No 3	61	1P	6	149	0.43	0.002	0.0009	0.0174	7.2	0.0009	0.0174	7.2	7.2	7.2	1011.6	0.048	0.73	0.02	1.3	3		7.2		LOST
								1I	6	149	0.9	0.0184	0.0165			0.0165														
12\11	H.W.	368785.15	6357340.05	33.75	33.75																									-
13\1	900x900 G.S.I.P.	368837.16	6357203.41	43.66	42.64			1P	6	149	0.43	0.0105	0.0045	0.0892	36.9	0.0045	0.0892	36.9	36.9	36.9								36.9		12\3
								1I	6	149	0.9	0.0942	0.0847			0.0847														
14\1	900x900 G.S.I.P.	368807.57	6357257.71	39.14	39.14			1P	6	149	0.43	0.0163	0.0069	0.1386	57.3	0.0069	0.1386	57.3	57.3	57.3								57.3		14\2
								1I	6	149	0.9	0.1463	0.1316			0.1316														
14\2	G.G.P. 1.8m E.K.I.	368796.25	6357251.01	37.41	37.41	ROAD No 2	209	1P	6	149	0.43	0.0105	0.0045	0.0891	36.9	0.0045	0.0891	36.9	36.9	40.9	9384.3	0.063	1.25	0.09	7	3		39	1.9	12\7
								1I	6	149	0.9	0.0941	0.0847			0.0847														

NOTE:

REFER TO SETOUT DETAIL.

FOR CONTINUATION REFER TO DRAWING No.508

NOTE:

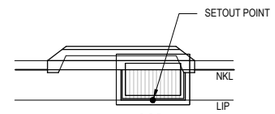
ALL DRAINAGE PITS TO BE TO COUNCIL STANDARDS UNLESS OTHERWISE SPECIFIED.

NOTES:

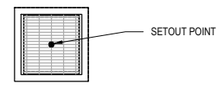
1. MODELLED USING 12d - RATIONAL METHOD
2. COLEBROOK WHITE ROUGHNESS FACTOR
   RC PIPES - 0.6mm
   PVC PIPES - 0.06mm
3. RRJ2 DENOTES RUBBER RING JOINT CLASS 2 PIPE ALL PVC PIPE TO BE CLASS SH OR EQUIVALENT.
4. THE PRESSURE CHANGE COEFFICIENT 'K' HAS BEEN DETERMINED DETERMINED USING MISSOURI CHARTS AND HARE'S EQUATIONS.
5. PITS DEEPER THAN 1.8m TO BE CONCRETE REINFORCED, REFER LAKE MACQUARIE CITY COUNCIL STD.
6. PITS DEEPER THAN 3.0m ARE STRUCTURALY DESIGNED.
7. STEP IRONS SHALL BE PROVIDED IN ALL PITS DEEPER THAN 1.2m
8. CONCRETE 32MPa COMPRESSIVE STRENGTH AT 28 DAYS.
9. PIT BLOCKAGE FACTORS FOR 100YR ARI
   PITS ON GRADE - 20%
   PITS IN SAG - 50%
10. ALL SETOUT COORDINATES FOR ROAD DRAINAGE (LINTELS) ARE RELATIVE TO A POINT ON THE LIP OF GUTTER ADJACENT TO THE CENTRE OF THE GRATE.
11. ALL SETOUT COORDINATES FOR IAD PITS ARE RELATIVE TO THE CENTRE OF THE GRATE.

PIT TYPE:

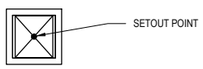
G.G.P.	GRATED GULLY PIT
G.S.I.P.	GRATED SURFACE INLET PIT
J.P.	JUNCTION PIT
H.W.	HEADWALL
D.C.	DIRECT CONNECTION
S.P.	SUMP PIT
BEND	BEND IN LINE
GPT	GROSS POLLUTANT TRAP
S.J.	SLOPE JUNCTION



G.G.P.



G.S.I.P.



JUNCTION PIT

PIT SETOUT POINT LOCATIONS

N.T.S.

FOR CONSTRUCTION CERTIFICATE

Revisions						
00	AW	DD	CB	TT	12/04/13	ISSUED FOR 80% REVIEW
01	AW	DD	CB	SG	2/10/13	ISSUED FOR CONSTRUCTION CERTIFICATE
02	VP	JP	SG		16/07/14	ISSUED WITH COUNCIL AMENDMENTS
03	BL	BL	PF	SAG	25/05/15	UPDATED TO COUNCIL COMMENTS
04	BL	BL	PF	SAG	5/08/15	NOTE ADDED TO RIGID PAVEMENT PLAN REGARDING SURFACE FINISH
05	BL	BL	PF		02/09/15	UPDATED TO REFLECT COMMENTS BY GEOTECHNICAL ENGINEER
First Issue	AW	DD	CB	TT	12/04/13	Revision Details
	Drawn	Design	Check	Appd.	Date	

Approval:
BY: STUART GREEN
FIEAust. CPEng.
Manager - Urban Development
SIGN:
DATE:

Client: HAMMERSMITH MANAGEMENT PTY LTD

Project: CAMERON GROVE - LINK ROAD
ROAD & DRAINAGE DESIGN

BROWN Smart Consulting

Drawing Title: DRAINAGE CALCULATIONS
SHEET 01 OF 02

Project No.:	Stage:	Milestone:	Dwg No.:	Revision:
L05016.014		CC	507	05

12D MODEL - HYDROLOGICAL DESIGN SHEET (cont.)

MINOR 10 YEAR STORM EVENT

FOR CONTINUATION REFER TO DRAWING No.507

Pit Name (-)	Pit Type (-)	Setout Easting * (m)	Setout Northing * (m)	Setout RL (m)	Grate RL (m)	Road Name (-)	Road Chainage (m)	Catch ID (-)	Time Tc (min)	Intensity I (mm/hr)	Runoff C (-)	Area A (ha)	Full CA (ha)	Full Sum CA (ha)	Full Qc=CIA (L/s)	Partial CA (ha)	Partial Sum CA (ha)	Partial Qc=CIA (L/s)	Catchment Flow Qc (L/s)	Approach Flow Qa (L/s)	Road Capacity (L/s)	Flooded Depth (m)	Flooded Width (m)	Flooded Vel.Dep (sq.m/s)	Road Grade (%)	Road Xfall (%)	Max Pond Depth (m)	Inlet Flow Qg (L/s)	Bypass Flow Qb (L/s)	Bypass Pit (-)
15\1	900x900 G.S.I.P.	368748.71	6357238.76	36.38	36.38			1P	6	149	0.43	0.0035	0.0015	0.0296	12.2	0.0015	0.0296	12.2	12.2	12.2									12.2		15\2
								1I	6	149	0.9	0.0312	0.0281			0.0281														
15\2	G.G.P. 1.8m E.K.I.	368742.38	6357249.15	36.22	36.22	Car Park Access No 2	18.91	1P	6	149	0.43	0.0058	0.0025	0.0494	20.5	0.0025	0.0494	20.5	20.5	20.5	332.1	0.058	2.57	0.03	2	1.6		20.5		15\3
								1I	6	149	0.9	0.0522	0.047			0.047														
15\3	G.G.P. 1.8m E.K.I.	368753.74	6357252.91	35.97	35.97	ROAD No 2	247.74	1P	6	149	0.43	0.002	0.0008	0.0167	6.9	0.0008	0.0167	6.9	6.9	6.9	629.5	0.046	1.21	0.02	2	1.3		6.9		12\6
								1I	6	149	0.9	0.0176	0.0159			0.0159														
16\1	900x900 G.S.I.P.	368748.83	6357273.11	36.13	36.13	ROAD No 3	4.22	1P	6	149	0.43	0.0015	0.0007	0.0131	5.4	0.0007	0.0131	5.4	5.4	5.4					2.1			5.4		16\2
								1I	6	149	0.9	0.0139	0.0125			0.0125														
16\2	G.G.P. 1.8m E.K.I.	368746.67	6357287.96	35.44	35.44	ROAD No 3	15.8	1P	6	149	0.43	0.0082	0.0035	0.0699	28.9	0.0035	0.0699	28.9	28.9	28.9					1	1.7		28.1	0.8	16\3
								1I	6	149	0.9	0.0738	0.0664			0.0664														
16\3	G.G.P. 1.8m E.K.I.	368769.41	6357310.16	34.92	34.92	ROAD No 3	46.39	1P	6	149	0.43	0.0047	0.002	0.0401	16.6	0.002	0.0401	16.6	16.6	17.4	211.6	0.063	1.23	0.04	1.5	2.9		17.4		LOST
								1I	6	149	0.9	0.0424	0.0381			0.0381														
17\1	900x900 G.S.I.P.	368783.22	6357294.77	36.37	36.37			1P	6	149	0.43	0.0092	0.0039	0.0783	32.4	0.0039	0.0783	32.4	32.4	32.4								32.4		12\9
								1I	6	149	0.9	0.0827	0.0744			0.0744														
18\1	G.G.P. 3.0m E.K.I.	369233.09	6357346.26	42.8	42.8	ROAD No 1	619.69	1P	6	149	0.43	0.0109	0.0046	0.0928	38.4	0.0046	0.0928	38.4	38.4	38.4					4.6	3		38.4		18\2
								1I	6	149	0.9	0.098	0.0882			0.0882														
18\2	G.G.P. 4.2m E.K.I.	369199.69	6357333.74	40.27	40.27	ROAD No 1	583.66	1P	6	149	0.43	0.0195	0.0083	0.1663	68.8	0.0083	0.1663	68.8	68.8	68.8					9.3	3		68.4	0.4	18\3
								1I	6	149	0.9	0.1755	0.1579			0.1579														
18\3	G.G.P. 4.2m E.K.I.	369171.5	6357323.47	37.66	37.66	ROAD No 1	553.67	1P	6	149	0.43	0.0108	0.0046	0.0922	38.2	0.0046	0.0922	38.2	38.2	38.6					7	3		38.6		18\4
								1I	6	149	0.9	0.0974	0.0876			0.0876														
18\4	G.G.P. 3.0m E.K.I.	369145.36	6357313.89	36.37	36.37	ROAD No 1	525.83	1P	6	149	0.43	0.0176	0.0075	0.1498	62	0.0075	0.1498	62	62	62					2.5	3		60.3	1.7	8\7
								1I	6	149	0.9	0.1581	0.1423			0.1423														
19\1	900x900 G.S.I.P.	368940.51	6357036.68	42.55	42.55	Car Park Access No 1	24.66	1P	6	149	0.43	0.0155	0.0066	0.1322	54.7	0.0066	0.1322	54.7	54.7	54.7								54.7		-
								1I	6	149	0.9	0.1395	0.1256			0.1256														
19\2	900x900 G.S.I.P.	368936.36	6357027.46	42.47	42.47	Car Park Access No 1	24.17	1P	6	149	0.43	0.001	0.0004	0.0087	3.6	0.0004	0.0087	3.6	3.6	3.6								3.6		-
								1I	6	149	0.9	0.0091	0.0082			0.0082														

NOTE:
ALL DRAINAGE PITS TO BE TO COUNCIL STANDARDS UNLESS OTHERWISE SPECIFIED.

12D MODEL - HYDRAULICS DESIGN SHEET

MINOR 10 YEAR STORM EVENT

Pipe ID (-)	Pipe Type (-)	Pipe Length (m)	Pipe Size (mm)	Full Pipe Area Af (sq.m)	Pipe Grade (%)	Pipe Grade (1 in)	Full-area Tct (min)	Full-area I (mm/hr)	Full-area Sum CA (ha)	Full-area Qc=CIA (L/s)	Part-area Tct (min)	Part-area I (mm/hr)	Part-area Sum CA (ha)	Part-area Qc=CIA (L/s)	Peak Flow Qrat (L/s)	Net Bypass Flow Qb (L/s)	Pipe Flow Q (L/s)	Capacity Flow Qcap (L/s)	Q/Qcap Ratio (-)	Full Pipe Vel Vf=Q/Af (m/s)	Norm Depth Vel Vn=Q/An (m/s)	Crit Depth Vel Vc=Q/Ac (m/s)	Capacity Vel Vcap=Qcap/Af (m/s)	US Pit Grate RL (m)	Pipe US IL (m)	Pipe DS IL (m)	DS Pit Grate RL (m)	Cover Limit (m)	Cover Min (m)	Pipe DS Bend (deg)	Pipe DS Drop (m)	US Pit Ku (-)	US Pit Kw (-)	Pipe V head (m)	P head Loss (Ku.V head) (m)	WSE Loss (Kw.V head) (m)	Pipe T head Loss (m)	US Pit HGL (m)	Pipe US HGL (m)	Pipe DS HGL (m)	DS Pit HGL (m)	HGL Grade (%)	HGL Grade (1 in)	F board US (m)
1\1 to 1\2	RR12	9.52	450	0.159	1	100	6	149	0.7286	301.5	6	149	0.7286	301.5	301.5	-1.5	301.5	323	0.93	1.9	2.29	2.09	2.03	40.73	38.57	38.48	40.36	1.2	1.2	-1.1	0.075	4.5		0.18	0.83			0.08	40.03	39.2	39.12	39.1	0.87	11.46	0.7	
1\2 to 1\3	RR12	24.16	525	0.216	3.84	26	7.06	140.55	1.269	495.5	6.08	148.21	1.2122	499	499	-1.5	497.5	952.3	0.52	2.3	4.44	2.45	4.4	40.36	38.4	37.48	40.22	1	1.42	35.2	0.05	0.71		0.27	0.19			0.68	39.12	38.98	38.25	38.25	2.81	35.6	1.24	
1\3 to 1\4	RR12	23.65	525	0.216	6.12	16.3	7.26	138.94	1.4818	571.9	6.86	141.84	1.4659	577.6	577.6		577.6	1203.3	0.48	2.67	5.5	2.76	5.56	40.22	37.43	35.98	37.88	1.2	0.77	-35.2	0.075	0.82		0.36	0.3			1.42	38.25	37.95	36.54	36.54	5.99	16.7	1.97	
1\4 to 1\5	RR12	43.5	600	0.283	6	16.7	7.45	137.37	1.4818	565.4	6.93	141.42	1.4578	572.7	572.7		572.7	1691.3	0.34	2.03	5.43	2.3	5.98	37.88	35.9	33.29	34.93	1	1.03	-0.6	0.05	0.15		0.21	0.03			2.62	36.54	36.5	33.88	33.88	6.02	16.6	1.35	
1\5 to 1\6	RR12	55.13	600	0.283	6.71	14.9	7.82	134.47	1.4818	553.5	7.13	139.94	1.4463	562.2	562.2		562.2	1789.2	0.31	1.99	5.63	2.28	6.33	34.93	33.24	29.54	31.38	1	1.01	-50.7	0.05	0.2		0.2	0.04			3.59	33.88	33.84	30.25	30.26	6.55	15.3	1.05	
1\6 to 1\7	RR12	11.91	600	0.283	7.5	13.3	8.28	131.34	1.4818	540.6	7.44	137.48	1.4336	547.5	547.5		547.5	1891.4	0.29	1.94	5.83	2.24	6.69	31.38	29.49	28.6	30.76	1	0.79	-49.1	0.05	0.82	0.85	0.19	0.16	0.16		0.8	30.26	30.09	29.29	29.3	6.72	14.9	1.12	
1\7 to 1\8	RR12	26	600	0.283	7.5	13.3	8.38	130.75	1.4818	538.2	7.54	136.68	1.4336	544.3	544.3		544.3	1891.4	0.29	1.93	5.82	2.24	6.69	30.76	28.55	26.6	28.64	1	1.44	0	0.05	0.76	0.77	0.19	0.14	0.15		1.96	29.3	29.15	27.19	27.19	7.55	13.2	1.47	
1\8 to 1\9	RR12	15.66	600	0.283	7.5	13.3	8.59	129.45	1.4818	532.8	7.76	134.95	1.4336	537.4	537.4		537.4	1891.4	0.28	1.9	5.8	2.22	6.69	28.64	26.55	25.38	26.96	1	0.98	51.3	0.909	0.2		0.18	0.04			0.03	27.19	27.15	25.59	25.58	9.94	10.1	1.46	
1\9 to 1\10	RR12	7.3	750	0.442	4	25	8.72	128.67	2.077	742.3	7.75	135.03	2.0156	756	756		756	2477.5	0.31	1.71	4.96	2.22	5.61	26.96	24.47	24.18	26.07	1	1.12	0		1.67	1.9	0.15	0.25	0.28		0.03	25.58	25.29	25.27	25.27	0.38	265.3	1.38	
2\1 to 2\2	RR12	14.69	375	0.11	4.95	20.2	6	149	0.0109	4.5	6	149	0.0109	4.5	4.5		4.5	446.6	0.01	0.04	1.33	0.56	4.04	42.53	41.07	40.34	42	1	1	48.8	0.05	4.5		0	0			0.77	41.44	41.44	40.67	40.67	5.27	19	1.09	
2\2 to 2\3	RR12	22.77	375	0.11	1.7	58.9	6.12	147.78	0.067	27.5	6	149	0.0668	27.6	27.6	1.1	28.7	261	0.11	0.26	1.57	0.93	2.36	42	40.29	39.91	41.43	1	1.13	-10.2	0.05	0.65		0	0			0.43	40.67	40.67	40.24	40.24	1.88	53.3	1.33	
2\3 to 2\4	RR12	24.03	375	0.11	2.75	36.3	6.31	145.88	0.0991	37.7	6.19	147.1	0.0929	37.9	37.9	1.5	39.5	332.7	0.12	0.36	2.05	1.02	3.01	41.43	39.86	39.19	40.71	1	1.12	10.7	0.05	1.44		0.01	0.01			0.7	40.24	40.23	39.53	39.53	2.91	34.4	1.19	
2\4 to 2\3	RR12	26.52	375	0.11	1	100	6.51	143.93	0.1201	48	6.39	145.1	0.1199	48.3	48.3	1.5	49.8	199.9	0.25	0.45	1.51	1.1	1.81	40.71	39.14	38.88	40.22	1	1	-54.8	1.453	1.22		0.01	0.01			0.41	39.53	39.52	39.01	38.25	1.93	51.7	1.18	
3\1 to 3\2	RR12	20.46	375	0.11	1.69	59.1	6	149	0.0878	36.3	6	149	0.0878	36.3	36.3	-2.4	34	260.4	0.13	0.31	1.65	0.98	2.36	42.7	41.24	40.89	42.48	1.2	1.2	6.1	0.05	4.5		0	0.02			0.36	41.64	41.62	41.25	41.25	1.78	56.1	1.07	
3\2 to 3\3	RR12	25.06	375	0.11	1	100	6.19	147.12	0.1963	80.2	6.17	147.3	0.1961	80.2	80.2	-1.5	78.7	199.9	0.39	0.71	1.71	1.27	1.81	42.48	40.84	40.59	42.16	1	1.16	-28.6	0.15	1.21		0.03	0.03			0.23	41.25	41.22	40.99	40.99	0.91	110.5	1.23	
3\3 to 3\4	RR12	16.4	525	0.216	1.57	63.6	6.4	145.04	0.3834	154.5	6.38	145.21	0.3831	154.5	154.5	-1.5	153	608.4	0.25	0.71	2.36	1.42	2.81	42.16	40.44	40.19	41.78	1	1.19	30	0.05	0.99		0.03	0.02			0.29	40.99	40.97	40.68	40.68	1.76	56.7	1.17	
3\4 to 3\5	RR12	18.2	525	0.216	3.39	29.5	6.53	143.8	0.4061	162.2	6.52	143.9	0.4059	162.2	162.2	-1.5	160.7	894.3	0.18	0.74	3.16	1.44	4.13	41.78	40.14	39.52	41.29	1.2	1.2	0	0.05	0.66		0.03	0.02			0.65	40.68	40.66	40.01	40.01	3.57	28	1.1	
3\5 to 3\6	RR12	21	525	0.216	1.49	66.9	6.68	142.89	0.4367	173.3	6.67	142.99	0.4365	173.4	173.4	-1.5	171.9	593	0.29	0.79	2.39	1.48	2.74	41.29	39.47	39.16	40.77	1	1.06	0.1	0.05	0.55		0.03	0.02			0.34	40.01	39.99	39.65	39.65	1.63	61.3	1.28	
3\6 to 1\2	RR12	23.52	525	0.216	1	100	6.86	141.84	0.4728	186.3	6.84	141.94	0.4726	186.3	186.3	-1.5	184.8	484.5	0.38	0.85	2.09	1.51	2.24	40.77	39.11	38.87	40.36	1	1	-90.1	0.466	0.58		0.04	0.02			0.38	39.65	39.63	39.12	39.12	2.17	46.1	1.12	
4\1 to 3\2	RR12	22.51	375	0.11	1	100	6	149	0.0788	32.6	6	149	0.0788	32.6	32.6	-1.5	31.1	199.9	0.16	0.28	1.33	0.95	1.81	42.5	41.12	40.89	42.48	1	1	-54.3	0.05	4.5		0	0.02			0.24	41.51	41.49	41.25	41.25	1.08	92.3	0.99	
5\1 to 1\9	RR12	5	450	0.159	11	9.1	6	149	0.5952	246.3	6	149	0.5952	246.3	246.3		246.3	1076.8	0.23	1.55	5.53	1.86	6.77	27.92	25.32	24.77	26.96	1	1.8	-38.7	0.3	4.5		0.12	0.55			0.22	26.32	25.77	25.54	25.58	4.47	22.4	1.6	
6\1 to 6\2	RR12	20.5	375	0.11	1.24	80.7	6	149	0.0168	6.9	6	149	0.0168	6.9	6.9		6.9	222.7	0.03	0.06	0.93	0.63	2.02	43.84	42.45	42.2	43.61	1	1	19.4	0.05	4.5		0	0			0.3	42.82	42.82	42.52	42.52	1.47	68.2	1.01	
6\2 to 6\3	RR12	20.43	375	0.11	10.85	9.2	6.17	147.29	0.0387	15.8	6	149	0.0382	15.8	15.8		15.8	662.1	0.02	0.14	2.56	0.79	6	43.61	42.15	39.93	42.08	1.2	1.2	-45.1	0.05	3.18		0	0			2.07	42.52	42.52	40.45	40.46	10.12	9.9	1.08	
6\3 to 6\4	RR12	69.09	450	0.159	12.8	7.8	6.87	141.79	0.5774	227.4	6.67	142.95	0.5703	226.4	227.4		227.4	1162	0.2	1.43	5.72	1.79	7.31	42.08	39.88	31.03	32.5	1	1.03	38.3	0.05	1.19	1.25	0.1	0.12	0.13		8.79	40.46	40.33	31.54	31.54	12.72	7.9	1.62	
6\4 to 6\5	RR12	14.52	450	0.159	13.94	7.2	7.44	137.44	0.6331	241.7	7.25	138.99	0.626	241.7	241.7		241.7	1212.7	0.2	1.52	6	1.84	7.63	32.5	30.98	28.96	31.09	1	1	4	0.05	0.93		0.12	0.11			1.91	31.54	31.43	29.52	29.52	13.19	7.6	0.96	
6\5 to 6\6	RR12	14.58	450	0.159	8.38	11.9	7.57	136.47	0.752	285.1	7.37	138.03	0.7449	285.6	285.6	-0.3	285.3	939.6	0.3	1.79	5.21	2.02	5.91	31.09	28.91	27.68	29.16	1	1.03	0		0.98		0.16	0.16			1.24	29.52	29.36	28.12	28.12	8.5	11.8	1.57	
7\1 to 7\2	RR12	23.29	375	0.11	1	100	6	149	0.0287	91.4	6	149	0.0287	91.4	91.4		91.4	199.9	0.46	0.83	1.77	1.34	1.81	42.65	41.27	41.04	42.94	1	1	-66.2	0.05	4.5		0.03	0.16			0.13	41.8	41.65	41.52	41.54	0.56	179.9	0.85	
7\2 to 7\2B	RR12	13.03	375	0.11	1	100	6.19	147.06	0.3356	137.1	6	149	0.3285	136	137.1	-0.2	136.9	199.9	0.69	1.24	1.94	1.59	1.81	42.94	40.99	40.86	43.16	1.2	1.7	36.8	0.05	1.96	2.28	0.08	0.15	0.18		0.08	41.54	41.36	41.29	41.29	0.58	173.3	1.4	
7/2B to 7\3	RR12	13.53	375	0.11	1	100	6.3	145.97	0.3356	136.1	6.11	147.91	0.3285	135	136.1	-0.2	135.9	199.9	0.68	1.23	1.94	1.58	1.81	43.16	40.81	40.67	42.98	1	1.95	-59.8	0.05	4.08		0.04	0.08			0.06	41.29	41.25	41.19	41.2	0.47	214.7	1.87	
7\3 to 7\4	RR12	10.5	450	0.159	1	100	6.42	144.85	0.4645	186.9	6.22	146.79	0.4574	186.5	186.9		186.9	323	0.58	1.18	2.1	1.63	2.03	42.99	40.62	40.52	43.15	1.2	1.9	0	0.05	1.64	1.83	0.07	0.12	0.13		0.09	41.2	41.07	40.98	40.98	0.86	116.5	1.79	
7\4 to 7\5	RR12	9	450	0.159	1	100	6.5	143.98	0.4739	189.5	6.31	145.91	0.4667	189.2	189.5		189.5	323	0.59	1.19	2.11	1.64	2.03	43.15	40.47	40.38	43.03	1	2.19	-74.1	0.05	0.3		0.07	0.02			0.03	40.98	40.96	40.93	40.95	0.35	287.7	2.17	
7\5 to 7/5B	RR12	14.54	450	0.159	1	100	6.58	143.53	0.5158	205.7	6.38	145.16	0.5087	205.1	205.7		205.7	323	0.64	1.29	2.15	1.7	2.03	43.03	40.33	40.18	43.1	1.2	2.36	16.4	0.05	1.78	2.05	0.09	0.15	0.17		0.17	40.95	40.78	40.6	40.6	1.2	83.5	2.08	
7/5B to 6\3	RR12	20.39	450	0.159	1	100	6.7	142.81	0.5158	204.6	6.5	143.97	0.5087	203.4	204.6		204.6	323	0.63	1.29	2.14	1.7	2.03	43.1	40.13	39.93	42.08	1	1.75	57.4	0.05	0.25		0.08	0.02			0.13	40.6	40.58	40.45	40.46	0.64	157.1	2.5	
8\1 to 8\2	RR12	27.64	525	0.216	5.13	19.5	6	149	0.7712	319.2	6	149	0.7712	319.2	319.2		319.2	1101.1	0.29	1.47	4.43	1.89	5.09	42.32	40.73	39.31	41.04	1	1.04	-35.5	0.05	4.5		0.11	0.5			1.3	41.75	41.25	39.95	39.95	4.72	21.2	0.56	
8\2 to 8\3	RR12	15.86	525	0.216	8.81	11.4	6.23	146.66	1.1448	466.4	6.23	146.7	1.1447	466.5	466.5	-3.3	463.1	1444.3	0.32	2.14	5.97	2.33	6.67	41.04	39.26	37.86	39.56	1.2	1.26	-37.7	0.05	0.7		0.23	0.16			1.23	39.95	39.79	38.56	38.56	7.75	12.9	1.09	
8\3 to 8\4	RR12	18.41	525	0.216	6.3	15.9	6.37	145.34	1.3051	526.9	6.36	145.37	1.305	527	527	-3.4	523.6	1220.5	0.43	2.42	5.43	2.55	5.64	39.56	37.81	36.65	38.29	1	1.1	0.5	0.05	0.73		0.3	0.22			1.01	38.56	38.34	37.33	37.33	5.49	18.2	1	
8\4 to 8\5	RR12	20	525	0.216	6.23	16	6.52	143.88	1.424	569.2	6.52	143.9	1.4239	569.2	569.2	-7.4	561.8	1214.1	0.46	2.6	5.5	2.69	5.61	38.29	36.6	36.36	37	1	0.98	11.5	0.05	0.58		0.34	0.2			0.61	37.33	37.13	36.12	36.12	5.06	19.8	0.96	
8\5 to 8\6	RR12	18.75	525	0.216	2.93	34.2	6.69	142.88	1.5161	601.7	6.68	142.9	1.5161	601.8	601.8	-6.1	595.7	831	0.72	2.75	4.16	2.83	3.84	37	35.31	34.76	36.33	1	0.98	0	0.075	0.51		0.39	0.2			0.28	36.12	35.92	35.64	35.64	1.51	66.3	0.88	
8\6 to 8\7	RR12	12.85	600	0.283	1.24	80.6	6.84	141.94	1.6039	632.4	6.84	141.97	1.6038	632.5	632.5	-6.3	626.2	767	0.82	2.21	3.01	2.44	2.71	36.33	34.68	34.52	36.2	1	0.98	91.1	0.05	0.2		0.25	0.05			0.11	35.64	35.59	35.48	35.54	0.83	120.6	0.69	
8\7 to 8\8	RR12	13	825	0.535	3.77	26.5	6.95	141.3	1.7672	693.6	6.95	141.32	1.7671	693.7	693.7	-1.6	692.1	3086.5	0.22	1.29	4.7	2.03	5.77	36.2	34.48	33.98	36.2	1	-0.51	-3.5	0.025	2.14	2.78	0.09	0.18	0.24		0.4	35.54	35.3	34.9	34.9	3.07	32.6	0.66	
8\8 to 8\9	RR12	35.18	825	0.535	9.65	10.4	7.06	140.54	2.4808	968.5	7.05	140.57	2.4808	968.6	968.6		968.6	4944.1	0.2	1.81	7.27	2.34	9.25	36.2	33.96	30.57	32.45	1	-1.07	0		0.69		0.17	0.12			2.99	34.9	34.79	31.8	31.8	8.49	11.8	1.3	
9\1 to 8\3	RR12	15.58	375	0.11	4.46	22.4	6	149	0.1109	45.9	6	149	0.1109	45.9	45.9	-3.2	42.7	423.8	0.1	0.39	2.49	1.04	3.84	40.1	38.66	37.96	39.56	1	1.04	63.5	0.15	4.5		0.01	0.03			0.48	39.07	39.03	38.56	38.56	3.05	32.7	1.03	
10\1 to 10\2	RR12	15.07	375	0.11	1.08	92.6	6	149	0.1062	44	6	149	0.1062	44	44	-3.3	40.6	395.4	0.1	0.37	2.34	1.03	3.58	41.72	40.18	39.59	41.09	1.2	1.23	47.8	0.05	4.5		0.01	0.03			0.44	40.58	40.55	40.11	40.11	2.93	34.2	1.14	
10\2 to 8\2	RR12	13.01	375	0.11	1	100	6.13	147.74	0.3274	134.4	6.09	148.11	0.3267	134.4	134.4	-3.3	131.1	199.9	0.66	1.19	1.99	1.56	1.81	41.09	40.14	39.41	41.04	1	1.2	47.3	0.115	1.45		0.07	0.1			0.06	40.11	40.01	39.95	39.95	0.43	230.7	0.98	
11\1 to 10\2	RR12	10.73	375	0.11	5	20	6	149	0.1355	56.1	6	149	0.1355	56.1	56.1		56.1	449	0.12	0.51	2.81	1.14	4.07	42.67	40.29	39.75	41.09