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01 December 2017

Attn: Neil Beck
Douglas Shire Council
64-66 Front Street
MOSSMAN QLD 4873

Project Name: Oceans Breeze Stage 6A & 6B
Project Number: Our Ref No. IH132900
Operational Works Application

Dear Neil,

Please find enclosed the following Operational Works Application documentation regarding the above mentioned development for your consideration and approval:

1) Operational Works Receipting Checklist.
2) Statement of Compliance.
3) DA Form 1.
4) Amended Decision Notice.
5) Report addressing RoL Conditions.
6) Masterplans for stormwater drainage, sewer, water reticulation and footpaths.
7) Stormwater Drainage Calculations.
8) Water Network Analysis.
9) Sewer Pump Station and Overflow Calculations.
10) Potential Acid Sulfate Soil Investigation.
11) Engineering drawings (2 x A3 sets and 1 x PDF set – refer enclosed CD).

Electrical reticulation and street lighting will be part of a separate application. Similarly landscaping will also be part of a separate application.

We trust the above meets with your approval and look forward to receipt of your approval. Should you require any additional information, please do not hesitate to contact this office.

Yours sincerely

Robert Carman
+61 7 4031 4599
robert.carman@jacobs.com

Enc. Operational Works Application and Supporting Documents
Engineering Drawings (2 x A3 sets and 1 x PDF set – refer enclosed CD)

Item 1

Operational Works Receipting Checklist

(To be completed by Consulting engineer making the application)

Name of Council: Douglas Shire Council

Development Name and Location: Oceans Breeze Stage 6 A & B

Planning Permit No/Council File No: ……/ ……/ ……

DESIGN SUBMISSION	CHECK	COMMENT
1. Completed 'Statement of Compliance' form. (FNQROC - AP1 – Appendix A)	Y	
2. IDAS Forms A ,E & IDAS Assessment Checklist (Available from www.ipa.qld.gov.au)	Y	DA Form 1
3. Payment of Engineering Application Fees (Copy of receipt to be attached)	Y	
4. Copy of Decision Notice for Development Application Conditions, inc. explanation of how each condition is to be addressed (Statement of Compliance)	Y	
5. Engineering Design drawings - Complete sets (1 x A1 set, 2 x A3 sets and 1 x electronic copy on compact disc in 'PDF' format)	Y	No A1 Plans
6. One copy of Design and Standard Specifications (Unbound Copy Preferable)	N	Using FNQROC Standard Specs
7. Written consent from adjoining property owners authorising any works on their property	NA	
8. Water reticulation network in electronic format (Engineer to confirm system requirements and compatibility with Cairns Water)	Y	
9. Landscape drawings - Complete set (1 x A1 set, 2 x A3 sets and 1 x electronic copy on compact disc in 'PDF' format). These must be accompanied by elements of the stormwater & street ltg. layout design, to avoid conflicts.	NA	

DESIGN SUBMISSION	CHECK	COMMENT
10. Overall network drawings (for staged development) for:		
• Water	Y	
• Stormwater	Y	
• Sewer	Y	
• Pathways and roads	NA	
• Street Lighting	NA	
• Electrical	NA	
• Gas	NA	
• Public Transport	NA	
• Park Reserves	NA	
• Drainage Reserves	NA	
11. Pavement design criteria	Y	Shown on drawings
12. Geotechnical reports for proposed earthworks	NA	
13. Structural and geotechnical certificates for retaining walls etc.	NA	
14. Water supply/sewerage pump station design parameters	Y	Shown on drawings
15. Stormwater drainage calculations	Y	
16. Erosion and Sediment Control Strategy (ESCS)	Y	Shown on drawings
17. Declared Pest Management Plan (if applicable)	NA	
18. The approval of any other Authorities & concurrence agencies likely to be affected by the works.	NA	

19. Contact details of the Consulting Engineer who is submitting the Application:

Name of Engineer	Robert Carman	
Name of Company	Jacobs Group (Australia) Pty Ltd	
Telephone Number (s)	Office: 07 4031 4599	Mobile:
Email address	robert.carman@jacobs.com	
RPEQ No.	6641	

20. Date of submission of application 01 / 12 / 2017

(For further information on all of the above refer to the FNQROC Development Manual Section AP1)

Item 2

FNQROC DEVELOPMENT MANUAL

Council Douglas Shire Council
(INSERT COUNCIL NAME)

STATEMENT OF COMPLIANCE
OPERATIONAL WORKS DESIGN

This form duly completed and signed by an authorised agent of the Designer shall be submitted with the Operational Works Application for Council Approval.

Name of Development Ocean Breeze Estate - Stage 6A & 6B

Location of Development Cooya Beach Road, Cooya Beach

Applicant Jonpa Pty Ltd

Designer Jacobs Group (Australia) Pty Ltd

It is hereby certified that the Calculations, Drawings, Specifications and related documents submitted herewith have been prepared, checked and amended in accordance with the requirements of the FNQROC Development Manual and that the completed works comply with the requirements therein, **except** as noted below.

Compliance with the requirements of the Operational Works Design Guidelines	Non-Compliance refer to non-compliance report / drawing number
Plan Presentation	Y
Geotechnical requirements	NA
Geometric Road Design	Y
Pavements	Y
Structures / Bridges	NA
Subsurface Drainage	Y
Stormwater Drainage	Y
Site Re-grading	Y
Erosion Control and Stormwater Management	Y
Pest Plant Management	NA
Cycleway / Pathways	Y

Landscaping	NA
Water Source and Disinfection/Treatment Infrastructure (if applicable)	NA
Water Reticulation, Pump Stations and water storages	Y
Sewer Reticulation and Pump Stations	Y
Electrical Reticulation and Street Lighting	NA
Public Transport	NA
Associated Documentation/ Specification	Y
Priced Schedule of Quantities	NA
Referral Agency Conditions	NA
Supporting Information (AP1.08)	Y
Other	NA

Conscientiously believing the above statements to be true and correct, signed on behalf of:

Designer Jacobs Group (Australia) Pty Ltd **RPEQ No** 6641

Name in Full Robert Carman

Signature ....  **Date** 01/12/17

Item 3

DA Form 1 – Development application details

Approved form (version 1.0 effective 3 July 2017) made under section 282 of the Planning Act 2016.

This form **must** be used to make a development application **involving code assessment or impact assessment**, except when applying for development involving building work.

For a development application involving **building work only**, use *DA Form 2 – Building work details*.

For a development application involving **building work associated with any other type of assessable development**, use this form (*DA Form 1*) **and** parts 4 to 6 of *DA Form 2 – Building work details.*

Unless stated otherwise, all parts of this form **must** be completed in full and all required supporting information **must** accompany the development application.

One or more additional pages may be attached as a schedule to this development application if there is insufficient space on the form to include all the necessary information.

This form and any other form relevant to the development application must be used to make a development application relating to strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994*, and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008.* For the purpose of assessing a development application relating to strategic port land and Brisbane core port land, any reference to a planning scheme is taken to mean a land use plan for the strategic port land, Brisbane port land use plan for Brisbane core port land, or a land use plan for airport land.

Note: *All terms used in this form have the meaning given under the Planning Act 2016, the Planning Regulation 2017, or the Development Assessment Rules (DA Rules).*

PART 1 – APPLICANT DETAILS

1) Applicant details	
Applicant name(s) *(individual or company full name)*	Jonpa Pty Ltd
Contact name *(only applicable for companies)*	Robert Carman
Postal address *(P.O. Box or street address)*	c/- Jacobs Group (Australia) Pty Ltd Po Box 1062
Suburb	North Cairns
State	QLD
Postcode	4870
Country	Australia
Contact number	07 4031 4599
Email address *(non-mandatory)*	Robert.carman@jacobs.com
Mobile number *(non-mandatory)*	
Fax number *(non-mandatory)*	
Applicant's reference number(s) *(if applicable)*	IH132900

2) Owner's consent
2.1) Is written consent of the owner required for this development application?
☐ Yes – the written consent of the owner(s) is attached to this development application ☒ No – proceed to 3)

PART 2 – LOCATION DETAILS

3) Location of the premises *(complete 3.1) or 3.2), and 3.3) as applicable)*

***Note**: Provide details below and attach a site plan for any or all premises part of the development application. For further information, see DA Forms Guide: Relevant plans.*

3.1) Street address and lot on plan

☐ Street address **AND** lot on plan (*all lots must be listed*), ***or***

☐ Street address **AND** lot on plan for an adjoining or adjacent property of the premises *(appropriate for development in water but adjoining or adjacent to land e.g. jetty, pontoon; all lots must be listed).*

a)	Unit No.	Street No.	Street Name and Type	Suburb
			Cooya Beach Road	Cooya Beach
	Postcode	Lot No.	Plan Type and Number *(e.g. RP, SP)*	Local Government Area(s)
		901	SP285536	Douglas
b)	Unit No.	Street No.	Street Name and Type	Suburb
	Postcode	Lot No.	Plan Type and Number *(e.g. RP, SP)*	Local Government Area(s)

3.2) Coordinates of premises *(appropriate for development in remote areas, over part of a lot or in water not adjoining or adjacent to land e.g. channel dredging in Moreton Bay)*

***Note**: Place each set of coordinates in a separate row. Only one set of coordinates is required for this part.*

☐ Coordinates of premises by longitude and latitude

Longitude(s)	Latitude(s)	Datum	Local Government Area(s) *(if applicable)*
		☐ WGS84 ☐ GDA94 ☐ Other:	

☐ Coordinates of premises by easting and northing

Easting(s)	Northing(s)	Zone Ref.	Datum	Local Government Area(s) *(if applicable)*
		☐ 54 ☐ 55 ☐ 56	☐ WGS84 ☐ GDA94 ☐ Other:	

3.3) Additional premises

☐ Additional premises are relevant to this development application and their details have been attached in a schedule to this application

☒ Not required

4) Identify any of the following that apply to the premises and provide any relevant details

☐ In or adjacent to a water body or watercourse or in or above an aquifer

Name of water body, watercourse or aquifer:

☐ On strategic port land under the *Transport Infrastructure Act 1994*

Lot on plan description of strategic port land:

Name of port authority for the lot:

☐ In a tidal area

Name of local government for the tidal area *(if applicable)*:

Name of port authority for tidal area *(if applicable)*:

☐ On airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*

Name of airport:

☐ Listed on the Environmental Management Register (EMR) under the *Environmental Protection Act 1994*

EMR site identification:

☐ Listed on the Contaminated Land Register (CLR) under the *Environmental Protection Act 1994*

CLR site identification:

5) Are there any existing easements over the premises?

Note: Easement uses vary throughout Queensland and are to be identified correctly and accurately. For further information on easements and how they may affect the proposed development, see DA Forms Guide.

☒ Yes – All easement locations, types and dimensions are included in plans submitted with this development application

☐ No

PART 3 – DEVELOPMENT DETAILS

Section 1 – Aspects of development

6.1) Provide details about the first development aspect

a) What is the type of development? *(tick only one box)*

☐ Material change of use ☐ Reconfiguring a lot ☒ Operational work ☐ Building work

b) What is the approval type? *(tick only one box)*

☒ Development permit ☐ Preliminary approval ☐ Preliminary approval that includes a variation approval

c) What is the level of assessment?

☒ Code assessment ☐ Impact assessment *(requires public notification)*

d) Provide a brief description of the proposal *(e.g. 6 unit apartment building defined as multi-unit dwelling, reconfiguration of 1 lot into 3 lots)*:

Operational Works associated with the development of 42 residential lots

e) Relevant plans

***Note**: Relevant plans are required to be submitted for all aspects of this development application. For further information, see DA Forms guide: Relevant plans.*

☒ Relevant plans of the proposed development are attached to the development application

6.2) Provide details about the second development aspect

a) What is the type of development? *(tick only one box)*

☐ Material change of use ☐ Reconfiguring a lot ☐ Operational work ☐ Building work

b) What is the approval type? *(tick only one box)*

☐ Development permit ☐ Preliminary approval ☐ Preliminary approval that includes a variation approval

c) What is the level of assessment?

☐ Code assessment ☐ Impact assessment *(requires public notification)*

d) Provide a brief description of the proposal *(e.g. 6 unit apartment building defined as multi-unit dwelling, reconfiguration of 1 lot into 3 lots)*

e) Relevant plans

***Note**: Relevant plans are required to be submitted for all aspects of this development application. For further information, see DA Forms Guide: Relevant plans.*

☐ Relevant plans of the proposed development are attached to the development application

6.3) Additional aspects of development

☐ Additional aspects of development are relevant to this development application and the details for these aspects that would be required under Part 3 Section 1 of this form have been attached to this development application

☐ Not required

Section 2 – Further development details

7) Does the proposed development application involve any of the following?	
Material change of use	☐ Yes – complete division 1 if assessable against a local planning instrument
Reconfiguring a lot	☐ Yes – complete division 2
Operational work	☒ Yes – complete division 3
Building work	☐ Yes – complete *DA Form 2 – Building work details*

Division 1 – Material change of use

***Note**: This division is only required to be completed if any part of the development application involves a material change of use assessable against a local planning instrument.*

8.1) Describe the proposed material change of use			
Provide a general description of the proposed use	Provide the planning scheme definition *(include each definition in a new row)*	Number of dwelling units *(if applicable)*	Gross floor area (m^2) *(if applicable)*

8.2) Does the proposed use involve the use of existing buildings on the premises?
☐ Yes
☐ No

Division 2 – Reconfiguring a lot

***Note**: This division is only required to be completed if any part of the development application involves reconfiguring a lot.*

9.1) What is the total number of existing lots making up the premises?

9.2) What is the nature of the lot reconfiguration? *(tick all applicable boxes)*	
☐ Subdivision *(complete 10))*	☐ Dividing land into parts by agreement *(complete 11))*
☐ Boundary realignment *(complete 12))*	☐ Creating or changing an easement giving access to a lot from a construction road *(complete 13))*

10) Subdivision 10.1) For this development, how many lots are being created and what is the intended use of those lots:				
Intended use of lots created	Residential	Commercial	Industrial	Other, please specify:
Number of lots created				

10.2) Will the subdivision be staged?	
☐ Yes – provide additional details below ☐ No	
How many stages will the works include?	
What stage(s) will this development application apply to?	

11) Dividing land into parts by agreement – how many parts are being created and what is the intended use of the parts?				
Intended use of parts created	Residential	Commercial	Industrial	Other, please specify:
Number of parts created				

12) Boundary realignment

12.1) What are the current and proposed areas for each lot comprising the premises?

Current lot		Proposed lot	
Lot on plan description	Area (m^2)	Lot on plan description	Area (m^2)

12.2) What is the reason for the boundary realignment?

13) What are the dimensions and nature of any existing easements being changed and/or any proposed easement? *(attach schedule if there are more than two easements)*

Existing or proposed?	Width (m)	Length (m)	Purpose of the easement? *(e.g. pedestrian access)*	Identify the land/lot(s) benefitted by the easement

Division 3 – Operational work

***Note**: This division is only required to be completed if any part of the development application involves operational work.*

14.1) What is the nature of the operational work?

☒ Road work	☒ Stormwater	☒ Water infrastructure
☒ Drainage work	☒ Earthworks	☒ Sewage infrastructure
☐ Landscaping	☐ Signage	☒ Clearing vegetation
☐ Other – please specify:		

14.2) Is the operational work necessary to facilitate the creation of new lots? *(e.g. subdivision)*

☒ Yes – specify number of new lots: 42

☐ No

14.3) What is the monetary value of the proposed operational work? *(include GST, materials and labour)*

$2,500,000.00

PART 4 – ASSESSMENT MANAGER DETAILS

15) Identify the assessment manager(s) who will be assessing this development application

Douglas Shire Council

16) Has the local government agreed to apply a superseded planning scheme for this development application?

☐ Yes – a copy of the decision notice is attached to this development application

☐ Local government is taken to have agreed to the superseded planning scheme request – relevant documents attached

☒ No

PART 5 – REFERRAL DETAILS

17) Do any aspects of the proposed development require referral for any referral requirements?

***Note**: A development application will require referral if prescribed by the* Planning Regulation 2017.

☒ No, there are no referral requirements relevant to any development aspects identified in this development application – proceed to Part 6

Matters requiring referral to the **chief executive of the Planning Regulation 2017:**

☐ Clearing native vegetation

☐ Contaminated land *(unexploded ordnance)*

☐ Environmentally relevant activities (ERA) *(only if the ERA have not been devolved to a local government)*
☐ Fisheries – aquaculture
☐ Fisheries – declared fish habitat area
☐ Fisheries – marine plants
☐ Fisheries – waterway barrier works
☐ Hazardous chemical facilities
☐ Queensland heritage place *(on or near a Queensland heritage place)*
☐ Infrastructure – designated premises
☐ Infrastructure – state transport infrastructure
☐ Infrastructure – state transport corridors and future state transport corridors
☐ Infrastructure – state-controlled transport tunnels and future state-controlled transport tunnels
☐ Infrastructure – state-controlled roads
☐ Land within Port of Brisbane's port limits
☐ SEQ development area
☐ SEQ regional landscape and rural production area or SEQ Rural living area – community activity
☐ SEQ regional landscape and rural production area or SEQ Rural living area – indoor recreation
☐ SEQ regional landscape and rural production area or SEQ Rural living area – residential development
☐ SEQ regional landscape and rural production area or SEQ Rural living area – urban activity
☐ Tidal works or works in a coastal management district
☐ Urban design
☐ Water-related development – taking or interfering with water
☐ Water-related development – removing quarry material *(from a watercourse or lake)*
☐ Water-related development – referable dams
☐ Water-related development – construction of new levees or modification of existing levees *(category 2 or 3 levees only)*
☐ Wetland protection area

Matters requiring referral to the **local government:**

☐ Airport land
☐ Environmentally relevant activities (ERA) (*only if the ERA have been devolved to local government)*
☐ Local heritage places

Matters requiring referral to the **chief executive of the distribution entity or transmission entity:**

☐ Electricity infrastructure

Matters requiring referral to:

- The **chief executive of the holder of the licence**, if not an individual
- The **holder of the licence**, if the holder of the licence is an individual

☐ Oil and gas infrastructure

Matters requiring referral to **the Brisbane City Council:**

☐ Brisbane core port land

Matters requiring referral to the **Minister under the Transport Infrastructure Act 1994:**

☐ Brisbane core port land
☐ Strategic port land

Matters requiring referral to the **relevant port operator:**

☐ Brisbane core port land (below high-water mark and within port limits)

Matters requiring referral to the **chief executive of the relevant port authority:**

☐ Land within limits of another port

Matters requiring referral to the **Gold Coast Waterways Authority:**

☐ Tidal works, or development in a coastal management district in Gold Coast waters

Matters requiring referral to the **Queensland Fire and Emergency Service:**

☐ Tidal works, or development in a coastal management district

18) Has any referral agency provided a referral response for this development application?		
☐ Yes – referral response(s) received and listed below are attached to this development application ☒ No		
Referral requirement	Referral agency	Date of referral response
Identify and describe any changes made to the proposed development application that was the subject of the referral response and the development application the subject of this form, or include details in a schedule to this development application *(if applicable).*		

PART 6 – INFORMATION REQUEST

19) Information request under Part 3 of the DA Rules

☒ I agree to receive an information request if determined necessary for this development application

☐ I do not agree to accept an information request for this development application

***Note**: By not agreeing to accept an information request I, the applicant, acknowledge:*

- *that this development application will be assessed and decided based on the information provided when making this development application and the assessment manager and any referral agencies relevant to the development application are not obligated under the DA Rules to accept any additional information provided by the applicant for the development application unless agreed to by the relevant parties*
- *Part 3 of the DA Rules will still apply if the application is an application listed under section 11.3 of the DA Rules.*

Further advice about information requests is contained in the DA Forms Guide.

PART 7 – FURTHER DETAILS

20) Are there any associated development applications or current approvals? *(e.g. a preliminary approval)*

☒ Yes – provide details below or include details in a schedule to this development application

☐ No

List of approval/development application references	Reference number	Date	Assessment manager
☒ Approval ☐ Development application	CA46	7 September 2007	Douglas Shire Council
☐ Approval ☐ Development application			

21) Has the portable long service leave levy been paid? *(only applicable to development applications involving building work or operational work)*

☐ Yes – the yellow local government/private certifier's copy of the receipted QLeave form is attached to this development application

☒ No – I, the applicant will provide evidence that the portable long service leave levy has been paid before the assessment manager decides the development application. I acknowledge that the assessment manager may give a development approval only if I provide evidence that the portable long service leave levy has been paid

☐ Not applicable

Amount paid	Date paid (dd/mm/yy)	QLeave levy number (A, B or E)
$		

22) Is this development application in response to a show cause notice or required as a result of an enforcement notice?

☐ Yes – show cause or enforcement notice is attached

☒ No

23) Further legislative requirements

Environmentally relevant activities

23.1) Is this development application also taken to be an application for an environmental authority for an **Environmentally Relevant Activity (ERA)** under section 115 of the *Environmental Protection Act 1994*?

☐ Yes – the required attachment (form EM941) for an application for an environmental authority accompanies this development application, and details are provided in the table below

☒ No

***Note**: Application for an environmental authority can be found by searching "EM941" at www.qld.gov.au. An ERA requires an environmental authority to operate. See www.business.qld.gov.au for further information.*

Proposed ERA number:		Proposed ERA threshold:	
Proposed ERA name:			

☐ Multiple ERAs are applicable to this development application and the details have been attached in a schedule to this development application.

Hazardous chemical facilities

23.2) Is this development application for a **hazardous chemical facility**?

☐ Yes – *Form 69: Notification of a facility exceeding 10% of schedule 15 threshold* is attached to this development application

☒ No

***Note**: See www.justice.qld.gov.au for further information.*

Clearing native vegetation

23.3) Does this development application involve **clearing native vegetation** that requires written confirmation the chief executive of the *Vegetation Management Act 1999* is satisfied the clearing is for a relevant purpose under section 22A of the *Vegetation Management Act 1999*?

☐ Yes – this development application is accompanied by written confirmation from the chief executive of the *Vegetation Management Act 1999* (s22A determination)

☒ No

***Note**: See www.qld.gov.au for further information.*

Environmental offsets

23.4) Is this development application taken to be a prescribed activity that may have a significant residual impact on a **prescribed environmental matter** under the *Environmental Offsets Act 2014*?

☐ Yes – I acknowledge that an environmental offset must be provided for any prescribed activity assessed as having a significant residual impact on a prescribed environmental matter

☒ No

***Note**: The environmental offset section of the Queensland Government's website can be accessed at www.qld.gov.au for further information on environmental offsets.*

Koala conservation

23.5) Does this development application involve a material change of use, reconfiguring a lot or operational work within an assessable development area under Schedule 10, Part 10 of the Planning Regulation 2017?

☐ Yes

☒ No

***Note**: See guidance materials at www.ehp.qld.gov.au for further information.*

Water resources

23.6) Does this development application involve **taking or interfering with artesian or sub artesian water, taking or interfering with water in a watercourse, lake or spring, taking overland flow water or waterway barrier works**?

☐ Yes – the relevant template is completed and attached to this development application

☒ No

***Note**: DA templates are available from www.dilgp.qld.gov.au.*

23.7) Does this application involve **taking or interfering with artesian or sub artesian water, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water** under the *Water Act 2000*?

☐ Yes – I acknowledge that a relevant water authorisation under the *Water Act 2000* may be required prior to commencing development

☒ No

***Note**: Contact the Department of Natural Resources and Mines at www.dnrm.qld.gov.au for further information.*

Marine activities

23.8) Does this development application involve **aquaculture, works within a declared fish habitat area or removal, disturbance or destruction of marine plants?**

☐ Yes – an associated resource allocation authority is attached to this development application, if required under the *Fisheries Act 1994*

☒ No

***Note**: See guidance materials at www.daf.qld.gov.au for further information.*

Quarry materials from a watercourse or lake

23.9) Does this development application involve the **removal of quarry materials from a watercourse or lake** under the *Water Act 2000?*

☐ Yes – I acknowledge that a quarry material allocation notice must be obtained prior to commencing development

☒ No

***Note**: Contact the Department of Natural Resources and Mines at www.dnrm.qld.gov.au for further information.*

Quarry materials from land under tidal waters

23.10) Does this development application involve the **removal of quarry materials from land under tidal water** under the *Coastal Protection and Management Act 1995?*

☐ Yes – I acknowledge that a quarry material allocation notice must be obtained prior to commencing development

☒ No

***Note**: Contact the Department of Environment and Heritage Protection at www.ehp.qld.gov.au for further information.*

Referable dams

23.11) Does this development application involve a **referable dam** required to be failure impact assessed under section 343 of the *Water Supply (Safety and Reliability) Act 2008* (the Water Supply Act)?

☐ Yes – the 'Notice Accepting a Failure Impact Assessment' from the chief executive administering the Water Supply Act is attached to this development application

☒ No

***Note**: See guidance materials at www.dews.qld.gov.au for further information.*

Tidal work or development within a coastal management district

23.12) Does this development application involve **tidal work or development in a coastal management district**?

☐ Yes – the following is included with this development application:

- ☐ Evidence the proposal meets the code for assessable development that is prescribed tidal work *(only required if application involves prescribed tidal work)*
- ☐ A certificate of title

☒ No

***Note**: See guidance materials at www.ehp.qld.gov.au for further information.*

Queensland and local heritage places

23.13) Does this development application propose development on or adjoining a place entered in the **Queensland heritage register** or on a place entered in a local government's **Local Heritage Register**?

☐ Yes – details of the heritage place are provided in the table below

☒ No

***Note**: See guidance materials at www.ehp.qld.gov.au for information requirements regarding development of Queensland heritage places.*

Name of the heritage place:		Place ID:	

Brothels

23.14) Does this development application involve a **material change of use for a brothel**?

☐ Yes – this development application demonstrates how the proposal meets the code for a development application for a brothel under Schedule 3 of the *Prostitution Regulation 2014*

☒ No

Decision under section 62 of the *Transport Infrastructure Act 1994*

23.15) Does this development application involve new or changed access to a state-controlled road?

☐ Yes - this application will be taken to be an application for a decision under section 62 of the *Transport Infrastructure Act 1994* (subject to the conditions in section 75 of the *Transport Infrastructure Act 1994* being satisfied)
☒ No

PART 8 – CHECKLIST AND APPLICANT DECLARATION

24) Development application checklist	
I have identified the assessment manager in question 15 and all relevant referral requirement(s) in question 17 ***Note**: See the Planning Regulation 2017 for referral requirements*	☒ Yes
If building work is associated with the proposed development, Parts 4 to 6 of *Form 2 – Building work details* have been completed and attached to this development application	☐ Yes ☒ Not applicable
Supporting information addressing any applicable assessment benchmarks is with development application ***Note**: This is a mandatory requirement and includes any relevant templates under question 23, a planning report and any technical reports required by the relevant categorising instruments (e.g. local government planning schemes, State Planning Policy, State Development Assessment Provisions). For further information, see DA Forms Guide: Planning Report Template.*	☒ Yes
Relevant plans of the development are attached to this development application ***Note**: Relevant plans are required to be submitted for all aspects of this development application. For further information, see DA Forms Guide: Relevant plans.*	☒ Yes
The portable long service leave levy for QLeave has been paid, or will be paid before a development permit is issued *(see 21))*	☒ Yes ☐ Not applicable

25) Applicant declaration

☒ By making this development application, I declare that all information in this development application is true and correct

☒ Where an email address is provided in Part 1 of this form, I consent to receive future electronic communications from the assessment manager and any referral agency for the development application where written information is required or permitted pursuant to sections 11 and 12 of the *Electronic Transactions Act 2001*

***Note**: It is unlawful to intentionally provide false or misleading information.*

Privacy – Personal information collected in this form will be used by the assessment manager and/or chosen assessment manager, any relevant referral agency and/or building certifier (including any professional advisers which may be engaged by those entities) while processing, assessing and deciding the development application.
All information relating to this development application may be available for inspection and purchase, and/or published on the assessment manager's and/or referral agency's website.
Personal information will not be disclosed for a purpose unrelated to the *Planning Act 2016*, Planning Regulation 2017 and the DA Rules except where:

- such disclosure is in accordance with the provisions about public access to documents contained in the *Planning Act 2016* and the Planning Regulation 2017, and the access rules made under the *Planning Act 2016* and Planning Regulation 2017; or
- required by other legislation (including the *Right to Information Act 2009*); or
- otherwise required by law.

This information may be stored in relevant databases. The information collected will be retained as required by the *Public Records Act 2002.*

PART 9 – FOR OFFICE USE ONLY

Date received: | | Reference number(s): | |

Notification of engagement of alternative assessment manager	
Prescribed assessment manager	
Name of chosen assessment manager	
Date chosen assessment manager engaged	
Contact number of chosen assessment manager	
Relevant licence number(s) of chosen assessment manager	

QLeave notification and payment *Note: For completion by assessment manager if applicable*	
Description of the work	
QLeave project number	
Amount paid ($)	
Date paid	
Date receipted form sighted by assessment manager	
Name of officer who sighted the form	

The *Planning Act 2016,* the Planning Regulation 2017 and the DA Rules are administered by the Department of Infrastructure, Local Government and Planning. This form and all other required development application materials should be sent to the assessment manager.

Item 4

DOUGLAS SHIRE COUNCIL

ENQUIRIES: Mr Paul Gleeson – Manager Planning Services
DEPARTMENT: Planning Services - ☎ (07) 4099 9450
EMAIL:

OUR REF: PTG
YOUR REF: CA46

Salson Pty Ltd as Trustee for the Simon White Family Trust
C/- C & B Group
P O Box 1949
CAIRNS QLD 4870

7 September 2007

INTEGRATED PLANNING ACT
AMENDED DECISION NOTICE

DEVELOPMENT APPLICATION

Applicant's Name	:	**Salson Pty Ltd as Trustee for the Simon White Family Trust**
Owner's Name	:	**Salson Pty Ltd**
Proposal	:	**Material Change of Use and Reconfiguring a Lot to permit 250 Residential A lots, 38 Residential B lots, 0.7 hectares to be used for commercial and community uses and 11.1 hectares to be used generally as open space**
Application Number	:	**CA46**
Site Address	:	**Cooya Beach Road, Bonnie Doon Road and Melaleuca Drive, Cooya Beach**
Property Description	:	**Lot 1 on RP 720316 and Lots 2 and 3 on SR 614**

This Amended Decision Notice supersedes the Negotiated Decision Notice dated 15 June 2005. Advice note 1 has been added to reflect the specific conditions required to be addressed with each stage of the subdivision. All other conditions remain unchanged.

1. Decision: **Decision Date:** 8 June 2005

Approved subject to Conditions

2. Type of Development Approval:

Material Change of Use	Preliminary Approval
Reconfiguration a Lot	Development Permit

3. Referral Agencies:

Concurrence Agencies:

Department of Main Roads	Conditions attached
Environmental Protection Agency	
Natural Resources & Mines	

4. Conditions

Assessment Manager Conditions

Plan of Reconfiguration

1. The approved reconfiguration and the carrying out of any works on the premises associated with the development must generally be in accordance with Plan of Reconfiguration No. 8021-3, Issue G, dated 18th May 2004, prepared by the C &B Group, and attached to this approval subject to:

   (a) Modifications required by any condition of this approval and any minor alterations found necessary by Council at the time of examination of engineering plans; and

   (b) Any development permit for operational works relating to the reconfiguration.

2. The Plan of Reconfiguration No. 8021-3 Issue G, dated 18th May 2004, must be amended as follows:

   (a) A pathway with a minimum width of four (4) metres must be provided from the cul-de-sac in the south-eastern corner of the site to Melaleuca Drive and a 1.5 metre wide concrete footpath must be constructed within the pathway.

Water Supply

3. The reticulated water supply must be constructed with the design plans approved by Council.

Internal

4. The applicant must provide a reticulated water supply to the development.

5. This system must make provision for services to the boundaries of all lots, including main works, enveloper pipes at cross street services, valve and hydrant markers and a water meter to each lot.

6. The plans and specifications of the internal water supply must be submitted to Council at Operational Works application stage for this reconfiguration for review.

External

7. Provision of water supply headworks contributions in accordance with Council's Policy on Applicant Contributions for Water Supply and Sewerage Services and Council's Schedule of Fees and Charges which provides for contribution amounts to be varied if not paid in full within12 months of the date of this approval. Headworks are to apply based on $4,449.00 per E.D.C. for water supply. Payment of such contributions shall be made prior to Council Signing and Sealing of the Plan of Survey except that in relation to the Commercial/ Community Purpose land (proposed Lot 900) the payment equivalent to one (1) EDC for water supply headworks shall be paid prior to Council Signing and Sealing the Plan of Survey. The balance of the water supply headworks contribution is to be paid prior to the issue of a Building Works Development Permit in respect of any development on the Commercial/Community Purposes land (proposed Lot 900). A notice will be placed on Council's rates database to this effect on Lot 900 when the title is created.

8. (a) The applicant is responsible for the external works to connect the site with Council's water supply at Cooya Beach Road and to upgrade the water main to 200mm diameter for the full length of the site frontage to Cooya Beach Road.

(b) The applicant must design and construct a 3.5 megalitre reservoir at the existing reservoir site.

The total cost of the works to install this reservoir will be determined on the basis of the ratio of the number of lots in the proposed development to the number of existing and currently approved lots in Cooya Beach. The applicant will construct all works and the equivalent amount for Council's contribution (existing allotments) to the reservoir will be subtracted from the applicant's water supply headworks contributions for the development.

Sewerage

Internal

9. Provision of sewerage reticulation to plans approved by Council. Provision shall be made for house connection branches for each allotment.

10. The plans and specifications of the internal sewerage works must be submitted to Council at Operational Works application stage for review.

11. Pumping stations are to be located on land vested under Council's control.

12. The design information submitted for Operational Works approval shall include design flows, pipe sizes, grades, pump rates, catchments and pressure main hydraulics.

13. Pumping stations shall incorporate aluminium fabricated covers to Council's standards. Switchboards are to be aluminium or stainless steel construction. Amp meters are required for each pump motor.

External

14. Provision of sewerage headworks contributions in accordance with Council's Policy on Applicant Contributions for Water Supply and Sewerage Services and Council's Schedule of Fees and Charges which provides for contribution amounts to be varied if not paid in full within 12months of the date of this approval. Headworks are to apply based on $2,665.00 per E.D.C. for sewerage. Payment of such contributions shall be made prior to Council Signing and Sealing of the Plan of Survey except that in relation to the Commercial/Community Purpose land (proposed Lot 900) the payment equivalent to one (1) EDC for sewerage headworks shall be paid prior to Council Signing and Sealing the Plan of Survey. The balance of the sewerage headworks contribution is to be paid prior to the issue of a Building Works Development Permit in respect of any development on the Commercial/Community Purposes land (proposed Lot 900). A notice will be placed on Council's rates database to this effect on Lot 900 when the title is created.

15. (a) The applicant must construct a pump station and rising main between the site and the Mossman Treatment Plant to provide a sewerage service to the proposed lots.

(b) The pump station is to be located adjacent to Cooya Beach Road at the eastern end of the park.

(c) The pump station and the rising main are to be sized to cater for the proposed development and for other areas of Cooya Beach which may ultimately be included in the sewerage scheme.

(d) The total cost of these works to install this reservoir will be determined on the basis of the ratio of the number of lots in the proposed development to the number of existing and currently approved lots in Cooya Beach. The applicant will construct all works and the equivalent amount for Council's contribution (existing allotments) to the reservoir will be subtracted from the applicant's water supply headworks contributions for the development.

Electrical & Telephone Services

16. Prior to the approval of the Plan of Survey, the Applicant must submit to Council a copy of a letter from Ergon Energy stating that satisfactory arrangements have been made for the provision of:

(a) an underground electrical supply to each lot; and

(b) street lighting in accordance with Council's adopted standards.

(c) locating of all above ground transformer cubicles clear of footpath and parkland areas.

17. Prior to the approval of the Plan of Survey, the Applicant must submit to Council a copy of a letter from Telstra stating that satisfactory arrangements have been made for the provision of:

(a) an underground telephone service to each lot; and

(b) locating of all above ground switching station cubicles clear of footpath and parkland areas.

18. (a) The applicant must transfer the area shown as Park and Mangrove on the Proposed Plan to Council in partial satisfaction of the applicant's obligation to provide parkland to Council in accordance with Local Planning Policy No.5 – Applicant Contributions – Parks. The applicant must bear all costs of the transfer.

(b) The applicant must contribute $250.00 per lot in partial satisfaction of the applicant's obligation to provide parkland to Council in accordance with the Local Planning Policy. This amount is based on the usable parkland area being 75% of the total parkland required and $250.00 being 25% of the standard Parkland Contribution under Planning Policy No. 5.

Alternatively, the amount of the contribution may be expended on works within the proposed parkland including landscaping, pathways, play equipment, shelter structures and water supply. In this case, a detailed design and costing is to be submitted for approval by Council at Operational Works stage.

Earthworks

19. All proposed lots must be drained from the rear boundary to the frontage of the lot in accordance with the Far North Queensland Regional Organisation of councils Development Manual, except as otherwise modified by these conditions or an Operational Works Development Permit.

20. All allotment and footpath slopes must be designed in accordance with the Far North Queensland Regional Organisation of Councils Development Manual.

21. Details of the proposed filling and excavation for the reconfiguration must be included in a plan and submitted at the time of lodgement of the application for Operational Works.

Stormwater Drainage

22. The proposed drainage area must be designed in accordance with the Far North Queensland Regional Organisation of Councils Development Manual. All easements and/or reserves are to be transferred to Council as a drainage easement and/or reserve in fee simple at the applicant's cost.

23. Prior to lodgement of the Plan of Survey for Signing and Sealing / an application for Operational Works, the applicant must submit to Council a plan:

(a) Detailing the drainage works to be undertaken on the land in connection with the reconfiguration;

(b) Detailing the ability of the proposed drainage works to meet with the requirements of the Far North Queensland Regional Organisation of Councils Development Manual.

24. Drainage (including underground), together with acceptable points of discharge are required in localities to be determined following submission of engineering drawings and designs at Operational Works stage.

25. The calculated design frequency for all storm water drainage shall be determined on a five (5) year recurrence interval and all relevant design data shall be submitted with the engineering drawings at Operational Works application stage.

26. Such storm water drainage work shall be designed and constructed in accordance with the requirements of the Far North Queensland Regional Organisation of Councils Development Manual and will not cause scouring, erosion, loss of vegetation, excess turbidity and landslip either within or external to the site.

27. The Applicants are required to place pollution control devices in stormwater drains in accordance with the requirements of the Far North Queensland Regional Organisation of Councils Development Manual. The design and location of these devices must be submitted at Operational Works application stage.

Truncations

28. Truncations in accordance with the provisions of Council's subdivisional Local Laws are to be provided.

Bikeway/Pathway

29 (a) A bikeway/walkway shall be constructed to a minimum width of two (2) metres on the southern side of Cooya Beach Road for the full frontage of the site from the eastern extent of the site to the north-western extent of the site adjacent to the unnamed road reserve along the northern boundary of the site. This pathway is intended to be constructed of bitumen with concrete edge restraints. This part of the bikeway/walkway is to be constructed at the applicant's expense.

(b) A bikeway/walkway shall be constructed to a minimum width of two (2) metres from the north-western extent of the site along Cooya Beach Road to connect to the existing bikeway/walkway at the Junction Bridge. . This pathway is intended to be constructed of bitumen with concrete edge restraints. This part of the bikeway/walkway is to be constructed by Council. The total cost of these works to install this part of the bikeway/walkway will be determined on the basis of the ratio of the number of lots in the proposed development to the number of existing and currently approved lots in Cooya Beach. The applicant is to provide cost estimates for this work at Operational Works stage.

30. The bikeway/walkway shall be suitably designed in accordance with the relevant Standards Association of Australia Code. The style and construction of all footpaths and bikeways internal and external to the development is to be bitumen centre with concrete edge restraints.

Operational Works Development Permit

31. The applicant must submit as part of an application for a Development Permit for Operational Works information and plans in accordance with the Far North Queensland Regional Organisation of Councils Development Manual.

32. Full engineering drawings, prepared and/or checked by a Registered Professional Engineer, shall be submitted for all road works, stormwater drainage and allotment improvement at Operational Works Application stage. Drawings should, in general, include the following:

    (a) locality plan;

    (b) layout and staging plan, where applicable;

    (c) layout plan for each new road;

    (d) longitudinal section of each road;

    (e) cross sections for each road, including standard cross sections;

    (f) detailed plan of each intersection and cul-de-sac head where longitudinal grades do not exceed 1%;

    (g) layout plan for each stormwater drainage;

    (h) longitudinal sections for each stormwater drain line;

    (i) details for non-standard drainage structures; and

    (j) such other details for the proper construction of the works i.e. retaining walls etc.

Street Names

33. At the time of lodging the Survey Plan with Council for endorsement, the applicant must lodge a plan of the reconfiguration displaying the proposed street names for the reconfiguration.

34. The street name signs shall be supplied and erected by the Applicant. The signs shall be aluminium on steel posts with reflective white legend (on both sides) on a green background.

Currency Period

35. The development authorised by this Development Permit must cease at the expiration of four (4) years from the day that this Development Permit takes effect under the *Integrated Planning Act 1997* unless a detailed plan of survey has been lodged with Council for endorsement and all conditions of this approval complied with.

Compliance with Conditions

36. The Plan of Survey with associated documents shall not be endorsed by Council until all of the conditions of approval have been complied with.

Acid Sulphate Soils

37. At the time of lodgement of an application for development approval for Operational Works for the reconfiguration, the applicant must submit to Council a report identifying:

(a) The location and extent of acid sulphate soils on the site;
(b) The applicant's proposed treatment of the acid sulphate soils identified.

Road Works

38. The applicant must undertake the following works:

Internal

Provision of kerb-to-kerb bitumen streets to widths required by the Far North Queensland Regional Organisation of Councils Development Manual.

Construction of a 1.5 metre wide footpath on one side of the full length of the internal loop road in the southern sector of the site and on one side of the full length of the loop road in the northern sector of the site and, in both cases, extending to Cooya Beach Road.

External

Provision is to be made for the following works external to the subject site in accordance with the Far North Queensland Regional Organisation of Councils Development Manual (FNQ ROC Development Manual).

The plans and specifications of the internal and external road works must be submitted to Council at Operational Works application stage for review.

39. Cooya Beach Road

Upgrading to the full frontage of the site in accordance with the Development Manual and generally as described in the Engineering Report submitted with the application to provide:

- a ten (10) metre wide sealed carriageway;
- kerb and channel and any associated drainage works on both sides of the carriageway;
- formed footpaths with a nominal width of 4.5 metres.

The design and construction of the works must provide for the retention of the grove of Melaleucas and other trees at the eastern end of Cooya Beach Road.

Bonnie Doon Road

Upgrading to the full frontage of the site in accordance with the FNQ ROC Development Manual. In regard to the minimum standard for the construction of Bonnie Doon Road

for the frontage of the development. Council's engineers have indicated that the carriageway will need to be upgraded to the following minimum standards in accordance with Section D1.27 part 1 of the FNQ Development Manual:

Traffic Volume/Road Class:	**1000 –7999 vpd (or sub-arterial)**
Formation	10m
Pavement Width	8m
Seal Width	8m
Shoulders	Incl. 0.5m seal on each side

Cooya Beach Road/Bonnie Doon Road Intersection

Construction of a channelised intersection in accordance with the FNQ ROC Development Manual.

Landscaping, Buffering and Fencing

40. (a) A street landscaping plan providing for street tree planting within the proposed internal roads and Cooya Beach Road and for landscaping of the proposed roundabouts must be submitted for approval at Operational Works stage.

(b) A planted buffer must be established to the full frontages of the site to Melaleuca Drive, Bonnie Doon Road and the un-constructed Palm Road adjacent to the northern boundary of the site. This buffer is to be densely planted and is to have a minimum width of 6.0metres.

The buffer must generally be in accordance with the details provided in the advice from the C&B Group dated 22nd October 2004.

Details including design of the buffer must be submitted for approval at the Operational Works stage.

The buffer must be established to the respective road frontages of each stage of the proposed development as a particular stage is constructed.

The applicant is to install a 1.8metre high fence along the un-constructed road reserve frontage to separate the agricultural uses from the residential uses. The purpose of this fence is for safety.

41. The subdivider shall lodge with the Council cash or bank bond calculated at the rate of ten percent (10%) of the contract price for the works concerned in the subdivision as a security that the maintenance works be not completed to the satisfaction of the Director Engineering Services the Council shall make good any of the said defects and deduct the costs thereof from the cash deposit or bank bond.

Commercial Development

42. The maximum permissible gross floor area for retail uses on the land designated for commercial purposes is 450m².

43. A detailed plan of development will be required to be submitted to Council prior to any self-assessable use commencing on the area designated for commercial and community purposes.

44. The Applicant shall pay to the Council headworks contributions for water supply and sewerage in accordance with Council's Local Planning Policy: "*Determination of Contributions for Water Supply and Sewerage Headworks and External Works*" ("the Policy").

The contribution shall be calculated at the rate per Equivalent Domestic Connection ("EDC") applicable at the time of payment in accordance with the Policy.

For information purposes only:

(a) The current rates per EDC at the time of this approval are:

Water Supply	$ 4,449.00
Sewerage	$ 2,665.00

(b) The current number of EDCs for the approved use are:

Water Supply	7
Sewerage	7

The payment equivalent to one (1) EDC each for water supply and sewerage headworks shall be paid prior to Council Signing and Sealing the Plan of Survey. The balance of the water supply and sewerage headworks contribution is to be paid prior to the issue of a Building Works Development Permit in respect of any development on the Commercial/ Community Purposes land (proposed Lot 900). A notice will be placed on Council's rates database to this effect on Lot 900 when the title is created.

Advice Note 1

The following is a ready reference to the specific conditions that must be met before the Plan of Survey for each stage can be endorsed by Council. The reference to stages is specific to Plan No.8021-3. If staged layout is amended, then the conditions relevant to the lots contained within the stages as shown on Plan No.8021-3 will need to be met when those lots are submitted for endorsement. All other conditions not referenced below relate to all stages and are to be met prior to the endorsement of the Plan of Survey.

Condition	**Stages as shown staged on Plan** 8021-3 Issue G
2	2
part 7 (commercial)	3
8	1
part 14 (commercial)	3
15	1
18(a)	1

29(a)	1; 2; 3; 4; 5
38	1
39 (Cooya Beach Rd)	1; 2; 3; 4; 5
39 (Bonnie Doon Rd)	4;
40(b)	2; 3; 4; 5; 6
42	2
43	2
44	2

5. Further Development Approvals Required:

Operational Works Development Permit

Paul Trotman
General Manager Development & Environment

Division 8 – Appeals to court relating to development applications

Appeals by applicants

4.1.27. **(1)** An applicant for a development application may appeal to the court against any of the following:-

(a) the refusal, or the refusal in part, of a development application;

(b) a matter stated in a development approval, including any condition applying to the development, and the identification of a code under Section 3.1.6;66

(c) the decision to give a preliminary approval when a development permit was applied for;

(d) the length of a currency period;

(e) a deemed refusal.

(2) An appeal under subsection (1)(a) to (d) must be started within twenty (20) business days (the **"applicant's appeal period"**) after the day the decision notice or negotiated decision notice is given to the applicant.

(3) An appeal under subsection (1)(e) may be started at any time after the last day a decision on the matter should have been made.

G3·27

COUNCIL & CORPORATE SERVICES GENERAL MEETING
30th November 2004
CONSULTANT PLANNER'S REPORT
APPLICATION FOR MATERIAL CHANGE OF USE AND RECONFIGURING A LOT
APPLICATION NO CA46

CONCURRENCE AGENCY – DEPT OF MAIN ROADS – APPENDIX A

Queensland Government

Department of Main Roads

14 July 2004

Mr T Melchert
Chief Executive Officer
Douglas Shire Council
PO Box 357
Mossman Qld 4873

Dear Mr Melchert

Douglas Shire : Captain Cook Highway
Located at Bonnie Doon Road, Cooya Beach Road & Melaleuca Drive, Cooya Beach
Lot 1 on RP 720316, and Lots 2 & 3 on SR 614, Parish of Victory
Salson Pty Ltd
Proposed Material Change of Use & Reconfiguration of Lot (250 Residential A allotments, 38 Residential B allotments, Community Centre/ Commercial allotment, Park & New Roads) Application
Referral Agency's Response (conditions apply)

I refer to the above application received at the Department 25 & 28 November 2003 and 27 & 31 May 2004 requesting consideration of the above development.

A. CONDITIONS OF DEVELOPMENT

Pursuant to the *Integrated Planning Act 1997*, the Queensland Department of Main Roads, as a Concurrence Agency, has assessed the impact of the proposed development on the State-controlled road network and requires that Council include the following conditions of development for the subject application:

1. Permitted Road Access Location

(i) Access between the State-controlled road (i.e. Captain Cook Highway) and the subject land shall be via Bonnie Doon Road and Cooya Beach Road, to the satisfaction of Douglas Shire Council.

(ii) No direct access between the State-controlled road reserve (i.e. Captain Cook Highway) and the subject land is permitted.

2. Road Intersection Works

(i) Road intersection works at the intersections of Captain Cook Highway and Bonnie Doon Road and of Captain Cook Highway and Junction Street (in Mossman) are required and shall be constructed in accordance with:

North Queensland Region
Peninsula District
PO Box 6185
CAIRNS Queensland 4870
ABN 57 836 727 711

Our ref 45/20A/102(3152)
Your ref CA 46/03
Enquiries MALCOLM HARDY
Telephone +61 7 4050 5511
Facsimile +61 7 4050 5438

DOUGLAS SHIRE COUNCIL

COUNCIL & CORPORATE SERVICES GENERAL MEETING
30th November 2004
CONSULTANT PLANNER'S REPORT
APPLICATION FOR MATERIAL CHANGE OF USE AND RECONFIGURING A LOT
APPLICATION NO CA46

- the Department of Main Roads *Road Planning and Design Manual*, and
- current Department of Main Roads standards.

A recent site inspection indicates the requirement for the provision of the following works:

- at the intersection of Captain Cook Highway and Bonnie Doon Road – upgrade to a Type CHR (channelised right turn treatment) in accordance with the Department's *Road Planning and Design Manual*, and
- at the intersection of Captain Cook Highway and Junction Street (in Mossman) – construct a through lane and right turn lane along the Highway travelling north, with the minimum storage capacity of the right turn lane in accordance with the Department's *Road Planning and Design Manual*.

(ii) The landowner/ applicant shall submit intersection design drawings prepared by a suitably qualified Registered Professional Engineer Queensland (RPEQ) for approval of the Cairns office of the Department of Main Roads prior to commencing any onsite works within the State-controlled road reserve (i.e. Captain Cook Highway).

(iii) All required works shall be completed to the satisfaction of the Director-General of the Department of Main Roads:

- at the intersection of Captain Cook Highway and Bonnie Doon Road – prior to Council sealing the plan of survey creating the 100th residential allotment (proposed Stage 2C), and
- at the intersection of Captain Cook Highway and Junction Street (in Mossman) – prior to Council sealing the first plan of survey of the subject land.

3. Advertising

No advertising device for the proposed development is permitted within the State-controlled road reserve (i.e. Captain Cook Highway).

Reasons

The reasons and information used in the setting of conditions detailed above include:

- Department of Main Roads Access Policy,
- Department of Main Roads Involvement in Development Applications Referrals and Assessment Guide, and
- Douglas Shire Planning Scheme.

B. GENERAL DISCUSSION

Council is requested to reflect Conditions 1 and 3 above on its Rates Record, to ensure that the planning intentions of Conditions 1 and 3 are secured.

This Department would appreciate a copy of Council's decision notice regarding the application.

A copy of this letter has been sent to the applicant.

Yours sincerely

Brad Finegan
A/MANAGER (TRANSPORT PLANNING) PENINSULA

Item 5

Project Notes

2 James Street
PO Box 1062
Cairns QLD 4870 Australia
T +61 7 4031 4599
F +61 7 4031 3967
www.jacobs.com

Subject	**Response to Amended Decision Notice**		
Client	Jonpa Pty Ltd	**Date**	01 December 2017
Project	Oceans Breeze Stage 6A & 6B		

Assessment Manager Conditions

Plan of Reconfiguration

1. The approved reconfiguration and the carrying out of any works on the premises associated with the development must generally be in accordance with Plan of Reconfiguration No. 8021-3, Issue G, dated 18th May 2004, prepared by the C&B Group, and attached to this approval subject to:

   (a) Modifications required by any condition of this approval and any minor alterations found necessary by Council at the time of examination of engineering plans; and

   (b) Any development permit for operational works relating to the reconfiguration.

   Some minor boundary changes have been made to various lots within Stage 6 to better suit the sewerage infrastructure. Lot 268 has been added to Stage 6A.

2. The Plan of Reconfiguration No. 8021-3 Issue G, dated 18th May 2004, must be amended as follows:

   (a) A pathway with a minimum width of four (4) metres must be provided from the cul-de-sac in the south-eastern comer of the site to Melaleuca Drive and a 1.5 metre wide concrete footpath must be constructed within the pathway.

   NA to this stage.

Water Supply

3. The reticulated water supply must be constructed with the design plans approved by Council.

   Noted.

Internal

4. The applicant must provide a reticulated water supply to the development.

   Done.

5. This system must make provision for services to the boundaries of all lots, including main works, enveloper pipes at cross street services, valve and hydrant markers and a water meter to each lot.

   No water meters are provided to individual lots. This is consistent with previous stages.

6. The plans and specifications of the internal water supply must be submitted to Council at Operational Works application stage for this reconfiguration for review.

   Noted.

External

7. Provision of water supply headworks contributions in accordance with Council's Policy on Applicant Contributions for Water Supply and Sewerage Services and Council's Schedule of Fees and Charges which provides for contribution amounts to be varied if not paid in full within12 months of the date of this approval. Headworks are to apply based on $4,449.00 per E.D.C. for water supply. Payment of such contributions shall be made prior to Council Signing and Sealing of the Plan of Survey except that in relation to the Commercial/ Community Purpose land (proposed Lot 900) the payment equivalent to one (1) EDC for water supply headworks shall be paid prior to Council Signing and Sealing the Plan of Survey. The balance of the water supply headworks contribution is to be paid prior to the issue of a Building Works Development Permit in respect of any development on the Commercial/Community Purposes land (proposed Lot 900). A notice will be placed on Council's rates database to this effect on Lot 900 when the title is created.

NA to Op Works.

8. (a) The applicant is responsible for the external works to connect the site with Council's water supply at Cooya Beach Road and to upgrade the water main to 200mm diameter for the full length of the site frontage to Cooya Beach Road.

NA to this stage.

(b) The applicant must design and construct a 3.5 megalitre reservoir at the existing reservoir site.

The total cost of the works to install this reservoir will be determined on the basis of the ratio of the number of lots in the proposed development to the number of existing and currently approved lots in Cooya Beach. The applicant will construct all works and the equivalent amount for Council's contribution (existing allotments) to the reservoir will be subtracted from the applicant's water supply headworks contributions for the development.

NA to this stage.

Sewerage

Internal

9. Provision of sewerage reticulation to plans approved by Council. Provision shall be made for house connection branches for each allotment.

Done.

10. The plans and specifications of the internal sewerage works must be submitted to Council at Operational Works application stage for review.

Noted.

11. Pumping stations are to be located on land vested under Council's control.

Done.

12. The design information submitted for Operational Works approval shall include design flows, pipe sizes, grades, pump rates, catchments and pressure main hydraulics.

Done, refer to the drawings, sewer masterplan and attached calculations.

13. Pumping stations shall incorporate aluminium fabricated covers to Council's standards. Switchboards are to be aluminium or stainless steel construction. Amp meters are required for each pump motor.

The pumpstation will be prefabricated. Materials to be confirmed.

External

14. Provision of sewerage headworks contributions in accordance with Council's Policy on Applicant Contributions for Water Supply and Sewerage Services and Council's Schedule of Fees and Charges which provides for contribution amounts to be varied if not paid in full within 12months of the date of this approval. Headworks are to apply based on $2,665.00 per E.D.C. for sewerage. Payment of such contributions shall be made prior to Council Signing and Sealing of the Plan of Survey except that in relation to the Commercial/Community Purpose land (proposed Lot 900) the payment equivalent to one (1) EDC for sewerage headworks shall be paid prior to Council Signing and Sealing the Plan of Survey. The balance of the sewerage headworks contribution is to be paid prior to the issue of a Building Works Development Permit in respect of any development on the Commercial/Community Purposes land (proposed Lot 900). A notice will be placed on Council's rates database to this effect on Lot 900 when the title is created.

NA to Op Works.

15. (a) The applicant must construct a pump station and rising main between the site and the Mossman Treatment Plant to provide a sewerage service to the proposed lots.

NA to this stage.

(b) The pump station is to be located adjacent to Cooya Beach Road at the eastern end of the park.

NA to this stage.

(c) The pump station and the rising main are to be sized to cater for the proposed development and for other areas of Cooya Beach which may ultimately be included in the sewerage scheme.

NA to this stage.

(d) The total cost of these works to install this reservoir will be determined on the basis of the ratio of the number of lots in the proposed development to the number of existing and currently approved lots in Cooya Beach. The applicant will construct all works and the equivalent amount for Council's contribution (existing allotments) to the reservoir will be subtracted from the applicant's water supply headworks contributions for the development.

NA to Op Works.

Electrical & Telephone Services

16. Prior to the approval of the Plan of Survey, the Applicant must submit to Council a copy of a letter from Ergon Energy stating that satisfactory arrangements have been made for the provision of:

(a) an underground electrical supply to each lot; and

(b) street lighting in accordance with Council's adopted standards.

(c) locating of all above ground transformer cubicles clear of footpath and parkland areas.

NA to Op Works.

17. Prior to the approval of the Plan of Survey, the Applicant must submit to Council a copy of a letter from Telstra stating that satisfactory arrangements have been made for the provision of:

    (a) an underground telephone service to each lot; and

    (b) locating of all above ground switching station cubicles clear of footpath and parkland areas.

    NA to Op Works.

18. (a) The applicant must transfer the area shown as Park and Mangrove on the Proposed Plan to Council in partial satisfaction of the applicant's obligation to provide parkland to Council in accordance with Local Planning Policy No.5 - Applicant Contributions - Parks. The applicant must bear all costs of the transfer.

    NA this stage.

    (b) The applicant must contribute $250.00 per lot in partial satisfaction of the applicant's obligation to provide parkland to Council in accordance with the Local Planning Policy. This amount is based on the usable parkland area being 75% of the total parkland required and $250.00 being 25% of the standard Parkland Contribution under Planning Policy No. 5.

    Alternatively, the amount of the contribution may be expended on works within the proposed parkland including landscaping, pathways, play equipment, shelter structures and water supply. In this case, a detailed design and costing is to be submitted for approval by Council at Operational Works stage.

    NA to Op Works.

Earthworks

19. All proposed lots must be drained from the rear boundary to the frontage of the lot in accordance with the Far North Queensland Regional Organisation of councils Development Manual, except as otherwise modified by these conditions or an Operational Works Development Permit.

    Done.

20. All allotment and footpath slopes must be designed in accordance with the Far North Queensland Regional Organisation of Councils Development Manual.

    Done.

21. Details of the proposed filling and excavation for the reconfiguration must be included in a plan and submitted at the time of lodgement of the application for Operational Works.

    Done, refer to the earthworks drawing.

Stormwater Drainage

22. The proposed drainage area must be designed in accordance with the Far North Queensland Regional Organisation of Councils Development Manual. All easements and/or reserves are to be transferred to Council as a drainage easement and/or reserve in fee simple at the applicant's cost.

    Done. No drainage easements are required.

23. Prior to lodgement of the Plan of Survey for Signing and Sealing/ an application for Operational Works, the applicant must submit to Council a plan:

    (a) Detailing the drainage works to be undertaken on the land in connection with the reconfiguration;

    Done.

    (b) Detailing the ability of the proposed drainage works to meet with the requirements of the Far North Queensland Regional Organisation of Councils Development Manual.

    Done.

24. Drainage (including underground), together with acceptable points of discharge are required in localities to be determined following submission of engineering drawings and designs at Operational Works stage.

    Done, points of discharge are as per the masterplans.

25. The calculated design frequency for all storm water drainage shall be determined on a five (5) year recurrence interval and all relevant design data shall be submitted with the engineering drawings at Operational Works application stage.

    The piped network has been designed for a 5 year event.

26. Such storm water drainage work shall be designed and constructed in accordance with the requirements of the Far North Queensland Regional Organisation of Councils Development Manual and will not cause scouring, erosion, loss of vegetation, excess turbidity and landslip either within or external to the site.

    Done.

27. The Applicants are required to place pollution control devices in stormwater drains in accordance with the requirements of the Far North Queensland Regional Organisation of Councils Development Manual. The design and location of these devices must be submitted at Operational Works application stage.

    No GPT's are proposed.

Truncations

28. Truncations in accordance with the provisions of Council's subdivisional Local Laws are to be provided.

    Lots are truncated to maintain the minimum verge width.

Bikeway/Pathway

29. (a) A bikeway/walkway shall be constructed to a minimum width of two (2) metres on the southern side of Cooya Beach Road for the full frontage of the site from the eastern extent of the site to the north-western extent of the site adjacent to the unnamed road reserve along the northern boundary of the site. This pathway is intended to be constructed of bitumen with concrete edge restraints. This part of the bikeway/walkway is to be constructed at the applicant's expense.

    NA to this stage.

(b) A bikeway/walkway shall be constructed to a minimum width of two (2) metres from the north-western extent of the site along Cooya Beach Road to connect to the existing bikeway/walkway at the Junction Bridge. This pathway is intended to be constructed of bitumen with concrete edge restraints. This part of the bikeway/walkway is to be constructed by Council. The total cost of these works to install this part of the bikeway/walkway will be determined on the basis of the ratio of the number of lots in the proposed development to the number of existing and currently approved lots in Cooya Beach. The applicant is to provide cost estimates for this work at Operational Works stage.

NA to this stage.

30. The bikeway/walkway shall be suitably designed in accordance with the relevant Standards Association of Australia Code. The style and construction of all footpaths and bikeways internal and external to the development is to be bitumen centre with concrete edge restraints.

NA to this stage.

Operational Works Development Permit

31. The applicant must submit as part of an application for a Development Permit for Operational Works information and plans in accordance with the Far North Queensland Regional Organisation of Councils Development Manual.

Done.

32. Full engineering drawings, prepared and/or checked by a Registered Professional Engineer, shall be submitted for all road works, stormwater drainage and allotment improvement at Operational Works Application stage. Drawings should, in general, include the following:

(a) locality plan;

Done.

(b) layout and staging plan, where applicable;

Done.

(c) layout plan for each new road;

Done.

(d) longitudinal section of each road;

Done.

(e) cross sections for each road, including standard cross sections;

Done.

(f) detailed plan of each intersection and cul-de-sac head where longitudinal grades do not exceed **1**%;

Due to the low lying flat nature of the site a minimum longitudinal grade of 0.5% has been adopted. This is consistent with previous stages.

(g) layout plan for each stormwater drainage;

Done.

(h) longitudinal sections for each stormwater drain line;

Done.

(i) details for non-standard drainage structures; and

Done.

(j) such other details for the proper construction of the works i.e. retaining walls etc.

Retaining walls are to be designed by the supplier.

Street Names

33. At the time of lodging the Survey Plan with Council for endorsement, the applicant must lodge a plan of the reconfiguration displaying the proposed street names for the reconfiguration.

NA to Op Works.

34. The street name signs shall be supplied and erected by the Applicant. The signs shall be aluminium on steel posts with reflective white legend (on both sides) on a green background.

Done, see general arrangement note 4 on DG-0002.

Currency Period

35. The development authorised by this Development Permit must cease at the expiration of four (4) years from the day that this Development Permit takes effect under the Integrated Planning Act 1997 unless a detailed plan of survey has been lodged with Council for endorsement and all conditions of this approval complied with.

Noted.

Compliance with Conditions

36. The Plan of Survey with associated documents shall not be endorsed by Council until all of the conditions of approval have been complied with

Noted.

Acid Sulphate Soils

37. At the time of lodgement of an application for development approval for Operational Works for the reconfiguration, the applicant must submit to Council a report identifying:

(a) The location and extent of acid sulphate soils on the site;

(b) The applicant's proposed treatment of the acid sulphate soils identified.

A PASS report is included with this submission which includes the treatment methodology of acid sulphate soils.

Road Works

38. The applicant must undertake the following works:

Internal

Provision of kerb-to-kerb bitumen streets to widths required by the Far North Queensland Regional Organisation of Councils Development Manual.

Done.

Construction of a 1.5 metre wide footpath on one side of the full length of the internal loop road in the southern sector of the site and on one side of the full length of the loop road in the northern sector of the site and, in both cases, extending to Cooya Beach Road.

Done.

External

Provision is to be made for the following works external to the subject site in accordance with the Far North Queensland Regional Organisation of Councils Development Manual (FNQ ROC Development Manual).

The plans and specifications of the internal and external road works must be submitted to Council at Operational Works application stage for review.

39. Cooya Beach Road

Upgrading to the full frontage of the site in accordance with the Development Manual and generally as described in the Engineering Report submitted with the application to provide:

- a ten (10) metre wide sealed carriageway;
- kerb and channel and any associated drainage works on both sides of the carriageway;
- formed footpaths with a nominal width of 4.5 metres.

The design and construction of the works must provide for the retention of the grove of Melaleucas and other trees at the eastern end of Cooya Beach Road.

NA this stage.

Bonnie Doon Road

Upgrading to the full frontage of the site in accordance with the FNQ ROC Development Manual. In regard to the minimum standard for the construction of Bonnie Doon Road

for the frontage of the development. Council's engineers have indicated that the carriageway will need to be upgraded to the following minimum standards in accordance with Section DI.27 part 1 of the FNQ Development Manual:

Traffic Volume/Road Class:	**1000 - 7999 vpd (or sub-arterial)**
Formation	10m
Pavement Width	8m
Seal Width	8m
Shoulders	Incl. 0.5m seal on each side

NA this stage.

Cooya Beach Road/Bonnie Doon Road Intersection

Construction of a channelised intersection in accordance with the FNQ ROC Development Manual.

NA this stage.

Landscaping, Buffering and Fencing

40. (a) A street landscaping plan providing for street tree planting within the proposed internal roads and Cooya Beach Road and for landscaping of the proposed roundabouts must be submitted for approval at Operational Works stage.

Landscaping plan is being prepared.

(b) A planted buffer must be established to the full frontages of the site to Melaleuca Drive, Bonnie Doon Road and the un-constructed Palm Road adjacent to the northern boundary of the site. This buffer is to be densely planted and is to have a minimum width of 6.0metres.

The buffer must generally be in accordance with the details provided in the advice from the C&B Group dated 22nd October 2004.

Details including design of the buffer must be submitted for approval at the Operational Works stage.

The buffer must be established to the respective road frontages of each stage of the proposed development as a particular stage is constructed.

The applicant is to install a 1.8metre high fence along the un-constructed road reserve frontage to separate the agricultural uses from the residential uses. The purpose of this fence is for safety.

The Palm Road road reserve is currently subject to a road licence to cultivate cane.

41. The subdivider shall lodge with the Council cash or bank bond calculated at the rate of ten percent (10%) of the contract price for the works concerned in the subdivision as a security that the maintenance works be not completed to the satisfaction of the Director Engineering Services the Council shall make good any of the said defects and deduct the costs thereof from the cash deposit or bank bond.

NA to Op Works.

Commercial

42. The maximum permissible gross floor area for retail uses on the land designated for commercial purposes is 450m^2.

NA to this stage.

43. A detailed plan of development will be required to be submitted to Council prior to any self-assessable use commencing on the area designated for commercial and community purposes.

NA to this stage.

44. The Applicant shall pay to the Council headworks contributions for water supply and sewerage in accordance with Council's local Planning Policy: "*Determination of Contributions for Water Supply and Sewerage Headworks and External Works"* ("the Policy").

The contribution shall be calculated at the rate per Equivalent Domestic Connection ("EDC") applicable at the time of payment in accordance with the Policy.

For information purposes only:

(a) The current rates per EC at the time of this approval are:

Water Supply	$ 4,449.00
Sewerage	$ 2,665.00

(b) The current number of EDCs for the approved use are:

Water Supply	7
Sewerage	7

The payment equivalent to one (1) EDC each for water supply and sewerage headworks shall be paid prior to Council Signing and Sealing the Plan of Survey. The balance of the

water supply and sewerage headworks contribution is to be paid prior to the issue of a Building Works Development Permit in respect of any development on the Commercial / Community Purposes Land (proposed Lot 900). A notice will be placed on Council's rates database to this effect on Lot 900 when the title is created.

NA to this stage.

Item 6

CHANNEL SHAPE TO BE CONFIRMED

STAGE 6A

STAGE 6B

A 7.20ha

B 9.81ha

C 12.12ha

VERGE TO FALL TOWARDS PARK

LEGEND

- DRAINAGE PIPE
- KERB INLET PIT
- HEADWALL
- POINT OF DISCHARGE
- EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- EXISTING DRAINAGE PIPE
- CATCHMENT BOUNDARY (PIPED N
- OVERLAND FLOWPATH

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

0 20 40 60 80 100m
20 10

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	PAM			INITIAL ISSUE		

OCEAN BREEZE estate

JACOBS
ABN 37 001 024 095 and ACN 001 024 095
Jacobs Group (Australia) Pty Ltd
2 James Street
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Tel: +61 7 4031 4599
Fax: +61 7 4031 3967
Web: www.jacobs.com

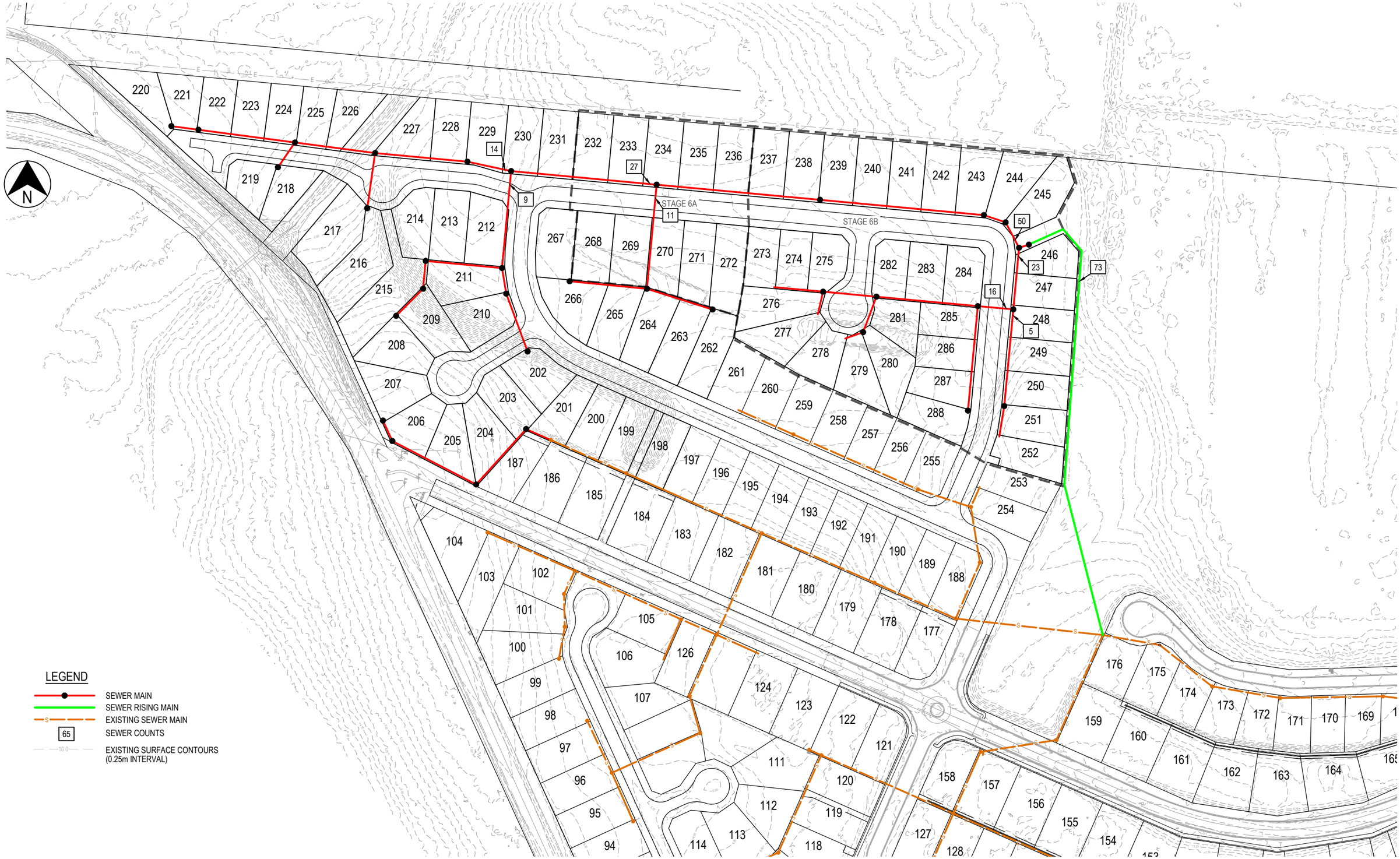
CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
PAM			
DESIGNED	DESIGN REVIEW	DATE	DATE

TITLE: MASTERPLANS
DRAINAGE MASTERPLAN

SCALE: AS SHOWN
DRAWING No: IH105400-CI-SK-0005
REV: A

DATE: 1/12/2017 1:44:58 PM NAME: MASHFORD, PAUL
LOCATION: C:\users\pmashford\appdata\local\jonp\acwise\jacobs_anz_ie\d0180900\IH132900-CI-SK-0005_0007.dwg



LEGEND

- SEWER MAIN
- SEWER RISING MAIN
- EXISTING SEWER MAIN
- 65 — SEWER COUNTS
- 10.0 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)

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

0 20 40 60 80 100m
20 10

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	PAM			INITIAL ISSUE		

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Web: www.jacobs.com

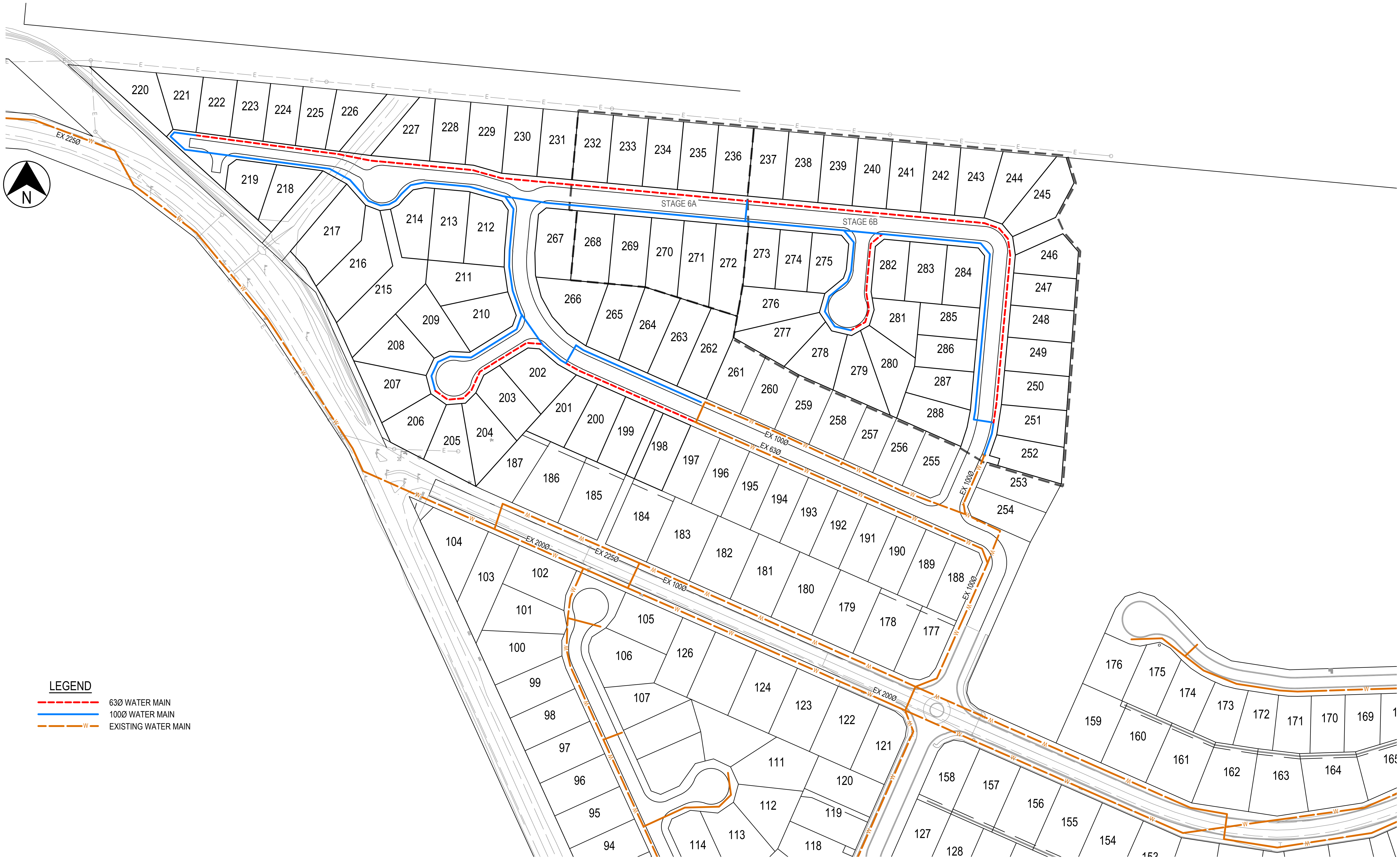
CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
PAM			
DESIGNED	DESIGN REVIEW	DATE	DATE

TITLE: MASTERPLANS
SEWER MASTERPLAN

SCALE: AS SHOWN
DRAWING No: IH105400-CI-SK-0006
REV: A

DATE: 1/12/2017 1:45:01 PM NAME: MASHFORD, PAUL
LOCATION: C:\users\pmashford\appdata\local\projectwise\jacobs_anz_ie\d0180900\IH132900-CI-SK-0005_0007.dwg



SCALE 1:1000 (A1)
1:2000 (A3)
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20 10

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	PAM			INITIAL ISSUE		

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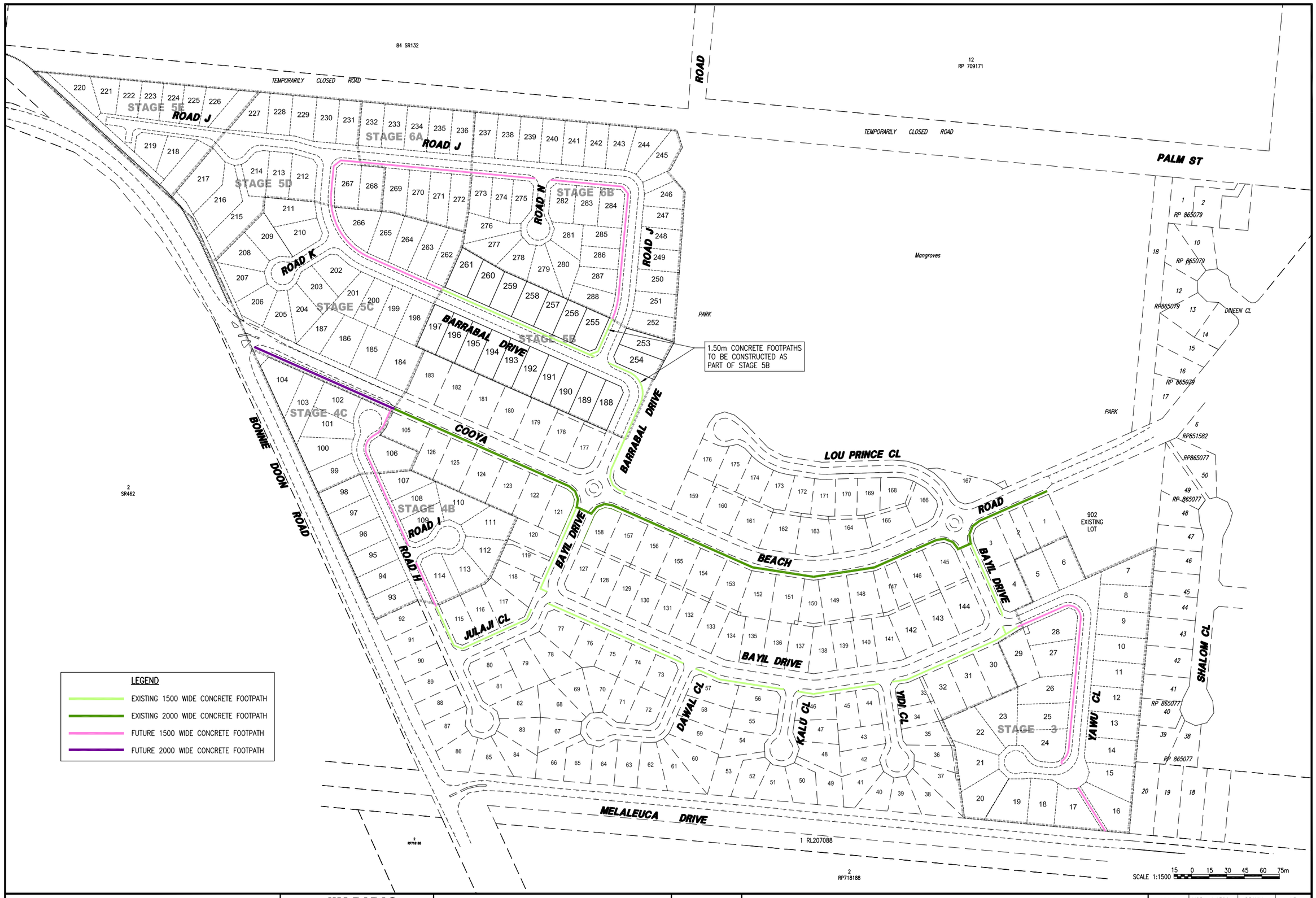
CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
PAM			
DESIGNED	DESIGN REVIEW	DATE	DATE

TITLE
MASTERPLANS
WATER MASTERPLAN

SCALE	DRAWING No	REV
AS SHOWN	IH105400-CI-SK-0007	A



LEGEND

- EXISTING 1500 WIDE CONCRETE FOOTPATH
- EXISTING 2000 WIDE CONCRETE FOOTPATH
- FUTURE 1500 WIDE CONCRETE FOOTPATH
- FUTURE 2000 WIDE CONCRETE FOOTPATH

amendments

A	ORIGINAL ISSUE	29.10.14

JIM PAPAS CIVIL ENGINEERING DESIGNER PTY. LTD.
CIVIL ENGINEERING DESIGN AND DRAFTING
P. O. Box 2347 Mareeba Q 4880
Mob. 0408 770 394
Email: admin@jpced.com.au

"Ocean Breeze Estate"

PROPOSED RESIDENTIAL SUBDIVISION AT COOYA BEACH ROAD, COOYA BEACH

DRAWING TITLE: CONCRETE FOOTPATHS MASTER PLAN

SCALE (AT A1 SIZE)	HOR 1:1500	DRAWN	J.P.
	VER	DESIGNED	J.P.
DATE	OCT 2014	CHECKED	J.P.
APPROVED	B. J. SMYTH RPEQ No. 9326		
DWG NUMBER	1187 – 0A CFP	AMDT	A

Item 7

1. Stormwater System

The stormwater system for the Ocean Breeze Estate has been designed to cater for the relevant minor and major storm events in accordance with the FNQROC & QUDM guidelines. The internal subdivision roads have been designed for a Q5 minor storm event and Q100 major event. The designed network complies with the FNQROC Development Manual and QUDM requirements for; flow widths, freeboard, pipe grades & velocities.

Refer Appendix A for the internal drainage layout plan and calculation results.

The site naturally falls to the adjacent mangroves towards the north-eastern boundary of the subject site.

2. Catchment Hydrology Inputs

2.1 Time of Concentration (ToC) Internal Catchments

A standard inlet time of 15 minutes in accordance with section 4.6.4 of QUDM has been adopted for the internal stormwater network due to the average slope of the development.

ToC's for the overland flow calculations have been adopted from the corresponding drainage structure as follows:

SECTION A – 19.8mins (ToC at Stage 1 pit 10/1)

SECTION B – 22.0 mins (from SECTION A + 200m @ 1.5m/s)

SECTION C – 22.0 mins (adopt same as SECTION B)

2.2 Coefficient of runoff

A fraction impervious (fi) of 0.5 has been adopted due to the pervious sandy soil conditions and low density of development. A corresponding coefficient of runoff (C_{10}) of 0.80 has been adopted. This is consistent with historical stages.

2.3 Rainfall Intensity

Rainfall intensities have been adopted from BOM data and verified against FNQROC tables.

2.4 Catchment Area

Catchment areas have been determined from available detail survey and topographical information.

Refer Appendix B.

3. Q100 Overland Flow

The original masterplanning for the development showed that secondary flows from stage 5B were to be directed towards the park adjacent lot 254. The detailed design for stage 5B directs the overland flow towards stage 6B. Overland flow checks have been performed which indicate that the change in the drainage philosophy would cause the roads in stage 6B to exceed capacity. See Appendix C for the original drainage masterplan.

As part of the Stage 6 works it is proposed to relieve the secondary flow in the vicinity of lot 188 by providing adverse crossfall towards the park. Providing adverse crossfall of the verge reduces the overland capacity of

this road to 0.42m^3/s. Overland flow in excess of this capacity will be directed through the park. For the stage 6B Q100 scenario an allowance of 0.50m3/s has been allowed for at SECTION A to continue north via the existing road.

An overland flow path -has been designed between lots 245 and 246 in Stage 6B. The Q100 overland flow is conveyed via this channel towards the mangroves to the east.

Refer to the catchment plan in Appendix B for the locations where overland flow has been checked.

Refer Appendix D for the relevant overland flow calculations.

4. Tail Water Level

The mean sea level in the vicinity of Port Douglas is RL 1.636m. This has been adopted as the tail water level at the outlet of the piped drainage network.

Appendix A. Internal Drainage Calculations

N

STAGE 6A
STAGE 5D
STAGE 5C
STAGE 6B
STAGE 5B

TEMPORARY SUBSOIL OUTLET

PROVIDE OUTLET AT 0.5% MIN LONGITUDINAL GRADE

ROAD 01
ROAD 02
BARRBAL DRIVE

CONNECT TO EXISTING SUBSURFACE DRAINAGE

JOINS INSET A

231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288

2/1 2/2 2/3 2/4 2/5 2/6 3/1 4/1 4/2 5/1 6/1 6/2

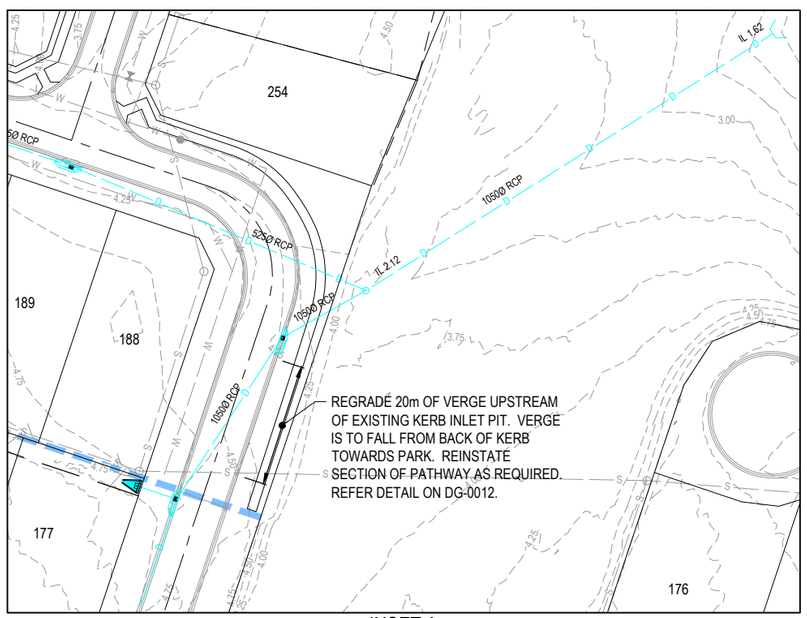
FP1 FP2 FP3

LEGEND

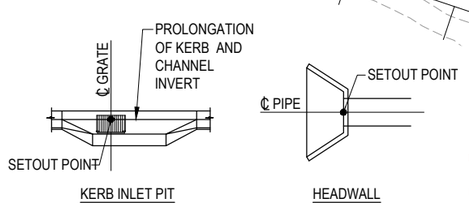
- 2/1 — LINE NUMBER / STRUCTURE No.
- STORMWATER DRAINAGE PIPE & MANHOLE
- SUBSURFACE DRAINAGE
- PROPOSED SEWER
- KERB INLET PIT
- HEADWALL
- FALL OF LOTS
- BATTER
- STAGE BOUNDARY
- 57.0 — DESIGN SURFACE CONTOURS (0.2m INTERVAL)
- 57.0 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- RETAINING WALL
- GROUTED STONE PITCHING SCOUR PROTECTION (10m² NOMINAL)
- EASEMENT BOUNDARY
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER
- PROVIDE 3x100Ø uPVC ROOFWATER PIPES AS PER FNQROC STD DRG 1035

NOTE

FOR NOTES REFER DG-0002.



INSET A



KERB INLET PIT HEADWALL

STRUCTURE SETOUT POINTS
N.T.S.

FLUSHING POINT LEGEND

FP1	FLUSHING POINT IN PIT
FP2	FLUSHING POINT IN LINE
FP3	FLUSHING POINT HEAD

SCALE 1:500 (A1)
1:1000 (A3)
0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

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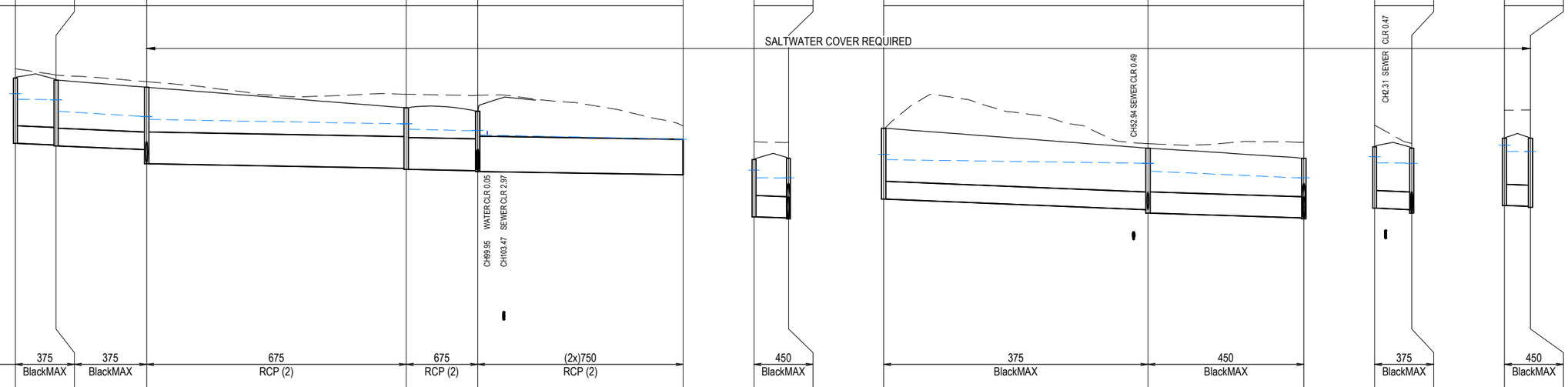
CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE
STORMWATER DRAINAGE

SCALE 1:500 (A1)
DRAWING No. IH132900-CI-DG-0011
REV A

STRUCTURE NAME	2/6	2/5	2/4	2/3	2/2	2/1	3/1	2/2	4/2	4/1	2/2	5/1	4/1	6/2	6/1
STRUCTURE DESCRIPTION	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	HEADWALL	SAG KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S
PIPE SIZE (mm)	375	375	675	675	(2x)750		450		375	450		375		450	
PIPE CLASS	BlackMAX	BlackMAX	RCP (2)	RCP (2)	RCP (2)		BlackMAX		BlackMAX	BlackMAX		BlackMAX		BlackMAX	
PIPE GRADE (%)	0.40%	0.40%	0.18%	0.18%	0.15%		0.30%		0.40%	0.30%		0.40%		0.30%	
PIPE SLOPE (1 in X)	250.00	250.00	555.55	555.56	666.66		333.33		250.00	333.33		250.00		333.33	
FULL PIPE VELOCITY (m/s)	0.74	1.58	1.27	1.45	1.16		0.71		0.76	1.55		0.78		0.78	
PART FULL VELOCITY (m/s)	1.35	1.58	1.48	1.45	1.16		1.31		1.36	1.55		1.36		1.34	
DATUM RL	-5.0						-4.0		-4.0			-4.0		-4.0	
H.G.L IN PIPE & W.S.E IN STRUCTURE	2.987 / 2.869	2.857 / 2.858	2.614 / 2.502	2.502 / 2.442	2.347 / 2.347	2.233 / 2.199 / 2.207	2.113 / 2.020 / 2.020	2.020	2.366 / 2.206	2.199 / 2.207	2.113	2.700 / 2.589	2.512 / 2.512	2.345	2.199 / 2.207	2.113	2.648 / 2.523	2.512 / 2.512	2.345	2.894 / 2.766	2.760 / 2.764
PIPE FLOW (Cumecs)	0.082		0.174		0.455	0.519	1.029		0.113			0.084	0.246				0.086		0.123		
PIPE CAPACITY AT GRADE (Cumecs)	0.144		0.144		0.464	0.464	0.863		0.203			0.144	0.203				0.144		0.203		
DEPTH TO INVERT	1.385	1.377	1.397	1.322	1.622	1.284 / 1.304 / 1.259	1.279 / 0.730 / 0.730		1.213	1.259	1.279	1.503	1.302		1.377	1.259	1.279	1.302	1.302	1.377	1.427	1.443
INVERT LEVEL OF DRAIN	1.933	1.898	1.878	1.802	1.502	1.403 / 1.383 / 1.355	1.335 / 1.270 / 1.270		1.377	1.355	1.335	1.753	1.529		1.454	1.355	1.335	1.561	1.529	1.454	1.616	1.599
DESIGN SURFACE LEVEL	3.318	3.276	3.123	2.687	2.614	2.000	2.590	2.614	3.256	2.832	2.614	2.863	2.832		3.043		3.043					
SETOUT COORDINATES	E 9004.677 / N 80639.761	E 9010.566 / N 80645.741	E 9029.684 / N 80643.962	E 9084.453 / N 80638.866	E 9096.130 / N 80629.479	E 9137.465 / N 80643.145	E 9089.154 / N 80627.278	E 9096.130 / N 80629.479	E 9088.858 / N 80540.816	E 9094.043 / N 80596.546	E 9096.130 / N 80629.479	E 9087.187 / N 80593.021	E 9094.043 / N 80596.546		E 9013.306 / N 80628.714	E 9018.782 / N 80628.205					
CHAINAGE	0.000	8.599 / 8.599	19.201 / 27.800	55.006 / 82.806	15.140 / 97.946	43.536 / 141.482	0.000	7.318 / 7.318	0.000	55.971 / 55.971	33.029 / 89.000	0.000	7.855 / 7.855		0.000	5.500 / 5.500						
LINE	2						3		4			5			6							



VERTICAL SCALE 1:50 (A1) 1:100 (A3) 0 1 2 3 4 5m; 1 0.5

HORIZONTAL SCALE 1:500 (A1) 1:1000 (A3) 0 10 20 30 40 50m; 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

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Tel: +61 7 4031 4599
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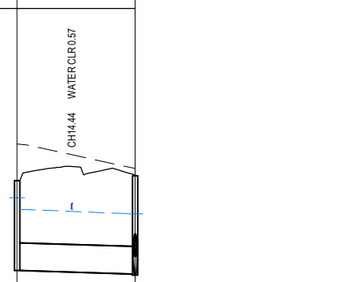
CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 1 OF 2

SCALE: 1:500H, 1:50V (A1) | DRAWING No: IH132900-CI-DG-0013 | REV: A

STRUCTURE NAME	6/1	2/4
STRUCTURE DESCRIPTION	SAG KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S



PIPE SIZE (mm)			450						
PIPE CLASS			BlackMAX						
PIPE GRADE (%)			0.30%						
PIPE SLOPE (1 in X)			333.33						
FULL PIPE VELOCITY (m/s)			1.44						
PART FULL VELOCITY (m/s)			1.44						
DATUM RL			-4.0						
H.G.L IN PIPE & W.S.E IN STRUCTURE	2.760	2.764	2.576			2.502	2.502	2.442	
PIPE FLOW (Cumecs)			0.228						
PIPE CAPACITY AT GRADE (Cumecs)			0.203						
DEPTH TO INVERT	1.443		1.463			1.602		1.622	
INVERT LEVEL OF DRAIN	1.599		1.579			1.522		1.502	
DESIGN SURFACE LEVEL	3.043					3.123			
SETOUT COORDINATES	E 9018.782	N 80628.205				E 9029.684	N 80643.962		
CHAINAGE	5.500		19.280			24.780			
LINE			6						

VERTICAL SCALE 1:50 (A1) 1:100 (A3) 0 1 2 3 4 5m / 1 0.5

HORIZONTAL SCALE 1:500 (A1) 1:1000 (A3) 0 10 20 30 40 50m / 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

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Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 2 OF 2

SCALE: 1:500H, 1:50V (A1) | DRAWING No: IH132900-CI-DG-0014 | REV: A

Project: OCEAN BREEZE ESTATE - STAGE 6

12D MODEL - DESIGN SHEET (QUDM) MINOR STORM EVENT Q5

LOCATION		SUB-CATCHMENT RUNOFF					INLET DESIGN											DRAIN DESIGN													HEAD LOSSES							PART FULL		DESIGN LEVELS							
		Tc	I	A	CA	Qc	Qa									Qg	Qb		Tc	I	CA	Qrat	Q	L	S			Vf=Q/A	Qcap	Vcap	Vt		Vf²/2g	Ku	hu	Kw	hw	Sf	hf	dn	Vn							
STRUCTURE No.	DRAIN SECTION	SUB-CATCHMENT TIME OF CONC.	RAINFALL INTENSITY	SUB-CATCHMENT AREA	EQUIVALENT AREA	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	HALF ROAD CAPACITY	FLOW WIDTH	FLOW DEPTH	FLOW DxV	ROAD GRADE AT INLET	ROAD XFALL AT INLET	INLET TYPE	INLET CURVE	FLOW INTO INLET	BYPASS FLOW	BYPASS STRUCTURE No.	CRITICAL TIME OF CONC.	RAINFALL INTENSITY	TOTAL (C x A)	PEAK FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE SIZE	PIPE CLASS	FULL PIPE VELOCITY	CAPACITY FLOW	CAPACITY VELOCITY	TRAVEL VELOCITY	CHART(S) USED	VELOCITY HEAD	U/S HEAD LOSS COEFFICIENT	U/S HEAD LOSS	W.S.E COEFFICIENT	CHANGE IN W.S.E	PIPE FRICTION SLOPE	PIPE FRICTION HEAD LOSS	NORMAL DEPTH	NORMAL DEPTH VEL.	PIPE U/S I.L	PIPE D/S I.L	PIPE U/S H.G.L	PIPE D/S H.G.L	W.S.E	GRATE LEVEL	STRUCTURE No.
		min	mm/h	ha	ha	L/s	L/s	L/s	m	m	m^2/s	%	%			L/s	L/s		min	mm/hr	ha	L/s	L/s	m	%	mm		m/s	L/s	m/s	m/s		m		m		m	%	m	m	m/s	m	m	m	m	m	m	
2/6	2/6 to 2/5	15.00	142	0.389	0.295	117	117	138	3.265	0.103	0.079	0.79	3.00	KIP-OG-S	1%	82	35	6/2	15.00	142	0.295	117	82	8.599	0.40	375	BlackMAX	0.74	144	1.31	2.00	G2	0.028	4.21	0.118		0.118	0.13	0.011	0.203	1.35	1.933	1.898	2.869	2.857	2.987	3.318	2/6
2/5	2/5 to 2/4	15.00	142	0.453	0.344	136	136	138	3.462	0.109	0.086	0.79	3.00	KIP-OG-S	1%	92	44	2/4	15.07	142	0.640	252	174	19.201	0.40	375	BlackMAX	1.58	144	1.31	2.00	G1/T4/T8	0.127	1.92	0.243		0.244	0.58	0.112	0.375	1.58	1.878	1.802	2.614	2.502	2.858	3.276	2/5
2/4	2/4 to 2/3	15.00	142	0.089	0.068	27	70	138	2.693	0.087	0.059	0.79	3.00	KIP-OG-S	1%	55	16	2/3	15.21	141	1.198	471	455	55.006	0.18	675	BlackMAX	1.27	464	1.30	2.00	T2/T4	0.083	0.73	0.061		0.061	0.17	0.095	0.542	1.48	1.502	1.403	2.442	2.347	2.502	3.123	2/4
2/3	2/3 to 2/2	15.00	142	0.269	0.205	81	97	138	3.038	0.097	0.071	0.79	3.00	KIP-OG-S	1%	71	26	2/2	15.62	140	1.401	545	519	15.140	0.18	675	BlackMAX	1.45	464	1.30	2.00	T2/T4	0.107	1.05	0.113		0.113	0.23	0.034	0.675	1.45	1.383	1.355	2.233	2.199	2.347	2.687	2/3
2/2	2/2 to 2/1	15.00	142	0.332	0.252	100	158	276		0.071		0.34	2.94	KIP-SAG-S	SAG S	158	0	98/2	15.74	140	2.656	1029	1029	43.536	0.15	(2x)750	RCP (2)	1.16	863	0.98	2.00	T4/T8	0.069	1.25	0.086	1.36	0.094	0.21	0.093	0.750	1.16	1.335	1.270	2.113	2.020	2.207	2.614	2/2
2/1														HW																															2.020	2.600	2/1
3/1	3/1 to 2/2	15.00	142	0.249	0.190	75	113	276		0.049		1.19	2.96	KIP-SAG-S	SAG S	113	0	2/2	15.00	142	0.190	75	113	7.318	0.30	450	BlackMAX	0.71	203	1.28	2.00	G2	0.026	6.18	0.159		0.159	0.09	0.007	0.240	1.31	1.377	1.355	2.206	2.199	2.366	2.590	3/1
4/2	4/2 to 4/1	15.00	142	0.403	0.307	121	121	134	3.342	0.105	0.080	0.76	3.00	KIP-OG-S	1%	84	37	4/1	15.00	142	0.307	121	84	55.971	0.40	375	BlackMAX	0.76	144	1.31	2.00	G1	0.030	3.72	0.111		0.111	0.14	0.077	0.206	1.36	1.753	1.529	2.589	2.512	2.700	3.256	4/2
4/1	4/1 to 2/2	15.00	142	0.251	0.191	75	112	134	3.246	0.103	0.076	0.76	3.00	KIP-OG-S	1%	80	33	2/2	15.07	142	0.805	317	246	33.029	0.30	450	BlackMAX	1.55	203	1.28	2.00	T2/T4	0.123	1.36	0.167		0.167	0.44	0.146	0.450	1.55	1.454	1.355	2.345	2.199	2.512	2.832	4/1
5/1	5/1 to 4/1	15.00	142	0.415	0.315	124	124	134	3.377	0.106	0.081	0.76	3.00	KIP-OG-S	1%	86	38	3/1	15.00	142	0.315	124	86	7.855	0.40	375	BlackMAX	0.78	144	1.31	2.00	G2	0.031	4.02	0.125		0.125	0.14	0.011	0.209	1.36	1.561	1.529	2.523	2.512	2.648	2.863	5/1
6/2	6/2 to 6/1	15.00	142	0.296	0.225	89	123	213		0.054				KIP-SAG-S		123	0		15.00	142	0.225	89	123	5.500	0.30	450	BlackMAX	0.78	203	1.28	2.00	G2	0.031	4.15	0.127		0.127	0.11	0.006	0.253	1.34	1.616	1.599	2.766	2.760	2.894	3.043	6/2
6/1	6/1 to 2/4	15.00	142	0.351	0.267	105	105	211		0.045				KIP-SAG-S		105	0		15.05	142	0.491	194	228	19.280	0.30	450	BlackMAX	1.44	203	1.28	2.00	T4/T8	0.105	1.75	0.185	1.79	0.189	0.38	0.073	0.450	1.44	1.579	1.522	2.576	2.502	2.764	3.043	6/1

Appendix B. Catchment Plans

CHANNEL SHAPE TO BE CONFIRMED

STAGE 6A

STAGE 6B

A 7.20ha

B 9.81ha

C 12.12ha

VERGE TO FALL TOWARDS PARK

LEGEND

- DRAINAGE PIPE
- KERB INLET PIT
- HEADWALL
- POINT OF DISCHARGE
- EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- EXISTING DRAINAGE PIPE
- CATCHMENT BOUNDARY (PIPED N
- OVERLAND FLOWPATH

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

0 20 40 60 80 100m
20 10

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	PAM			INITIAL ISSUE		

OCEAN BREEZE estate

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CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
PAM			
DESIGNED	DESIGN REVIEW	DATE	DATE

TITLE: MASTERPLANS
DRAINAGE MASTERPLAN

SCALE: AS SHOWN
DRAWING No: IH105400-CI-SK-0005
REV: A

Appendix C. Original Drainage Masterplan

FLANAGAN CONSULTING GROUP

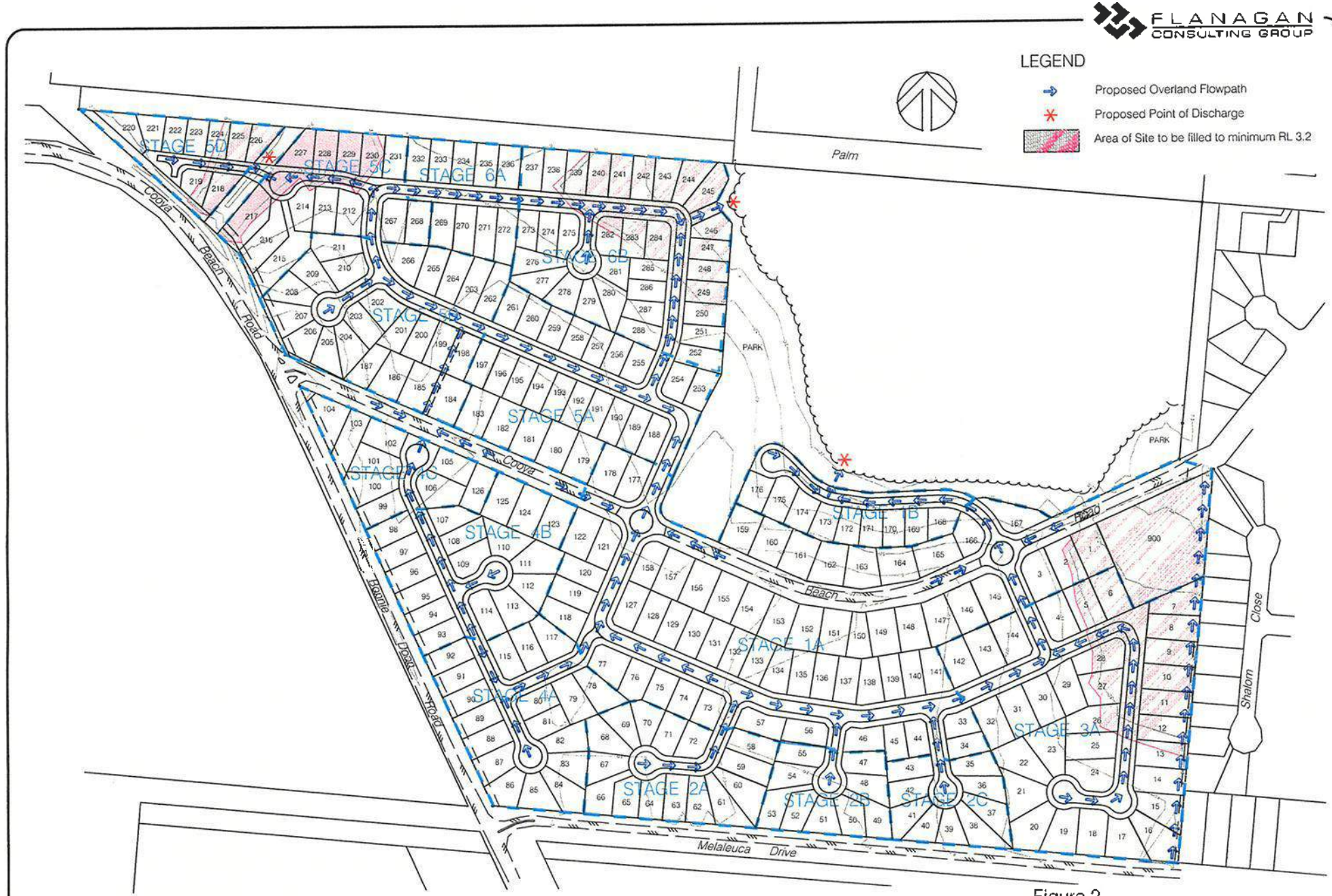


Figure 2
Site Filling and Drainage Path

Scale 1:3000

FCG ACAD No. 1329ADA

Appendix D. Q100 Overland Flow

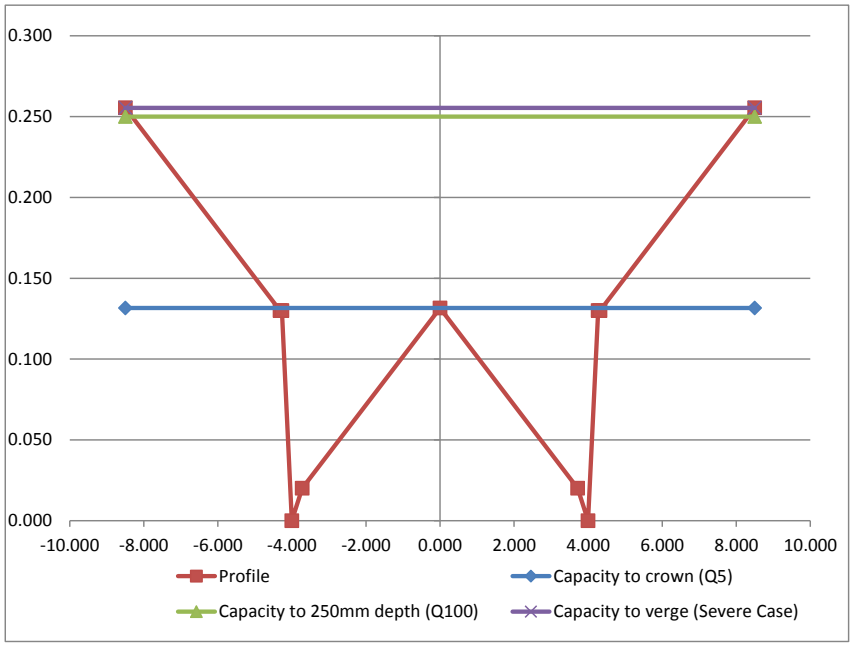
Secondary Overland Flow Catchment Calculations

Ocean Breeze Estate

Catchment	Area	c10	c1	c2	c5	c10	c50	c100	Adopted tc	(mm/h | m3/s) for ARI												Overland Minor Q100-Q5	Comment	Capacity
										100		**50**		**10**		**5**		**2**		**1**				
										mm/h	**m3/s**	**mm/h**	**m3/s**	**mm/h**	**m3/s**	**mm/h**	**m3/s**	**mm/h**	**m3/s**	**mm/h**	**m3/s**			
SECTION A	7.20	0.8	0.64	0.68	0.76	0.8	0.92	0.96	19.80	198.00	3.80	180.30	3.32	139.40	2.23	126.90	1.93	105.00	1.43	83.20	1.06	1.87	0.5m3/s only towards SECTION B & C	**0.5m3/s**
SECTION B	9.81	0.8	0.64	0.68	0.76	0.8	0.92	0.96	22.00	188.80	4.94	172.00	4.31	133.20	2.90	121.30	2.51	100.50	1.86	79.70	1.39	2.43		
SECTION C	12.12	0.8	0.64	0.68	0.76	0.8	0.92	0.96	22.00	188.80	6.10	172.00	5.33	133.20	3.59	121.30	3.10	100.50	2.30	79.70	1.72	3.00		
Recalculate excluding SECTION A Area																								
SECTION B	2.61	0.8	0.64	0.68	0.76	0.8	0.92	0.96	22.00	188.80	1.31	172.00	1.15	133.20	0.77	121.30	0.67	100.50	0.50	79.70	0.37	0.65	+ 0.50 = **1.15**m3/s	**2.62m3/s**
SECTION C	4.92	0.8	0.64	0.68	0.76	0.8	0.92	0.96	22.00	188.80	2.48	172.00	2.16	133.20	1.46	121.30	1.26	100.50	0.93	79.70	0.70	1.22	+ 0.50 = **1.72**m3/s	**2.86m3/s**

Project Description			
File name	SECTION A		Xsectn
Irregular Channel Details			
Xsectn	Offset	Height	Man N
	-8.500	0.255	0.035
	-4.320	0.130	0.013
	-4.270	0.130	
	-4.000	0.000	
	-3.720	0.020	0.015
	0.000	0.132	
	3.720	0.020	0.013
	4.000	0.000	
	4.270	0.130	
	4.320	0.130	0.035
	8.500	0.255	

Correction factor 0.9

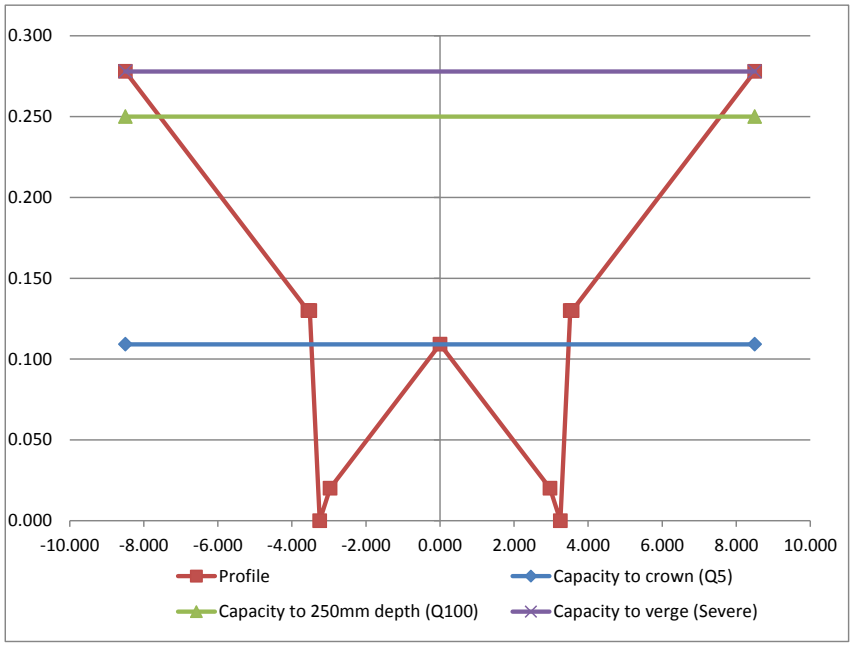


Results using Izzard's Equation

Location	Slope %	Flow Depth (m)	Flow (m3/s)	Velocity (m/s)	dxV
Capacity to crown (Q5)	0.5	0.132	0.422	0.813	0.107
Capacity to 250mm depth (Q100)	0.5	0.250	2.338	1.156	0.289
Capacity to verge (Severe Case)	0.5	0.255	2.465	1.167	0.298

Project Description			
File name	SECTION B		Xsectn
Irregular Channel Details			
Xsectn	Offset	Height	Man N
	-8.500	0.278	0.035
	-3.570	0.130	0.013
	-3.520	0.130	
	-3.250	0.000	
	-2.970	0.020	0.015
	0.000	0.109	
	2.970	0.020	0.013
	3.250	0.000	
	3.520	0.130	
	3.570	0.130	0.035
	8.500	0.278	

Correction factor 0.9



Results using Izzard's Equation

Location	Slope %	Flow Depth (m)	Flow (m3/s)	Velocity (m/s)	dxV
Capacity to crown (Q5)	0.76	0.109	0.305	0.883	0.096
Capacity to 250mm depth (Q100)	0.76	0.250	2.621	1.434	0.359
Capacity to verge (Severe)	0.76	0.278	3.382	1.486	0.413

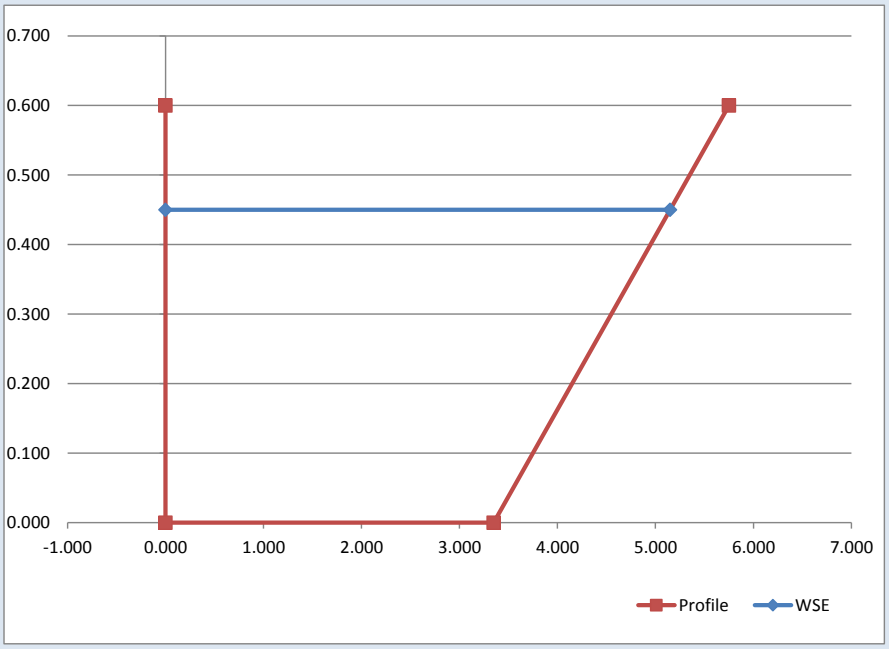
Project Description							
File name	Flowmaster.xlsx	Xsectn	SECTION C	Method	Mannings Formula	Solve for	Channel Depth

Irregular Channel Details

Xsectn	Offset	Height	Man N
	-0.001	0.600	0.03
	0.000	0.000	
	3.350	0.000	
	5.750	0.600	

Input		
Flow	3.10	m^3/s
Slope	0.010	m/m

Results			Chain	TWL
Hydraulic String	NAME=SECTI			
Flowrate	3.1	m3/s	-0.001	0.45
Normal Depth	0.45	m	5.15	0.45
TWL	0.45			
Flow Area	1.915	m2		
Wetted Perimeter	5.658	m		
Top Width	5.153	m		
Composite Mannings N	0.03			
Critical Depth	0.407	m		
Critical Slope	0	m		
Velocity	1.619	m/s		
Velocity Head	0.134	m		
D*V Product	0.729	m2/s		
Froude	0.848			
Is Sub Critical	TRUE			



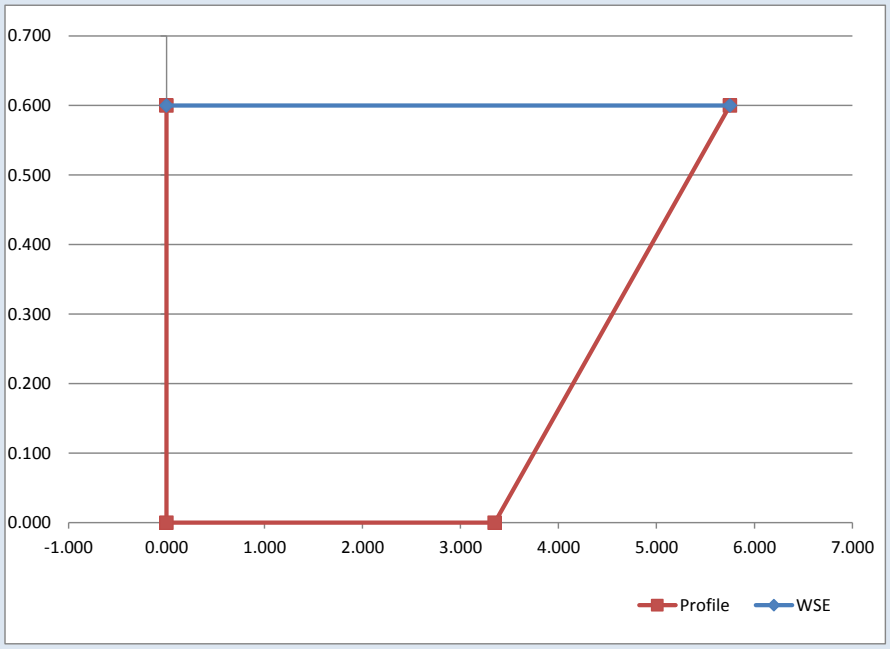
Project Description								
File name	Flowmaster.xlsx		Xsectn	SECTION C - SEVERE	Method	Mannings Formula	Solve for	Channel Depth

Irregular Channel Details

Xsectn	Offset	Height	Man N
	-0.001	0.600	0.03
	0.000	0.000	
	3.350	0.000	
	5.750	0.600	

Input		
Flow	5.15	m^3/s
Slope	0.010	m/m

Results			Chain	TWL
Hydraulic String	NAME=SECTI			
Flowrate	5.15	m3/s	-0.001	0.6
Normal Depth	0.6	m	-0.001	0.6
TWL	0.6			
Flow Area	2.732	m2		
Wetted Perimeter	6.424	m		
Top Width	5.751	m		
Composite Mannings N	0.03			
Critical Depth	0.554	m		
Critical Slope	0	m		
Velocity	1.885	m/s		
Velocity Head	0.181	m		
D*V Product	1.132	m2/s		
Froude	0.873			
Is Sub Critical	TRUE			



Item 8

Ocean Breeze Estate Stage 6 - Cooya Beach

JONPA Pty Ltd

Water Reticulation Network Analysis

IH132900-0000-CU-RPT-0001 | 0

1 December 2017

Ocean Breeze Estate Stage 6 - Cooya Beach

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Document history and status

Revision	Date	Description	By	Review	Approved
A	29/11/2017	Draft for internal review	JPH	PSD	-
0	01/12/2017	Amended following review and issued to Client	JPH	-	DMc

Contents

Important note about this report

The sole purpose of this report and the associated services performed by Jacobs Group (Australia) Pty Ltd® is to analyse the water reticulation network of the proposed Ocean Breeze Estate Stage 6 - Cooya Beach development in accordance with the scope of services set out in the contract between Jacobs and the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then our observations and conclusions as expressed in this report may change.

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1. Introduction

Jacobs has completed this analysis of the water reticulation network for the proposed Ocean Breeze Estate Stage 6 - Cooya Beach subdivision to evaluate the network's ability to meet demand.

The input model assumptions and results are summarised in the following sections.

2. Modelling Parameters

2.1 Model

Jacobs has modelled the reticulation network for the proposed Ocean Breeze Estate Stage 6 - Cooya Beach subdivision using the WATSYS program. The WATSYS program analyses the head losses within the network using the Hazen Williams headloss formula in accordance with *FNQROC Development Manual* 'D6 Water Reticulation'. Refer to Appendix A for the proposed water supply network.

Two (2) different reticulation networks with their respective demands were modelled. These are summarised as the following scenarios:

- Scenario 1 – External Demands (outside of Ocean Breeze Estate) + Existing Stage Demands + Stage 6 Lots
- Scenario 2 – External Demands (outside of Ocean Breeze Estate) + All proposed allotments.

For the purpose of the model the two (2) Cooya Beach reservoirs have been assumed to be online as well as the associated 225 mm trunk main from the reservoirs to the site.

The Reservoirs servicing the site have the following characteristics:

1. Top Water Level (TWL) 69.61 m
2. Bottom Water Level (BWL) 60.56 m
3. Total Volume 3.5 ML

2.2 Residential Demands

The Ocean Breeze Estate Stage 6 - Cooya Beach subdivision demand loading was calculated in accordance with *FNQROC Development Manual* 'D6 Water Reticulation'.

The demands applied to the model are based on the following:

- External demands to the development (existing Cooya Beach Demands);
- Existing Stages (Stage 1-4, 5A and 5B) demands; and
- Proposed allotments within Stage 6 of the development.

The number of connections within the development has been taken from the current lot layout. The external demands are based on information provided by DSC and have been allocated as a point load in the model.

The demand for each scenario, given as Equivalent Persons (EPs) and EDCs, is provided in Table 2.1 and Table 2.2.

Table 2.1 : Scenario 1 Demand

Demand Description	Land Use / Development Yield	Equivalent Persons (EP) / Connection	No. of Lots	EPs	EDCs^
	Single Family Dwelling				
External Demand	Lot 401 m² to 900 m²	2.8	280	784	280
Existing Stages Demand	Lot 401 m² to 900 m²	2.8	127	355.6	127
	Lot 901 m² to 1100 m²	3.1	68	210.8	75.3
	Lot 1101 to 1500 m²	3.4	4	13.6	4.9
Stage 6 Demand	Lot 401 m² to 900 m²	2.8	41	114.8	41
		Total	**520**	**1478.8**	**528.2**

^ 1 EDC is equivalent to 2.8 EPs

Table 2.2 : Scenario 2 Demand

Demand Description	Land Use / Development Yield	Equivalent Persons (EP) / Connection	No. of Lots	EPs	EDCs^
	Single Family Dwelling				
External Demand	Lot 401 m² to 900 m²	2.8	280	784	280
Existing Stages Demand	Lot 401 m² to 900 m²	2.8	127	355.6	127
	Lot 901 m² to 1100 m²	3.1	68	210.8	75.3
	Lot 1101 to 1500 m²	3.4	4	13.6	4.9
Stage 6 Demand	Lot 401 m² to 900 m²	2.8	41	114.8	41
Remaining Allotments (Stage 5C, 5D and 5E)	Lot 401 m² to 900 m²	2.8	38	106.4	38
	Lot 901 m² to 1100 m²	3.1	3	9.3	3.3
	Lot 1101 to 1500 m²	3.4	4	13.6	4.9
		Total	**565**	**1608.1**	**574.4**

^ 1 EDC is equivalent to 2.8 EPs

2.3 Water Supply Requirements

2.3.1 Flow Parameters

The water supply flow parameters for the network model were calculated in accordance with *FNQROC Development Manual* 'D6 Water Reticulation'. The following Average Daily consumption and peaking factors were applied to the design of the water supply scheme:

- Average Daily Consumption (AD) = 500 L/person/day
- Mean Day Maximum Month (MDMM) = 1.5 × AD
- Peak Day (PD) = 2.25 × AD
- Peak Hour (PH) = 1/12 × PD over a 1 hour period

Refer to Table 2.3 and Table 2.4 for the flow parameter values applied to the network model for each scenario.

Table 2.3 : Scenario 1 – Flow parameters and their calculated values for the network model

Flow Parameters	Scenario 1 Flow (L/s)
Average Daily Consumption (AD) AD = EP x 500 L/person/day	8.56
Mean Day max Month (MDMM) MDMM = 1.50 x AD	12.84
Peak Day (PD) PD = 2.25 x AD	19.26
Peak Hour (PH) PH = 2 x PD	38.52

Table 2.4 : Scenario 2 – Flow parameters and their calculated values for the network model

Flow Parameters	Scenario 2 Flow (L/s)
Average Daily Consumption (AD) AD = EP x 500 L/person/day	9.31
Mean Day max Month (MDMM) MDMM = 1.50 x AD	13.96
Peak Day (PD) PD = 2.25 x AD	20.95
Peak Hour (PH) PH = 2 x PD	47.14

2.3.2 Pressure Parameters

A Peak Hour (PH) flow analysis was conducted in accordance with *FNQROC Development Manual*. The residual pressure during peak day (and hence peak hour) flow should range between 22 m and 60 m, at the building pad for the above design criteria.

2.3.3 Firefighting Parameters

A static fire flow analysis was conducted in accordance with *FNQROC Development Manual*. The fire flow (FF) requirement for a residential area is 15 L/s for 2 hours. In accordance with the guidelines, two fire event scenarios were simulated with the following background demands and minimum criteria:

1) Scenario 1 (FF + 2/3 PH):
    i. Fire flow requirements is 15 L/s for 2 h
    ii. Background demand is 2/3 PH
    iii. Minimum criterion is 12 m residual pressure
2) Scenario 2 (FF + PH):
    i. Fire flow requirement is 15 L/s for 2 h
    ii. Background demand is PH
    iii. Minimum criterion is that pressures in the network remain positive

3. Model Results – Stage 6

The network was modelled for peak hour and fire flow requirements for the Ocean Breeze Estate Stage 6 - Cooya Beach subdivision.

3.1 Peak Hour Demand

The model flow rates and residual pressures for peak hour flows are listed in Appendix B (Table B.1 and Table B.2).

In this model, all lots in Stage 6 achieves the minimum 22 m residual pressure during peak hour and are all below the required 60 m residual pressure during peak day flow.

3.2 Fire Flow

3.2.1 Scenario 1 (FF + 2/3 PH)

Fire Flow Scenario 1 has a background demand of two-thirds Peak Hour flow during the fire event with a minimum criterion of 12 metres residual pressure.

A fire scenario was trialled at a number of different nodes in the network. The worst case occurred when fire flow was drawn from Node 21.

The model flow rates and residual pressures for Scenario 1 are listed in Appendix B (Table B.3, Table B.4).

During fire and two-thirds Peak Hour flows, residual pressures are greater than the required minimum of 12m. The residual pressure does not fall below this level at any node for the duration of the simulation.

3.2.2 Scenario 2 (FF + PH)

Fire Flow Scenario 2 has a background demand of Peak Hour flow during the fire event with a minimum criterion of positive residual pressure in the network.

The model flow rates and residual pressures for Scenario 2 are listed in Appendix B (Table B.5 and Table B.6).

During fire and Peak Hour flows, residual pressures remain positive. The residual pressure does not fall below zero at any node for the duration of the simulation.

4. Model Results – Master Plan

The network was modelled for peak hour and fire flow requirements for the Ocean Breeze Estate Stage 6 - Cooya Beach subdivision Water Reticulation Master Plan.

4.1 Peak Hour Demand

The model flow rates and residual pressures for peak hour flows are listed in Appendix C (Table C.1 and Table C.2).

In this model, all lots in Stage 1 achieves the minimum 22 m residual pressure during peak hour and are all below the required 60 m residual pressure during peak day flow.

4.2 Fire Flow

4.2.1 Scenario 1 (FF + 2/3 PH)

Fire Flow Scenario 1 has a background demand of two-thirds Peak Hour flow during the fire event with a minimum criterion of 12 metres residual pressure.

A fire scenario was trialled at a number of different nodes in the network. The worst case occurred when fire flow was drawn from Node 21.

The model flow rates and residual pressures for Scenario 1 are and listed in Appendix C (Table C.3,Table C.4).

During fire and two-thirds Peak Hour flows, residual pressures are greater than the required minimum of 12m. The residual pressure does not fall below this level at any node for the duration of the simulation.

4.2.2 Scenario 2 (FF + PH)

Fire Flow Scenario 2 has a background demand of Peak Hour flow during the fire event with a minimum criterion of positive residual pressure in the network.

The model flow rates and residual pressures for Scenario 2 are listed in Appendix C (Table C.5 and Table C.6).

During fire and Peak Hour flows, residual pressures remain positive. The residual pressure does not fall below zero at any node for the duration of the simulation.

5. Conclusion

The water supply network as shown in Appendix A has sufficient capacity to support the proposed Ocean Breeze Estate Stage 6 - Cooya Beach subdivision and the overall master plan based on estimated demand and the required design guidelines. This is on the basis that the existing two (2) Cooya Beach reservoirs are online and feeding the development via a 225 mm trunk main from the reservoir.

Appendix A. Water Network Layout

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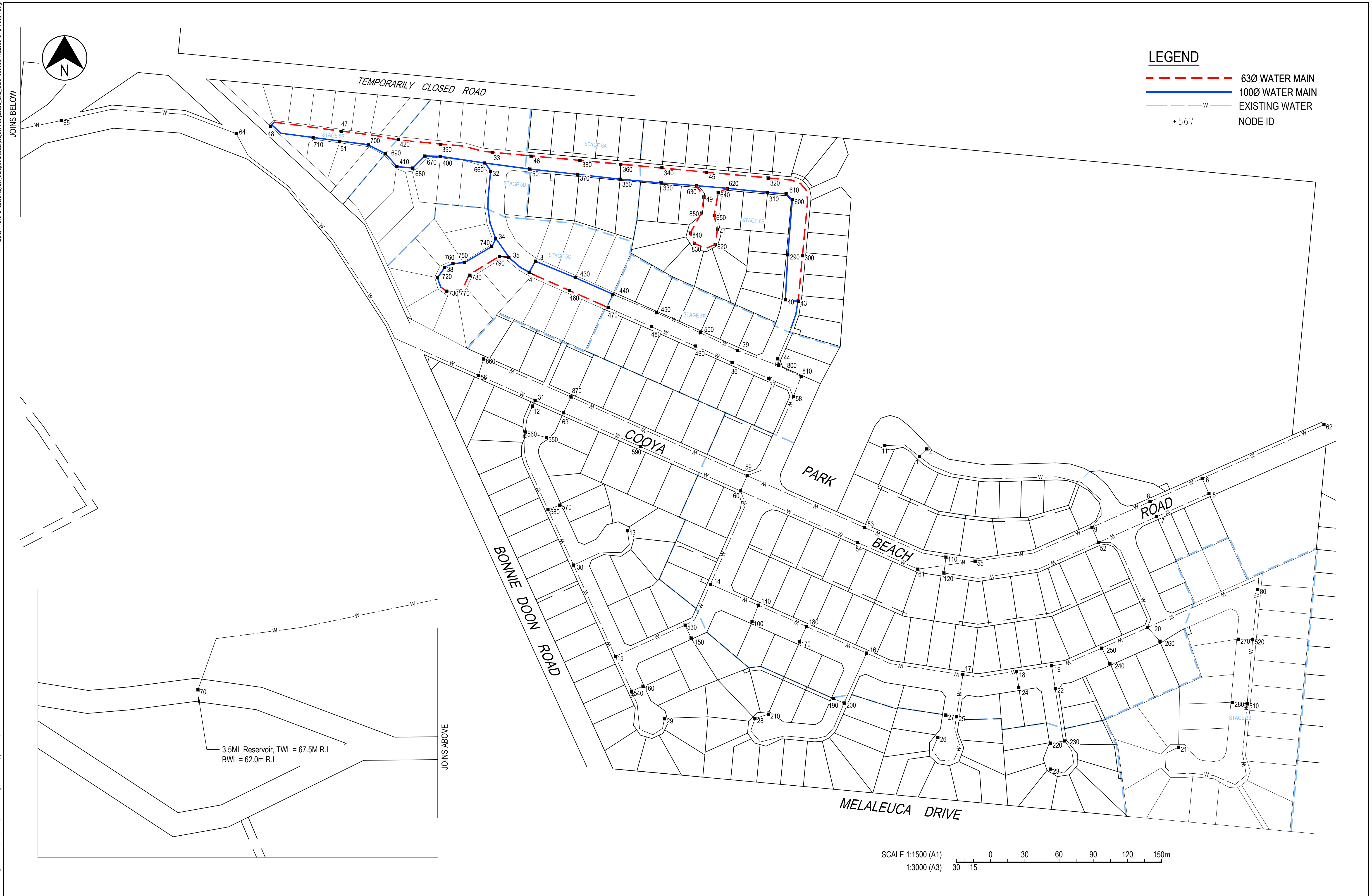

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A		JP			INITIAL ISSUE		

OCEAN BREEZE estate

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CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
JP			
DESIGNED	DESIGN REVIEW	DATE	DATE

TITLE
MASTERPLANS
WATER NETWORK LAYOUT
MASTER PLAN

SCALE	DRAWING No	REV
AS SHOWN	IH105400-CI-SK-0001	A

N

TEMPORARILY CLOSED ROAD

STAGE 5E
STAGE 6A
STAGE 5D
STAGE 6B
STAGE 5C
STAGE 5B
STAGE 6C

COOYA BEACH PARK ROAD

BONNIE DOON ROAD

MELALEUCA DRIVE

LEGEND

- 63Ø WATER MAIN
- 100Ø WATER MAIN
- W EXISTING WATER
- • 567 NODE ID

SCALE 1:1500 (A1) 1:3000 (A3)

0 30 60 90 120 150m
30 15

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A		JP			INITIAL ISSUE		

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CLIENT	JONPA PTY LTD
PROJECT	OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
JP			
DESIGNED	DESIGN REVIEW	DATE	DATE

TITLE
MASTERPLANS
WATER NETWORK LAYOUT
STAGE 6

SCALE	DRAWING No	REV
AS SHOWN	IH105400-CI-SK-0002	A

Appendix B. Stage 6 Results Tables

B.1 Network Results at Peak Hour Demands

Table B.1 : Node results at peak hour demands

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
1	0.571	54.47	59.47
100	0.163	53.92	59.92
11	0	54.47	59.47
110	0.408	52.79	59.79
12	0	55.39	60.89
120	0	52.76	59.76
13	0.49	53.93	60.43
130	0.734	55.39	60.89
14	0.408	54.1	60.1
140	0	53.92	59.92
15	0	54.23	60.23
150	0.163	53.89	60.14
16	0	53.35	59.6
160	0.163	53.98	60.23
17	0.408	52.72	59.47
170	0.163	53.76	59.76
18	0	53.43	59.43
180	0.49	53.76	59.76
19	0.163	53.91	59.41
190	0.163	53.08	59.58
2	0	55.97	59.47
20	0.245	54.91	59.41
200	0.082	53.08	59.58
21	0.653	54.78	59.28
210	15	52.55	59.55
22	0.16	53.91	59.41
220	0.163	53.41	59.41
23	0.571	53.4	59.4
230	0	53.41	59.41
24	0.163	53.43	59.43
240	0.163	53.91	59.41
25	0.082	52.71	59.46
250	0	53.91	59.41
26	0.653	52.46	59.46

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
260	0.163	54.91	59.41
27	0.163	52.71	59.46
270	0.163	56.81	59.31
28	1.142	52.55	59.55
280	0.163	56.29	59.29
29	0.49	53.22	60.22
290	0.163	56.15	59.65
30	0.408	54.43	60.43
300	0.408	56.04	59.54
31	0	55.41	60.91
310	0.163	56.59	59.59
320	0.326	56.45	59.45
330	0.163	56.54	59.54
340	0	56.49	59.49
350	0.163	56.53	59.53
36	0	54.13	59.63
360	0.408	56.53	59.53
37	0.245	55.49	59.74
370	0.163	56.53	59.53
380	0	56.53	59.53
39	0.163	54.79	59.79
40	0.163	55.68	59.68
41	0.653	54.53	59.53
43	0	55.69	59.69
44	0.326	55.28	59.78
440	0.163	54.79	59.79
45	0.326	56.45	59.45
450	0.163	54.79	59.79
46	0	56.53	59.53
470	0	54.39	59.39
480	0.653	54.39	59.39
49	0	56.05	59.55
490	0	54.53	59.53
5	0	56.82	59.32
50	0.163	56.53	59.53

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
500	0.163	54.79	59.79
510	0.571	56.3	59.3
52	0.408	53.97	59.47
520	0	56.82	59.32
53	0	53.45	59.95
530	0.245	53.89	60.14
54	0	53.27	59.97
540	0	53.98	60.23
55	0	52.72	59.72
550	0.163	55.3	60.8
56	0.245	53.51	61.01
560	0.408	55.3	60.8
57	0	55.49	60.99
570	0.163	54.58	60.58
58	0	55.65	59.9
580	0	54.58	60.58
59	0.163	54.2	60.2
590	0.326	55.09	60.59
6	0	56.8	59.3
60	0.326	53.73	60.23
600	0	56.86	59.61
61	0.571	52.84	59.84
610	0	56.85	59.6
62	22.844	56.55	59.05
620	0	56.32	59.57
63	0	55.38	60.88
630	0	56.05	59.55
64	0	57.77	62.27
640	0	56.06	59.56
65	0	57.91	62.91
650	0	56.29	59.54
7	0.245	54.89	59.39
70	0	3.51	65.51
8	0.082	54.89	59.39
80	0.408	56.83	59.33

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
800	0	55.54	59.79
810	0	55.6	59.85
820	0	55.55	59.55
830	0	55.55	59.55
840	0	55.55	59.55
850	0	56.05	59.55
9	0.408	53.98	59.48

Table B.2 : Pipeline results at peak hour demands

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0001	20.146	0.63	0.09
MA0003	-5.434	-0.64	-0.69
MA0006	22.441	0.56	0.02
MA0008	23.072	0.72	0.11
MA0009	31.206	0.97	0.28
MA0011	-4.447	-0.52	-0.16
MA0012	3.581	0.42	0.2
MA0013	14.934	0.47	0.04
MA0016	5.213	0.61	0.02
MA0019	23.643	0.74	0.26
MA0020	3.76	0.44	0.03
MA0022	2.524	0.3	0.01
MA0023	0.653	0.33	0.11
MA0024	23.643	0.74	0.13
MA0026	0	0	0
MA0027	19.976	0.62	0.09
MA0029	-1.592	-0.19	-0.01
MA0030	-0.163	-0.02	0
MA0031	0.163	0.02	0
MA0032	-0.897	-0.11	-0.01
MA0033	20.057	0.63	0.1
MA0034	2.036	0.24	0.01
MA0035	-0.897	-0.11	0
MA0036	22.844	0.71	0.25
MA0037	2.868	0.34	0.06
MA0038	2.868	0.34	0.02
MA0041	42.832	1.08	0.64
MA0042	42.832	1.08	1.26
MA0049	-0.653	-0.08	-0.01
MA0050	-3.06	-0.36	-0.13
MA0051	-3.151	-0.37	-0.14
MA0052	-0.005	0	0
MA0054	0.653	0.33	0.11
MA0055	-0.321	-0.16	-0.04
MA0057	-4.478	-0.53	-0.15
MA0059	0.49	0.06	0
MA0061	-0.49	-0.06	0
MA0062	2.928	0.34	0.09

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0065	-5.14	-0.61	-0.3
MA0067	0.897	0.46	0.15
MA0068	3.263	0.38	0.09
MA0069	-1.142	-0.13	-0.03
MA0071	0	0	0
MA0072	-0.571	-0.07	-0.01
MA0073	1.958	0.23	0.08
MA0075	-0.571	-0.07	0
MA0076	23.072	-0.72	-0.24
MA0078	1.755	0.21	0.04
MA0079	-1.998	-0.24	-0.06
MA0080	0.531	0.06	0
MA0082	42.832	1.08	2.6
MA0083	1.55	0.18	0.02
MA0089	3.891	0.46	0.25
MA0090	-3.891	-0.46	-0.17
MA0091	3.483	0.41	0.29
MA0092	3.483	0.41	0.03
MA0093	3.113	0.37	0.09
MA0094	22.441	-0.56	-0.1
MA0095	16.272	-0.41	-0.01
MA0096	-5.263	-0.62	-0.17
MA0097	-5.1	-0.6	-0.17
MA0098	-1.387	-0.16	-0.02
MA0099	-0.734	-0.09	-0.01
MA0100	0.368	0.04	0
MA0101	-0.739	-0.38	-0.15
MA0102	-0.331	-0.17	-0.09
MA0103	-0.321	-0.16	-0.04
MA0104	0	0	0
MA0105	0	0	0
MA0110	0	0	0
MA0111	0.653	0.33	0.13
MA0200	0.653	0.08	0.02
MA0201	1.387	0.16	0.02
MA0202	2.52	0.3	0.04
MA0203	-0.653	-0.08	0
MA0204	0.163	0.02	0
MA0205	0.163	0.02	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0206	0.163	0.02	0
MA0207	0.163	0.02	0
MA0208	0.163	0.02	0
MA0209	0	0	0
MA0210	0.163	0.02	0
MA0211	0.163	0.02	0
MA0212	0.163	0.02	0
MA0213	-0.163	-0.02	0
MA0214	-0.163	-0.02	0
MA0218	-0.729	-0.09	0
MA0226	-5.213	-0.61	-0.09
MA0227	-4.641	-0.55	-0.22
MA0228	-0.163	-0.02	0
MA0229	-0.163	-0.02	0
MA0230	30.88	0.96	0.36
MA000126	2.361	0.28	0.04
MA000127	2.198	0.26	0.01
MA000128	2.198	0.26	0.04
MA000129	2.198	0.26	0.01
MA000130	2.035	0.24	0.02
MA000121	0.287	0.15	0.01
MA000122	0.287	0.15	0.01
MA000123	0.287	0.15	0.01
MA000124	1.747	0.21	0.01
MA000125	-0.365	-0.04	0
MA000131	1.382	0.16	0.01
MA000132	1.219	0.14	0.01
MA000133	0.326	0.04	0
MA000134	0.163	0.02	0
MA000158	-0.163	-0.02	0
MA000159	-0.326	-0.04	0
MA000160	-0.49	-0.06	0
MA000162	4.242	0.5	0.05
MA000163	4.242	0.5	0.06
MA000164	3.59	0.42	0.01
MA000165	-0.653	-0.08	0
MA000166	0.365	0.04	0
MA000161	0.365	0.04	0
MA000167	0.365	0.04	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000168	0.365	0.04	0
MA000169	0.365	0.19	0.02

B.2 Network Results at Firefighting Demands – Scenario 1 (FF + 2/3 PH)

Table B.3 : Node results at firefighting demands - Scenario 1 (FF + 2/3 PH) (Fire at Node 12)

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
1	0.345	60.62	55.62
100	0.099	60.74	54.74
11	0.000	60.62	55.62
110	0.247	60.86	53.86
12	0	61.96	56.46
120	0	60.83	53.83
13	0.296	61.49	54.99
130	0.444	61.96	56.46
14	0.247	61.09	55.09
140	0	60.74	54.74
15	0	61.29	55.29
150	0.099	61.16	54.91
16	0	60.03	53.78
160	0.099	61.29	55.04
17	0.247	59.57	52.82
170	0.099	60.41	54.41
18	0	59.38	53.38
180	0.296	60.41	54.41
19	0.099	59.26	53.76
190	0.099	60.02	53.52
2	0	60.62	57.12
20	0.148	58.97	54.47
200	0.049	60.02	53.52
21	15.395	48.32	43.82
210	0	60.01	53.01
22	0.099	59.25	53.75
220	0.099	59.25	53.25

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
23	0.345	59.25	53.25
230	0	59.25	53.25
24	0.099	59.38	53.38
240	0.099	59.11	53.61
25	0.049	59.56	52.81
250	0	59.11	53.61
26	0.395	59.56	52.56
260	0.099	58.97	54.47
27	0.099	59.56	52.81
270	0.099	54.31	51.81
28	0.691	60.01	53.01
280	0.099	52.73	49.73
29	0.296	61.29	54.29
290	0.099	61.1	57.6
30	0.247	61.5	55.5
300	0.247	61.06	57.56
31	0	61.98	56.48
310	0.099	61.08	58.08
320	0.197	61.03	58.03
330	0.099	61.06	58.06
340	0	61.04	58.04
350	0.099	61.06	58.06
36	0	61.1	55.6
360	0.247	61.05	58.05
37	0.148	61.14	56.89
370	0.099	61.05	58.05
380	0	61.05	58.05

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
39	0.099	61.16	56.16
40	0.099	61.12	57.12
41	0.395	61.06	56.06
43	0	61.12	57.12
44	0.197	61.16	56.66
440	0.099	61.16	56.16
45	0.197	61.03	58.03
450	0.099	61.16	56.16
46	0	61.05	58.05
470	0	61	56
480	0.395	61	56
49	0	61.06	57.56
490	0	61.05	56.05
5	0	60.52	58.02
50	0.099	61.05	58.05
500	0.099	61.16	56.16
510	0.345	52.73	49.73
52	0.247	60.52	55.02
520	0	54.31	51.81
53	0	61.05	54.55
530	0.148	61.16	54.91
54	0	61.09	54.39
540	0	61.29	55.04
55	0	60.86	53.86
550	0.099	61.87	56.37
56	0.148	62.07	54.57
560	0.247	61.87	56.37

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
57	0	62.05	56.55
570	0.099	61.65	55.65
58	0	61.21	56.96
580	0	61.65	55.65
59	0.099	61.33	55.33
590	0.197	61.69	56.19
6	0	60.52	58.02
60	0.197	61.34	54.84
600	0	61.09	58.34
61	0.345	60.97	53.97
610	0	61.09	58.34
62	13.815	60.42	57.92
620	0	61.07	57.82
63	0	61.95	56.45
630	0	61.06	57.56
64	0	63.23	58.73
640	0	61.07	57.57
65	0	63.82	58.82
650	0	61.06	57.81
7	0.148	60.52	56.02
70	0	66.21	4.21
8	0.049	60.57	56.07
80	0.247	55.57	53.07
800	0	61.16	56.91
810	0	61.19	56.94
820	0	61.06	57.06
830	0	61.06	57.06

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
840	0	61.06	57.06
850	0	61.06	57.56
9	0.247	60.62	55.12

Table B.4 : Pipeline results at firefighting demands - Scenario 1 (FF + 2/3 PH) (Fire at Node 12)

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0001	19.616	0.61	0.09
MA0003	-5.181	-0.61	-0.63
MA0006	21.139	0.53	0.02
MA0008	22.689	0.71	0.11
MA0009	30.118	0.94	0.27
MA0011	-7.158	-0.84	-0.38
MA0012	4.026	0.47	0.2
MA0013	14.603	0.46	0.03
MA0016	5.013	0.59	0.02
MA0019	23.035	0.72	0.25
MA0020	2.174	0.26	0.01
MA0022	1.531	0.18	0
MA0023	0.395	0.2	0.05
MA0024	23.035	0.72	0.13
MA0026	0	0	150
MA0027	14.414	0.45	0.05
MA0029	-5.432	-0.64	-0.13
MA0030	-0.099	-0.01	0
MA0031	0.099	0.01	0
MA0032	-0.543	-0.06	0
MA0033	14.464	0.45	0.05
MA0034	7.634	0.9	0.11
MA0035	-0.543	-0.06	0
MA0036	13.815	0.43	0.1
MA0037	-0.599	-0.07	0
MA0038	-0.599	-0.07	0
MA0041	40.903	1.03	0.59
MA0042	40.903	1.03	1.16
MA0049	-0.395	-0.05	0
MA0050	-6.32	-0.74	-0.46
MA0051	-4.514	-0.53	-0.26
MA0052	0.001	0	320
MA0054	0.395	0.2	0.05
MA0055	-0.198	-0.1	-0.02
MA0057	-4.569	-0.54	-0.16
MA0059	0.296	0.03	0
MA0061	-0.296	-0.03	0
MA0062	3.631	0.43	0.13

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0065	-3.108	-0.37	-0.12
MA0067	0.543	0.28	0.06
MA0068	1.974	0.23	0.04
MA0069	-0.691	-0.08	-0.01
MA0071	0	0	430
MA0072	-0.345	-0.04	-0.01
MA0073	16.184	1.91	3.4
MA0075	-0.345	-0.04	0
MA0076	22.689	-0.71	-0.23
MA0078	5.53	0.65	0.19
MA0079	11.739	-1.38	-1.55
MA0080	4.79	0.56	0.15
MA0082	40.903	1.03	2.39
MA0083	15.937	1.88	1.26
MA0089	4.148	0.49	0.28
MA0090	-4.148	-0.49	-0.19
MA0091	3.901	0.46	0.32
MA0092	3.901	0.46	0.03
MA0093	-0.451	-0.05	0
MA0094	21.139	-0.53	-0.09
MA0095	15.515	-0.39	-0.01
MA0096	-7.652	-0.9	-0.34
MA0097	-7.553	-0.89	-0.34
MA0098	-0.839	-0.1	-0.01
MA0099	-0.444	-0.05	0
MA0100	4.691	0.55	0.14
MA0101	-0.443	-0.23	-0.06
MA0102	-0.196	-0.1	-0.04
MA0103	-0.198	-0.1	-0.01
MA0104	0	0	680
MA0105	0	0	690
MA0110	0	0	700
MA0111	0.395	0.2	0.05
MA0200	15.395	1.81	4.41
MA0201	15.839	1.86	1.58
MA0202	3.385	0.4	0.08
MA0203	-0.395	-0.05	0
MA0204	0.099	0.01	0
MA0205	0.099	0.01	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0206	0.099	0.01	0
MA0207	0.099	0.01	0
MA0208	0.099	0.01	0
MA0209	0	0	810
MA0210	0.099	0.01	0
MA0211	0.099	0.01	0
MA0212	0.099	0.01	0
MA0213	-0.099	-0.01	0
MA0214	-0.099	-0.01	0
MA0218	-0.445	-0.05	0
MA0226	-5.013	-0.59	-0.08
MA0227	-4.667	-0.55	-0.22
MA0228	-0.099	-0.01	0
MA0229	-0.099	-0.01	0
MA0230	29.92	0.93	0.34
MA000126	1.432	0.17	0.01
MA000127	1.333	0.16	0
MA000128	1.333	0.16	0.02
MA000129	1.333	0.16	0.01
MA000130	1.235	0.15	0.01
MA000121	0.176	0.09	0
MA000122	0.176	0.09	0.01
MA000123	0.176	0.09	0
MA000124	1.058	0.12	0.01
MA000125	-0.218	-0.03	0
MA000131	0.84	0.1	0
MA000132	0.741	0.09	0
MA000133	0.197	0.02	0
MA000134	0.099	0.01	0
MA000158	-0.099	-0.01	0
MA000159	-0.197	-0.02	0
MA000160	-0.296	-0.03	0
MA000162	2.566	0.3	0.02
MA000163	2.566	0.3	0.02
MA000164	2.171	0.26	0
MA000165	-0.395	-0.05	0
MA000166	0.218	0.03	0
MA000161	0.218	0.03	0
MA000167	0.218	0.03	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000168	0.218	0.03	0
MA000169	0.218	0.11	0.01

B.3 Network Results at Firefighting Demands – Scenario 2 (FF + PH)

Table B.5 : Node results at firefighting demands - Scenario 2 (FF + PH) (FF at Node 12)

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
1	0.571	49.89	54.89
100	0.163	49.34	55.34
11	0.000	49.89	54.89
110	0.408	48.39	55.39
12	0.000	51.91	57.41
120	0.000	48.33	55.33
13	0.490	50.07	56.57
130	0.734	51.9	57.4
14	0.408	49.86	55.86
140	0.000	49.34	55.34
15	0.000	50.18	56.18
150	0.163	49.72	55.97
16	0.000	48.03	54.28
160	0.163	49.93	56.18
17	0.408	46.92	53.67
170	0.163	48.84	54.84
18	0.000	47.41	53.41
180	0.490	48.84	54.84
19	0.163	47.76	53.26
190	0.163	47.77	54.27
2	0	51.39	54.89
20	0.245	48.47	52.97
200	0.082	47.77	54.27
21	15.653	37.18	41.68
210	0	47.24	54.24
22	0.163	47.76	53.26
220	0.163	47.25	53.25

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
23	0.571	47.25	53.25
230	0	47.26	53.26
24	0.163	47.41	53.41
240	0.163	47.61	53.11
25	0.082	46.92	53.67
250	0	47.61	53.11
26	0.653	46.66	53.66
260	0.163	48.47	52.97
27	0.163	46.92	53.67
270	0.163	45.42	47.92
28	1.142	47.24	54.24
280	0.163	43.23	46.23
29	0.49	49.18	56.18
290	0.163	52.16	55.66
30	0.408	50.58	56.58
300	0.408	52.06	55.56
31	0	51.94	57.44
310	0.163	52.6	55.6
320	0.326	52.47	55.47
330	0.163	52.55	55.55
340	0	52.5	55.5
350	0.163	52.54	55.54
36	0	50.15	55.65
360	0.408	52.54	55.54
37	0.245	51.51	55.76
370	0.163	52.54	55.54
380	0	52.54	55.54

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
39	0.163	50.8	55.8
40	0.163	51.7	55.7
41	0.653	50.55	55.55
43	0	51.71	55.71
44	0.326	51.3	55.8
440	0.163	50.8	55.8
45	0.326	52.47	55.47
450	0.163	50.8	55.8
46	0	52.54	55.54
470	0	50.41	55.41
480	0.653	50.41	55.41
49	0	52.06	55.56
490	0	50.54	55.54
5	0	52.2	54.7
50	0.163	52.54	55.54
500	0.163	50.8	55.8
510	0.571	43.23	46.23
52	0.408	49.25	54.75
520	0	45.42	47.92
53	0	49.22	55.72
530	0.245	49.72	55.97
54	0	49.08	55.78
540	0	49.93	56.18
55	0	48.34	55.34
550	0.163	51.75	57.25
56	0.245	50.11	57.61
560	0.408	51.75	57.25

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
57	0	52.07	57.57
570	0.163	50.86	56.86
58	0	51.66	55.91
580	0	50.86	56.86
59	0.163	50.22	56.22
590	0.326	51.39	56.89
6	0	52.2	54.7
60	0.326	49.74	56.24
600	0	52.87	55.62
61	0.571	48.54	55.54
610	0	52.87	55.62
62	22.844	51.94	54.44
620	0	52.33	55.58
63	0	51.88	57.38
630	0	52.07	55.57
64	0	55.29	59.79
640	0	52.07	55.57
65	0	55.9	60.9
650	0	52.31	55.56
7	0.245	50.22	54.72
70	0	3.42	65.42
8	0.082	50.29	54.79
80	0.408	46.77	49.27
800	0	51.56	55.81
810	0	51.61	55.86
820	0	51.56	55.56
830	0	51.56	55.56

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
840	0	51.56	55.56
850	0	52.06	55.56
9	0.408	49.4	54.9

Table B.6 : Pipeline results at firefighting demands - Scenario 2 (FF + PH) (FF at Node 12)

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0001	27.364	0.85	0.16
MA0003	-7.356	-0.87	-1.18
MA0006	30.224	0.76	0.03
MA0008	31.918	1	0.2
MA0009	42.48	1.33	0.5
MA0011	-8.783	-1.03	-0.55
MA0012	5.386	0.63	0.4
MA0013	20.346	0.63	0.06
MA0016	7.017	0.83	0.04
MA0019	32.489	1.01	0.46
MA0020	3.656	0.43	0.03
MA0022	2.524	0.3	0.01
MA0023	0.653	0.33	0.11
MA0024	32.489	1.01	0.24
MA0026	0	0	0
MA0027	21.498	0.67	0.1
MA0029	-5.928	-0.7	-0.15
MA0030	-0.163	-0.02	0
MA0031	0.163	0.02	0
MA0032	-0.897	-0.11	-0.01
MA0033	21.58	0.67	0.11
MA0034	9.359	1.1	0.16
MA0035	-0.897	-0.11	0
MA0036	22.844	0.71	0.25
MA0037	1.346	0.16	0.02
MA0038	1.346	0.16	0
MA0041	57.832	1.45	1.11

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0042	57.832	1.45	2.18
MA0049	-0.653	-0.08	-0.01
MA0050	-7.396	-0.87	-0.61
MA0051	-5.682	-0.67	-0.39
MA0052	-0.005	0	0
MA0054	0.653	0.33	0.11
MA0055	-0.322	-0.16	-0.04
MA0057	-6.283	-0.74	-0.28
MA0059	0.49	0.06	0
MA0061	-0.49	-0.06	0
MA0062	4.733	0.56	0.21
MA0065	-5.14	-0.61	-0.3
MA0067	0.897	0.46	0.15
MA0068	3.263	0.38	0.09
MA0069	-1.142	-0.13	-0.03
MA0071	0	0	0
MA0072	-0.571	-0.07	-0.01
MA0073	16.958	2	3.7
MA0075	-0.571	-0.07	0
MA0076	31.918	-1	-0.43
MA0078	6.091	0.72	0.26
MA0079	12.662	-1.49	-1.78
MA0080	4.867	0.57	0.15
MA0082	57.832	1.45	4.52
MA0083	16.55	1.95	1.35
MA0089	5.709	0.67	0.49
MA0090	-5.709	-0.67	-0.34

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0091	5.301	0.62	0.58
MA0092	5.301	0.62	0.05
MA0093	1.59	0.19	0.03
MA0094	30.224	-0.76	-0.17
MA0095	22.133	-0.56	-0.02
MA0096	-9.599	-1.13	-0.51
MA0097	-9.436	-1.11	-0.5
MA0098	-1.387	-0.16	-0.02
MA0099	-0.734	-0.09	-0.01
MA0100	4.704	0.55	0.14
MA0101	-0.739	-0.38	-0.15
MA0102	-0.331	-0.17	-0.09
MA0103	-0.322	-0.16	-0.04
MA0104	0	0	0
MA0105	0	0	0
MA0110	0	0	0
MA0111	0.653	0.33	0.13
MA0200	15.653	1.84	4.55
MA0201	16.387	1.93	1.69
MA0202	4.325	0.51	0.12
MA0203	-0.653	-0.08	0
MA0204	0.163	0.02	0
MA0205	0.163	0.02	0
MA0206	0.163	0.02	0
MA0207	0.163	0.02	0
MA0208	0.163	0.02	0
MA0209	0	0	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0210	0.163	0.02	0
MA0211	0.163	0.02	0
MA0212	0.163	0.02	0
MA0213	-0.163	-0.02	0
MA0214	-0.163	-0.02	0
MA0218	-0.729	-0.09	0
MA0226	-7.017	-0.83	-0.15
MA0227	-6.446	-0.76	-0.4
MA0228	-0.163	-0.02	0
MA0229	-0.163	-0.02	0
MA0230	42.154	1.32	0.64
MA000126	2.361	0.28	0.04
MA000127	2.198	0.26	0.01
MA000128	2.198	0.26	0.04
MA000129	2.198	0.26	0.01
MA000130	2.035	0.24	0.02
MA000121	0.287	0.15	0.01
MA000122	0.287	0.15	0.01
MA000123	0.287	0.15	0.01
MA000124	1.748	0.21	0.01
MA000125	-0.365	-0.04	0
MA000131	1.382	0.16	0.01
MA000132	1.219	0.14	0.01
MA000133	0.326	0.04	0
MA000134	0.163	0.02	0
MA000158	-0.163	-0.02	0
MA000159	-0.326	-0.04	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000160	-0.49	-0.06	0
MA000162	4.242	0.5	0.05
MA000163	4.242	0.5	0.06
MA000164	3.59	0.42	0.01
MA000165	-0.653	-0.08	0
MA000166	0.365	0.04	0
MA000161	0.365	0.04	0
MA000167	0.365	0.04	0
MA000168	0.365	0.04	0
MA000169	0.365	0.19	0.02

Appendix C. Master Plan Results Tables

C.1 Network Results at Peak Hour Demands

Table C.1 : Node results at peak hour demands

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
1	0.571	53.48	58.48
100	0.163	52.95	58.95
11	0	53.48	58.48
110	0.408	51.76	58.76
12	0	54.52	60.02
120	0	51.74	58.74
13	0.49	53.01	59.51
14	0.408	53.12	59.12
140	0	52.95	58.95
15	0	53.28	59.28
150	0.163	52.93	59.18
16	0	52.37	58.62
160	0.163	53.02	59.27
17	0.408	51.74	58.49
170	0.163	52.78	58.78
18	0	52.44	58.44
180	0.49	52.78	58.78
19	0.163	52.92	58.42
190	0.163	52.1	58.6
2	0	54.98	58.48
20	0.245	53.92	58.42
200	0.082	52.1	58.6
21	0.653	53.79	58.29
210	0	51.57	58.57
22	0.163	52.92	58.42
220	0.163	52.41	58.41
23	0.571	52.41	58.41
230	0	52.42	58.42
24	0.163	52.44	58.44
240	0.163	52.92	58.42
25	0.082	51.73	58.48
250	0	52.92	58.42
26	0.653	51.48	58.48
260	0.163	53.92	58.42

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
27	0.163	51.73	58.48
270	0.163	55.82	58.32
28	1.142	51.57	58.57
280	0.163	55.3	58.3
29	0.49	52.27	59.27
290	0.163	54.36	57.86
3	0.163	52.73	57.73
30	0.408	53.52	59.52
300	0.408	54.25	57.75
31	0	54.54	60.04
310	0.163	54.78	57.78
32	0.408	54.16	57.66
320	0.326	54.62	57.62
33	0.326	54.45	57.45
330	0.163	54.7	57.7
34	0.245	53.88	57.68
340	0	54.64	57.64
35	0	53.7	57.7
350	0.163	54.68	57.68
36	0	52.54	58.04
360	0.408	54.62	57.62
37	0.245	53.93	58.18
370	0.163	54.66	57.66
38	0.571	50.68	57.68
380	0	54.57	57.57
39	0.163	52.99	57.99
390	0.163	54.19	57.44
4	0.326	52.72	57.72
40	0.163	53.92	57.92
400	0.163	54.4	57.65
41	0.653	52.7	57.7
410	0.245	54.39	57.64
420	0	54.19	57.44
43	0	53.93	57.93
430	0.163	52.77	57.77

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
44	0.326	53.55	58.05
440	0.163	52.81	57.81
45	0.326	54.62	57.62
450	0.163	52.87	57.87
46	0	54.5	57.5
460	0	52.73	57.73
47	0.571	54.44	57.44
470	0	52.74	57.74
48	0	53.63	57.63
480	0.653	52.74	57.74
49	0	54.22	57.72
490	0	52.91	57.91
5	0	55.83	58.33
50	0.163	54.66	57.66
500	0.163	52.93	57.93
51	0.163	54.63	57.63
510	0.571	55.3	58.3
52	0.408	52.98	58.48
520	0	55.82	58.32
53	0	52.42	58.92
530	0.245	52.93	59.18
54	0	52.28	58.98
540	0	53.02	59.27
55	0	51.73	58.73
550	0.163	54.42	59.92
56	0.245	52.65	60.15
560	0.408	54.42	59.92
570	0.163	53.68	59.68
58	0	54.12	58.37
580	0	53.68	59.68
59	0.163	53.15	59.15
590	0.326	54.17	59.67
6	0	55.81	58.31
60	0.326	52.75	59.25
600	0	55.06	57.81

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
61	0.571	51.85	58.85
610	0	55.05	57.8
62	22.844	55.55	58.05
620	0	54.49	57.74
63	0	54.49	59.99
630	0	54.22	57.72
64	0	57.1	61.6
640	0	54.23	57.73
65	0	57.34	62.34
650	0	54.47	57.72
660	0	54.16	57.66
670	0	54.39	57.64
680	0	54.39	57.64
690	0	54.64	57.64
7	0.245	53.89	58.39
70	0	3.35	65.35
700	0	54.38	57.63
710	0	54.38	57.63
720	0	51.43	57.68
730	0	51.43	57.68
740	0	55.18	57.68
750	0	52.18	57.68
760	0	51.68	57.68
770	0	51.68	57.68
780	0	51.94	57.69
790	0	56.94	57.69
8	0.082	53.9	58.4
80	0.408	55.84	58.34
800	0	53.81	58.06
810	0	53.98	58.23
820	0	53.72	57.72
830	0	53.72	57.72
840	0	53.72	57.72
850	0	54.22	57.72
860	0	54.63	60.13

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
870	0.734	54.50	60
9	0.408	52.99	58.49

Table C.2 : Pipeline results at peak hour demands

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0001	21.800	0.68	0.11
MA0002	-0.441	-0.22	-0.05
MA0008	23.197	0.72	0.11
MA0009	33.75	1.05	0.33
MA0011	-4.483	-0.53	-0.16
MA0012	3.794	0.45	0.24
MA0013	16.374	0.51	0.05
MA0015	2.109	0.25	0.01
MA0016	5.426	0.64	0.02
MA0017	2.491	0.29	0.01
MA0019	23.768	0.74	0.26
MA0020	6.357	0.75	0.1
MA0022	3.048	0.36	0.02
MA0023	0.746	0.38	0.14
MA0024	23.768	0.74	0.14
MA0026	0	0	0
MA0027	20.009	0.62	0.09
MA0029	-1.627	-0.19	-0.01
MA0030	-0.163	-0.02	0
MA0031	0.163	0.02	0
MA0032	-0.897	-0.11	-0.01
MA0033	20.09	0.63	0.1
MA0034	2.127	0.25	0.01
MA0035	-0.897	-0.11	0
MA0036	22.844	0.71	0.25
MA0037	2.835	0.33	0.06
MA0038	2.835	0.33	0.02
MA0039	1.442	0.17	0.02
MA0040	0.62	0.32	0.18
MA0041	46.34	1.17	0.74
MA0042	46.34	1.17	1.46
MA0043	0.049	0.02	0
MA0049	-0.653	-0.08	-0.01
MA0050	-3.096	-0.36	-0.13
MA0051	-2.973	-0.35	-0.12
MA0052	-0.079	-0.04	0
MA0054	0.746	0.38	0.14
MA0055	-0.248	-0.13	-0.02

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0056	-2.258	-0.27	-0.02
MA0057	-4.691	-0.55	-0.17
MA0059	0.49	0.06	0
MA0061	-0.49	-0.06	0
MA0062	3.141	0.37	0.1
MA0065	-8.648	-1.02	-0.78
MA0067	0.99	0.5	0.18
MA0068	3.861	0.45	0.12
MA0069	-1.142	-0.13	-0.03
MA0071	0	0	0
MA0072	-0.571	-0.07	-0.01
MA0073	1.958	0.23	0.08
MA0075	-0.571	-0.07	0
MA0076	23.197	-0.72	-0.24
MA0078	1.791	0.21	0.05
MA0079	-1.962	-0.23	-0.06
MA0080	0.567	0.07	0
MA0082	46.34	1.17	3.01
MA0083	1.55	0.18	0.02
MA0089	3.731	0.44	0.23
MA0090	-3.731	-0.44	-0.16
MA0091	3.323	0.39	0.25
MA0092	3.323	0.39	0.02
MA0093	3.08	0.36	0.09
MA0096	-5.299	-0.62	-0.18
MA0097	-5.136	-0.6	-0.17
MA0098	-1.387	-0.16	-0.02
MA0099	-0.734	-0.09	-0.01
MA0100	0.404	0.05	0
MA0101	-0.813	-0.41	-0.18
MA0102	-0.405	-0.21	-0.13
MA0103	-0.248	-0.13	0.02
MA0104	0.441	0.22	0.06
MA0105	0.441	0.22	0.07
MA0106	-0.114	-0.06	-0.01
MA0107	0.049	0.02	0
MA0108	0.093	0.05	0.02
MA0109	0.093	0.05	0
MA0110	0.093	0.05	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0111	0.746	0.38	0.16
MA0200	0.653	0.08	0.02
MA0201	1.387	0.16	0.02
MA0202	2.733	0.32	0.05
MA0203	-0.653	-0.08	0
MA0204	0.163	0.02	0
MA0205	0.163	0.02	0
MA0206	0.163	0.02	0
MA0207	0.163	0.02	0
MA0208	0.163	0.02	0
MA0209	0	0	0
MA0210	0.163	0.02	0
MA0211	0.163	0.02	0
MA0212	0.163	0.02	0
MA0213	-0.163	-0.02	0
MA0214	-0.163	-0.02	0
MA0218	-1.096	-0.13	-0.06
MA0226	-5.426	-0.64	-0.1
MA0227	-4.855	-0.57	-0.24
MA0228	-0.163	-0.02	0
MA0229	-0.163	-0.02	0
MA0230	33.424	1.04	0.42
MA000126	2.885	0.34	0.05
MA000127	2.722	0.32	0.01
MA000128	2.722	0.32	0.06
MA000129	2.722	0.32	0.02
MA000130	2.558	0.3	0.04
MA000121	0.315	0.16	0.01
MA000122	0.315	0.16	0.02
MA000123	0.315	0.16	0.01
MA000124	2.243	0.26	0.02
MA000125	-0.337	-0.04	0
MA000131	1.906	0.22	0.02
MA000132	1.743	0.21	0.02
MA000133	0.483	0.06	0.02
MA000134	0.32	0.04	0
MA000135	0.157	0.02	0
MA000136	1.034	0.12	0
MA000137	1.191	0.14	0.01

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000138	1.028	0.12	0
MA000139	1.028	0.12	0
MA000140	1.028	0.12	0
MA000141	0.783	0.09	0
MA000142	0.783	0.09	0
MA000143	0.783	0.09	0
MA000144	0.62	0.07	0
MA000145	0.62	0.07	0
MA000147	0.149	0.02	0
MA000148	-0.149	-0.02	0
MA000149	0.422	0.05	0
MA000150	-0.422	-0.05	0
MA000151	0.422	0.05	0
MA000152	0.422	0.05	0
MA000153	-0.149	-0.08	0
MA000154	-0.149	-0.08	0
MA000155	-0.149	-0.08	-0.01
MA000156	0.149	0.08	0
MA000157	-2.655	-0.31	-0.04
MA000146	-2.818	-0.33	-0.04
MA000158	-2.981	-0.35	-0.06
MA000159	-3.144	-0.37	-0.06
MA000160	-3.307	-0.39	-0.06
MA000162	7.658	0.9	0.14
MA000163	7.658	0.9	0.16
MA000164	4.187	0.49	0.02
MA000165	-3.47	-0.41	-0.07
MA000166	0.337	0.04	0
MA000161	0.337	0.04	0
MA000167	0.337	0.04	0
MA000168	0.337	0.04	0
MA000169	0.337	0.17	0.01
MA000170	24.295	0.61	0.02
MA000171	24.295	-0.61	-0.12
MA000172	6.185	0.73	0.86
MA000173	17.376	-0.44	-0.01

C.2 Network Results at Firefighting Demands – Scenario 1 (FF + 2/3 PH)

Table C.3 : Node results at firefighting demands - Scenario 1 (FF + 2/3 PH) (Fire at Node 12)

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
1	0.345	55.04	60.04
100	0.099	54.18	60.18
11	0.000	55.04	60.04
110	0.247	53.27	60.27
12	0	55.94	61.44
120	0	53.24	60.24
13	0.296	54.45	60.95
14	0.247	54.52	60.52
140	0	54.18	60.18
15	0	54.74	60.74
150	0.099	54.35	60.6
16	0	53.2	59.45
160	0.099	54.49	60.74
17	0.247	52.24	58.99
170	0.099	53.84	59.84
18	0	52.81	58.81
180	0.296	53.84	59.84
19	0.099	53.18	58.68
190	0.099	52.95	59.45
2	0	56.54	60.04
20	0.148	53.89	58.39
200	0.049	52.95	59.45
21	15.395	43.24	47.74
210	0	52.44	59.44
22	0.099	53.18	58.68
220	0.099	52.68	58.68
23	0.345	52.67	58.67

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
230	0	52.68	58.68
24	0.099	52.81	58.81
240	0.099	53.03	58.53
25	0.049	52.24	58.99
250	0	53.03	58.53
26	0.395	51.99	58.99
260	0.099	53.89	58.39
27	0.099	52.24	58.99
270	0.099	51.23	53.73
28	0.691	52.44	59.44
280	0.099	49.15	52.15
29	0.296	53.74	60.74
290	0.099	56.71	60.21
3	0.099	55.16	60.16
30	0.247	54.96	60.96
300	0.247	56.67	60.17
31	0	55.96	61.46
310	0.099	57.18	60.18
32	0.247	56.63	60.13
320	0.197	57.11	60.11
33	0.197	57.05	60.05
330	0.099	57.14	60.14
34	0.148	56.34	60.14
340	0	57.12	60.12
35	0	56.15	60.15
350	0.099	57.13	60.13
36	0	54.79	60.29

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
360	0.247	57.13	60.13
37	0.148	56.09	60.34
370	0.099	57.13	60.13
38	0.345	53.14	60.14
380	0	57.11	60.11
39	0.099	55.27	60.27
390	0.099	56.8	60.05
4	0.197	55.16	60.16
40	0.099	56.23	60.23
400	0.099	56.88	60.13
41	0.395	55.14	60.14
410	0.148	56.87	60.12
420	0	56.8	60.05
43	0	56.24	60.24
430	0.099	55.18	60.18
44	0.197	55.79	60.29
440	0.099	55.19	60.19
45	0.197	57.11	60.11
450	0.099	55.22	60.22
46	0	57.08	60.08
460	0	55.16	60.16
47	0.345	57.05	60.05
470	0	55.16	60.16
48	0	56.12	60.12
480	0.395	55.16	60.16
49	0	56.65	60.15
490	0	55.23	60.23

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
5	0	57.44	59.94
50	0.099	57.13	60.13
500	0.099	55.24	60.24
51	0.099	57.12	60.12
510	0.345	49.15	52.15
52	0.247	54.43	59.93
520	0	51.23	53.73
53	0	53.96	60.46
530	0.148	54.35	60.6
54	0	53.81	60.51
540	0	54.49	60.74
55	0	53.28	60.28
550	0.099	55.85	61.35
56	0.148	54.06	61.56
560	0.247	55.85	61.35
570	0.099	55.12	61.12
58	0	56.17	60.42
580	0	55.12	61.12
59	0.099	54.73	60.73
590	0.197	55.64	61.14
6	0	57.44	59.94
60	0.197	54.26	60.76
600	0	57.44	60.19
61	0.345	53.39	60.39
610	0	57.43	60.18
62	13.815	57.34	59.84
620	0	56.91	60.16

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
63	0	55.93	61.43
630	0	56.65	60.15
64	0	58.33	62.83
640	0	56.66	60.16
65	0	58.48	63.48
650	0	56.9	60.15
660	0	56.63	60.13
670	0	56.88	60.13
680	0	56.88	60.13
690	0	57.12	60.12
7	0.148	55.44	59.94
70	0	4.11	66.11
700	0	56.87	60.12
710	0	56.87	60.12
720	0	53.89	60.14
730	0	53.89	60.14
740	0	57.64	60.14
750	0	54.64	60.14
760	0	54.14	60.14
770	0	54.14	60.14
780	0	54.39	60.14
790	0	59.4	60.15
8	0.049	55.49	59.99
80	0.247	52.49	54.99
800	0	56.05	60.3
810	0	56.11	60.36
820	0	56.15	60.15

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
830	0	56.15	60.15
840	0	56.15	60.15
850	0	56.65	60.15
860	0	56.04	61.54
870	0.444	55.94	61.44
9	0.247	54.54	60.04

Table C.4 : Pipeline results at firefighting demands - Scenario 1 (FF + 2/3 PH) (Fire at Node 12)

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0001	20.815	0.65	0.10
MA0002	-0.280	-0.14	-0.02
MA0008	22.722	0.71	0.11
MA0009	31.716	0.99	0.29
MA0011	-7.175	-0.84	-0.38
MA0012	4.161	0.49	0.22
MA0013	15.668	0.49	0.03
MA0015	1.251	0.15	0.01
MA0016	5.148	0.61	0.02
MA0017	1.485	0.17	0
MA0019	23.068	0.72	0.25
MA0020	3.858	0.45	0.03
MA0022	1.871	0.22	0.01
MA0023	0.45	0.23	0.06
MA0024	23.068	0.72	0.13
MA0026	0	0	0
MA0027	14.431	0.45	0.05
MA0029	-5.448	-0.64	-0.13
MA0030	-0.099	-0.01	0
MA0031	0.099	0.01	0
MA0032	-0.543	-0.06	0
MA0033	14.48	0.45	0.05
MA0034	7.65	0.9	0.11
MA0035	-0.543	-0.06	0
MA0036	13.815	0.43	0.1
MA0037	-0.616	-0.07	0
MA0038	-0.616	-0.07	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0039	0.849	0.1	0.01
MA0040	0.361	0.18	0.07
MA0041	43.025	1.08	0.65
MA0042	43.025	1.08	1.27
MA0043	0.016	0.01	0
MA0049	-0.395	-0.05	0
MA0050	-6.337	-0.75	-0.46
MA0051	-4.396	-0.52	-0.25
MA0052	-0.043	-0.02	0
MA0054	0.45	0.23	0.06
MA0055	-0.155	-0.08	-0.01
MA0056	-1.342	-0.16	-0.01
MA0057	-4.704	-0.55	-0.17
MA0059	0.296	0.03	0
MA0061	-0.296	-0.03	0
MA0062	3.766	0.44	0.14
MA0065	-5.23	-0.62	-0.31
MA0067	0.598	0.3	0.07
MA0068	2.358	0.28	0.05
MA0069	-0.691	-0.08	-0.01
MA0071	0	0	0
MA0072	-0.345	-0.04	-0.01
MA0073	16.184	1.91	3.4
MA0075	-0.345	-0.04	0
MA0076	22.722	-0.71	-0.23
MA0078	5.547	0.65	0.19
MA0079	11.723	-1.38	-1.54

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0080	4.807	0.57	0.15
MA0082	43.025	1.08	2.63
MA0083	15.937	1.88	1.26
MA0089	4.098	0.48	0.27
MA0090	-4.098	-0.48	-0.19
MA0091	3.851	0.45	0.31
MA0092	3.851	0.45	0.03
MA0093	-0.468	-0.06	0
MA0096	-7.669	-0.9	-0.34
MA0097	-7.57	-0.89	-0.34
MA0098	-0.839	-0.1	-0.01
MA0099	-0.444	-0.05	0
MA0100	4.708	0.55	0.14
MA0101	-0.487	-0.25	-0.07
MA0102	-0.24	-0.12	-0.05
MA0103	-0.155	-0.08	-0.01
MA0104	0.28	0.14	0.03
MA0105	0.28	0.14	0.03
MA0106	-0.083	-0.04	0
MA0107	0.016	0.01	0
MA0108	0.055	0.03	0
MA0109	0.055	0.03	0
MA0110	0.055	0.03	0
MA0111	0.45	0.23	0.07
MA0200	15.395	1.81	4.41
MA0201	15.839	1.86	1.58
MA0202	3.52	0.41	0.08

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0203	-0.395	-0.05	0
MA0204	0.099	0.01	0
MA0205	0.099	0.01	0
MA0206	0.099	0.01	0
MA0207	0.099	0.01	0
MA0208	0.099	0.01	0
MA0209	0	0	0
MA0210	0.099	0.01	0
MA0211	0.099	0.01	0
MA0212	0.099	0.01	0
MA0213	-0.099	-0.01	0
MA0214	-0.099	-0.01	0
MA0218	-0.682	-0.08	0
MA0226	-5.148	-0.61	-0.09
MA0227	-4.802	-0.57	-0.23
MA0228	-0.099	-0.01	0
MA0229	-0.099	-0.01	0
MA0230	31.519	0.98	0.38
MA000126	1.773	0.21	0.02
MA000127	1.674	0.2	0
MA000128	1.674	0.2	0.02
MA000129	1.674	0.2	0.01
MA000130	1.575	0.19	0.02
MA000121	0.195	0.1	0
MA000122	0.195	0.1	0.01
MA000123	0.195	0.1	0
MA000124	1.38	0.16	0.01

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000125	-0.199	-0.02	0
MA000131	1.181	0.14	0.01
MA000132	1.082	0.13	0.01
MA000133	0.302	0.04	0
MA000134	0.203	0.02	0
MA000135	0.104	0.01	0
MA000136	0.602	0.07	0
MA000137	0.706	0.08	0
MA000138	0.608	0.07	0
MA000139	0.608	0.07	0
MA000140	0.608	0.07	0
MA000141	0.46	0.05	0
MA000142	0.46	0.05	0
MA000143	0.46	0.05	0
MA000144	0.361	0.04	0
MA000145	0.361	0.04	0
MA000147	0.091	0.01	0
MA000148	-0.091	-0.01	0
MA000149	0.254	0.03	0
MA000150	-0.254	-0.03	0
MA000151	0.254	0.03	0
MA000152	0.254	0.03	0
MA000153	-0.091	-0.05	0
MA000154	-0.091	-0.05	0
MA000155	-0.091	-0.05	0
MA000156	0.091	0.05	0
MA000157	-1.583	-0.19	-0.02

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000146	-1.682	-0.2	-0.02
MA000158	-1.781	-0.21	-0.02
MA000159	-1.879	-0.22	-0.03
MA000160	-1.978	-0.23	-0.02
MA000162	4.632	0.55	0.06
MA000163	4.632	0.55	0.07
MA000164	2.556	0.3	0.01
MA000165	-2.077	-0.24	-0.03
MA000166	0.199	0.02	0
MA000161	0.199	0.02	0
MA000167	0.199	0.02	0
MA000168	0.199	0.02	0
MA000169	0.199	0.1	0.01
MA000170	22.061	0.55	0.02
MA000171	22.061	-0.55	-0.1
MA000172	5.569	0.66	0.71
MA000173	16.049	-0.4	-0.01

C.3 Network Results at Firefighting Demands – Scenario 2 (FF + PH)

Table C.5 : Node results at firefighting demands - Scenario 2 (FF + PH) (FF at Node 12)

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
1	0.571	48.67	53.67
100	0.163	48.15	54.15
11	0.000	48.67	53.67
110	0.408	47.13	54.13
12	0.000	50.83	56.33
120	0.000	47.07	54.07
13	0.490	48.94	55.44
14	0.408	48.66	54.66
140	0.000	48.15	54.15
15	0.000	49.02	55.02
150	0.163	48.54	54.79
16	0.000	46.83	53.08
160	0.163	48.77	55.02
17	0.408	45.72	52.47
170	0.163	47.64	53.64
18	0.000	46.2	52.2
180	0.490	47.64	53.64
19	0.163	46.55	52.05
190	0.163	46.57	53.07
2	0.000	50.17	53.67
20	0.245	47.26	51.76
200	0.082	46.57	53.07
21	15.653	35.97	40.47
210	0.000	46.04	53.04
22	0.163	46.55	52.05
220	0.163	46.04	52.04
23	0.571	46.04	52.04
230	0.000	46.04	52.04
24	0.163	46.2	52.2
240	0.163	46.4	51.9
25	0.082	45.71	52.46
250	0.000	46.4	51.9
26	0.653	45.45	52.45
260	0.163	47.26	51.76

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
27	0.163	45.71	52.46
270	0.163	44.2	46.7
28	1.142	46.04	53.04
280	0.163	42.02	45.02
29	0.490	48.01	55.01
290	0.163	50.15	53.65
3	0.163	48.52	53.52
30	0.408	49.45	55.45
300	0.408	50.03	53.53
31	0.000	50.86	56.36
310	0.163	50.56	53.56
32	0.408	49.95	53.45
320	0.326	50.41	53.41
33	0.326	50.24	53.24
330	0.163	50.48	53.48
34	0.245	49.67	53.47
340	0.000	50.43	53.43
35	0.000	49.49	53.49
350	0.163	50.46	53.46
36	0.000	48.33	53.83
360	0.408	50.42	53.42
37	0.245	49.72	53.97
370	0.163	50.45	53.45
38	0.571	46.47	53.47
380	0.000	50.37	53.37
39	0.163	48.78	53.78
390	0.163	49.98	53.23
4	0.326	48.5	53.5
40	0.163	49.7	53.7
400	0.163	50.19	53.44
41	0.653	48.49	53.49
410	0.245	50.18	53.43
420	0.000	49.99	53.24
43	0.000	49.72	53.72
430	0.163	48.56	53.56

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
44	0.326	49.33	53.83
440	0.163	48.6	53.6
45	0.326	50.41	53.41
450	0.163	48.66	53.66
46	0.000	50.3	53.3
460	0.000	48.52	53.52
47	0.571	50.24	53.24
470	0.000	48.52	53.52
48	0.000	49.41	53.41
480	0.653	48.53	53.53
49	0.000	50	53.5
490	0.000	48.69	53.69
5	0.000	50.98	53.48
50	0.163	50.45	53.45
500	0.163	48.72	53.72
51	0.163	50.42	53.42
510	0.571	42.02	45.02
52	0.408	48.03	53.53
520	0.000	44.2	46.7
53	0.000	47.95	54.45
530	0.245	48.54	54.79
54	0.000	47.86	54.56
540	0.000	48.77	55.02
55	0.000	47.12	54.12
550	0.163	50.66	56.16
56	0.245	49.05	56.55
560	0.408	50.66	56.16
570	0.163	49.74	55.74
58	0.000	49.9	54.15
580	0.000	49.74	55.74
59	0.163	48.93	54.93
590	0.326	50.24	55.74
6	0.000	50.98	53.48
60	0.326	48.53	55.03
600	0.000	50.84	53.59

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
61	0.571	47.32	54.32
610	0.000	50.83	53.58
62	22.844	50.72	53.22
620	0.000	50.28	53.53
63	0.000	50.8	56.3
630	0.000	50	53.5
64	0.000	54.48	58.98
640	0.000	50.02	53.52
65	0.000	55.22	60.22
650	0.000	50.25	53.5
660	0.000	49.95	53.45
670	0.000	50.18	53.43
680	0.000	50.18	53.43
690	0.000	50.43	53.43
7	0.245	49	53.5
70	0.000	3.25	65.25
700	0.000	50.17	53.42
710	0.000	50.17	53.42
720	0.000	47.22	53.47
730	0.000	47.22	53.47
740	0.000	50.97	53.47
750	0.000	47.97	53.47
760	0.000	47.47	53.47
770	0.000	47.47	53.47
780	0.000	47.73	53.48
790	0.000	52.73	53.48
8	0.082	49.07	53.57
80	0.408	45.56	48.06
800	0.000	49.6	53.85
810	0.000	49.76	54.01
820	0.000	49.5	53.5
830	0.000	49.5	53.5
840	0.000	49.5	53.5
850	0.000	50	53.5
860	0.000	51.01	56.51

Node ID	Node Discharge (L/s)	Node Residual Pressure (m)	Node HGL (m)
870	0.734	50.82	56.32
9	0.408	48.18	53.68

Table C.6 : Pipeline results at firefighting demands - Scenario 2 (FF + PH) (FF at Node 12)

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0001	29.266	0.91	0.19
MA0002	-0.448	-0.23	-0.05
MA0008	31.979	1	0.2
MA0009	45.055	1.41	0.55
MA0011	-8.815	-1.04	-0.56
MA0012	5.615	0.66	0.43
MA0013	22.02	0.69	0.07
MA0015	2.096	0.25	0.01
MA0016	7.247	0.85	0.04
MA0017	2.479	0.29	0.01
MA0019	32.55	1.02	0.47
MA0020	6.367	0.75	0.1
MA0022	3.062	0.36	0.02
MA0023	0.746	0.38	0.14
MA0024	32.55	1.02	0.24
MA0026	0	0	0
MA0027	21.516	0.67	0.1
MA0029	-5.96	-0.7	-0.15
MA0030	-0.163	-0.02	0
MA0031	0.163	0.02	0
MA0032	-0.897	-0.11	-0.01
MA0033	21.598	0.67	0.11
MA0034	9.403	1.11	0.16
MA0035	-0.897	-0.11	0
MA0036	22.844	0.71	0.25
MA0037	1.328	0.16	0.02
MA0038	1.328	0.16	0
MA0039	1.43	0.17	0.02
MA0040	0.613	0.31	0.18
MA0041	61.34	1.54	1.24
MA0042	61.34	1.54	2.43
MA0043	0.041	0.02	0
MA0049	-0.653	-0.08	-0.01
MA0050	-7.428	-0.87	-0.62
MA0051	-5.485	-0.65	-0.36
MA0052	-0.076	-0.04	0
MA0054	0.746	0.38	0.14
MA0055	-0.25	-0.13	-0.02

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0056	-2.246	-0.26	-0.02
MA0057	-6.512	-0.77	-0.3
MA0059	0.49	0.06	0
MA0061	-0.49	-0.06	0
MA0062	4.962	0.58	0.23
MA0065	-8.648	-1.02	-0.78
MA0067	0.991	0.5	0.18
MA0068	3.873	0.46	0.12
MA0069	-1.142	-0.13	-0.03
MA0071	0	0	0
MA0072	-0.571	-0.07	-0.01
MA0073	16.958	2	3.7
MA0075	-0.571	-0.07	0
MA0076	31.979	-1	-0.43
MA0078	6.123	0.72	0.27
MA0079	12.63	-1.49	-1.77
MA0080	4.899	0.58	0.16
MA0082	61.34	1.54	5.03
MA0083	16.55	1.95	1.35
MA0089	5.616	0.66	0.48
MA0090	-5.616	-0.66	-0.33
MA0091	5.208	0.61	0.55
MA0092	5.208	0.61	0.05
MA0093	1.573	0.19	0.03
MA0096	-9.631	-1.13	-0.52
MA0097	-9.468	-1.11	-0.51
MA0098	-1.387	-0.16	-0.02
MA0099	-0.734	-0.09	-0.01
MA0100	4.736	0.56	0.14
MA0101	-0.811	-0.41	-0.18
MA0102	-0.403	-0.21	-0.13
MA0103	-0.25	-0.13	0
MA0104	0.448	0.23	0.06
MA0105	0.448	0.23	0.07
MA0106	-0.122	-0.06	-0.01
MA0107	0.041	0.02	0
MA0108	0.094	0.05	0.01
MA0109	0.094	0.05	0
MA0110	0.094	0.05	0

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA0111	0.746	0.38	0.17
MA0200	15.653	1.84	4.55
MA0201	16.387	1.93	1.69
MA0202	4.554	0.54	0.13
MA0203	-0.653	-0.08	0
MA0204	0.163	0.02	0
MA0205	0.163	0.02	0
MA0206	0.163	0.02	0
MA0207	0.163	0.02	0
MA0208	0.163	0.02	0
MA0209	0	0	0
MA0210	0.163	0.02	0
MA0211	0.163	0.02	0
MA0212	0.163	0.02	0
MA0213	-0.163	-0.02	0
MA0214	-0.163	-0.02	0
MA0218	-1.106	-0.13	-0.04
MA0226	-7.247	-0.85	-0.16
MA0227	-6.675	-0.79	-0.42
MA0228	-0.163	-0.02	0
MA0229	-0.163	-0.02	0
MA0230	44.729	1.4	0.72
MA000126	2.899	0.34	0.05
MA000127	2.736	0.32	0.01
MA000128	2.736	0.32	0.06
MA000129	2.736	0.32	0.02
MA000130	2.573	0.3	0.04
MA000121	0.318	0.16	0.01
MA000122	0.318	0.16	0.02
MA000123	0.318	0.16	0.01
MA000124	2.254	0.27	0.02
MA000125	-0.335	-0.04	0
MA000131	1.92	0.23	0.02
MA000132	1.757	0.21	0.02
MA000133	0.488	0.06	0.02
MA000134	0.324	0.04	0
MA000135	0.161	0.02	0
MA000136	1.022	0.12	0
MA000137	1.184	0.14	0.01

Pipe ID	Flow (L/s)	Velocity (m/s)	Headloss (m/km)
MA000138	1.02	0.12	0
MA000139	1.02	0.12	0
MA000140	1.02	0.12	0
MA000141	0.776	0.09	0
MA000142	0.776	0.09	0
MA000143	0.776	0.09	0
MA000144	0.613	0.07	0
MA000145	0.613	0.07	0
MA000147	0.15	0.02	0
MA000148	-0.15	-0.02	0
MA000149	0.421	0.05	0
MA000150	-0.421	-0.05	0
MA000151	0.421	0.05	0
MA000152	0.421	0.05	0
MA000153	-0.15	-0.08	0
MA000154	-0.15	-0.08	0
MA000155	-0.15	-0.08	-0.01
MA000156	0.15	0.08	0
MA000157	-2.642	-0.31	-0.04
MA000146	-2.805	-0.33	-0.04
MA000158	-2.968	-0.35	-0.06
MA000159	-3.131	-0.37	-0.06
MA000160	-3.295	-0.39	-0.06
MA000162	7.657	0.9	0.14
MA000163	7.657	0.9	0.16
MA000164	4.199	0.49	0.02
MA000165	-3.458	-0.41	-0.07
MA000166	0.335	0.04	0
MA000161	0.335	0.04	0
MA000167	0.335	0.04	0
MA000168	0.335	0.04	0
MA000169	0.335	0.17	0.01
MA000170	31.829	0.8	0.04
MA000171	31.829	-0.8	-0.2
MA000172	8.06	0.95	1.39
MA000173	23.035	-0.58	-0.02

Item 9

IH132900
OCEAN BREEZE ESTATE SEWERAGE RETICULATION

Demand Summary

Queensland Planning Guidelines
at 2.5

	Lots	EP/EDC	EP	EDC	
Lots <400m^2		2.5	0	0	
Lots >400m^2	78	2.8	218.4	78	
Existing Demand =				78.00	EDC
Catchment Total =				**78.00**	**EDC**

PUMP STATION 1

FLOW
*** in accordance with FNQROC Development Manual**

Occupancy ratio =	2.8	EP/EDC
Average dry weather flow =	270	L/EP/day

Demand

Occupancy ratio =	78.00	EDC
	218.4	**EP**
ADWF =	**58.97**	**kL/day**
C1 =	**6.38**	
PWWF =	**376.24**	**kL/day**
C2 =	**2.67**	
PDWF =	**157.43**	**kL/day**

Infiltration

Length of gravity sewers =	1500	m
Length of house drain per EDC =	20	m
Infiltration =	20	m^3/km/day
Infiltration =	**61.20**	**kL/day**

PUMP STATION
SIZE PUMP WELL

Calculate Peak Wet Weather Flow (PWWF)

Enter ADWF from hand calcs	58.97	kL/day		
Enter C1	6.38			
Enter C2	2.67			
Enter Major Industrial Flows	0	kL/day		
Enter Infiltration / Inflow	61.20	kL/day		
Max Flow - C1 x ADWF =	376.242858			
Max Flow - C2 x ADWF + I/I =	218.631897			
Design Flow Rate (PWWF)	**376.242858**	**kL/day**	**4.35 L/s**	Size pumps on this flow

Calculate Storage Capacity of Wet Well (Qld Sew Guidelines)

Enter max no of acceptable starts	12		Motor rating <50 - 12 starts per hour, >50 - 5 starts per hour
Storage Capacity	0.327	m^3	

Determine the Storage Height

Enter Internal Well Diameter	2.1		1.8, 2.1, 2.4
Height in well	0.300	m	Height should be minimum 300mm

Check if Adequate Pump Starts for ADWF

Adopted height	0.3	m		
ADWF	0.68	L/s		
Well volume for adopted height	1.039	m^3		
Time for pumps to empty well	283	sec		Remove full volume plus inflow during pump duration
Time to refill well	1522	sec		
Determin no starts per hour	283	Empty	1	
	1805	Fill	1	
	2087	Empty	2	
	3609	Fill	2	
	3892	Empty	3	
	5414	Fill	3	
	5696	Empty	4	
	7218	Fill	4	
	7501	Empty	5	
	9023	Fill	5	
	9305	Empty	6	
	10827	Fill	6	
	11110	Empty	7	
	12632	Fill	7	
	12914	Empty	8	
	14436	Fill	8	
	14719	Empty	9	
	16241	Fill	9	
	16523	Empty	10	
	18045	Fill	10	
Total starts per hours	2			First Value greater than 3600 sec, should be greater than 5 starts

Determine Total Well Depth (excluding plug)

Enter Surface Level	3.4	RL
Enter Sewer Inlet Level	-1.73	RL
Enter height between Alarm and S/B pump start	0.3	m
Enter height between S/B and Duty pump start	0.2	m
Height between pump start and pump stop	0.300	m
Enter height between pump stop and well bottom	0.34	m
Bottom of well level	-2.87	RL

* Hand calculations should be included with pump design (as required above)

JACOBS

PUMP STATION 1
CALCULATE DEPTH OF PLUG IN PUMP STATION

Enter Internal Diameter of Well	2.1	m	From "Well Size" worksheet
Enter Well wall thickness	0.23	m	FNQROC Drawing S3020
Enter Depth of Well (excl. plug)	6.27	m	From "Well Size" worksheet
Enter Depth of plug	2.3	m	change until get FOS

Volume of Water Displaced

Pump Station		
Area of Pump Station (X section) =	5.14	m^2
Depth of Pump Station =	8.57	m
Volume of Pump Station =	44.09	m^3
Valve Pit		
Area of Valve Pit (X section) =	1.67	m^2
Depth of Valve Pit =	1.45	m
Volume of Valve Pit =	2.43	m^3
Volume of Concrete =	2.43	m^3
Total Volume Displaced =	**48.94**	**m^3**

Volume of concrete in Pump Station

Pump Station Walls		
Area of Pump Station Walls =	1.68	m^2
Depth of Pump Station Walls =	8.72	m
Volume of Pump Station walls =	14.67	m^3
Volume of Pump Station base =	1.18	m^3
Valve Pit Walls		
Area of Valve Pit Walls =	0.89	m^2
Depth of Valve Pit Walls =	1.60	m
Volume of Valve Pit walls =	1.42	m^3
Volume of Valve Pit base =	0.38	m^3
Total Volume of FRP =	**17.66**	m^3

Volume of Concrete in Pump Station

Plug		
Area of Plug =	3.46	m^3
Depth of Plug =	2.3	m3
Volume of Plug =	7.96	**m^3**
Total Volume of Concrete =	**7.96**	**m^3**

Density of Water =	1000	kg/m^3
Density of FRP =	2400	kg/m^3
Density of Concrete =	2400	kg/m^3
Weight of Water displaced =	489	kN
Weight of FRP =	424	kN
Weight of Concrete =	191	kN
FOS	1.26	

*Factor of Safety (FOS) should be greater than 1.25
(may be less if skin friction ignored)

**Skin Friction resisting buoyancy has been ignored for this calculation (conservative)

***Valve pit based on FNQROC - cast in situ

****Change depth of plug until acceptable FOS achieved

Comment:

JACOBS

PUMP STATION 1
RISING MAIN AND PUMP SIZING

Determine Static Lift

Enter Discharge Point Level	4.768	RL	Highest point in rising main long section
Duty Pump start level	-2.23	RL	From "Well Size" worksheet
Pump stop level	-2.53	RL	From "Well Size" worksheet
Maximum Static lift	7.298	m	
Minimum Static lift	6.998	m	

Details of Section 1 (Internal Pipework)

Enter Pipe Length	8	m
Enter internal diameter	89	mm
Calculate Area	0.00621799	m^2

Details of Section 2 (External Pipework)

Enter Pipe Length	257	m
Enter internal diameter	89	mm
Calculate Area	0.00621799	m2

Enter flow information

ADWF	0.68	L/s	From "Well Size" worksheet
PWWF	4.35	L/s	From "Well Size" worksheet
Velocity at duty flow	0.70	m/s	

Determine Detention Time

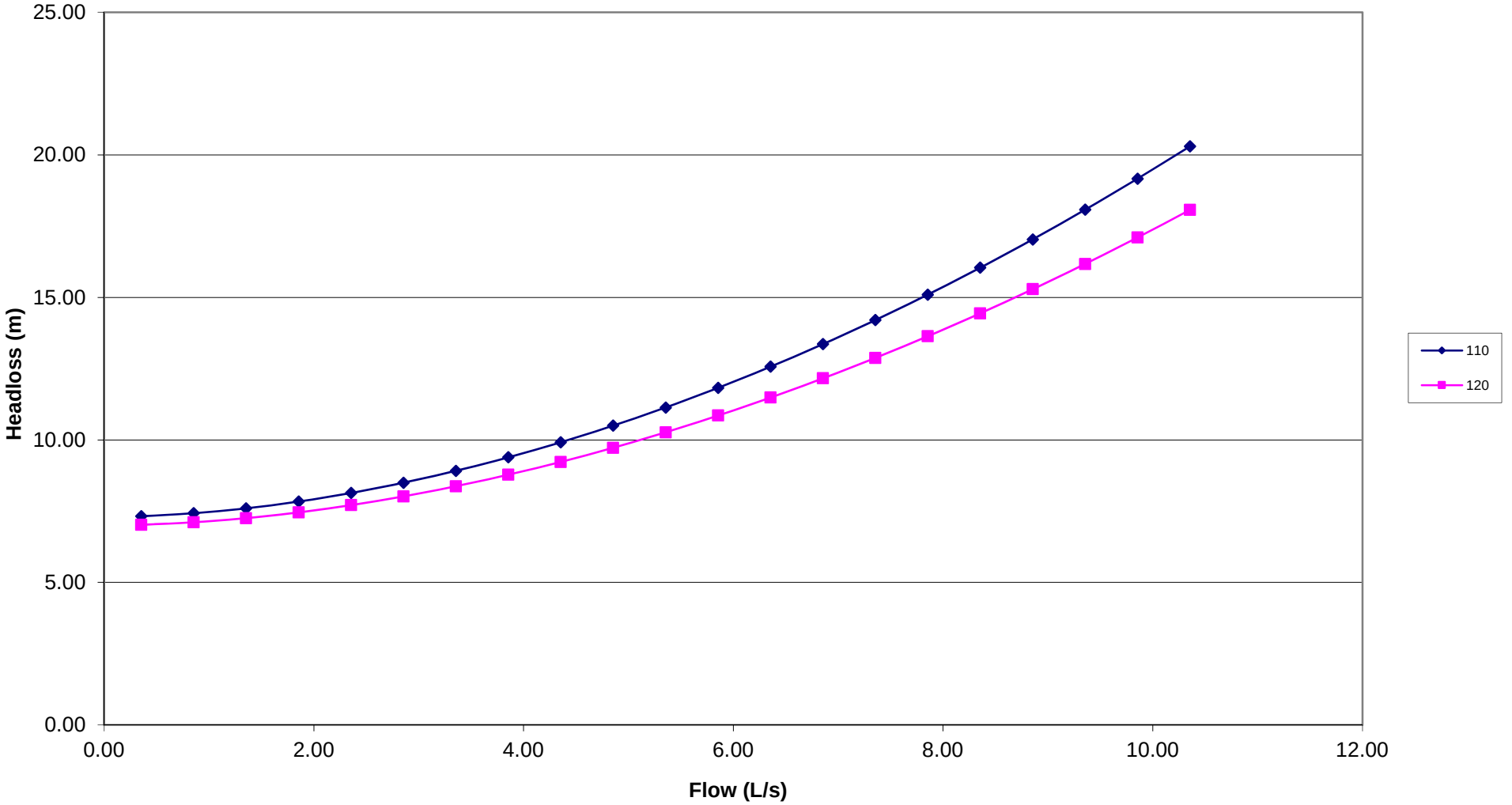
Total Daily Flow	58.968	kL/day
Determine Detention Voume	1.65	kL
Determine Changes of Volume	35.79	per day
Detention Time	0.67	hours

Calculate Headloss for different flows for System Curve

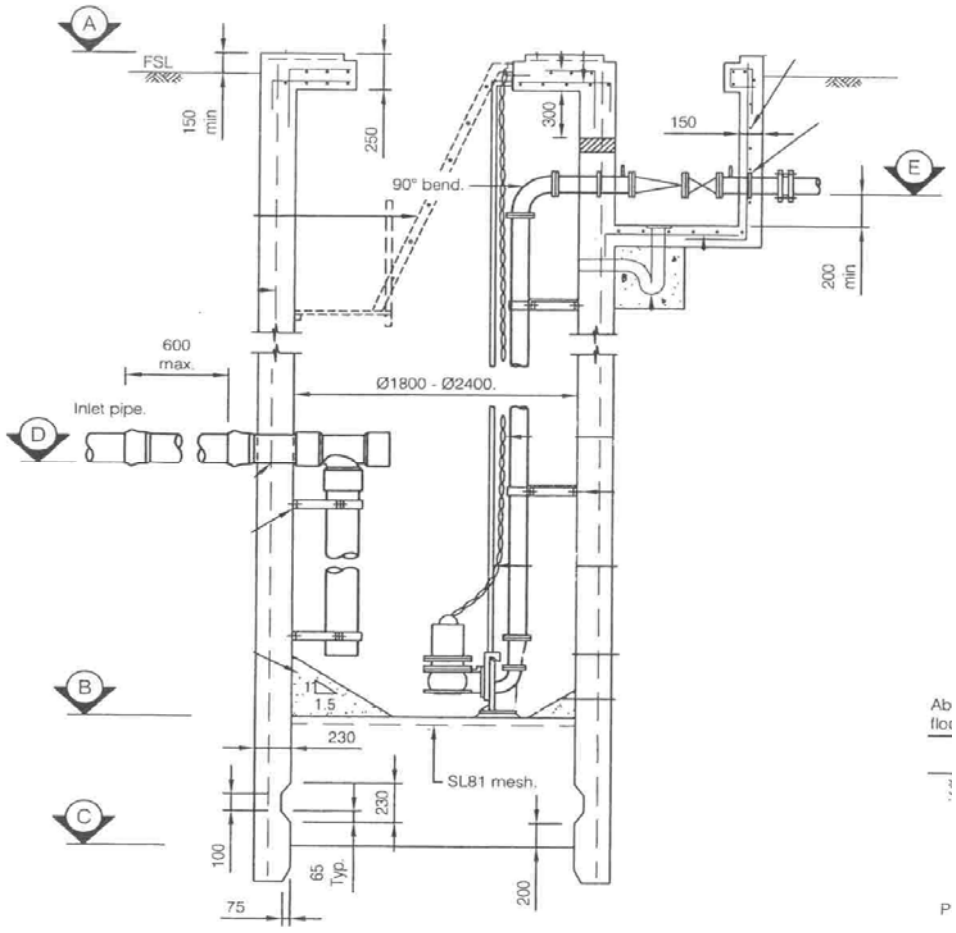
Enter Minimum C factor	110
Enter Maximum C factor	120

	Headloss											
	Headloss Pipe Section 1		Headloss Pipe Section 2		Headloss Pipe Section 3		Headloss Pipe Section 4		Pipe Headloss (m)		Total Head Curve	
Flow	110	120	110	120	100	110	100	110	110	120	110	120
0.35	0.001	0.001	0.025	0.021					0.025	0.022	7.32	7.02
0.85	0.004	0.003	0.125	0.106					0.129	0.110	7.43	7.11
1.35	0.009	0.008	0.293	0.249					0.302	0.257	7.60	7.26
1.85	0.016	0.014	0.524	0.446					0.540	0.460	7.84	7.46
2.35	0.025	0.022	0.814	0.693					0.840	0.715	8.14	7.71
2.85	0.036	0.031	1.163	0.990					1.199	1.021	8.50	8.02
3.35	0.049	0.042	1.568	1.335					1.616	1.376	8.91	8.37
3.85	0.063	0.054	2.027	1.726					2.090	1.779	9.39	8.78
4.35	0.079	0.067	2.540	2.163					2.619	2.230	9.92	9.23
4.85	0.097	0.082	3.106	2.644					3.203	2.727	10.50	9.72
5.35	0.116	0.099	3.724	3.170					3.840	3.269	11.14	10.27
5.85	0.137	0.116	4.392	3.739					4.529	3.856	11.83	10.85
6.35	0.159	0.135	5.111	4.351					5.270	4.487	12.57	11.48
6.85	0.183	0.156	5.880	5.006					6.063	5.162	13.36	12.16
7.35	0.209	0.178	6.698	5.702					6.907	5.880	14.20	12.88
7.85	0.235	0.200	7.565	6.440					7.800	6.641	15.10	13.64
8.35	0.264	0.225	8.480	7.219					8.744	7.444	16.04	14.44
8.85	0.294	0.250	9.442	8.038					9.736	8.289	17.03	15.29
9.35	0.325	0.277	10.452	8.898					10.778	9.175	18.08	16.17
9.85	0.358	0.305	11.509	9.798					11.868	10.103	19.17	17.10
10.35	0.393	0.334	12.613	10.738					13.005	11.072	20.30	18.07

Pump Station 1 System Curve



PUMP STATION 1 (Catchments 1 & 2_Existing & Future Demand)
PUMP STATION HEIGHTS



Pump Station Levels (RL)

A =	3.4 m
B =	-2.87 m
C =	-5.17 m
D =	-1.73 m
E =	2.315 m

Project: IH132900 - Ocean Breeze Estate - Stage 6B
Client: Jonpa Pty Ltd
Sewer Capacity Calculations

Overflow Invert Depth 1.55 m
Manhole Dia. 1.05 m

	Manholes Invert	Depth	Volume	Pipe Dia. (m)	Ef. Length	Volume	Volumes M/H	Section
1/1	-1.698	3.248	2.81					
				0.15	16.03	0.28		
1/2	-1.539	3.089	2.67					
				0.15	12.9	0.23		
1/3	-1.427	2.977	2.58					
				0.15	92.08	1.63		
1/4	-0.875	2.425	2.10					
				0.15	91.08	1.61		
1/5	-0.325	1.875	1.62					
				0.15	53	0.94		
1/6	-	-	-					
							11.79	4.68
1/5	x	x	x					
				0.15	15.45792	0.27		
1/7	-	-	-					
								0.27
1/1	x	x	x					
				0.15	34.68	0.61		
2/1	0.796	0.754	0.65					
				0.15	35.76681	0.63		
2/2	-	-	-					
							0.65	1.24
2/1	x	x	x					
				0.15	20	0.35		
3/1	0.999	0.551	0.48					
				0.15	56.91	1.01		
3/2	1.449	0.101	0.09					
				0.15	8.519747	0.15		
3/3	-	-	-					
							0.56	1.51
3/1	x	x	x					
				0.15	29.15832	0.52		
4/1	-	-	-					
								0.52
3/2	x	x	x					
				0.15	10.16223	0.18		
5/1	-	-	-					
								0.18
							13.01	8.41
						Total		21.41 m3
								21413 L

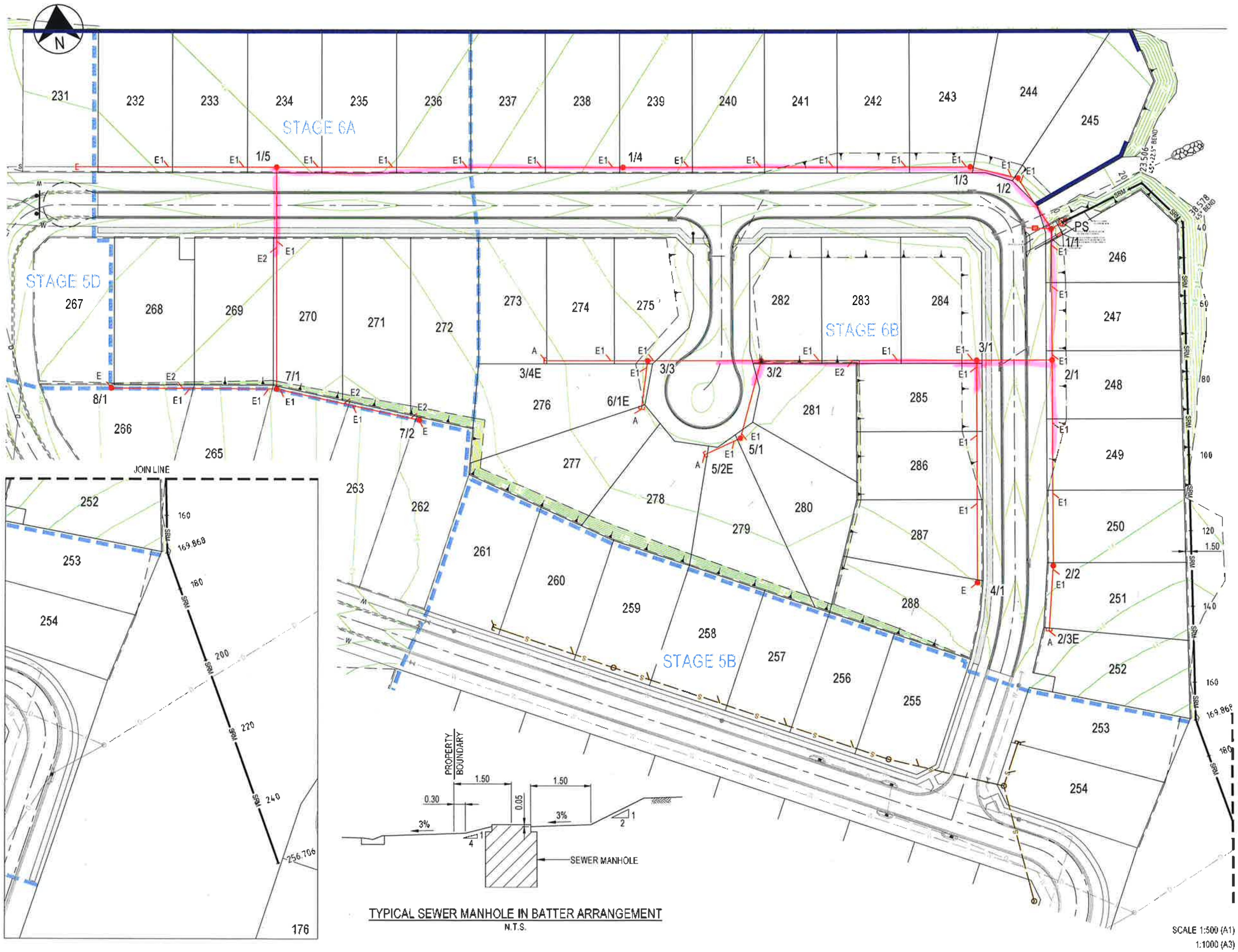
For ADWF

Units	EP/unit	L/EP/d	ADWF/d	
78	2.8	270	58968	L

Storage Requirement for 6hrs 14.742 kL

Pump Station Volume = 13.397 kL
Manhole volume = 13.01 kL
Sewer volume = 8.41 kL

Available Storage 34.810 kL



LEGEND

2/1	LINE NUMBER / STRUCTURE No.
	SEWER MAIN, MANHOLE AND ENDCAP
SRM	SEWER RISING MAIN
E1	HOUSE CONNECTION BRANCH / TYPE
E1	HOUSE CONNECTION BRANCH / TYPE ON EXISTING SEWER LINE
	PROPOSED STORMWATER
	BATTER
	STAGE BOUNDARY
	DESIGN SURFACE CONTOURS (0.2m INTERVAL)
	EXISTING SURFACE CONTOURS (0.5m INTERVAL)
	RETAINING WALL
34.00	MINIMUM LEVEL OF LOT ABLE TO BE SERVICED BY SEWER
	EXISTING STORMWATER
	EXISTING SEWER
	EXISTING WATER
	EXTENTS

NOTE

FOR NOTES REFER DG-0002.

REV	DATE	DRAWN	REV'D	APP'D	REVISION
A		SAB	RJC	DMc	INITIAL ISSUE

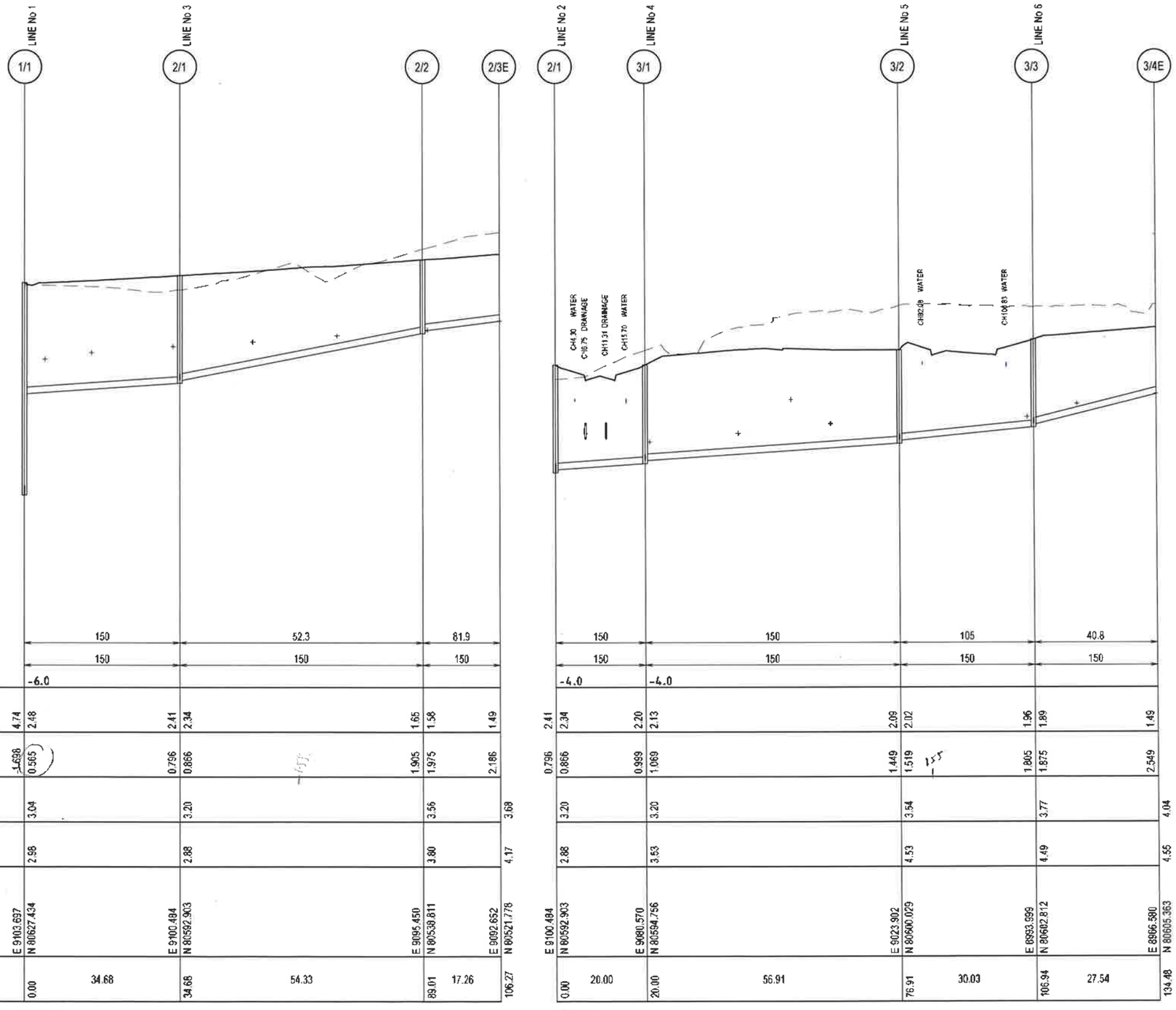
JACOBS

CLIENT: JONPA PTY LTD
PROJECT: COOYA BEACH - STAGE 6A & 6B

TITLE: SEWERAGE

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED: PAM	DESIGN REVIEW: RJC		

SCALE: 1:500 (A1)
DRAWING No.: IH132900-CI-DG-0015
REV: A



LEGEND

+	HOUSE CONNECTION BRANCH

NOTES

1. ALL MANHOLE DIAMETERS, DROP TYPES AND COVERS TO BE IN ACCORDANCE WITH FNQROC STD. DRG. S3000.

	1/1		2/1		2/2		2/3E
GRADE (1 in "X")		150		52.3		81.9	
PIPE SIZE (mm)		150		150		150	
DATUM RL	-6.0						
DEPTH TO INVERT	4.74 2.48		2.41 2.34		1.65 1.58		1.49
INVERT LEVEL	~~1.698~~ 0.565		0.796 0.866	[illegible]	1.905 1.975		2.186
DESIGN SURFACE LEVEL	3.04		3.20		3.56		3.68
EXISTING SURFACE LEVEL	2.98		2.88		3.80		4.17
SETOUT COORDINATES	E 9103.697 N 80627.434		E 9100.484 N 80592.903		E 9095.450 N 80539.811		E 9092.652 N 80521.778
CHAINAGE	0.00	34.68	34.68	54.33	89.01	17.26	106.27

LINE 2

	2/1		3/1		3/2		3/3		3/4E
GRADE (1 in "X")		150		150		105		40.8	
PIPE SIZE (mm)		150		150		150		150	
DATUM RL	-4.0		-4.0						
DEPTH TO INVERT	2.41 2.34		2.20 2.13		2.09 2.02		1.96 1.89		1.49
INVERT LEVEL	0.796 0.866		0.999 1.069		1.449 1.519	155	1.805 1.875		2.549
DESIGN SURFACE LEVEL	3.20		3.20		3.54		3.77		4.04
EXISTING SURFACE LEVEL	2.88		3.53		4.53		4.49		4.55
SETOUT COORDINATES	E 9100.484 N 80592.903		E 9080.570 N 80594.756		E 9023.902 N 80600.029		E 8993.999 N 80602.812		E 8966.580 N 80605.363
CHAINAGE	0.00	20.00	20.00	56.91	76.91	30.03	106.94	27.54	134.48

LINE 3

HORIZONTAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

VERTICAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A		SAB	RJC	DMc	INITIAL ISSUE		

JACOBS

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AUSTRALIA
Tel +61 7 4031 4999
Fax +61 7 4031 3967
Web www.jacobs.com

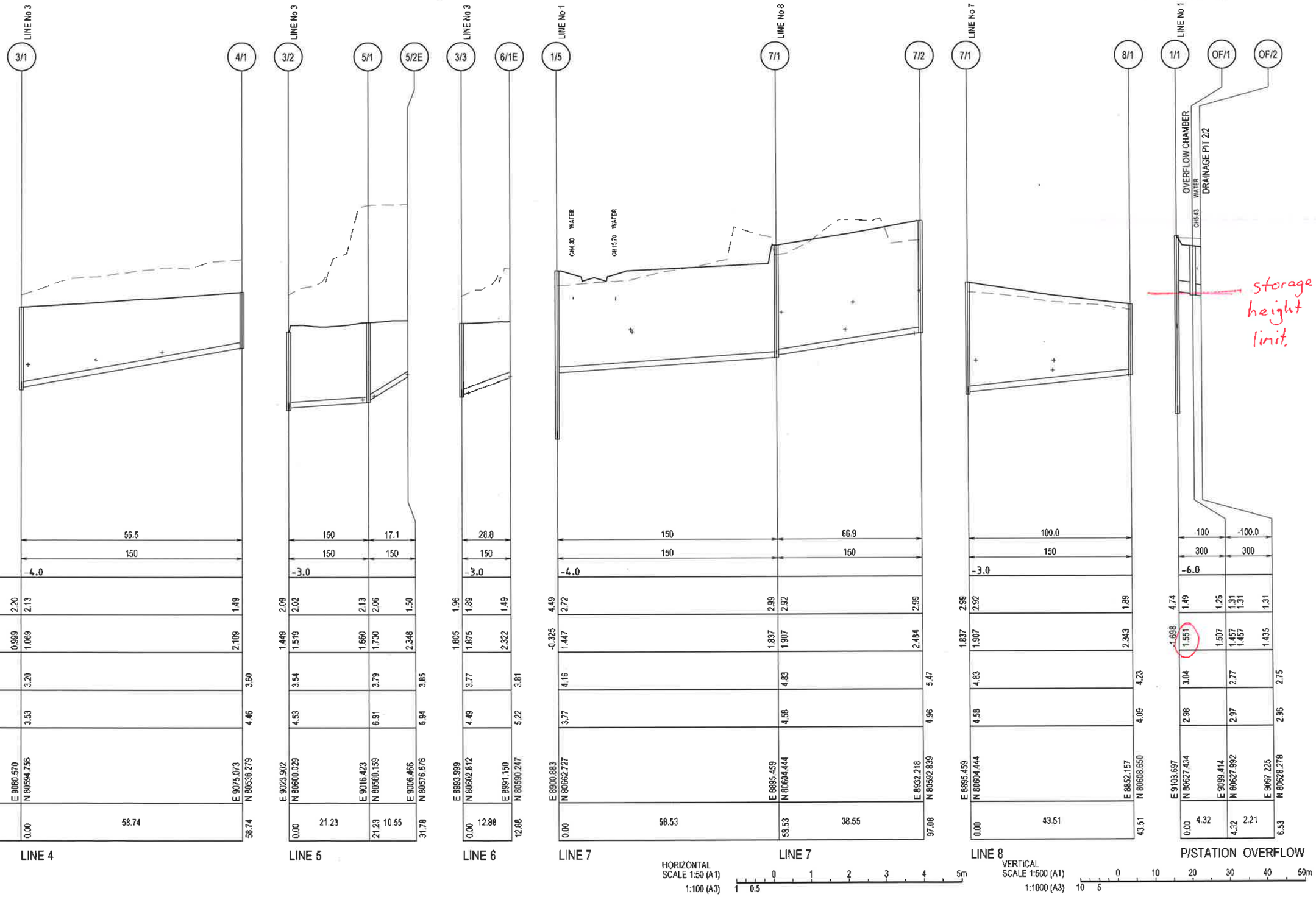
CLIENT	JONPA PTY LTD
PROJECT	COOYA BEACH - STAGE 6A & 6B
DRAWN	SAB
DRAWING CHECK	RJB
DESIGNED	PAM
DESIGN REVIEW	RJC
REVIEWED	D.McEWAN
DATE	
APPROVED	R.J.CARMAN
DATE	
TITLE	SEWERAGE LONGITUDINAL SECTIONS SHEET 1 OF 3
SCALE	1:500H, 1:100V (A1)
DRAWING No	IH132900-CI-DG-0017
REV	A

LEGEND

+ HOUSE CONNECTION BRANCH

NOTES

1. ALL MANHOLE DIAMETERS, DROP TYPES AND COVERS TO BE IN ACCORDANCE WITH FNQROC STD. DRG. S3000.



	LINE 4			LINE 5			LINE 6		LINE 7			LINE 8			P/STATION OVERFLOW		
GRADE (1 in "X")		56.5			150	17.1		28.8		150	66.9		100.0			-100	-100.0
PIPE SIZE (mm)		150			150	150		150		150			150			300	300
DATUM RL		-4.0			-3.0			-3.0		-4.0			-3.0			-6.0	
DEPTH TO INVERT	2.20	2.13	1.49	2.09	2.02	2.13 2.06	1.96	1.89	4.49	2.72	2.99 2.92	2.99	2.92	1.88	4.74	1.49	1.26 1.31 1.31
INVERT LEVEL	0.999	1.069	2.109	1.449	1.519	1.660 1.730	1.805	1.875	-0.325	1.447	1.837 1.907	2.484	1.907	2.343	-1.698	1.551	1.507 1.457 1.457
DESIGN SURFACE LEVEL	3.20		3.60	3.54		3.79	3.77		4.16		4.83	5.47	4.83	4.23		3.04	2.77 2.75
EXISTING SURFACE LEVEL	3.53		4.46	4.53		6.91	4.49		3.77		4.58	4.96	4.58	4.09		2.98	2.97 2.96
SETOUT COORDINATES	E 9080.570 N 80594.766		E 9075.073 N 80536.279	E 9023.902 N 80600.029		E 9016.423 N 80580.159	E 8993.999 N 80602.812		E 8900.883 N 80662.727		E 8895.459 N 80604.444	E 8932.218 N 80592.839	E 8895.459 N 80604.444	E 8852.157 N 80608.550	E 9103.597 N 80627.434		E 9099.414 N 80627.992 E 9097.225 N 80628.278
CHAINAGE	0.00	58.74	58.74	0.00	21.23	21.23 10.55	0.00	12.88	0.00	58.53	58.53 38.55	97.08	0.00	43.51	43.51	0.00 4.32	4.32 2.21 6.53

HORIZONTAL SCALE 1:50 (A1) 1:100 (A3) 0 1 2 3 4 5m; 1 0.5

VERTICAL SCALE 1:500 (A1) 1:1000 (A3) 0 10 20 30 40 50m; 10 5

REV	DATE	DRAWN	REVD	APPD	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A		SAB	RJC	DMc	INITIAL ISSUE		

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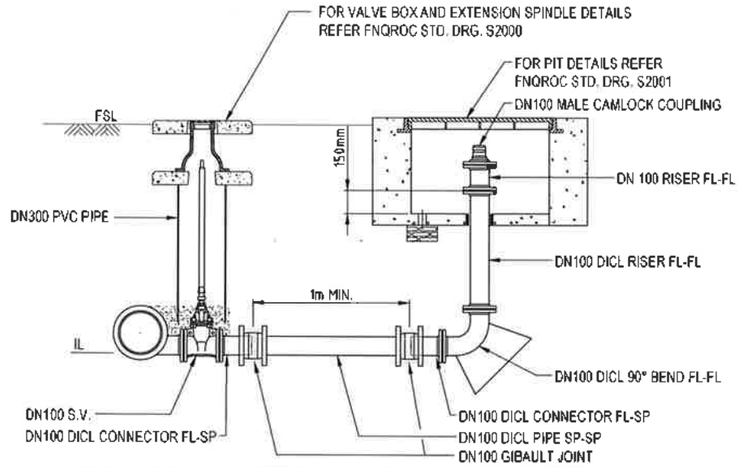
CLIENT JONPA PTY LTD
PROJECT COOYA BEACH - STAGE 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE	DATE
PAM	RJC		

TITLE
SEWERAGE LONGITUDINAL SECTIONS
SHEET 1 OF 3

SCALE 1:500H, 1:100V (A1)
DRAWING No. IH132900-CI-DG-0017
REV A

DATE 27/11/2017 9:25:09 AM NAME: BOUNDY TROY A
LOCATION: C:\users\tboundy\appdata\local\projectwise\jacobs_anz_ie\d0181886\IH132900-CI-DG-0017-0019_Sewerage LS.dwg

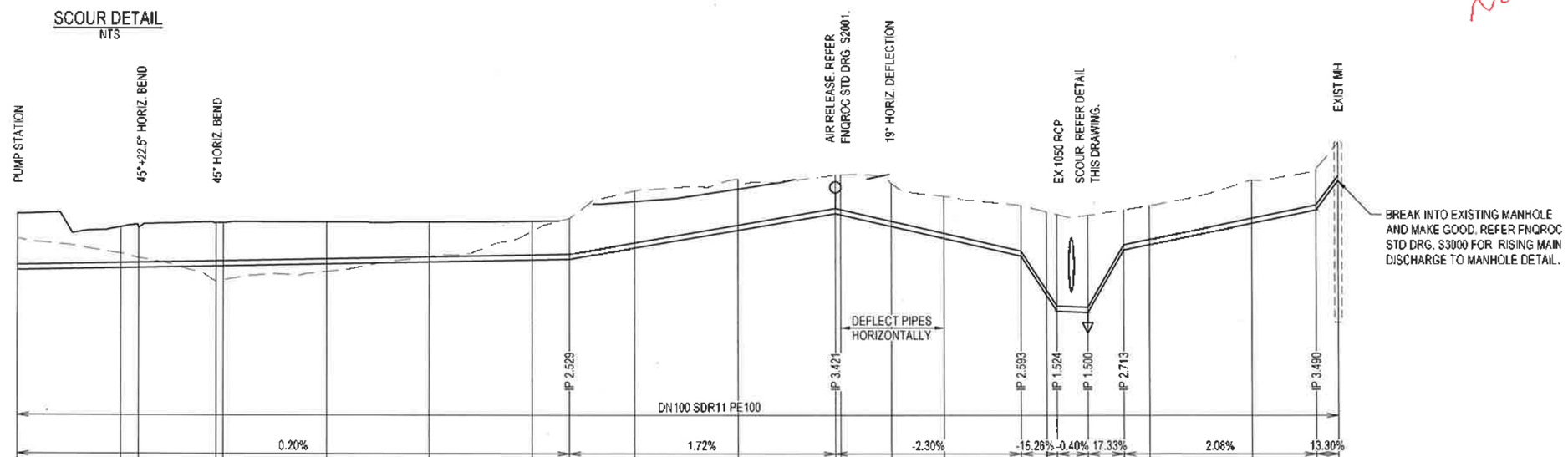


SCOUR DETAIL
NTS

STANDARD DRAWING REFERENCE

1. AIR RELEASE DETAILS:
   PROVIDE MANUAL AIR RELEASE IN ACCORDANCE WITH FNQROC STD DRG 2001.
2. FOR STANDARD MARKER PLATE DETAILS REFER FNQROC STD. DRG. S2010 AND S2011.
3. FOR THRUST BLOCK DETAILS REFER FNQROC STD DRG. S2015.
4. PROVIDE TRENCH STOPS IN ACCORDANCE WITH WSA 03-2011-3.1

Not applicable



INVERT LEVEL	2.315	2.355	2.362	2.392	2.395	2.435	2.475	2.515	2.529	2.750	3.094	3.421	3.398	3.171	2.938	2.593	1.830	1.524	1.500	2.713	2.817	3.232	3.490	4.058
DESIGN SURFACE LEVEL	3.405	3.154	3.137	3.223	3.232	3.251	3.252	3.268		3.653	3.697													
EXISTING SURFACE LEVEL	2.924	2.638	2.553	2.099	2.124	2.291	2.583	3.079	3.324	3.858	4.083	4.171	4.175	4.006	3.755	3.576	3.453	3.403	3.385	3.497	3.578	4.071	4.293	4.808
CHAINAGE	0.000	20.000	23.506	38.578	40.000	60.000	80.000	100.000	107.210	120.000	140.000	158.988	160.000	169.868	180.000	195.001	200.000	202.005	208.000	215.000	220.000	240.000	252.436	256.706
HORIZONTAL DATA																								

LONGITUDINAL SECTION SEWER RISING MAIN
SCALE 1:500H
1:50V

HORIZONTAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

VERTICAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A		SAB	RJC	DMc	INITIAL ISSUE		

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CLIENT JONPA PTY LTD
PROJECT COOYA BEACH - STAGE 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE	DATE
PAM	RJC		

TITLE
SEWERAGE LONGITUDINAL SECTIONS
SHEET 1 OF 3

SCALE 1:500H, 1:100V (A1)
DRAWING No IH132900-CI-DG-0017
REV A

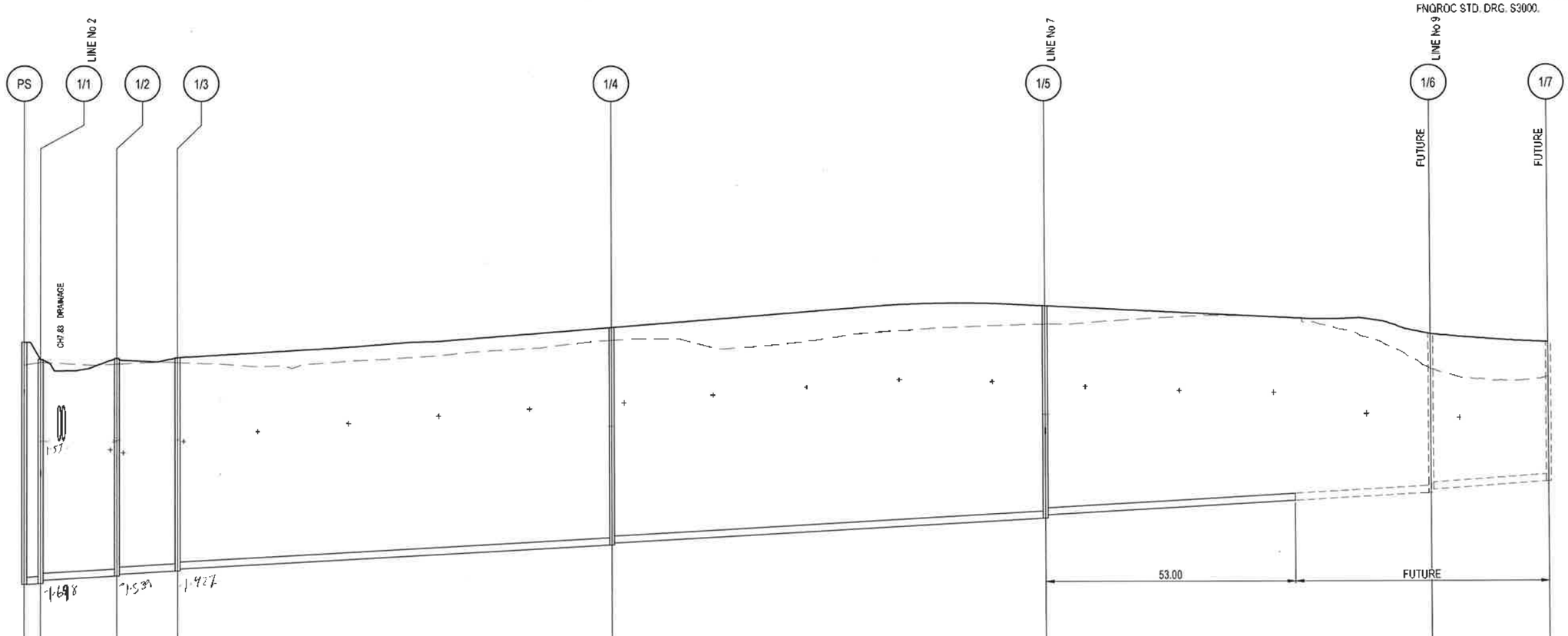
DATE: 27/11/2017 9:25:04 AM NAME: BOUNDY, TROY A
LOCATION: C:\users\tboundy\appdata\local\projectwise\jacobs_anz_iel\d0181886\IH132900-CI-DG-0017-0019_Sewerage LS.dwg

LEGEND

+	HOUSE CONNECTION BRANCH

NOTES

1. ALL MANHOLE DIAMETERS, DROP TYPES AND COVERS TO BE IN ACCORDANCE WITH FNQROC STD. DRG. S3000.



	PS		1/1		1/2		1/3		1/4		1/5		1/6		1/7
GRADE (1 in "X")		180		180		180		180		180		180		150	
PIPE SIZE (mm)		150		150		150		150		150		150		150	
DATUM RL		-5.0													
DEPTH TO INVERT	5.12 5.12		4.74 4.67		4.61 4.57		4.51 4.47		4.59 4.55		4.49 4.42		3.36 3.29		2.94
INVERT LEVEL	-1.717 -1.717		-1.698 -1.628		-1.539 -1.499		-1.427 -1.387		-0.875 -0.835		-0.325 -0.255		0.199 0.269		0.436
DESIGN SURFACE LEVEL	3.41		3.04		3.07		3.08		3.72		4.16		3.56		3.38
EXISTING SURFACE LEVEL	2.92		2.98		2.94		2.98		3.45		3.77		2.82		2.65
SETOUT COORDINATES	E 9106.857 N 80628.855		E 9103.697 N 80627.434		E 9096.201 N 80641.601		E 9083.968 N 80645.690		E 8992.287 N 80654.221		E 8900.883 N 80662.727		E 8819.400 N 80670.309		E 8794.939 N 80675.598
CHAINAGE	0.00	3.47	3.47	16.03	19.49	12.90	32.39	92.08	124.47	91.80	216.27	81.83	298.10	25.03	323.13

LINE 1

HORIZONTAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

VERTICAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A		SAB	RJC	DMc	INITIAL ISSUE		

JACOBS

ABN 37 001 024 095 and ACN 001 024 095
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CLIENT JONPA PTY LTD
PROJECT COOYA BEACH - STAGE 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE	DATE
PAM	RJC		

TITLE
SEWERAGE LONGITUDINAL SECTIONS
SHEET 1 OF 3

SCALE 1:500H, 1:100V (A1)
DRAWING No IH132900-CI-DG-0017
REV A

Item 10

C&B GROUP

- Project Management
- Planning
- Environmental Services
- Surveying

Potential Acid Sulfate Soil Investigation

Lot 1 on RP720316 & Lots 2 & 3 on SR614 Cooya Beach

Salson Pty Ltd

Date: October 2003
Ref: 8021 (R43337)

CAIRNS
1st Floor, Florence House, 26 Florence Street, Cairns Queensland 4870
PO Box 1949, Cairns Queensland 4870

Telephone: (07) 4031 1336 Facsimile: (07) 4031 2942
E-Mail Address: cairns@cbgroup.com.au

TABLE OF CONTENTS

FIGURES

ANNEXURES

C&B GROUP

1.0 INTRODUCTION

C&B Consulting Group was commissioned by Salson Pty Ltd. to conduct an assessment of the presence and location of Potential Acid Sulphate Soils (PASS) in the area including Lot 1 RP720316 and Lots 2 & 3 on SR614 Cooya Beach. The site has been proposed for a 270 lot residential estate. The following report provides supporting information in the form of a baseline survey and an assessment of risk from earthworks during site construction.

During field investigations, PASS was identified at approximately 0.0 metres AHD. The development constraints that PASS poses to the proposed development and management options are identified in this report.

2.0 SITE DESCRIPTION

Bonnie Doon Road in the West and Melaleuca Drive in the south bound the subject lot 1 on RP 720316 and Lots 2 & 3 on SR614 (Refer **Figure 1**). Cooya Beach Road bisects the subject lots 2 on SR614 and Lot 3 on SR614 and extends in a roughly west to east direction providing access to the community of Cooya Beach. The eastern boundaries of Lot 1 on RP720316 and Lot 2 & 3 on SR614 are located directly adjacent to residential housing.

The highest point of the subject lands (8 metres AHD) is located towards the western corners of both Lots 2 & 3 on SR614 (Refer **Figure 2**). From this point, land recedes gently towards the east and northeast, intersecting a shallow drain towards the central areas of Lot 1 on RP 720316 and Lot 2 on SR614. Elevated lands in the west (3 to 8 metres AHD) are proposed for residential housing, with areas below 3 metres in the central and eastern sections being maintained for a park and mangrove regeneration.

From the corner of Bonnie Doon Road and Melaleuca Drive in the south west of Lot 3 on SR614, land recedes gently towards the east intersecting shallow drain between existing and proposed residential housing.

Drainage relief from Lot 1 on RP 720316 and Lot 2 on SR614 is provided by a shallow easterly flowing drain in the north and east (Refer **Figure 2**). Drainage from Lot 3 on SR614 flows into a shallow northerly flowing drain along the eastern boundary. Both drains flow into the Mossman River estuary. Vegetation on all three allotments has been extensively cleared for sugar cane production. Vegetation remains in the riparian zone along the easterly flowing drain in Lot 1 on RP720316 and Lot 2 on SR614. Vegetation in this riparian zone will be retained as part of the proposed park and mangrove regeneration areas.

3.0 NATURE OF DISTURBANCE

3.1 EXCAVATION OF FILL MATERIAL

It is intended that fill for low-lying areas be sourced on-site from the high area (7 to 8 metres AHD) in the west near the existing shed (Refer **Figure 2**). All fill will be sourced from above 5 metres AHD and therefore does not trigger the SPP 2/02 Planning and Managing Development involving Acid Sulfate Soils.

Proposed fill material was sampled at three sites including waypoint 6, 8 and 15 (Refer **Figures 1 & 2**). Fill material sampled at these sites generally consists of organic sandy loams underlain by red and yellow clayey sands. PASS was not detected in these more elevated areas however the re-activity of some soils during field-testing indicated the presence of manganese.

3.2 FILLING ACTIVITIES

Disturbances associated with the proposed development include filling of selected low lying lands to 3.2 metres AHD, being the minimum site level required by Douglas Shire Council. Areas to be filled are included as the hatched areas on **Figure 2**. Areas requiring fill are also included in the Flanagan Consulting Group Report 1329/01 Engineering Issues, Material Change of Use and Reconfiguration Lot 1 on RP720316 and Lots 2 and 3 on SR614 Cooya Beach, **Figure 2**.

The three areas requiring fill include:

1. The NE corner of Lot 3 on SR614

This 1.9-Hectare area including Lots 1 through to 6 (Refer **Figure 1 & 2**) is bounded by a shallow drain in the East. Elevation of land to be filled ranges from 2 to 3.2 metres with an average fill depth of 0.8 metres (approx). Fill volume will exceed 500m^3 and 0.5 metre depth thereby triggering the State Planning Policy 2/02 Planning and Managing Development involving Acid Sulfate soils, Section 3.6.

Test pits excavated in this area include waypoint 9, 10 and 13 (Refer **Figure 2**). No actionable PASS was encountered at any of these three test pits however low levels of reduced sulfur species were encountered towards the base of waypoint 10 and 13. Non-actionable material was encountered below 1 metre AHD with a gentle increase in re-activity with increasing depth.

Below 0.45 metres AHD a sulfurous odour was identifiable however this is believed to be a gradual transition into the PASS layer identified elsewhere at 0 metres AHD. Using a conservative approach, actionable PASS may occur below 0.45 metres AHD.

Fill depth along the drain will approach 1.2 metres however the risk of any de-watering or hydraulic movement of PASS material into the shallow drain is negligible due to:

- Deposition of fill will not de-water underlying coarse sands as coarse sand does not pack tightly. Loosely packed coarse sand allows almost unimpeded groundwater movement.

- Coarse Sand does not undergo subsoil displacement. Subsoil displacement is usually associated with heavy wet marine clays. Any PASS occurring below 0.4 metres AHD would have to be forced in excess of 1 metre (vertically) in order to intercept the shallow drain.

Due to the coarse texture of sands and sandy clays adjacent to the drain, it would be advisable to stabilise the western drainage embankment. Sands and sandy clays exposed in the drain batters are predominantly unconsolidated and could erode causing erosion issues on site and sedimentation problems in the culvert under Cooya Beach Road.

2. The NW corner of Lot 1 on RP720316

This 0.3-Hectare area includes Lots 237 to 243 and Lots 248 to 250 (Refer (**Figure 1 & 2**) and is bisected by a shallow NE flowing drain. Elevation of land to be filled ranges from 2.25 to 3.2 metres AHD with an average fill depth of 0.6 metres (approx). Fill volume will exceed 500 m^3 and 0.5 metres depth thereby triggering the State Planning Policy 2/02 Planning and Managing Development involving Acid Sulfate Soils, Section 3.6.

The test pit at waypoint 18 is representative of soils in the NW corner of Lot 1 on RP720316. Testing of soils from WP 18 suggests that non-actionable quantities of reduced sulfide species occur below 0.5 metres AHD with actionable PASS likely to occur below 0 metres AHD. Using the most conservative approach, actionable PASS may occur below 0.5 metres AHD.

3. The Northern Central area of Lot 1 on RP720316

This 0.82-Hectare area includes Lots 226 to 228 (Refer **Figure 1 & 2**). Elevation of land to be filled ranges between 2 to 3.2 metres AHD with an average fill depth of 0.6 metres (approx). Fill volume will exceed 500 m^3 and 0.5 metres depth thereby triggering the State Planning Policy 2/02 Planning and Managing Development involving Acid sulfate Soils, Section 3.6.

Test pits excavated in this area include waypoint 17 and 19. No PASS was encountered in the test pit at WP17, which reached a maximum depth of 0.75 metres AHD. Marginally actionable PASS material was encountered below 0 metres AHD at WP19 however these lands are to become part of the proposed parkland area (Refer **Figure 1**).

3.3 SEWERAGE AND WATER INFRASTRUCTURE

As the residential development will require water supply and sewerage services, excavation will be required to facilitate installation. It is anticipated that the deepest excavation would be in the order of 2.5 m below filled ground level (maximum depth 0.7 metres AHD) and be associated with the sewerage service. Excavation volume will exceed 100 m^3 at or below 5 metres AHD thereby triggering the State Planning Policy 2/02 Planning and Managing Development involving Acid Sulfate Soils, Section 3.6.

4.0 SOIL DESCRIPTION

Soil mapping (Murtha, 1989), (Refer **Figure 3**), indicates that soil comprises;

Br (Brosnan) Dark Grey Sandy loam A1; yellowish red or red sandy loam to sandy clay loam massive B horizon

Mm (Mossman) Dark grey brown medium clay Ap to 30 cm; olive brown or brownish yellow, moderate to strong fine blocky structured medium clay B horizon.

Surface soils in the more elevated lands on Brosnan soil type (waypoints 6, 8, 9, and 15) typically comprised dark organic sandy loams underlain by well-drained red and yellow clayey sands respectively. In low-lying areas represented by waypoints 10, 13, 16, 17 and 19, surface soil comprised dark organic sandy loams underlain by grey coarse sands and sandy clays.

The Mossman soil type represented by waypoint 18 consisted of brown clays surface soils underlain by sandy grey clays and grey sand respectively.

5.0 FIELD INVESTIGATIONS

Field investigations, excluding sampling intensity were undertaken in accordance with the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998 (QASSIT Guidelines).

The investigation involved the excavation of 10 test pits over the 41.202 Hectare site. Whilst up to 84 test pits are recommended for a site up to 41 Hectares, this number was reduced due to the following;

- The majority of subject lands will not require any filling and therefore will not trigger the SPP 2/02. Over the 41.2 Hectare site, approximately 3.04 Hectares will require some filling (Refer **Figure 2**)

- Test pits were strategically located to provide good coverage across the areas proposed for the location of fill. Locating test pits in low-lying areas increased the likelihood of locating PASS (Refer **Figure 2**).

- Excavations associated with the proposed development will only be shallow (associated with the provision of drainage and sewerage infrastructure) and are considered to be of low risk.

- Soil strata appeared to be relatively uniform across the site. PASS encountered appeared to be weak and closely associated with the permanent groundwater level around RL = 0 metres AHD.

Field works involved test pitting with a backhoe and sampling of each soil horizon or every 0.25 m interval to depth of approximately 2 m below ground level.

The test pits allowed good opportunity for observation and sampling of soil horizons. Samples were immediately placed in sealable High-Density Poly-Ethylene (HDPE) plastic bags, air excluded and then sealed. Samples were placed on ice after the excavation of each test pit.

Soil colour and texture descriptions were recorded for each soil horizon and are presented in **Annexure 1**.

Field acid sulphate soil tests were then carried out on the soil samples. Field tests involve the determination of field pH (pH_F) using a pH meter and distilled water, followed by oxidation of the soil sample with pH buffered 30% hydrogen peroxide and determination of the field oxidation pH (pH_{FOX}).

The pH_F and pH_{FOX} values were recorded in addition to the strength of the observed reaction of the sample with hydrogen peroxide.

Interpreted correctly, field tests can indicate the possible presence of acid sulphate soil and can be used to assist in the selection of samples submitted for laboratory determination. It is noted that while field tests indicate the likely presence of a potential acid sulphate soil, they do not replace laboratory techniques, which confirm the presence or quantify the risk of a PASS. Refer to Section 7.1.2 for laboratory analysis. Complete soil descriptions for each test pit are presented in **Annexure 1.**

5.1 GROUND WATER QUALITY

Ground water levels were determined during the field test pitting exercise by observation of the level where ground water was observed to be flowing freely into the pit. Ground waters at waypoints 10, 13, 16, 18 and 19 were measured for pH, Electrical Conductivity and Salinity.

Location	PH	EC	Salinity
WP10	5.29	100.3 uS	46.8 ppm
WP13	5.36	141 uS	67.3 ppm
WP16 (Brackish)	5.19	227.9 uS	108 ppm
WP18	5.14	149.6 uS	71 ppm
WP19 (Saline)	5.38	15.85mS	9.30ppK

6.0 SAMPLE AND LABORATORY INTEGRITY

Soil samples were collected and recorded by a suitably qualified and experienced environmental scientist.

Samples were presented to the laboratory in a chilled state and in good condition within sample holding times.

Samples submitted for laboratory determination were analysed for Action criteria using a Combination of TAA (Total Actual Acidity) and Scr (Chromium Reducible Sulfur) method. One sample was analysed for manganese.

Laboratory determinations were carried out by NATA Registered laboratory (Australian Environmental Laboratories, Cairns).

The portable field meter used to determine soil and water pH and electrical conductivity was calibrated prior to and after use.

7.0 RESULTS

7.1 DELINEATION OF THE PASS HORIZON

7.1.1 Field Testing

Field-testing was used to determine if PASS occurs on lands defined as Lot 1 on RP720316 and Lots 2 & 3 on SR614. Field-testing suggests that PASS occurs below 0 metres (AHD) and may occur below 0.5 metres AHD (Refer **Annexure 1**). After field testing, twelve soil samples were selected laboratory analysis. Samples were taken from the depth considered to represent the NON-PASS/PASS boundary so that a maximum cut depth for sewerage infrastructure might be determined.

7.1.2 Lab Analysis

PASS action criteria, as presented in the QASSIT Guidelines, for three broad soil texture categories are provided in Table 1. The action criteria have been prepared with consideration of the texture of coarse, medium and fine textured soils which each have variable buffering capacity against acidity.

Table 1 – ASS Action Criteria (For 3 Broad Texture Classes)

Type of Material		Action Criteria			
		1 – 1000 t disturbed		> 1000 t disturbed	
Texture Range	**Approx. clay content (%)**	Sulfur trail % S	Acid trail mol H^+ / t	Sulfur trail % S	Acid trail mol H^+ / t
Coarse Texture	≤5	0.03	18	0.03	18
Medium Texture Sandy loams to light clays	5 – 40	0.06	36	0.03	18
Fine Texture Medium to heavy clays	≥ 40	0.1	62	0.03	18

Sulfur Trail (% S) is determined by dividing the TAA (Total Actual Acidity) by a conversion factor of 30.59 and adding the result to the Scr (Chromium Reducible Sulfur).

%S = (TAA/30.59) + Scr

Note that the laboratory analysis results for TAA (Total Actual Acidity) are expressed with a limit of reporting of 0.5 kg H_2SO_4/t (dry weight). When the TAA is <0.5, 0.5 is used to allow margin or a "worst case" figure. The TAA for all laboratory samples was less than 0.5 kg H_2SO_4/tonne (dry weight).

Laboratory testing confirmed that the PASS/NON-PASS boundary was successfully identified at 0.0 metres AHD with some residual low-level sulfidic material detected between 0.5 and 0 metres AHD (Refer **Annexure 1**). Residual sulfidic material above 0.0 metres AHD suggests that the water table is transitional, usually residing above 0.5 metres AHD with permanent water below 0 metres AHD.

7.2 LIMING RATE FOR THE STRONGEST PASS SOIL ENCOUNTERED

From laboratory analysis of PASS found on the site, the strongest PASS was used to formulate an interim-liming rate. In the event that PASS is exposed during excavations this liming rate can be used to treat soils until proper laboratory results for the exposed PASS become available.

Liming Rate = %S * Conversion to $H_2SO_4^-$ * conversion to $CaCO_3^-$ * 1.5 (Safey Factor)

= 0.016634 * 30.52 * 1.02 * 1.5

= **7.768 Kg $CaCO_3^-$/tonne**

Conversion to Kg $CaCO_3^-$ /m^3 (Approximate Specific Gravity of wet sand is 1.92 tonnes/m^3)

= 7.768 * 1.92

= **14.914 Kg $CaCO_3^-$/m^3**

7.3 ACTUAL ACID SULFATE SOILS

The pH_F field test results indicate that the soils in their natural state are acidic with pH ranging from pH 4.40 to 6.44 (Refer **Annexure 1**). Acidic soils are commonly encountered in north Queensland where soils are strongly weathered and in locations where soils have previously underlain freshwater swamps rich in organic matter.

Total Actual Acidity (TAA) values were not within detection limits indicating that while some of the soils are mildly acidic, they are not AASS (Actual Acid Sulphate Soil). Interpolation of laboratory and field assessments indicates the absence of ASS soils (Refer **Annexure 2**).

8.0 ENVIRONMENTAL MANAGEMENT PLAN

Objective/Target

To ensure that during construction/excavation, potential acid sulfate soils are not disturbed, however if they are disturbed, to undertake the necessary mitigation measures to neutralise the soil and prevent any runoff of acidic waters.

Tasks/Actions

- An acid sulfate soil investigation of the site (C&B Group, September 2003) indicates potential acid sulfate soils (PASS) may occur below 0.5 metres AHD. The investigation was confined to a maximum excavation depth of -0.4 metres AHD. Any proposed excavation works below -0.4 metres AHD shall be subject to further investigation prior to commencement of works.

- In the event that soils with PASS or ASS characteristics are disturbed and remain exposed to the atmosphere, the area shall be treated with up to 15 kg / m^3 (to be confirmed through laboratory analysis) fine agricultural lime. This figure was calculated from the highest %S found in the test pit at waypoint 16 between -0.22 to -0.4 m AHD. The calculations are in accordance with the Queensland Acid Sulfate Technical Manual Soil Management Guidelines (version 3.8)

- Prevent any lowering of the permanent groundwater table height that may be caused by the proposed activity. If groundwater table height is expected to be lowered by activities such as temporary dewatering, implement groundwater monitoring. As a minimum pH, EC and the chloride and sulfate concentration should be monitored for each aquifer. This activity should be continued should the pH drop by greater than 1 pH unit, or EC increase by 10 % or more.

- Any suspected PASS material disturbed shall be stockpiled separately and tested using pH field oxidation tests and laboratory analysis to confirm if the soil is PASS. Bunding, diversion drains, and contaminated water treatment impoundments shall be used to contain run off from the storage area.

- Prior to release, impounded stormwater from the bunded area will be monitored to ensure acceptable turbidity and pH concentrations (Total suspended solids (TSS) 50mg/L and pH 6.0-8.5)

- As an alternative to liming treatment, PASS may be buried below the water table. However, AASS (Actual Acid Sulfate Soil) will require neutralisation prior to burial under the water table.

- Minimise the depth in essential drainage structures. Manage drainage to maintain the watertable surrounding drainage structures above any sulfidic layer (ie above 0.5 metres AHD) in the soil (eg. Shallow grassed drains)

- In the event that an alternative procedure to neutralisation by lime is to be undertaken, the efficiency of the techniques shall be trialed using material from the site. If the techniques are found to be suitable, the use shall be approved in writing by the EPA and DNRM prior to commencement of construction.

- Removal of any neutralised PASS material offsite shall be approved by the Douglas Shire Council, Environmental Protection Agency and or the Department of Natural Resources and Mines.

- Earthwork contractors (if required) shall be briefed in relation to the identification and potential environmental risks associated with PASS.

Performance Indicators

The pH of any off site discharge or runoff from any excavations below 0.5 metres AHD or stockpiled PASS shall be within QASSIT guidelines (6.0-8.5 pH units) or above background surface water pH.

Monitoring

Visual monitoring should be undertaken to identify signs of ASS oxidation, including:

- Rust coloured deposits on plants and on banks of drains, water bodies and watercourses indicating iron precipitates;
- Areas of green-blue water or extremely clear water indicating high concentrations of dissolved metals in solution;
- Sulfurous smells (eg. Mangrove Mud Smell);
- Formation of the mineral jarosite and other acidic salts in exposed or excavated soils;
- Black or odorous waters indicating de-oxygenation;
- Unexplained scalding, degradation or death of vegetation;
- Unexplained death or disease in aquatic organisms;
- A transition to, or establishment of, a community dominated by acid tolerant species;
- Invasion of a community or area by acid tolerant species;
- Corrosion of concrete and/or steel structures in contact with soil or water;
- Monitoring the pH of soil and runoff, to be undertaken as required.

Responsible Person/Organisation

The earthwork contractor shall be responsible for the appointment of suitably qualified personnel to undertake PASS testing of any suspicious soils and routine monitoring of site runoff and stockpiles.

Corrective Action

In the event that monitoring indicates the presence of PASS or acidic runoff, application of agricultural or hydrated lime (water) at rates appropriate to neutralise acidic soils or runoff shall be immediately undertaken.

Reporting/Review

A review of the PASS management plan to be undertaken following any exceedance of performance criteria.

9.0 CONCLUSION

9.1 FILLING ACTIVITIES

From the analysis of field and laboratory results, filling activities described in Section 3.2 and **Figure 2** are not considered to pose any foreseeable risk in relation to the exposure and/or disturbance of potential acid sulfate soils.

Due to the porous nature and low compaction of sandy Brosnan Soils, compaction related de-watering is highly unlikely. Filling on Mossman soils will be light (around 0.6 metres depth) and it is unlikely that the deep PASS layer could hydraulically penetrate the shallow drain. Actual Acid Sulfate Soils were not encountered during laboratory analysis and therefore any acidity released from soils being moved beneath the water table is considered to be negligible.

9.2 CUTTING ACTIVITIES

The design plan for sewerage system installation is available in the Flanagan Consulting Group Report 1329/01 Engineering Issues, Material Change of Use and Reconfiguration Lot 1 on RP720316 and Lots 2 and 3 on SR614 Cooya Beach, **Figure 6**.

Depth of sewerage system infrastructure generally ranges from 1 to 2.5 metres below ground surface level. From the required minimum ground surface level of 3.2 metres AHD, sewerage pipes would lie between 2.2 and 0.7 metres AHD. Therefore trenches cut for the emplacement of sewerage infrastructure will be above the weak marginally actionable layer at 0.5 metres AHD and are highly unlikely to disturb PASS below 0 metres AHD.

To avoid PASS disturbance, it would be considered prudent that any disturbances or excavations below 0.5 metres AHD should be subject to further on-site testing and performance criteria set out in the Environmental Management Plan (Refer Section 8.0).

10.0 REFERENCES

State Planning Policy Guideline, 2/02, Planning and Managing Development involving Acid Sulfate Soils V2, Queensland Government.

Queensland Acid Sulphate Soils Investigation Team (1998) Guidelines for Sampling and Analysis of Lowland Acid Sulphate Soils (ASS) in Queensland 1998 (October 1998, Revision 4.0), Department of Natural Resources, Brisbane.

Instructions for the Treatment and management of Acid Sulfate Soils (2001) (version 1.0) Produced by the Environmental Protection Agency in consultation with the Department of Natural Resources and Mines and the Department of Primary Industries.

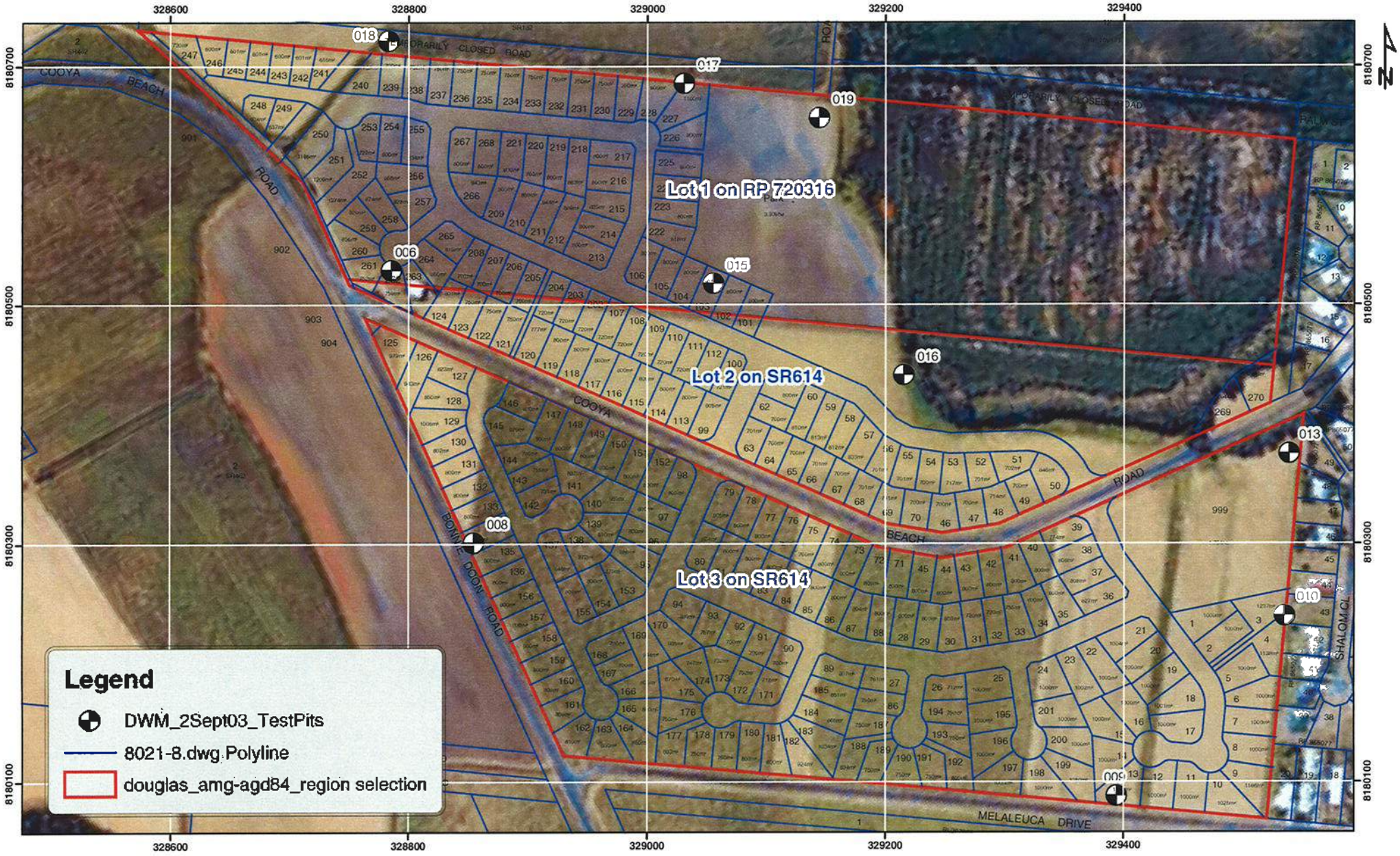
Dear SE, Moore NG, Dobos SK, Watling KM, Ahern CR (2002) Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines (version 3.8) Department of Natural Resources and Mines, Brisbane.

Murtha, G. G. (1989) Soils of the Mossman Cape Tribulation Area, North Queensland. CSIRO.

Figure 1

C&B Group Plan 8021-4 Location and Layout of the Proposed Residential Development including Test Pit locations

Borehole Locations on Lot 1 RP720316 and Lots 2 & 3 on SR614



C&B GROUP

0 25 50 100 150 200 250
Metres

Note : Borehole Locations were taken with a hand held GPS unit and may be subject to errors up to 5 metres

Borehole Location Plan
C&B Group Plan 8021-4
Drafted by DwM 29-09-2003
Scale 1:3000 @ A3

Figure 2

C&B Group Plan 8021-5 Elevation, Drainage and areas requiring fill

Elevation (AHD) over Lot 1 on RP720316 and Lots 2 & 3 on SR614

C&B GROUP

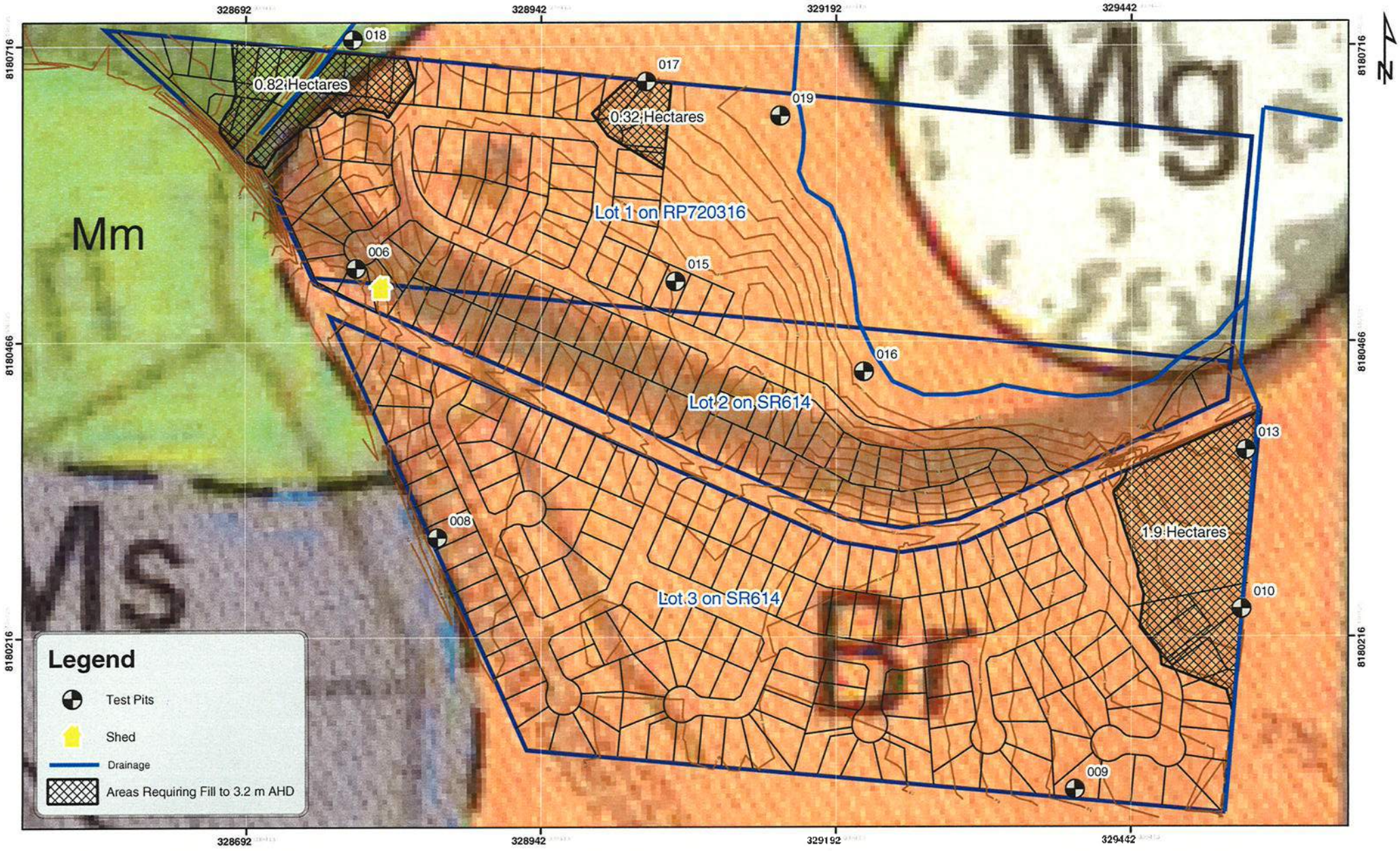
Note : Borehole Locations were taken with a hand held GPS unit and may be subject to errors up to 5 metres

C&B Group Plan 8021-5
Drafted DwM 30-09-2003
Scale 1:3000 @ A3

Figure 3

C&B Group Plan 8021-9 Soils on Lot 1 RP 720316 and Lots 2 & 3 on SR614

Soils on Lot 1 on RP720316 and Lots 2 & 3 on SR614



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SOIL TYPES

Br (Brosnan)	Dark Grey Sandy loam A1; yellowish red or red sandy loam to sandy clay loam massive B horizon.
Mm (Mossman)	Dark grey bown medium clay Ap to 30 cm; olive brown or brownish yellow, moderate to strong fine blocky structured medium clay B horizon.

C&B Group Plan 8021-9
Drafted DwM 3-10-2003
Scale 1:3000 @ A3

Annexure 1

PASS/ASS Investigation Summary Results

Assessor 1 2/06/2023

Test Site	Depth Below GSL	RL (AHD) (metres)	Description	pH	pHfox	Difference	Reaction	Manganese (mg/kg)	%S (Peroxide) (% w/w)	Scr (% w/w)	TAA (kg H2SO4/ tonne)	TAA (as %S) (%S)	Action Criteria (%S)	Comment
WP5														
Ground Surface	0	7.25	Greyey Brown Organic Sandy Loam	5.73	5.02	0.71	L							Organic Reaction
	0.3	6.95	Reddy Brown Clayey Fine Sand	5.77	4.7	1.07	VL							Organic Reaction
	0.61	6.74	Red Fine-Medium Sand	5.59	5.05	0.51	-							
	1	6.25	Red Fine-Medium Sand	5.76	4.46	1.29	-							
	1.5	5.75	Red Fine-Medium Sand	5.26	4.75	0.59	-							
	2	5.25	Yellow Fine-Med Sand (slight orange mottle)	5.19	4.58	0.77	-							
Pit Base	2.6	4.75												
WP6														
Ground Surface	0	5.25	Light Brown Pebbly Clay (likely imported fill)	5.44	5.17	1.26	vl							
	0.22	5.03	Chocolate Brown Organic Sandy Loam	4.85	4.36	0.49	M							
	0.4	4.85	Brown Loamy Sand	5.21	4.58	0.63	L-M							
	0.62	4.73	Browny Red Clayey Pebbly Sand	4.87	4.48	0.39	M							
	0.8	4.45	Browny Red Coarse Clayey Sand (poorly sorted)	4.4	4.75	-0.39	M							
	1.2	4.05	Browny Red Coarse Clayey Pebbly Sand	5.25	5.48	-0.23	M							
	1.5	4.75	Reddy Yellow Clayey Sand (poorly sorted)	4.87	5.62	-0.85	M							
	2	4.25	Yellow Clayey Sand (Dark mineral agregate ~20% manganese?)	5.41	5.35	0.05	H							Reaction with Manganese
Pit Base	2.3	3.95												
WP9														
Ground Surface	0	4.75	Dark Organic Sandy Loam	4.79	4.57	0.22	-							
	0.49	4.26	Light Grey Loamy Sand (poorly sorted)	4.64	4.61	0.03	-							
	0.7	4.05	White Grey Loamy Sand (poorly sorted)	4.59	4.45	0.14	-							
	0.89	3.86	Yellow Orange Clayey Sand (poorly sorted)	4.69	4.61	0.08	-							
	1.3	3.45	Yellow Clayey Sand (minor orange mottle)	4.61	4.57	0.44	-							
	1.6	3.15	Light Grey Coarse Sand (heavy red mottle)	5.04	5.57	-0.53	H	59	<0.005		<0.5	0.016345211		Manganese Nodules Found
Pit Base	2	2.75												
WP10														
Ground Surface	0	2	Dark Grey Black Silty Sand	4.52	3.73	1.09	-							
	0.35	1.65	Grey Brown Clayey Sand (poorly sorted)	5.08	4.44	0.64	-							
	0.6	1.4	Dump Browny Grey Coarse Sand	5.15	4.7	0.45	-							
	0.8	1.2	Dump Grey Brown Clayey Coarse Sand	5.27	4.27	1	-							
	1	1	Dump Grey Clayey Coarse Sand	6.23	4.73	1.45	-			0.04	<0.5	0.016345211		
	1.3	0.7	Dump Light Grey Coarse Sand	5.13	3.2	1.93	VL			0.005	<0.5	0.016345211		
[illegible]		0.45	Wet Light Grey Coarse Sand (sulfurous smell)	5.32	2.93	2.39	L							
[illegible]		0.3												
WP13														
Ground Surface	0	2	Dark Organic Sandy Silt	5.42	3.44	1.98	L							Organic Reaction
	0.32	1.68	Yellow Grey Coarse Sandy Clay	5.36	4.22	1.14	-							
	0.49	1.51	Moist Grey Brown Clayey Sand	5.32	4.61	0.71	-							
	0.69	1.31	Yellow Grey Coarse Sandy Clay (heavy orange mottle)	5.58	4.37	1.19	-							
	1	1	Damp Yellow Grey Coarse Sand	5.49	4.24	1.25	-			0.005	<0.5	0.016345211		
	1.2	0.8	Coarse Grey Sand (yellow mottle, no smell)	5.79	2.99	2.8	L-M			0.007	<0.5	0.016345211		
	1.5	0.5	Medium Grey Coarse Clayey Sand (minor yellow mottle)	5.77	3.83	1.94	L-M							Likely Transitional Horizon
[illegible]		0.27	Wet Medium Grey Coarse Sand	5.37	3.98	1.39	L							Likely Transitional Horizon
[illegible]		0												
WP15														
Ground Surface	0	4.5	Dark Organic Sandy Loam	4.78	3.66	1.12	L							Organic Reaction
	0.32	4.18	Brown Sandy Clay	4.77	3.86	0.91	L							Organic Reaction
	0.65	3.84	Yellow Red Sandy Clay	4.72	3.82	0.9	L							
	1	3.5	Reddy Yellow Sandy Clay	4.84	4.07	0.77	L							
	1.22	3.28	Yellow Grey Sandy Clay	4.42	4.1	0.32	L							
	1.5	3	Yellow Grey Sandy Clay	4.56	4.06	0.49	-							
	1.75	2.75	Light Grey Sandy Clay (minor reddy yellow mottle)	4.86	3.82	1.04	L-M			0.005	<0.5	0.016345211		Likely Reaction with Manganese
	2	2.5	Light Grey Sandy Clay (minor reddy yellow mottle)	5.39	4.14	1.25	-							
Pit Base	2.3	2.2												
WP16														
Ground Surface	0	4.6	Dark Organic Sandy Silt	5.24	4.05	1.19	-							
	0.4	4.2	Dark Brown Grey Sandy Clay	5.02	4.26	0.76	-							
	0.6	4.0	Dark Grey Clayey Sand	5.16	4.15	0.62	-							
	0.8	3.8	Dark Grey Clayey Sand	5.07	4.05	0.82	-							
	1	3.6	Light Grey Sandy Clay (no odour)	5.04	4.57	0.47	-							
	1.2	3.4	Mottled Grey Clay	5.06	4.71	0.35	-							
	1.5	3	Wet Grey Sand (no smell)	5.53	4.78	1.16	-			0.02	<0.5	0.016345211		Weak PASS
[illegible]		-0.25	Light to Medium Grey Clayey Sand (sulfurous smell)	5.76	4.49	4.13	H			0.15	<0.5	0.016345211		PASS
[illegible]		-0.9												
WP17														
Ground Surface	0	2.75	Dark Organic Coarse Sandy Loam	4.97	3.86	1.11	L							
	0.5	2.25	Yellow Grey Sandy Clay	5.23	4.5	0.73	-							
	1	1.75	Grey Sandy Clay (heavy orange mottle)	5.17	4.3	0.87	-							
	1.3	1.45	Grey Coarse Sand (heavy orange mottle)	5.1	4.21	0.89	-							
	1.6	1.15	Coarse Grey Sand	5.23	4.15	1.07	-							
Pit Base	2	0.75												
WP18														
Ground Surface	0	2	Brown Medium Clay	5.05	3.85	1.22	H							Organic Reaction
	0.32	1.68	Dark Brown Medium Clay	5.17	3.48	1.69	M							Organic Reaction
	0.6	1.4	Mod Browny Grey Clay	4.95	3.88	1.08	L							
	0.81	1.19	Dark Grey Medium Clay	5.21	4.29	1.02	L							
	1.2	0.8	Mod Grey Medium Clay	5.06	4.48	0.64	M							
	1.5	0.5	Heavy Grey Clay	6.43	3.88	1.68	VL			0.009	<0.5	0.016345211		
[illegible]		0.22	Grey Clayey Coarse Sand (Sulfurous smell)	5.29	2.89	2.41	VL			0.021	<0.5	0.016345211		Weak PASS
[illegible]		0												
WP19														
Ground Surface	0	1.5	Browny Grey Organic Clay	4.85	3.91	0.97	VL							Organic Reaction
	0.3	1.2	Medium Grey Clay	5.15	4	1.15	-							
	0.6	0.9	Light Grey Sandy Clay	5.71	4.29	1.42	-							
	0.9	0.6	Moist Light Grey Sandy Clay	5.6	4.08	1.52	-							
	1.1	0.4	Light Grey Sandy Clay	5.58	4.15	1.43	-							Likely Transitional Horizon
	1.3	0.2	Light Grey Medium Clay	5.31	4.38	0.93	-			0.072	<0.5	0.016345211		Weak PASS
[illegible]		-0.3	Medium Grey Clay (sulfurous smell)	5.9	1.72	4.08	L-M			0.08	<0.5	0.016345211		Weak PASS

Key (Groundwater)

[illegible]

Key (Action Criteria)

[illegible]	Below Action Criteria
[illegible]	Below Action Criteria
[illegible]	Above Action Criteria

Annexure 2

Laboratory Report

SGS

CERTIFICATE OF ANALYSIS

25 September, 2003

Mr David Morrison
C & B Group
PO Box 1949
CAIRNS QLD 4870

Your Order No: -
Laboratory Report No: 45871

Date Received: 8 September 2003

Dear Sir:

Twelve soil samples labelled according to the following tables were received and analysed for the parameters as listed. Please find the results in the attached report.

Yours faithfully,

SGS Environmental Services

Jon Dicker
Operations Manager
CAIRNS

Jon Scott
Inorganic Chemist
CAIRNS

NATA Accredited Laboratory No: 2562
NATA Endorsed Test Report

Environmental Services Unit 2, 58 Comport Street, Portsmith 4870 QLD Australia www.sgs.com
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SGS

Laboratory Report No: 45871

RESULTS I

SGS Reference	Your Reference	Moisture* % H_2O	pH KCl	TAA (pH 5.5) kg H_2SO_4/tonne
Blank		-	5.8	-
45871-02	**WP10: 1.0-1.3**	14	4.8	<0.5
45871-03	**WP10: 1.3-1.5**	16	4.9	<0.5
45871-04	**WP13: 1.0-1.2**	15	4.8	<0.5
45871-05	**WP13: 1.2-1.5**	14	4.8	<0.5
45871-06	**WP15: 1.75-2.0**	10	5.3	<0.5
45871-07	**WP16: 1.5-1.72**	11	5.5	<0.5
45871-08	**WP16: 1.72-2.0**	9	5.0	<0.5
45871-09	**WP18: 1.5-1.64**	23	4.4	<0.5
45871-10	**WP18: 1.64-2.0**	16	4.8	<0.5
45871-11	**WP19: 1.3-1.5**	16	5.1	<0.5
45871-12	**WP19: 1.5-1.8**	17	5.0	<0.5
	Limit of Reporting	1	0.1	0.5
	ASSMAC Method	2B1	21A	21F

Results determined on a dry basis.

* NATA accreditation does not cover the performance of this analysis.

SGS

Laboratory Report No: 45871

RESULTS II

SGS Reference	Your Reference	Chromium Reducible Sulphur* (S_{Cr}) % w/w
45871-02	**WP10: 1.0-1.3**	0.010
45871-03	**WP10: 1.3-1.5**	0.005
45871-04	**WP13: 1.0-1.2**	<0.005
45871-05	**WP13: 1.2-1.5**	0.007
45871-06	**WP15: 1.75-2.0**	<0.005
45871-07	**WP16: 1.5-1.72**	0.020
45871-08	**WP16: 1.72-2.0**	0.15
45871-09	**WP18: 1.5-1.64**	0.009
45871-10	**WP18: 1.64-2.0**	0.021
45871-11	**WP19: 1.3-1.5**	0.072
45871-12	**WP19: 1.5-1.8**	0.080
	Limit of Reporting	0.005
	ASSMAC† Method	22B

Results determined on a dry basis.

† Acid Sulfate Soils Management Advisory Committee.

SGS

Laboratory Report No: 45871

RESULTS III

SGS Reference	Your Reference	Manganese (Mn) mg/kg
45871-01	WP09: 1.6-2.0	59
	Limit of Reporting	0.05
	SGS Method	CEI-200

Results determined on a dry basis.

SGS

Laboratory Report No: 45871

RESULTS IV

Our Reference	Your Reference	Moisture‡ % H_2O	pH $_{KCl}$	TAA (pH 5.5) kg H_2SO_4/tonne	pH $_{OX}$	TPA (pH 5.5) kg H_2SO_4/tonne	TSA (pH 5.5) kg H_2SO_4/tonne
Blank		-	5.8	-	5.9	-	-
45871-1	WP9: 1.6-2.0	20	5.0	<0.5	4.7	<0.5	<0.5
R45871-1	*Repeat* WP9: 1.6-2.0	-	5.0	<0.5	4.8	<0.5	<0.5
	Limit of Reporting	1	0.1	0.5	0.1	0.5	0.5
	ASSMAC§ method	2B1	21A	21F	21B	21G	21H

Our Reference	Your Reference	S_{KCl}‡ % w/w	S_P‡ % w/w	S_{POS}‡ % w/w	Ca_{KCl}‡ % w/w	Ca_P‡ % w/w	Ca_A‡ % w/w	Mg_{KCl}‡ % w/w	Mg_P‡ % w/w	Mg_A‡ % w/w	Na_{KCl}‡ % w/w	Na_P‡ % w/w	Na_A‡ % w/w
Blank		-	-	-	-	-	-	-	-	-	-	-	-
45871-1	WP9: 1.6-2.0	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
R45871-1	*Repeat* WP9: 1.6-2.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Limit of Reporting	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	ASSMAC Method	21Ce	21De	21Ee	21Vh	21Wh	21Xh	21Sm	21Tm	21Um	21Ms	21Ns	21Ps

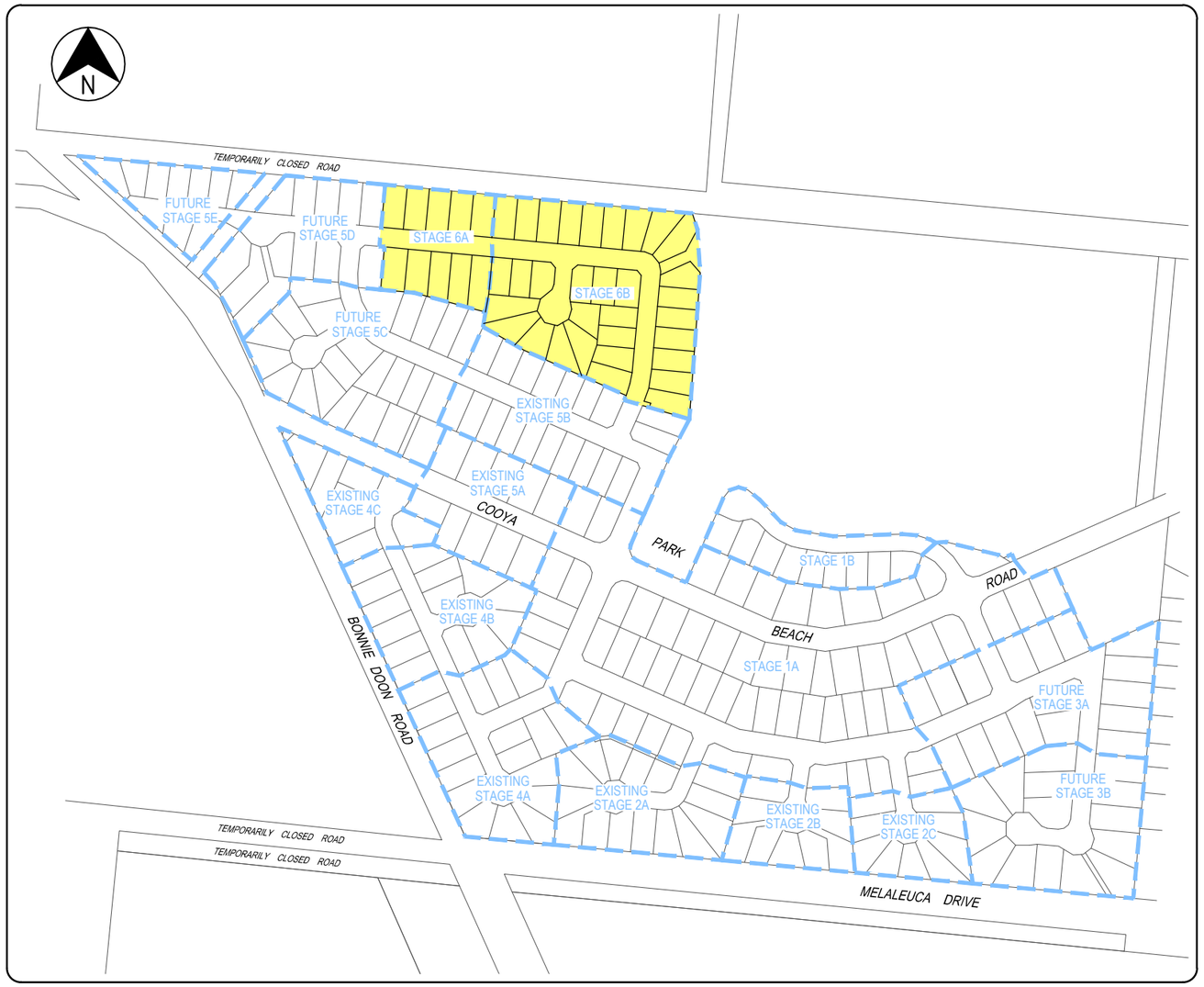
Results determined on a dry basis.

‡ NATA accreditation does not cover the performance of this analysis.
§ ASSMAC - Acid Sulfate Soils Management Advisory Committee - Acid Sulfate Soil Manual. August 1998

NATA Accredited Laboratory No: 2562
NATA Endorsed Test Report

Item 11

OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B



LOCALITY PLAN
N.T.S.

DRAWING INDEX

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA STANDARD DRAWINGS

DRAWING No.	DRAWING TITLE
D-0040	SEDIMENT CONTROL DEVICES - SEDIMENT FENCE, ENTRY/EXIT SEDIMENT TRAP
D-0041	SEDIMENT CONTROL DEVICES - KERB AND FIELD INLETS, CHECK DAMS & STRAW BALE BANKS

FNQROC STANDARD DRAWINGS

DRAWING No.	DRAWING TITLE
S1000 - S1110	ROADWORKS AND DRAINAGE
S2000 - S2025	WATER
S3000 - S3015	SEWERAGE

SEQ CODE STANDARD DRAWINGS

DRAWING No.	DRAWING TITLE
SEQ-WAT-1205 & 1206	WATER PIPE THRUST AND ANCHOR BLOCK DETAILS

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

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Fax: +61 7 4031 3967
Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE	DATE
PAM	RJC	01.12.17	01.12.17

TITLE: LOCALITY PLAN AND DRAWING INDEX

SCALE	DRAWING No	REV
N.T.S.	IH132900-CI-DG-0001	A

GENERAL ARRANGEMENT

GENERAL

1. FOR TYPICAL CROSS SECTIONS AND CONTROL LINE SETOUT DETAILS REFER DG-0005.
2. FOR KERB PROFILE DETAILS REFER FNQROC STD. DRG. S1000.
3. FOR KERB RAMP DETAILS REFER FNQROC STD. DRG. S1016. KERB RAMPS ARE TO ALIGN DIRECTIONALLY WITH THE RAMP ON THE OPPOSING SIDE OF THE ROAD.
4. FOR STREET NAME POST DETAILS REFER FNQROC STD. DRG. S1040. THE SIGN SHALL HAVE A REFLECTIVE WHITE LEGEND ON A GREEN BACKGROUND.
5. CONTRACTOR TO PROVIDE PUBLIC NOTIFICATION/SIGNS (REFER FNQROC DEVELOPMENT MANUAL CP1.11).
6. CLEARED VEGETATION SHALL BE MULCHED ON SITE BY THE CONTRACTOR.
7. FOR CONCRETE PATHWAY DETAILS REFER FNQROC STD. DRG. S1035.
8. FOR JOIN TO EXISTING ROADS REFER DETAIL ON DG-0005.

EXISTING SERVICES

1. EXISTING SERVICES ARE PLOTTED FROM THE BEST INFORMATION AVAILABLE. NO RESPONSIBILITY IS TAKEN BY THE PRINCIPAL OR SUPERINTENDENT FOR THE ACCURACY AND COMPLETENESS OF THE INFORMATION SHOWN.
2. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION THE CONTRACTOR IS TO ESTABLISH ON SITE THE EXACT POSITION OF ALL UNDERGROUND SERVICES IN THE PROPOSED WORKS AREA. METHODS FOR ACHIEVING THIS WILL INCLUDE BUT NOT BE LIMITED TO:-
   - ●CAREFUL EXAMINATION OF THE CONTRACT DRAWINGS.
   - ●CONSULTATION WITH THE RELEVANT SERVICE AUTHORITIES.
   - ●COMPREHENSIVELY SCANNING THE AFFECTED AREAS WITH A CABLE DETECTOR AND MARKING ON THE GROUND THE POSITION OF ALL SERVICES.
   - ●HAND EXCAVATING TO EXPOSE ALL SUCH SERVICES WHICH MAY BE AFFECTED BY THE PROPOSED WORKS UNDER THE DIRECTION OF THE RELEVANT SERVICE AUTHORITY.
3. THE CONTRACTOR IS TO BRING TO THE SUPERINTENDENT'S ATTENTION ANY DISCREPANCIES BETWEEN THE EXISTING SERVICES THUS IDENTIFIED AND DOCUMENTED SERVICES WHICH MIGHT AFFECT THE PROPOSED WORKS. APPROPRIATE MEASURES TO RESOLVE ANY CONFLICTS WILL BE DOCUMENTED BY THE SUPERINTENDENT.

EARTHWORKS

1. ALL BATTERS TO ROAD FRONTAGES OF LOTS ARE 1 ON 4 OR FLATTER. ALL OTHER BATTERS ARE 1 0N 1 U.N.O.
2. BATTERS TO BE ADJUSTED LOCALLY AROUND SEWER MANHOLES. REFER DG-0015 FOR DETAILS.
3. UPON COMPLETION ALL BATTERS STEEPER THAN 1 IN 2 AND HIGHER THAN 1.5m SHALL REQUIRE CERTIFICATION AS TO THE STABILITY BY A GEOTECHNICAL ENGINEER.

INTERSECTION DETAILS

1. ALL KERB SETOUT DETAILS REFER TO THE LIP OF KERB AND CHANNEL OR FACE OF KERB AS APPLICABLE.
2. FOR KERB PROFILE DETAILS REFER FNQROC STD. DRG. S1000.

STORMWATER DRAINAGE

1. FOR STANDARD STORMWATER DRAINAGE DETAILS REFER FNQROC STD. DRGS. S1045-S1100 INCLUSIVE.
2. THE CONTRACTOR IS TO LOCATE ALL EXISTING SERVICES IN THE WORKS AREA PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
3. SUBSURFACE DRAINS TO BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATION, FLUSHING POINTS IN ACCORDANCE WITH FNQROC STD. DRG. S1095.
4. ALL STORMWATER PIPES ARE TO BE CLASS 2 FJ, RCP'S U.N.O. CONCRETE PIPES BELOW RL 1.80 ARE TO HAVE SALTWATER COVER TO REINFORCEMENT.
5. WHERE ANY PART OF THE STORMWATER PIT IS BELOW RL 1.80 THE CONCRETE GRADE AND COVER TO REINFORCEMENT SHALL BE IN ACCORDANCE WITH FNQROC STD DRGS S1050 & S1055.
6. FOR BEDDING DIMENSIONS TO BLACKMAX PIPES REFER DG-0005.
7. PRIOR TO COMMENCEMENT OF PIPEWORK, THE CONTRACTOR IS TO CONFIRM THE INVERT LEVEL OF DOWNSTREAM DRAINAGE TO ENSURE THE STORMWATER SYSTEM CAN DRAIN SATISFACTORILY. REFER ANY DISCREPANCY TO THE SUPERINTENDENT.
8. CCTV INSPECTIONS ARE TO BE CONDUCTED FOR ALL NEW STORMWATER PIPES FOR COUNCIL ASSESSMENT.

SEWERAGE

1. ALL SEWER PIPES SHALL BE uPVC CLASS 'S.N.8.' (U.N.O.).
2. FOR STANDARD DETAILS OF SEWER MAINS, ETC. REFER FNQROC STD. DRGS. S3000 TO S3015 INCLUSIVE.
3. MANHOLES ADJACENT ROAD BOUNDARIES SHALL BE ON A 1.5m ALIGNMENT U.N.O. MANHOLES ADJACENT SIDE AND REAR BOUNDARIES SHALL BE ON A 0.8m ALIGNMENT U.N.O.
4. SEWER MANHOLES SHALL BE FINISHED 50mm MAX ABOVE FINISHED SURFACE LEVEL IN ALLOTMENTS AND FLUSH IN ROAD RESERVES.
5. HOUSE DRAINS ARE TO EXTEND 1.5m CLEAR OF ANY EARTHWORKS BATTER THAT IS STEEPER THAN 1 ON 2. AN INSPECTION OPENING IS TO BE PROVIDED AT THE DOWNSTREAM END OF THE HOUSE DRAIN.
6. THE CONTRACTOR IS TO LOCATE ALL EXISTING SERVICES IN THE WORKS AREA PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
7. CONNECTION OF SEWER TO EXISTING MANHOLE SHALL BE IN ACCORDANCE WITH FNQROC's REQUIREMENTS. CONNECTION TO MANHOLE TO BE MADE WITH SAND-SOCKETED PIPES (TO BE CONFIRMED WITH DOUGLAS SHIRE COUNCIL PRIOR TO CONSTRUCTION).
8. EXISTING LOTS TO BE REINSTATED AFTER CONSTRUCTION OF THE SEWER.
9. ALL HOUSE CONNECTION BRANCHES ARE REQUIRED TO BE BROUGHT TO WITHIN A MAXIMUM OF 300mm OF THE FINISHED SURFACE LEVEL AND A GLUED CAP INSTALLED. THE RISER MUST BE CONNECTED TO A MARKER PEG WITH PLASTIC COATED WIRE. THE MARKER PEG IS TO BE OF HARDWOOD MATERIAL, PROTRUDING 20mm ABOVE THE GROUND AND SHALL BE INSTALLED IMMEDIATELY ADJACENT TO THE RISER IN ACCORDANCE WITH FNQROC DRAWING S3005.
10. ALL VERTICAL DROPS SHALL BE CONSTRUCTED USING FIBREGLASS HEAVY DUTY DEEP SEWER DROPS.
11. CONNECTIONS TO EXISTING COUNCIL MAINS TO BE MADE BY DOUGLAS SHIRE COUNCIL.
12. CCTV INSPECTIONS ARE TO BE CONDUCTED FOR ALL NEW SEWERS FOR COUNCIL ASSESSMENT.
13. ALL WORKS ARE TO BE IN ACCORDANCE WITH FNQROC DESIGN MANUAL SPECIFICATION S6.

WATER

1. ALL WATER MAINS ARE ON 2.8m ALIGNMENTS FROM BOUNDARY U.N.O.
2. FOR STANDARD DETAILS REFER FNQROC. STD. DRGS. S2000 TO S2035 INCLUSIVE.
3. CONNECTIONS TO EXISTING COUNCIL MAINS TO BE MADE BY DOUGLAS SHIRE COUNCIL.
4. THE CONTRACTOR IS TO LOCATE ALL EXISTING SERVICES IN THE WORKS AREA PRIOR TO COMMENCEMENT OF CONSTRUCTION.
5. PROVIDE 80mm uPVC CLASS 6 CONDUITS WITH 300mm COVER UNDER CONCRETE FOOTPATH FOR WATER SERVICES AS PER FNQROC STD. DRG. S2038. EXTEND CONDUITS 200mm PAST THE EDGE OF FOOTPATH. FINAL LOCATION OF CONDUITS TO BE CONFIRMED ONCE ERGON PILLAR BOX LOCATIONS ARE AVAILABLE.
6. PROVIDE A COMPRESSIBLE LAYER BETWEEN ALL EXISTING AND PROPOSED HYDRANT OR VALVE SURROUNDS WITHIN AREAS OF CONCRETE.
7. ALL WORKS ARE TO BE IN ACCORDANCE WITH FNQROC DESIGN MANUAL SPECIFICATION S5.

EROSION AND SEDIMENT CONTROL STRATEGY

1. SEQUENCING OF CONTROL MEASURES
   a) INSTALL STABLE POINT OF ENTRY
   b) INSTALL SILT FENCES
   c) PROTECT TOPSOIL STOCKPILES
   d) CONSTRUCT TEMPORARY SEDIMENT BASINS
   e) INSTALL STORMWATER PIPES
   f) IMPLEMENT PROTECTION MEASURES TO STORMWATER PITS
   g) REVEGETATE BARE AREAS UPON COMPLETION OF EARTHWORKS
   h) THE SEDIMENT CONTROL STRUCTURES ARE TO BE CLEANED & MAINTAINED AFTER EVERY STORM EVENT. ERODED SOILS SHALL BE STOCKPILED AS DIRECTED.
2. THE AMOUNT OF DISTURBANCE TO EXISTING VEGETATION BE KEPT TO A MINIMUM.
3. EXACT LOCATION OF SEDIMENT CONTROL STRUCTURES TO BE DETERMINED ON SITE BY COUNCIL & SUPERINTENDENT.
4. STOCKPILE LOCATIONS TO BE AGREED WITH COUNCIL & THE SUPERINTENDENT. STOCKPILES TO BE PROTECTED VIA DIVERSION DRAIN ON THE UPSLOPE & SILT FENCE ON THE DOWNSLOPE.
5. RETURNS IN SILT FENCE TO BE AT 20m INTERVALS WHEN INSTALLED ALONG THE CONTOUR. SPACING IS TO DECREASE TO 5-10m DEPENDING ON SLOPE IF THE SILT FENCE IS INSTALLED AT AN ANGLE TO THE CONTOUR. THE RETURN SHALL CONSIST OF EITHER:
   - V-SHAPED SECTION EXTENDING AT LEAST 1.5m UP THE SLOPE; OR
   - SANDBAG OR ROCK/AGGREGATE CHECK DAM A MINIMUM OF 1/3 AND MAXIMUM OF 1/2 FENCE HEIGHT, AND EXTENDING AT LEAST 1.5m UP THE SLOPE.
6. STORMWATER PIPES TO HAVE PIT PROTECTION MEASURES AS DETAILED IN FNQROC DEVELOPMENT MANUAL.
7. ALL SEDIMENT CONTROL MEASURES TO BE IN ACCORDANCE WITH THE CONTRACTORS ESC PLAN.
8. THE FOLLOWING REVEGETATION MEASURES ARE TO BE UNDERTAKEN IMMEDIATELY UPON COMPLETION OF EARTHWORKS.
   a) CUT & FILL BATTERS 1 ON 4 OR STEEPER TO BE HYDROMULCHED.
   b) VERGES & ALLOTMENTS TO BE GRASS SEEDED.
   c) PLACE TURF STRIPS BEHIND ALL KERB LINES.
9. REVEGETATION IS TO BE WATERED & MAINTAINED UNTIL GROWTH IS ESTABLISHED.
10. CONTRACTOR TO PROVIDE DUST SUPPRESSION MEASURES AS REQUIRED.
11. SEDIMENT BASIN
    a) INLET PROTECTION TO MINIMISE SCOUR & EVENLY DISTRIBUTE FLOW THROUGH BASIN.
    b) A MARKER PEG SHOULD BE INSTALLED TO SHOW THE STORAGE DEPTH. SEDIMENT SHALL BE REMOVED FROM BASIN WHEN 30% STORAGE DEPTH IS ENCROACHED & APPROPRIATELY DISPOSED ON SITE BY RESPREADING IN AREAS OF NON-EROSIVE FLOWS.
12. DESIGN CRITERIA FOR CONTRACTOR'S EROSION & SEDIMENT CONTROL PLAN TO BE IN ACCORDANCE WITH SECTION CP1.05 OF THE FNQROC DEVELOPMENT MANUAL.

SEDIMENT BASIN CALCS

EXPECTED LIFE OF EROSION CONTROL MEASURES 0-6 MONTHS.
DESIGN ARI = 10 YEAR, 6 HOUR STORM

SEDIMENT BASIN 1	SEDIMENT BASIN 2
AREA = 0.70ha	AREA = 2.96ha
I = 34.2mm/hr	I = 34.2mm/hr
C = 0.7	C = 0.7
Q = 50L/s	Q = 200L/s
TARGET PARTICLE SIZE = 0.05mm	TARGET PARTICLE SIZE = 0.05mm
SETTLING VELOCITY = 0.0019m/s	SETTLING VELOCITY = 0.0019m/s
THEREFORE, BASIN AREA = 635m2/m3/s	THEREFORE, BASIN AREA = 635m2/m3/s
BASIN AREA = 29.6m2	BASIN AREA = 125m2
LENGTH:WIDTH RATIO = 3:1	LENGTH:WIDTH RATIO = 3:1
9.5m LONG X 3.2m WIDE X 0.82m DEEP	19.4m LONG X 6.5m WIDE X 0.82m DEEP

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

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Fax: +61 7 4031 3967
Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: GENERAL NOTES

SCALE	DRAWING No	REV
N.T.S.	IH132900-CI-DG-0002	A

N

PROVIDE TEMPORARY GRAVEL TURNAROUND (MIN. RADIUS 6.0m) TO ROAD STUB. GRADE GRAVEL 0.5% MIN TO REDUCE PONDING.

3m WIDE SEWER EASEMENT

ROAD 01

ROAD 02

BARRBAL DRIVE

TC 470.371

TC 713.118

CT 728.826

TC 38.438

TC 350.965

TC 816.993

CT 842.851

CT 107.167

TC 83.605

D4-5

3.5m WIDE CONCRETE COMMERCIAL ACCESS. REFER FNQROC STD DRG S1110.

JOIN NEATLY TO EXISTING ROAD. REFER DETAIL ON DRG. DG-0005.

JOIN NEATLY TO EXISTING PATHWAY.

EXISTING ERGON PADMOUNT.

STAGE 5D

STAGE 6A

STAGE 6B

STAGE 5C

STAGE 5B

231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288

LEGEND

- ASPHALT SEALED PAVEMENT
- CONCRETE PATHWAY (1.5m WIDE U.N.O.)
- KERB RAMP
- STREET/PATHWAY SIGN
- STAGE BOUNDARY
- RETAINING WALL
- D4-5
- EASEMENT BOUNDARY
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER

NOTE

FOR NOTES REFER DG-0002.

SCALE 1:500 (A1)
1:1000 (A3)
0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

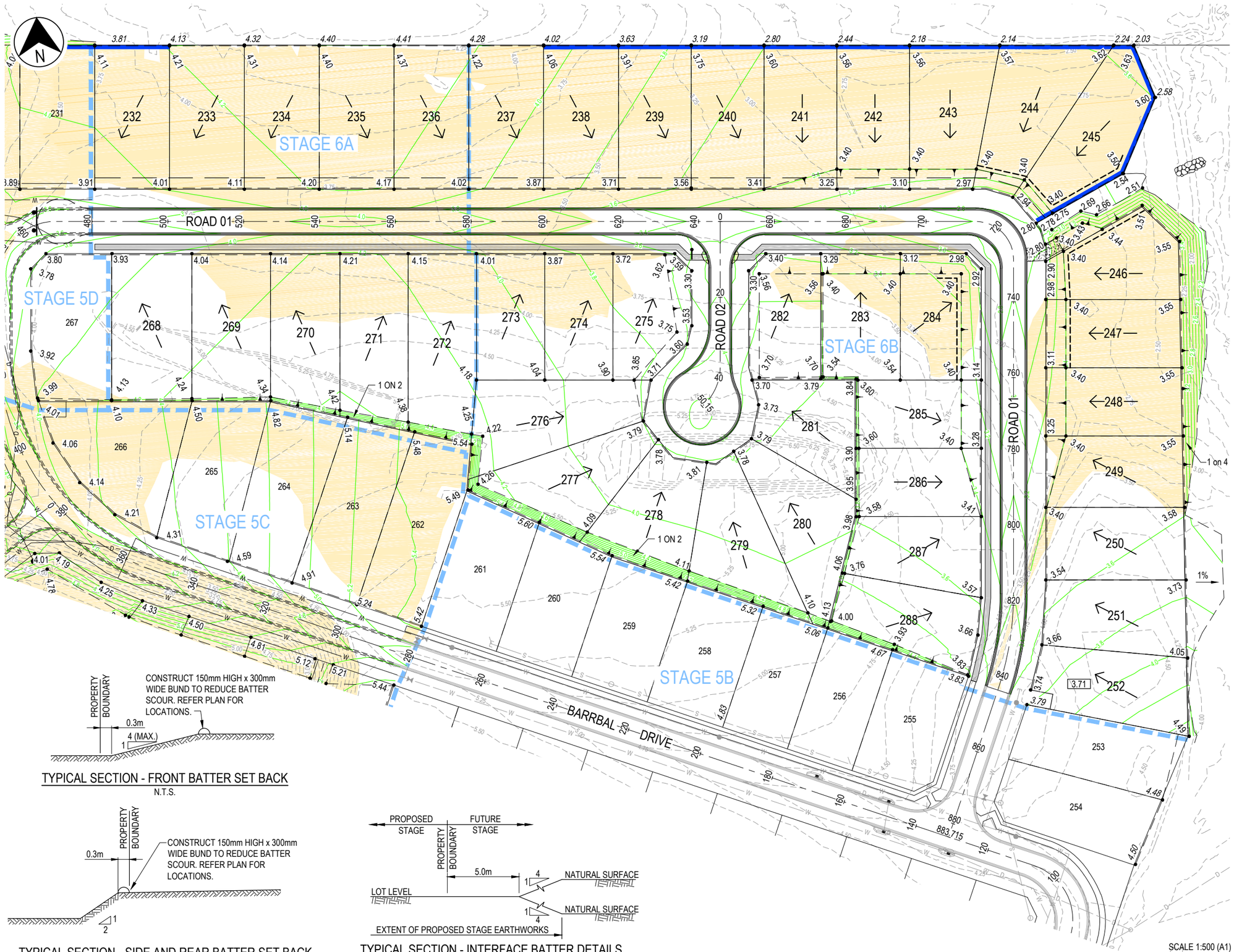
JACOBS
ABN 37 001 024 095 and ACN 001 024 095
Jacobs Group (Australia) Pty Ltd
2 James Street
CAIRNS, QLD 4870
AUSTRALIA
Tel: +61 7 4031 4599
Fax: +61 7 4031 3967
Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: GENERAL ARRANGEMENT

SCALE 1:500 (A1) | DRAWING No IH132900-CI-DG-0003 | REV A



LEGEND

- AREAS OF FILL
- 3.70 FINISHED SURFACE LEVEL
- 2.68 NATURAL SURFACE LEVEL
- FALL OF LOTS
- CONCRETE PATHWAY (1.5m WIDE U.N.O.)
- BATTER
- STAGE BOUNDARY
- 57.0 DESIGN SURFACE CONTOURS (0.2m INTERVAL)
- 57.0 EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- RETAINING WALL, REFER DETAIL
- BATTER BUND
- EASEMENT BOUNDARY
- 3.71 MINIMUM LEVEL OF LOT ABLE TO BE SERVICED BY SEWER
- D EXISTING STORMWATER
- S EXISTING SEWER
- W EXISTING WATER

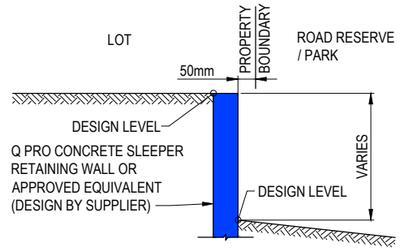
NOTE

FOR NOTES REFER DG-0002.

TYPICAL SECTION - FRONT BATTER SET BACK
N.T.S.

TYPICAL SECTION - SIDE AND REAR BATTER SET BACK
N.T.S.

TYPICAL SECTION - INTERFACE BATTER DETAILS
N.T.S.



TYPICAL RETAINING WALL DETAIL
N.T.S.

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

0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: EARTHWORKS

SCALE	DRAWING No	REV
1:500 (A1)	IH132900-CI-DG-0004	A

CONTROL LINE ROAD 01 SETOUT

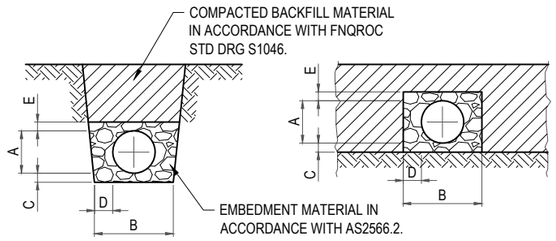
CHAINAGE	COORDINATES		BEARING	RADIUS OF	TANGENT	ARC
	EASTING	NORTHING	DEG MIN SEC	CURVATURE	LENGTH	LENGTH
0.000	9057.835	80368.789	23° 50' 4"	STRAIGHT		
83.605	9091.620	80445.264	23° 50' 4"	-15.000		
IP 95.386	9097.681	80458.985	-	-15.000	15.000	23.562
107.167	9083.961	80465.046	293° 50' 6"	STRAIGHT		
350.965	8860.955	80563.566	293° 50' 6"	61.500		
IP 389.328	8820.472	80581.451	-	61.500	44.258	76.726
427.692	8824.572	80625.519	5° 18' 58"	STRAIGHT		
446.809	8826.343	80644.555	5° 18' 58"	15.000		
IP 458.590	8827.733	80659.490	-	15.000	15.000	23.562
470.371	8842.669	80658.100	95° 18' 58"	STRAIGHT		
713.118	9084.371	80635.610	95° 18' 58"	10.000		
IP 720.972	9094.328	80634.683	-	10.000	10.000	15.708
728.826	9093.402	80624.726	185° 18' 58"	STRAIGHT		
816.993	9085.233	80536.938	185° 18' 58"	80.000		
IP 829.922	9084.024	80523.952	-	80.000	13.042	25.857
842.851	9078.754	80512.022	293° 50' 6"	STRAIGHT		
130.913	9062.240	80474.642	293° 50' 6"	STRAIGHT		

CONTROL LINE ROAD 02 SETOUT

CHAINAGE	COORDINATES		BEARING	RADIUS OF	TANGENT	ARC
	EASTING	NORTHING	DEG MIN SEC	CURVATURE	LENGTH	LENGTH
0.000	9017.290	80641.852	185° 18' 58"	STRAIGHT		
38.438	9013.729	80603.579	185° 18' 58"	13.449		
IP 44.294	9013.149	80597.350	-	13.449	6.257	11.712
50.150	9008.011	80593.780	235° 12' 45"	STRAIGHT		

BLACKMAX PIPE BEDDING DIMENSIONS

DN	DIMENSIONS (mm)				
	A	B	C	D	E
225	259	560	100	150	150
300	344	645	100	150	150
375	428	830	100	200	150
450	514	915	100	200	150
525	600	1200	150	300	150
600	682	1285	150	300	150



BLACKMAX PIPE BEDDING DETAILS

N.T.S.

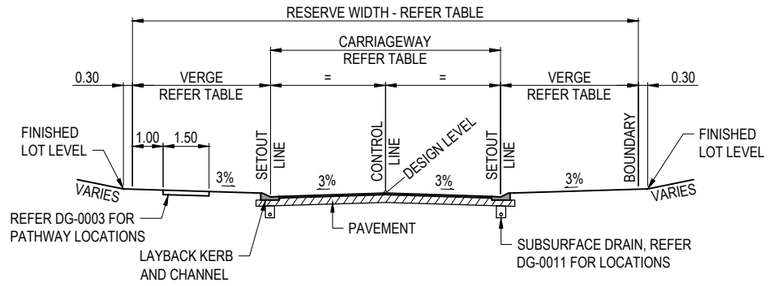
TABLE OF WIDTHS

ROAD	CARRIAGEWAY WIDTH (m)	VERGE WIDTH (m)		RESERVE WIDTH (m)
		LHS	RHS	
ROAD 01	6.50	5.25	5.25	17
ROAD 02	5.50	4.75	4.75	15

PROVISIONAL PAVEMENT DETAILS

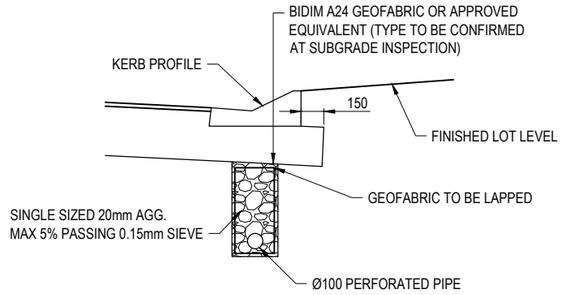
ROAD	SURFACING	SUBBASE CBR 45 (mm)	BASE CBR 60 (mm)
ROAD 01	30mm ASPHALT	100	100
ROAD 02	30mm ASPHALT	100	100

NOTES
PROVISIONAL PAVEMENT DESIGN IS BASED ON AN ASSUMED SUBGRADE SOAKED CBR OF 10. THE CONTRACTOR IS TO CONFIRM SUBGRADE CBR DURING CONSTRUCTION AND THE PAVEMENT DESIGN MAY BE AMENDED ACCORDINGLY BY THE DOUGLAS SHIRE COUNCIL.



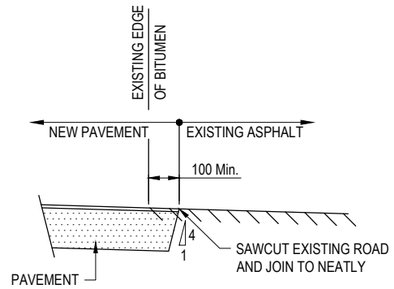
TYPICAL ROAD CROSS SECTION

N.T.S.



SUB SURFACE DRAINAGE DETAIL

N.T.S.



TYPICAL JOIN TO EXISTING ROAD

N.T.S.

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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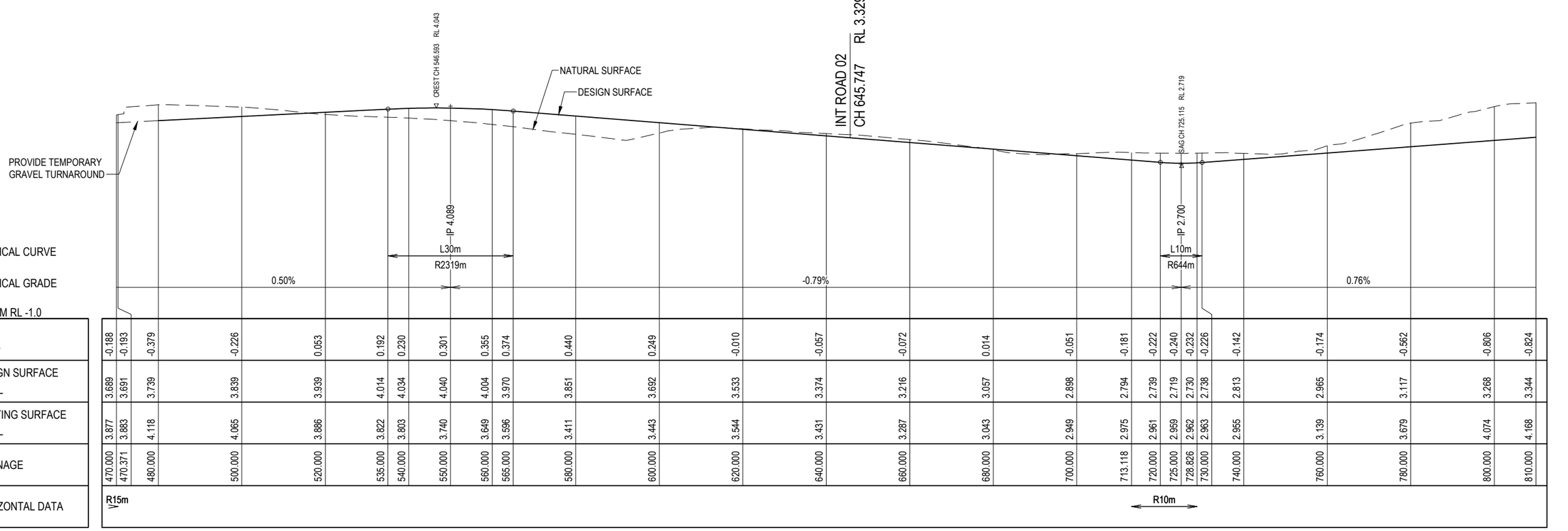
Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: MISCELLANEOUS SECTIONS AND DETAILS

SCALE: N.T.S. | DRAWING No: IH132900-CI-DG-0005 | REV: A



CUT - FILL +	-0.188	-0.193	-0.379	-0.226	0.053	0.192	0.230	0.301	0.355	0.374	0.440	0.249	-0.010	-0.057
DESIGN SURFACE LEVEL	3.689	3.691	3.739	3.839	3.939	4.014	4.034	4.040	4.004	3.970	3.851	3.692	3.533	3.374
EXISTING SURFACE LEVEL	3.877	3.883	4.118	4.065	3.886	3.822	3.803	3.740	3.649	3.596	3.411	3.443	3.544	3.431
CHAINAGE	470.000	470.371	480.000	500.000	520.000	535.000	540.000	550.000	560.000	565.000	580.000	600.000	620.000	640.000
HORIZONTAL DATA	R15m													

CUT - FILL +	-0.072	0.014	-0.051	-0.181	-0.222	-0.240	-0.232	-0.226	-0.142	-0.174	-0.562	-0.806	-0.824
DESIGN SURFACE LEVEL	3.216	3.057	2.898	2.794	2.739	2.719	2.730	2.738	2.813	2.965	3.117	3.268	3.344
EXISTING SURFACE LEVEL	3.287	3.043	2.949	2.975	2.961	2.959	2.962	2.963	2.955	3.139	3.679	4.074	4.168
CHAINAGE	660.000	680.000	700.000	713.118	720.000	725.000	728.826	730.000	740.000	760.000	780.000	800.000	810.000
HORIZONTAL DATA				R10m									

LONGITUDINAL SECTION ROAD 01

SCALE 1:500H
1:50V

VERTICAL SCALE 1:50 (A1)
1:100 (A3)

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

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE
estate

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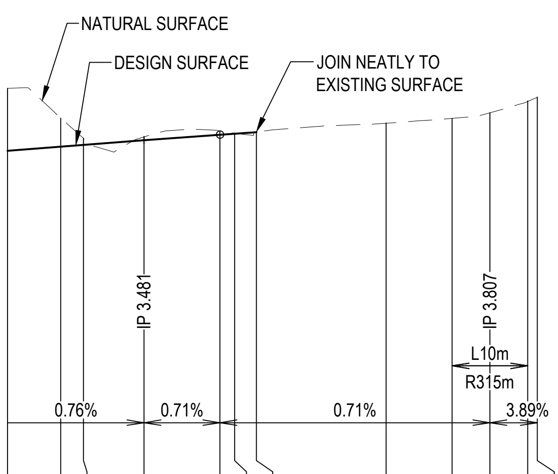
CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW		
PAM	RJC	DATE 01.12.17	DATE 01.12.17

TITLE
ROAD LONGITUDINAL SECTIONS
SHEET 1 OF 2

SCALE 1:500H, 1:50V (A1)
DRAWING No IH132900-CI-DG-0006
REV A



VERTICAL CURVE

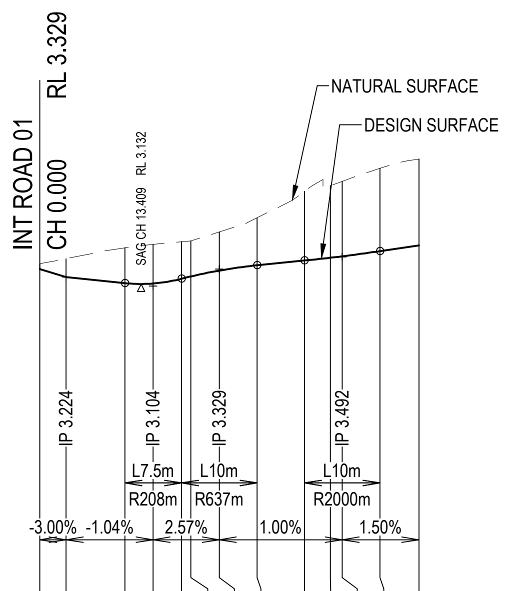
VERTICAL GRADE

DATUM RL -1.0

CUT - FILL +	-0.824	-0.377	-0.088	-0.050	-0.051	-0.008						
DESIGN SURFACE LEVEL	3.344	3.397	3.420	3.481	3.552	3.566						
EXISTING SURFACE LEVEL	4.168	3.774	3.508	3.530	3.603	3.575	3.593	3.707	3.771	3.845	3.995	4.047
CHAINAGE	810.000	816.993	820.000	828.000	838.040	840.000	842.851	860.000	868.725	873.725	878.725	880.000
HORIZONTAL DATA	R80m											

LONGITUDINAL SECTION ROAD 01

SCALE 1:500H
1:50V



VERTICAL CURVE

VERTICAL GRADE

DATUM RL -1.0

CUT - FILL +	-0.074	-0.243	-0.468	-0.517	-0.491	-0.471	-0.513	-0.628	-0.915	-0.955	-0.993	-1.098	-1.140
DESIGN SURFACE LEVEL	3.329	3.224	3.143	3.138	3.201	3.232	3.310	3.379	3.442	3.479	3.498	3.567	3.644
EXISTING SURFACE LEVEL	3.402	3.467	3.611	3.655	3.691	3.703	3.822	4.007	4.357	4.434	4.491	4.664	4.784
CHAINAGE	0.000	3.500	11.250	15.000	18.750	20.000	23.750	28.750	35.000	38.438	40.000	45.000	50.150
HORIZONTAL DATA												R13.45m	

LONGITUDINAL SECTION ROAD 02

SCALE 1:500H
1:50V

VERTICAL SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

HORIZONTAL SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

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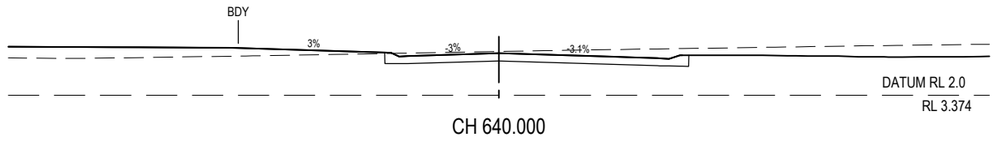
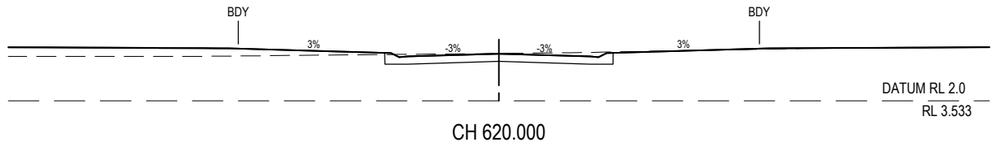
DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED PAM	DESIGN REVIEW RJC	DATE 01.12.17	DATE 01.12.17

TITLE ROAD LONGITUDINAL SECTIONS
SHEET 2 OF 2

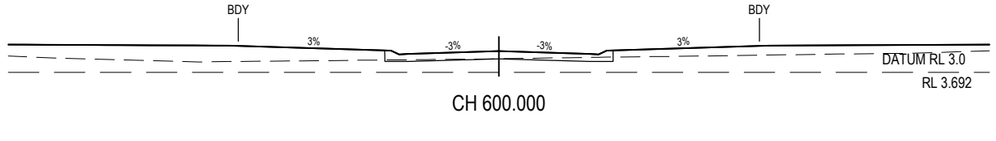
SCALE 1:500H, 1:50V (A1)
DRAWING No IH132900-CI-DG-0007
REV A



CH 640.000



CH 620.000



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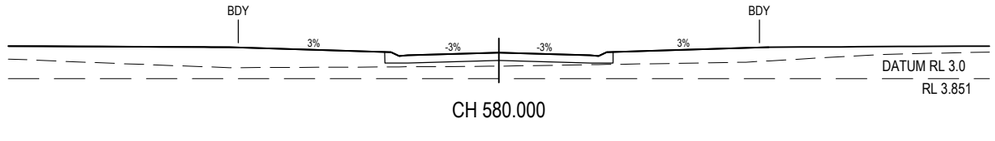

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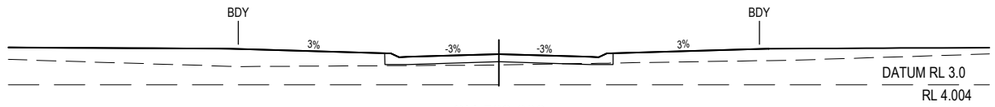

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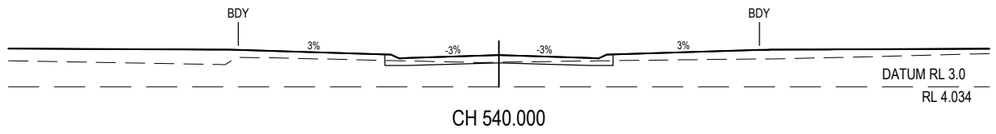

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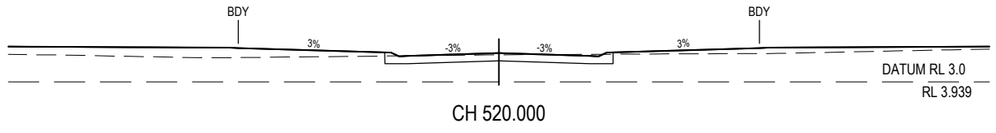

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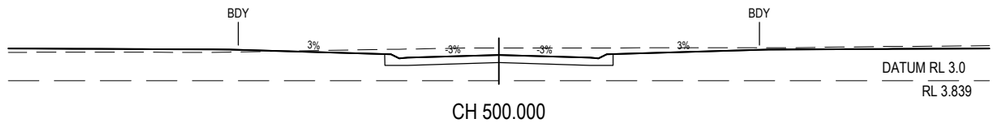
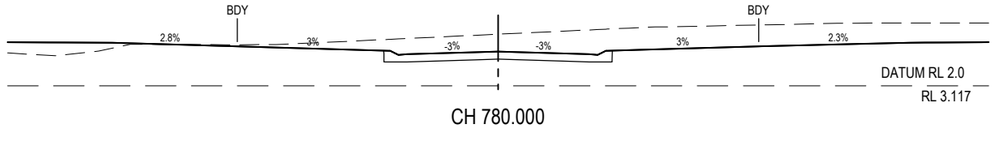


CH 500.000

ROAD 01



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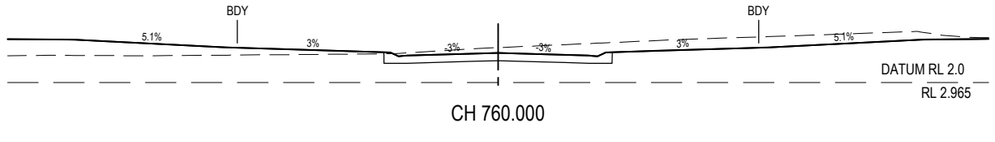
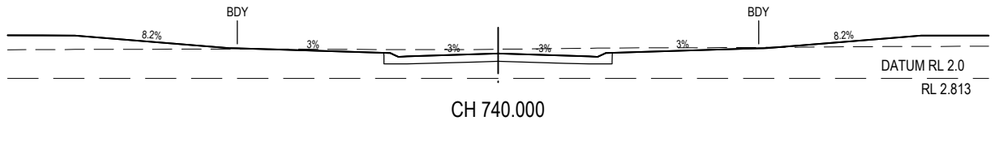
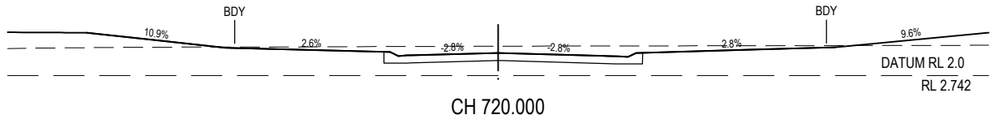


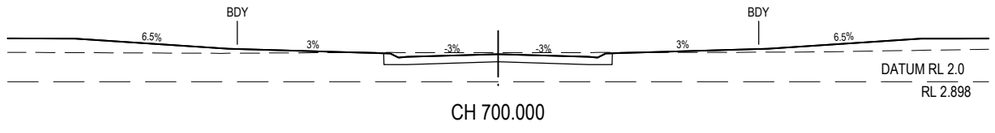
CH 760.000



CH 740.000



CH 720.000



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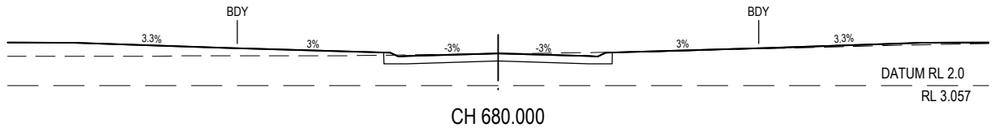

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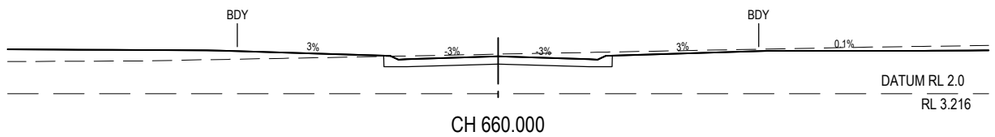

CH 660.000

ROAD 01

SCALE 1:100 (A1)
1:200 (A3)

0 2 4 6 8 10m
2 1

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: ROAD CROSS SECTIONS SHEET 1 OF 2

SCALE: 1:100 (A1)
DRAWING No: IH132900-CI-DG-0008
REV: A

CH 840.000

CH 820.000

CH 800.000

ROAD 01

CH 40.000

CH 20.000

ROAD 02

SCALE 1:100 (A1)
1:200 (A3)

0 2 4 6 8 10m
2 1

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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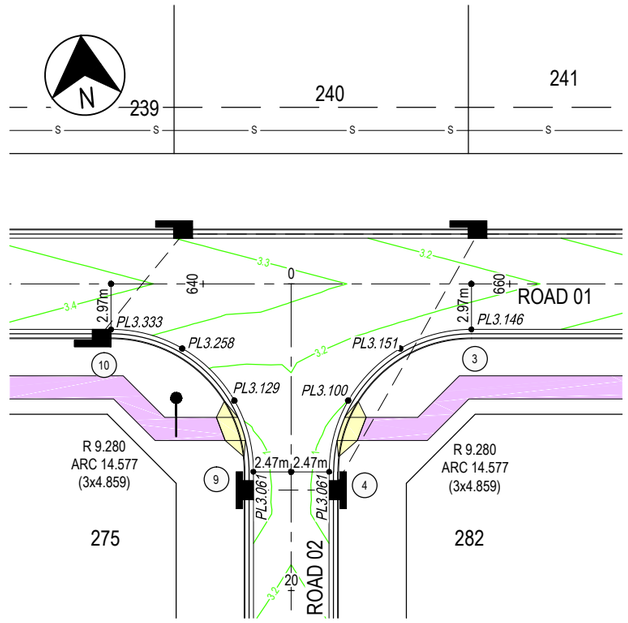
Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

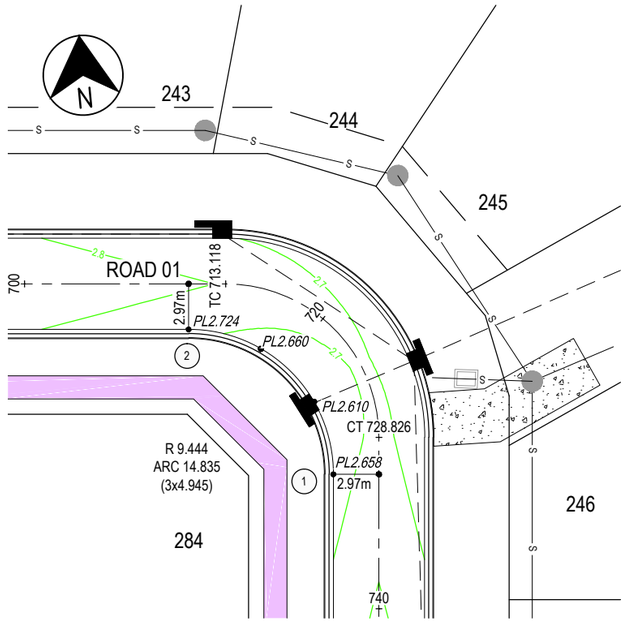
DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: ROAD CROSS SECTIONS
SHEET 2 OF 2

SCALE 1:100 (A1) | DRAWING No IH132900-CI-DG-0009 | REV A



INTERSECTION ROAD 01 & ROAD 02



ROAD WIDENING ROAD 01

INTERSECTION SETOUT TABLE

POINT	EASTING	NORTHING
01	9090.221	80622.598
02	9081.692	80632.876
03	9028.715	80637.806
04	9018.615	80629.426
05	9016.238	80603.885
06	9017.125	80597.158
07	9003.762	80602.522
08	9012.297	80614.849
09	9013.696	80629.883
10	9005.316	80639.983

LEGEND

- PL3.256 — PAVEMENT LEVEL OF KERB LIP
- 1 — SETOUT POINT
- LAYBACK KERB AND CHANNEL
- OR — KERB INLET PIT
- PROPOSED STORMWATER
- S — PROPOSED SEWER
- 57.0 — DESIGN SURFACE CONTOURS (0.1m INTERVAL)
- STREET SIGN
- KERB RAMP
- CONCRETE PATHWAY (1.5m WIDE U.N.O.)

CUL-DE-SAC ROAD 02

NOTE

FOR NOTES REFER DG-0002.

SCALE 1:200 (A1)
1:400 (A3)
0 4 8 12 16 20m
4 2

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

JACOBS
ABN 37 001 024 095 and ACN 001 024 095
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CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

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SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: INTERSECTION DETAILS

SCALE	DRAWING No	REV
1:200 (A1)	IH132900-CI-DG-0010	A

N

STAGE 6A

STAGE 5D

STAGE 6B

STAGE 5C

STAGE 5B

ROAD 01

ROAD 02

BARRBAL DRIVE

TEMPORARY SUBSOIL OUTLET

PROVIDE OUTLET AT 0.5% MIN LONGITUDINAL GRADE

CONNECT TO EXISTING SUBSURFACE DRAINAGE

JOINS INSET A

231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288

2/1 2/2 2/3 2/4 2/5 2/6 3/1 4/1 4/2 5/1 6/1 6/2

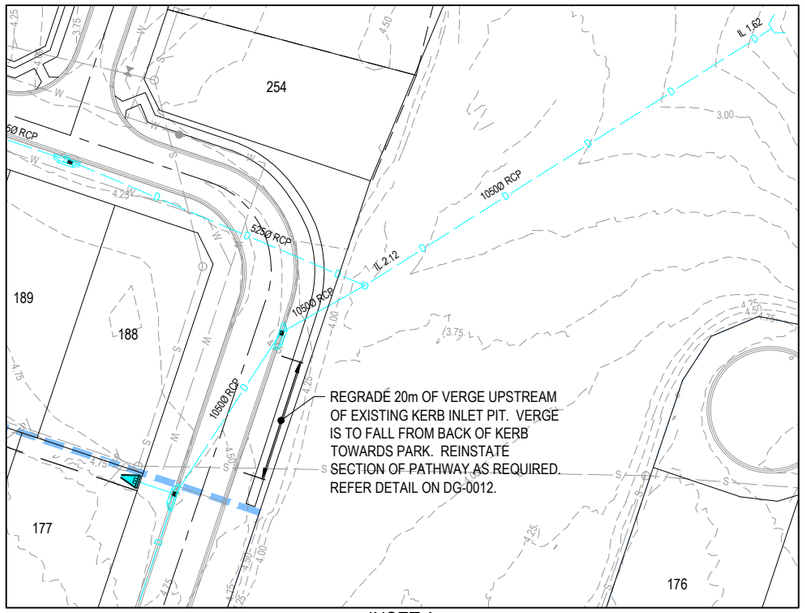
FP1 FP2 FP3

LEGEND

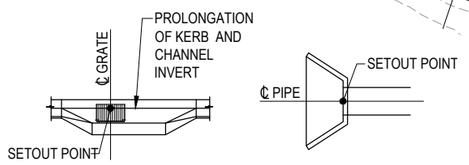
- 2/1 — LINE NUMBER / STRUCTURE No.
- STORMWATER DRAINAGE PIPE & MANHOLE
- SUBSURFACE DRAINAGE
- PROPOSED SEWER
- KERB INLET PIT
- HEADWALL
- FALL OF LOTS
- BATTER
- STAGE BOUNDARY
- 57.0 — DESIGN SURFACE CONTOURS (0.2m INTERVAL)
- 57.0 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- RETAINING WALL
- GROUTED STONE PITCHING SCOUR PROTECTION (10m² NOMINAL)
- EASEMENT BOUNDARY
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER
- PROVIDE 3x100Ø uPVC ROOFWATER PIPES AS PER FNQROC STD DRG 1035

NOTE

FOR NOTES REFER DG-0002.



INSET A



KERB INLET PIT HEADWALL

STRUCTURE SETOUT POINTS

N.T.S.

FLUSHING POINT LEGEND

- FP1 FLUSHING POINT IN PIT
- FP2 FLUSHING POINT IN LINE
- FP3 FLUSHING POINT HEAD

SCALE 1:500 (A1)
1:1000 (A3)
0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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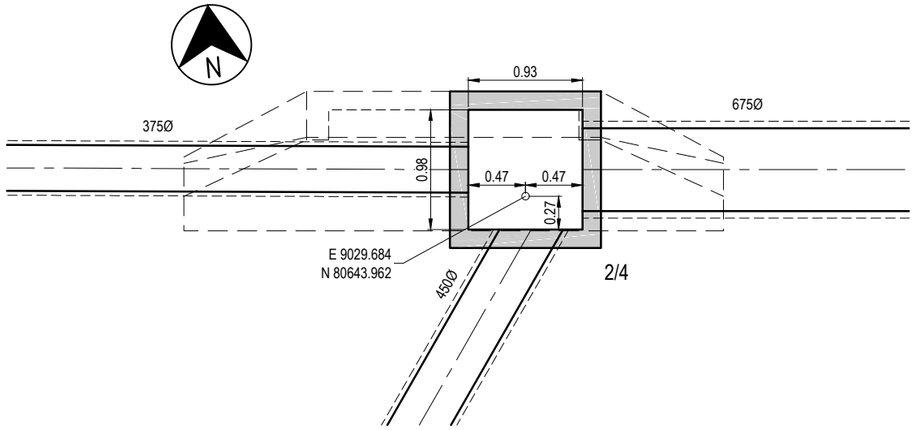
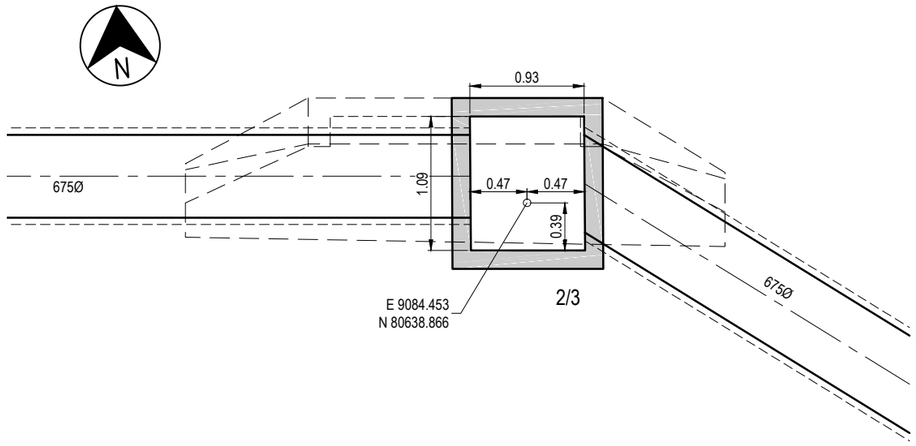
PAM	RJC		

TITLE STORMWATER DRAINAGE

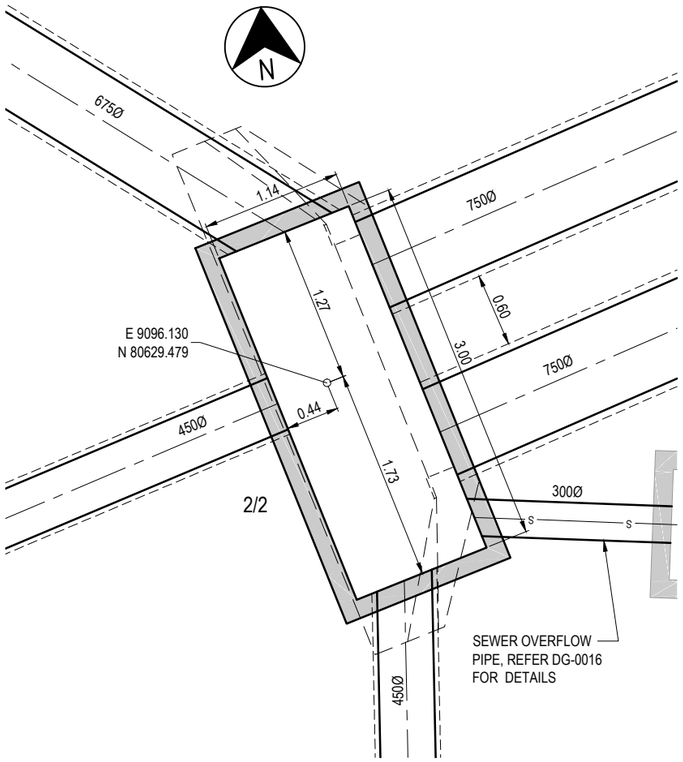
SCALE 1:500 (A1) | DRAWING No IH132900-CI-DG-0011 | REV A



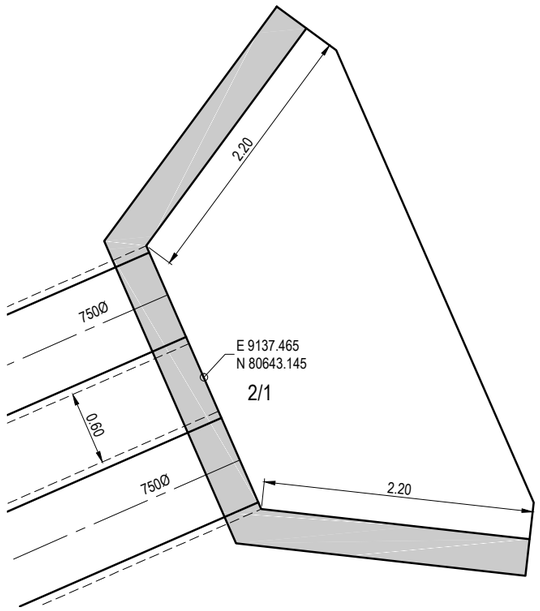
STORMWATER PIT 2/4 DETAIL
SCALE 1:25



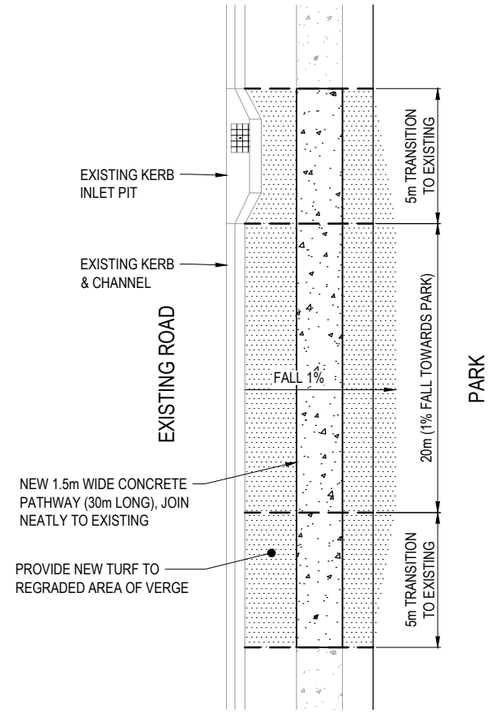
STORMWATER PIT 2/3 DETAIL
SCALE 1:25



STORMWATER PIT 2/2 DETAIL
SCALE 1:25



STORMWATER PIT 2/1 DETAIL
SCALE 1:25



REGRADE EXISTING VERGE DETAIL
N.T.S.

SCALE 1:25 (A1) 1:50 (A3)
0 0.5 1 1.5 2 2.5m
0.5 0.25

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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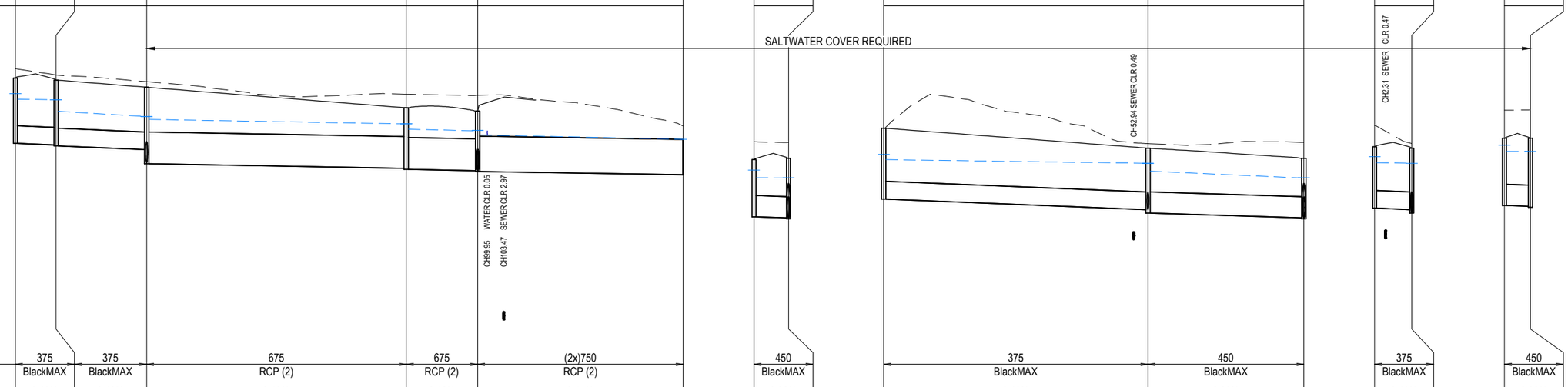
DRAWN SAB	DRAWING CHECK RJB	REVIEWED D.McEWAN DATE 01.12.17	APPROVED R.J.CARMAN DATE 01.12.17
DESIGNED PAM	DESIGN REVIEW RJC		

TITLE: STORMWATER DRAINAGE DETAILS

SCALE	DRAWING No	REV
AS SHOWN	IH132900-CI-DG-0012	A

STRUCTURE NAME	2/6	2/5	2/4	2/3	2/2	2/1	3/1	2/2	4/2	4/1	2/2	5/1	4/1	6/2	6/1
STRUCTURE DESCRIPTION	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	HEADWALL	SAG KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S	SAG KERB INLET PIT; LINTEL TYPE S
PIPE SIZE (mm)	375	375	675	675	(2x)750		450		375	450		375		450	
PIPE CLASS	BlackMAX	BlackMAX	RCP (2)	RCP (2)	RCP (2)		BlackMAX		BlackMAX	BlackMAX		BlackMAX		BlackMAX	
PIPE GRADE (%)	0.40%	0.40%	0.18%	0.18%	0.15%		0.30%		0.40%	0.30%		0.40%		0.30%	
PIPE SLOPE (1 in X)	250.00	250.00	555.55	555.56	666.66		333.33		250.00	333.33		250.00		333.33	
FULL PIPE VELOCITY (m/s)	0.74	1.58	1.27	1.45	1.16		0.71		0.76	1.55		0.78		0.78	
PART FULL VELOCITY (m/s)	1.35	1.58	1.48	1.45	1.16		1.31		1.36	1.55		1.36		1.34	
DATUM RL	-5.0						-4.0		-4.0			-4.0		-4.0	
H.G.L IN PIPE & W.S.E IN STRUCTURE	2.987 / 2.869	2.857 / 2.858	2.614 / 2.502	2.502 / 2.442	2.347 / 2.347	2.233 / 2.199 / 2.207	2.113 / 2.020 / 2.020	2.020	2.366 / 2.206	2.199 / 2.207	2.113	2.700 / 2.589	2.512 / 2.512	2.345	2.199 / 2.207	2.113	2.648 / 2.523	2.512 / 2.512	2.345	2.894 / 2.766	2.760 / 2.764
PIPE FLOW (Cumecs)	0.082		0.174		0.455	0.519	1.029		0.113			0.084	0.246				0.086		0.123		
PIPE CAPACITY AT GRADE (Cumecs)	0.144		0.144		0.464	0.464	0.863		0.203			0.144	0.203				0.144		0.203		
DEPTH TO INVERT	1.385	1.377	1.397	1.322	1.622	1.284 / 1.304 / 1.259	1.279 / 0.730 / 0.730		1.213	1.259	1.279	1.503	1.302		1.377	1.259	1.279	1.302	1.302	1.377	1.427	1.443
INVERT LEVEL OF DRAIN	1.933	1.898	1.878	1.802	1.502	1.403 / 1.383 / 1.355	1.335 / 1.270 / 1.270		1.377	1.355	1.335	1.753	1.529		1.454	1.355	1.335	1.561	1.529	1.454	1.616	1.599
DESIGN SURFACE LEVEL	3.318	3.276	3.123	2.687	2.614	2.000	2.590	2.614	3.256	2.832	2.614	2.863	2.832		3.043		3.043					
SETOUT COORDINATES	E 9004.677 / N 80639.761	E 9010.566 / N 80645.741	E 9029.684 / N 80643.962	E 9084.453 / N 80638.866	E 9096.130 / N 80629.479	E 9137.465 / N 80643.145	E 9089.154 / N 80627.278	E 9096.130 / N 80629.479	E 9088.858 / N 80540.816	E 9094.043 / N 80596.546	E 9096.130 / N 80629.479	E 9087.187 / N 80593.021	E 9094.043 / N 80596.546		E 9013.306 / N 80628.714	E 9018.782 / N 80628.205					
CHAINAGE	0.000	8.599 / 8.599	19.201 / 27.800	55.006 / 82.806	15.140 / 97.946	43.536 / 141.482	0.000	7.318 / 7.318	0.000	55.971 / 55.971	33.029 / 89.000	0.000	7.855 / 7.855		0.000	5.500 / 5.500						
LINE	2						3		4			5			6							



VERTICAL SCALE 1:50 (A1) 1:100 (A3) 0 1 2 3 4 5m; 1 0.5

HORIZONTAL SCALE 1:500 (A1) 1:1000 (A3) 0 10 20 30 40 50m; 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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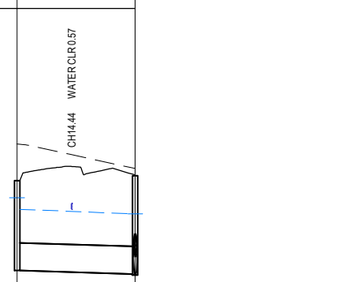
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 1 OF 2

SCALE: 1:500H, 1:50V (A1) | DRAWING No: IH132900-CI-DG-0013 | REV: A

STRUCTURE NAME	6/1	2/4
STRUCTURE DESCRIPTION	SAG KERB INLET PIT; LINTEL TYPE S	ON-GRADE KERB INLET PIT; LINTEL TYPE S



PIPE SIZE (mm)			450						
PIPE CLASS			BlackMAX						
PIPE GRADE (%)			0.30%						
PIPE SLOPE (1 in X)			333.33						
FULL PIPE VELOCITY (m/s)			1.44						
PART FULL VELOCITY (m/s)			1.44						
DATUM RL			-4.0						
H.G.L IN PIPE & W.S.E IN STRUCTURE	2.760	2.764	2.576			2.502	2.502	2.442	
PIPE FLOW (Cumecs)			0.228						
PIPE CAPACITY AT GRADE (Cumecs)			0.203						
DEPTH TO INVERT	1.443		1.463			1.602		1.622	
INVERT LEVEL OF DRAIN	1.599		1.579			1.522		1.502	
DESIGN SURFACE LEVEL	3.043					3.123			
SETOUT COORDINATES	E 9018.782	N 80628.205				E 9029.684	N 80643.962		
CHAINAGE	5.500		19.280			24.780			
LINE			6						

VERTICAL SCALE 1:50 (A1) 1:100 (A3) 0 1 2 3 4 5m / 1 0.5

HORIZONTAL SCALE 1:500 (A1) 1:1000 (A3) 0 10 20 30 40 50m / 10 5

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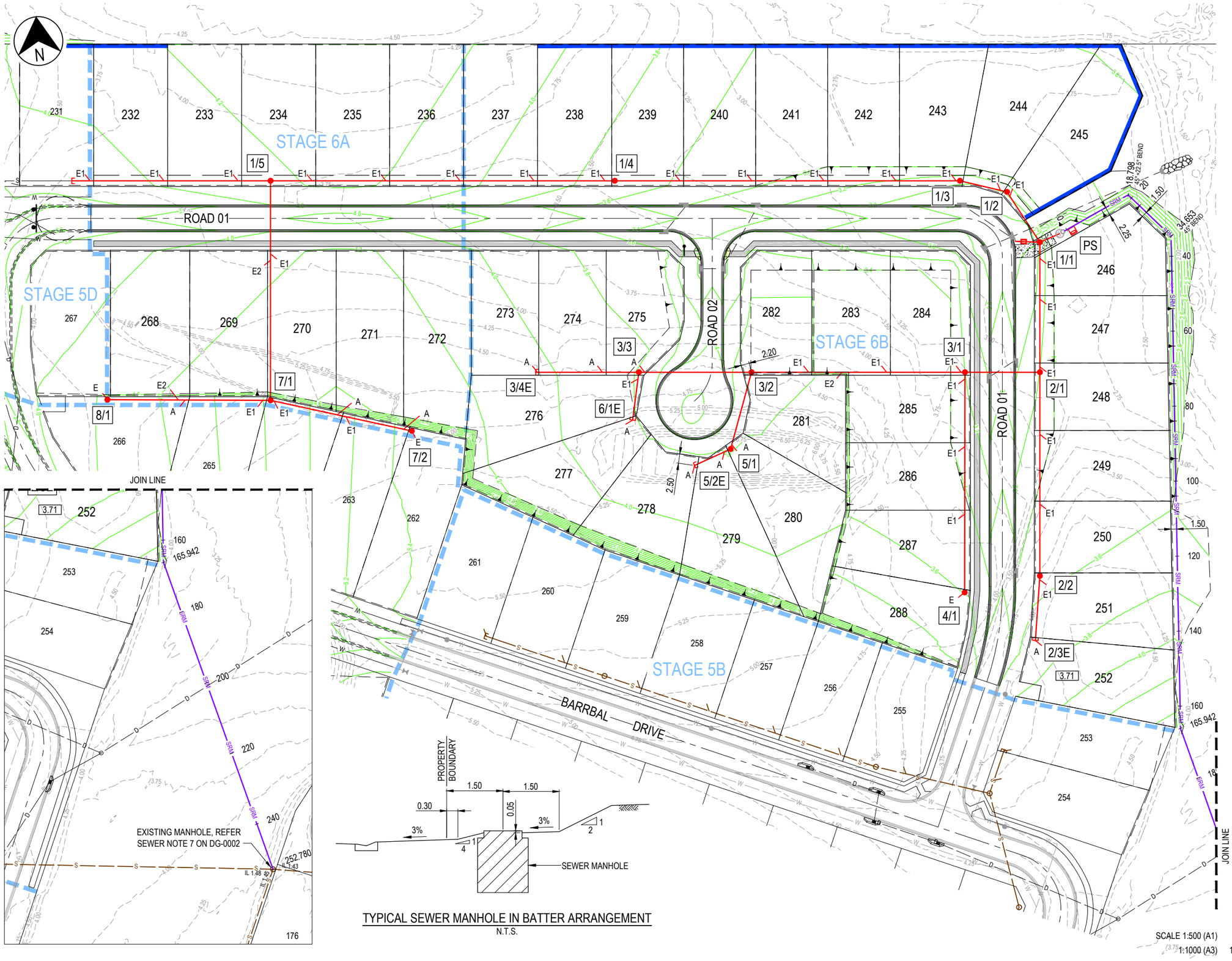
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 2 OF 2

SCALE: 1:500H, 1:50V (A1) | DRAWING No: IH132900-CI-DG-0014 | REV: A



LEGEND

- 2/1 — LINE NUMBER / STRUCTURE No.
- SEWER MAIN, MANHOLE AND ENDCAP
- SRM — SEWER RISING MAIN
- E1 — HOUSE CONNECTION BRANCH / TYPE
- PROPOSED STORMWATER
- BATTER
- STAGE BOUNDARY
- 57.0 — DESIGN SURFACE CONTOURS (0.2m INTERVAL)
- 57.0 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- RETAINING WALL
- 3.71 — MINIMUM LEVEL OF LOT ABLE TO BE SERVICED BY SEWER
- D — EXISTING STORMWATER
- S — EXISTING SEWER
- W — EXISTING WATER

NOTE

FOR NOTES REFER DG-0002.

TYPICAL SEWER MANHOLE IN BATTER ARRANGEMENT

N.T.S.

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

0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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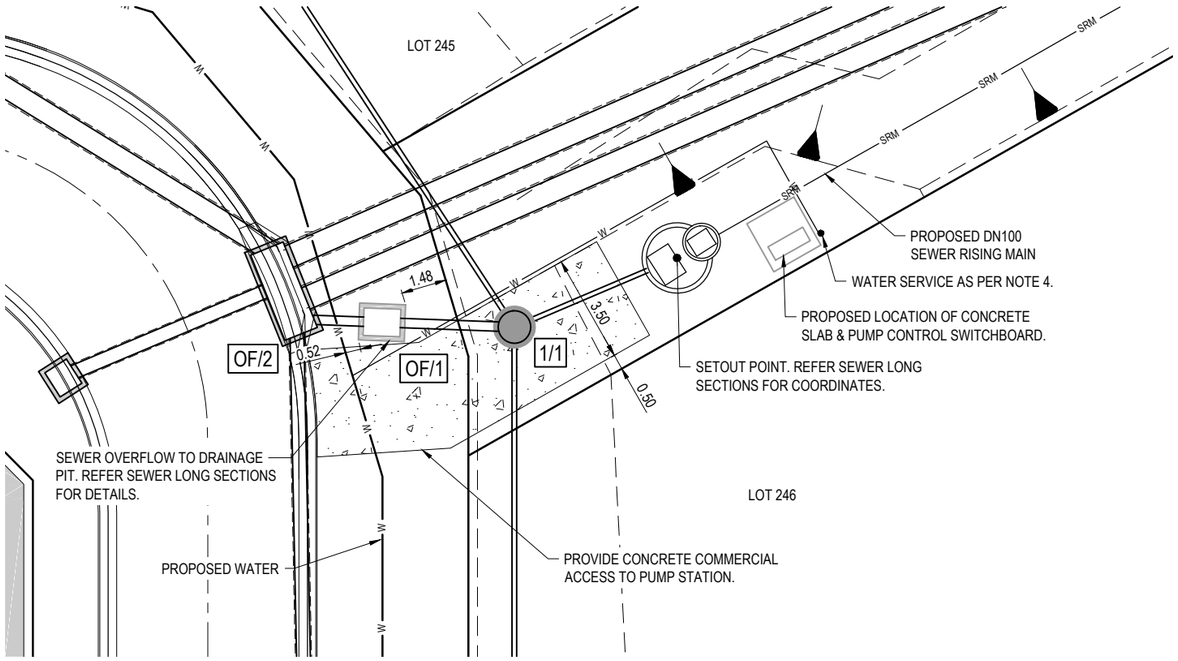
DRAWN: SAB	DRAWING CHECK: RJB	REVIEWED: D.McEWAN DATE 01.12.17	APPROVED: R.J.CARMAN DATE 01.12.17
DESIGNED: PAM	DESIGN REVIEW: RJC		

TITLE: SEWERAGE

SCALE	DRAWING No	REV
1:500 (A1)	IH132900-CI-DG-0015	A



SEWAGE PUMP STATION - LAYOUT PLAN
SCALE 1:100

NOTES

1. CONTRACTOR TO PROVIDE MULLALY ENGINEERING (OR APPROVED EQUIVALENT) FRP PACKAGED PUMP STATION, COMPLETE WITH REINFORCED CONCRETE ROOF SLAB IN ACCORDANCE WITH FNQROC STD. DRG. S3025 AND THE SPECIFICATION. THE CONTRACTOR IS TO SUBMIT "MULLALY ENGINEERING" SHOP DRAWINGS AND BUOYANCY CALCULATIONS TO SUPERINTENDENT FOR APPROVAL PRIOR TO CONSTRUCTION. CONTRACTOR TO CONFIRM WITH PACKAGED PUMP STATION SUPPLIER THE MAXIMUM SLAB THICKNESS/WEIGHT THAT CAN BEAR ONTO PUMP STATION.
2. NO LADDER AND PLATFORM REQUIRED WITHIN NEW PUMP STATION - ACCESS TO BE UNDERTAKEN BY PERSONNEL TRAINED IN CONFINED SPACE TRAINING.
3. CONTRACTOR TO PROVIDE CONCRETE PLINTH FOR SWITCHBOARD IN ACCORDANCE WITH FNQROC STD DRG S3020. SUPERINTENDENT TO CONFIRM LOCATION.
4. CONTRACTOR TO PROVIDE 25mm WATER SERVICE COMPLETE WITH RPZD. REFER FNQROC STD DRG S2038 FOR STANDARD ARRANGEMENT. SUPERINTENDENT TO CONFIRM LOCATION.
5. DUTY POINT FOR PUMPS TO BE 4.35 L/S @ 9.92m HEAD.

PUMP STATION CONSTRUCTION LEVELS	
NOMINAL INTERNAL DIAMETER	2.1
FINISHED PUMP STATION LEVEL (A)	3.4
SEWER INLET LEVEL (D)	-1.73
PUMP STATION IL (B)	-2.87
OUTLET IL (E)	2.315

PUMP STATION CONTROL LEVELS	
PUMP STOP LEVEL	-2.53
DUTY PUMP START LEVEL	-2.23
STANDBY PUMP START LEVEL	-2.03
ALARM LEVEL	-1.73

SCALE 1:100 (A1)
1:200 (A3)
0 2 4 6 8 10m
2 1

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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DRAWN: SAB	DRAWING CHECK: RJB	REVIEWED: D.McEWAN	APPROVED: R.J.CARMAN
DESIGNED: PAM	DESIGN REVIEW: RJC	DATE: 01.12.17	DATE: 01.12.17

TITLE: SEWAGE PUMP STATION DETAILS

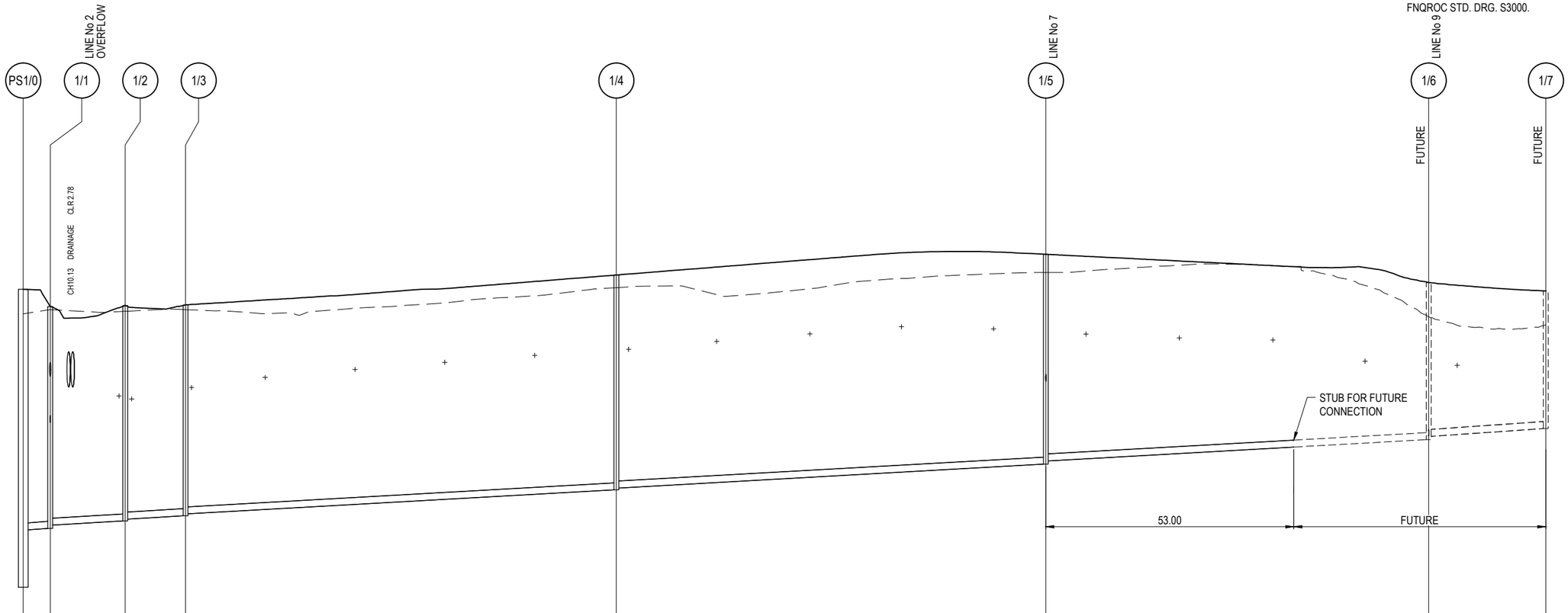
SCALE	DRAWING No	REV
1:500 (A1)	IH132900-CI-DG-0016	A

LEGEND

+	HOUSE CONNECTION BRANCH

NOTES

1. ALL MANHOLE DIAMETERS, DROP TYPES AND COVERS TO BE IN ACCORDANCE WITH FNQROC STD. DRG. S3000.



GRADE (1 in "X")		180		180		180		180		180		180		150	
PIPE SIZE (mm)		150		150		150		150		150		150		150	
DATUM RL	-6.0														
DEPTH TO INVERT	6.28 5.14		4.74 4.67		4.61 4.57		4.51 4.47		4.59 4.55		4.49 4.42		3.36 3.29		2.94
INVERT LEVEL	-2.870 -1.730		-1.698 -1.628		-1.539 -1.499		-1.427 -1.387		-0.875 -0.835		-0.325 -0.255		0.199 0.269		0.436
DESIGN SURFACE LEVEL	3.41		3.04		3.07		3.08		3.72		4.16		3.56		3.38
EXISTING SURFACE LEVEL	2.89		2.98		2.94		2.98		3.45		3.77		2.82		2.65
SETOUT COORDINATES	E 9109.188 N 80629.191		E 9103.697 N 80627.434		E 9096.201 N 80641.601		E 9083.968 N 80645.690		E 8992.287 N 80654.221		E 8900.883 N 80662.727		E 8819.400 N 80670.309		E 8794.939 N 80675.598
CHAINAGE	0.00	5.77	5.77	16.03	21.79	12.90	34.69	92.08	126.77	91.80	218.57	81.83	300.40	25.03	325.43

LINE 1

VERTICAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

HORIZONTAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE
estate

JACOBS

ABN 37 001 024 095 and ACN 001 024 095
Jacobs Group (Australia) Pty Ltd
2 James Street
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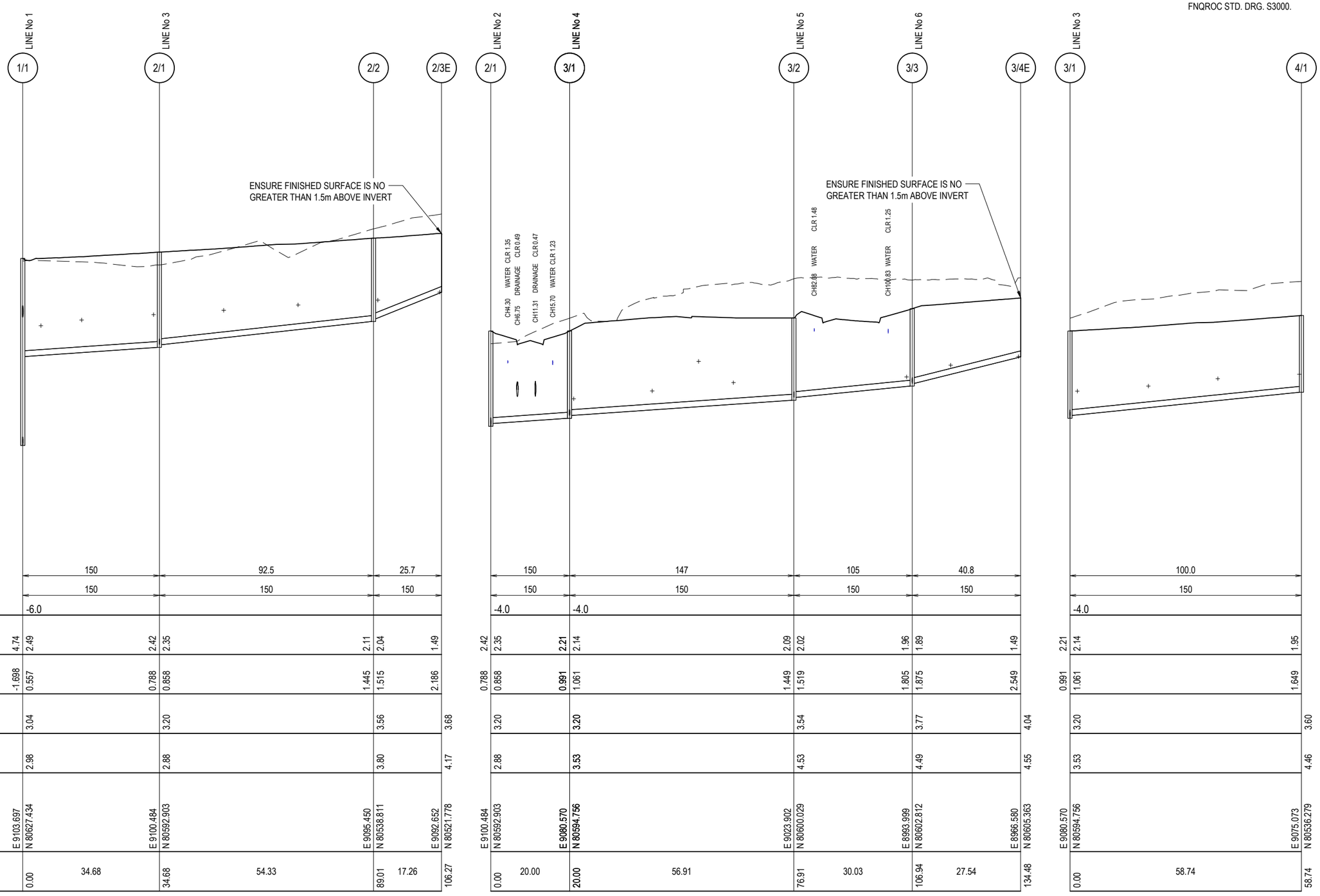
Web: www.jacobs.com

CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED PAM	DESIGN REVIEW RJC	DATE 01.12.17	DATE 01.12.17

TITLE
SEWERAGE LONGITUDINAL SECTIONS
SHEET 1 OF 3

SCALE 1:500H, 1:50V (A1)
DRAWING No IH132900-CI-DG-0017
REV A



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LOCATION: C:\Users\pmashford\AppData\Local\projectwise\jacobs_anz_ie\d0181886\IH132900-CI-DG-0017-0020_Sewerage LS.dwg

LEGEND

+	HOUSE CONNECTION BRANCH

NOTES

1. ALL MANHOLE DIAMETERS, DROP TYPES AND COVERS TO BE IN ACCORDANCE WITH FNQROC STD. DRG. S3000.

ENSURE FINISHED SURFACE IS NO GREATER THAN 1.5m ABOVE INVERT

ENSURE FINISHED SURFACE IS NO GREATER THAN 1.5m ABOVE INVERT

LINE 2

	1/1		2/1		2/2		2/3E
GRADE (1 in "X")		150		92.5		25.7	
PIPE SIZE (mm)		150		150		150	
DATUM RL	-6.0						
DEPTH TO INVERT	4.74 2.49		2.42 2.35		2.11 2.04		1.49
INVERT LEVEL	-1.698 0.557		0.788 0.858		1.445 1.515		2.186
DESIGN SURFACE LEVEL	3.04		3.20		3.56		3.68
EXISTING SURFACE LEVEL	2.98		2.88		3.80		4.17
SETOUT COORDINATES	E 9103.697 N 80627.434		E 9100.484 N 80592.903		E 9095.450 N 80538.811		E 9092.652 N 80521.778
CHAINAGE	0.00	34.68	34.68	54.33	89.01	17.26	106.27

LINE 3

	2/1		3/1		3/2		3/3		3/4E
GRADE (1 in "X")		150		147		105		40.8	
PIPE SIZE (mm)		150		150		150		150	
DATUM RL	-4.0		-4.0						
DEPTH TO INVERT	2.42 2.35		2.21 2.14		2.09 2.02		1.96 1.89		1.49
INVERT LEVEL	0.788 0.858		0.991 1.061		1.449 1.519		1.805 1.875		2.549
DESIGN SURFACE LEVEL	3.20		3.20		3.54		3.77		4.04
EXISTING SURFACE LEVEL	2.88		3.53		4.53		4.49		4.55
SETOUT COORDINATES	E 9100.484 N 80592.903		E 9080.570 N 80594.756		E 9023.902 N 80600.029		E 8993.999 N 80602.812		E 8966.580 N 80605.363
CHAINAGE	0.00	20.00	20.00	56.91	76.91	30.03	106.94	27.54	134.48

LINE 4

	3/1		4/1
GRADE (1 in "X")		100.0	
PIPE SIZE (mm)		150	
DATUM RL	-4.0		
DEPTH TO INVERT	2.21 2.14		1.95
INVERT LEVEL	0.991 1.061		1.649
DESIGN SURFACE LEVEL	3.20		3.60
EXISTING SURFACE LEVEL	3.53		4.46
SETOUT COORDINATES	E 9080.570 N 80594.756		E 9075.073 N 80536.279
CHAINAGE	0.00	58.74	58.74

VERTICAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

HORIZONTAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

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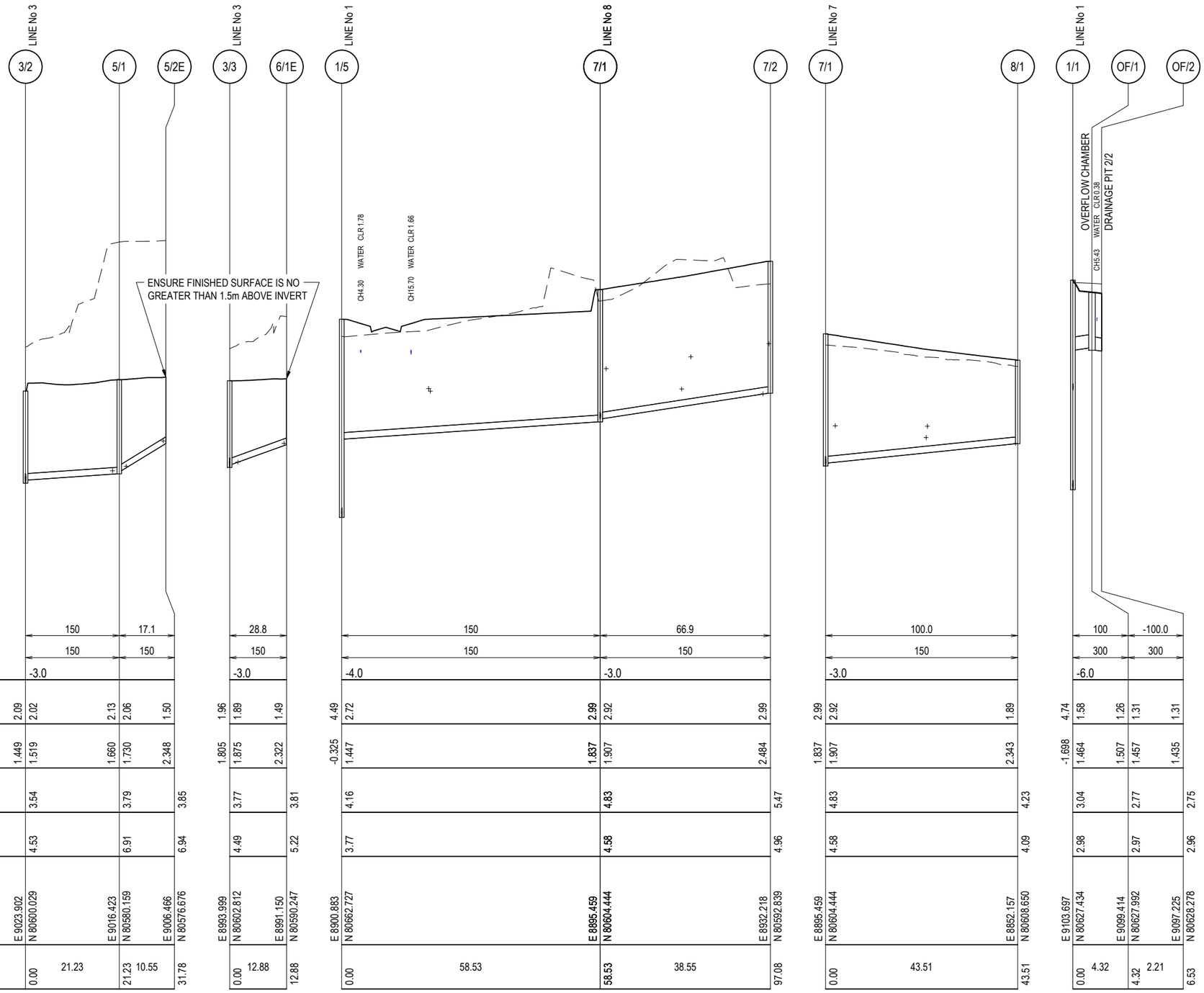
CLIENT	JONPA PTY LTD		
PROJECT	OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B		
DRAWN SAB	DRAWING CHECK RJB	REVIEWED D.McEWAN	APPROVED R.J.CARMAN
DESIGNED PAM	DESIGN REVIEW RJC	DATE 01.12.17	DATE 01.12.17

TITLE
SEWERAGE LONGITUDINAL SECTIONS
SHEET 2 OF 3

SCALE	DRAWING No	REV
1:500H, 1:50V (A1)	IH132900-CI-DG-0018	A



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LOCATION: C:\Users\pmashford\AppData\Local\projectwise\jacobs_anz_ie\d0181886\IH132900-CI-DG-0017-0020_Sewerage LS.dwg

LEGEND

+ HOUSE CONNECTION BRANCH

NOTES

1. ALL MANHOLE DIAMETERS, DROP TYPES AND COVERS TO BE IN ACCORDANCE WITH FNQROC STD. DRG. S3000.

LINE 5

	3/2		5/1		5/2E
GRADE (1 in "X")		150		17.1	
PIPE SIZE (mm)		150		150	
DATUM RL	-3.0				
DEPTH TO INVERT	2.09 2.02		2.13 2.06		1.50
INVERT LEVEL	1.449 1.519		1.660 1.730		2.348
DESIGN SURFACE LEVEL	3.54		3.79		3.85
EXISTING SURFACE LEVEL	4.53		6.91		6.94
SETOUT COORDINATES	E 9023.902 N 80600.029		E 9016.423 N 80580.159		E 9006.466 N 80576.676
CHAINAGE	0.00	21.23	21.23	10.55	31.78

LINE 6

	3/3		6/1E
GRADE (1 in "X")		28.8	
PIPE SIZE (mm)		150	
DATUM RL	-3.0		
DEPTH TO INVERT	1.96 1.89		1.49
INVERT LEVEL	1.805 1.875		2.322
DESIGN SURFACE LEVEL	3.77		3.81
EXISTING SURFACE LEVEL	4.49		5.22
SETOUT COORDINATES	E 8993.999 N 80602.812		E 8991.150 N 80590.247
CHAINAGE	0.00	12.88	12.88

LINE 7

	1/5		7/1		7/2
GRADE (1 in "X")		150		66.9	
PIPE SIZE (mm)		150		150	
DATUM RL	-4.0		-3.0		
DEPTH TO INVERT	4.49 2.72		2.99 2.92		2.99
INVERT LEVEL	-0.325 1.447		1.837 1.907		2.484
DESIGN SURFACE LEVEL	4.16		4.83		5.47
EXISTING SURFACE LEVEL	3.77		4.58		4.96
SETOUT COORDINATES	E 8900.883 N 80662.727		E 8895.459 N 80604.444		E 8932.218 N 80592.839
CHAINAGE	0.00	58.53	58.53	38.55	97.08

LINE 8

	7/1		8/1
GRADE (1 in "X")		100.0	
PIPE SIZE (mm)		150	
DATUM RL	-3.0		
DEPTH TO INVERT	2.99 2.92		1.89
INVERT LEVEL	1.837 1.907		2.343
DESIGN SURFACE LEVEL	4.83		4.23
EXISTING SURFACE LEVEL	4.58		4.09
SETOUT COORDINATES	E 8895.459 N 80604.444		E 8852.157 N 80608.650
CHAINAGE	0.00	43.51	43.51

PUMP STATION OVERFLOW

	1/1		OF/1		OF/2
GRADE (1 in "X")		100		-100.0	
PIPE SIZE (mm)		300		300	
DATUM RL	-6.0				
DEPTH TO INVERT	4.74 1.58		1.26 1.31		1.31
INVERT LEVEL	-1.698 1.464		1.507 1.457		1.435
DESIGN SURFACE LEVEL	3.04		2.77		2.75
EXISTING SURFACE LEVEL	2.98		2.97		2.96
SETOUT COORDINATES	E 9103.697 N 80627.434		E 9099.414 N 80627.992		E 9097.225 N 80628.278
CHAINAGE	0.00	4.32	4.32	2.21	6.53

VERTICAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

HORIZONTAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

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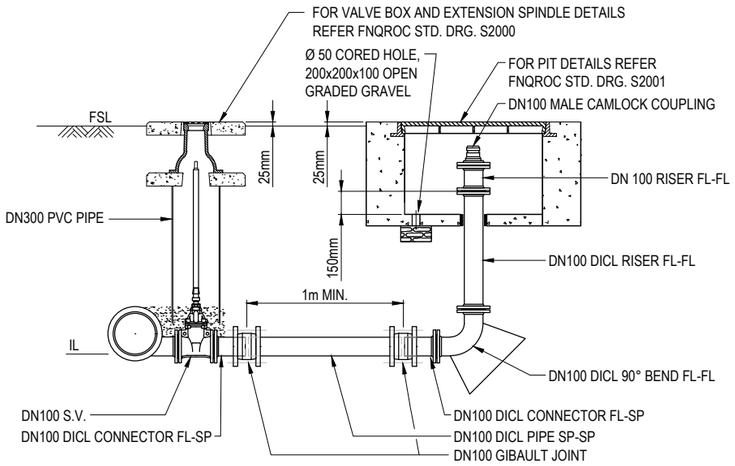
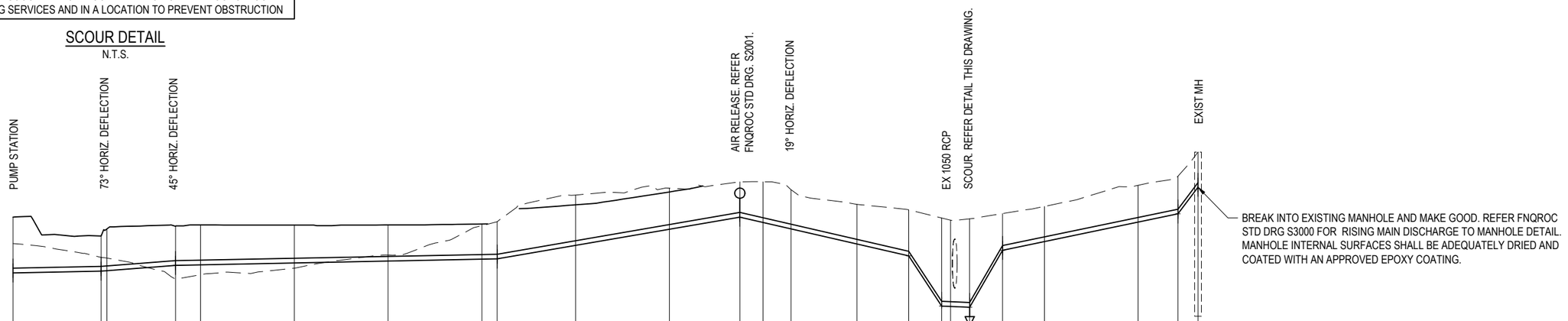
CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE
SEWERAGE LONGITUDINAL SECTIONS
SHEET 3 OF 3

SCALE	DRAWING No	REV
1:500H, 1:50V (A1)	IH132900-CI-DG-0019	A





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LOCATION: C:\Users\pmashford\AppData\Local\projectwise\jacobs_anz_ie\d0181886\IH132900-CI-DG-0017-0020_Sewerage LS.dwg

FINAL LOCATION OF SCOUR PIT TO BE CONFIRMED ON SITE AND CONSTRUCTED
CLEAR OF EXISTING SERVICES AND IN A LOCATION TO PREVENT OBSTRUCTION

SCOUR DETAIL

N.T.S.

STANDARD DRAWING REFERENCE

1. AIR RELEASE DETAILS:
   PROVIDE MANUAL AIR RELEASE IN ACCORDANCE WITH FNQROC STD DRG 2001.
2. MARKER POSTS ARE TO BE PROVIDED AT ALL HORIZONTAL CHANGES IN DIRECTION AND VALVES IN ACCORDANCE WITH FNQROC STD DRG S2011.
3. THRUST BLOCKS ARE TO BE PROVIDED TO ALL HORIZONTAL AND VERTICAL BENDS IN ACCORDANCE WITH SEQ-WAT-1205 & 1206.

SEWER RISING MAIN SETOUT

CHAINAGE	COORDINATES		BEARING DEG MIN SEC
	EASTING	NORTHING	
0.000	9111.176	80630.085	65° 47' 0"
18.798	9128.320	80637.796	139° 11' 16"
34.653	9138.682	80625.796	184° 12' 40"
165.942	9129.041	80494.861	165° 39' 50"
252.780	9150.543	80410.727	165° 39' 50"

BREAK INTO EXISTING MANHOLE AND MAKE GOOD. REFER FNQROC STD DRG S3000 FOR RISING MAIN DISCHARGE TO MANHOLE DETAIL. MANHOLE INTERNAL SURFACES SHALL BE ADEQUATELY DRIED AND COATED WITH AN APPROVED EPOXY COATING.

PIPE TYPE / CLASS
VERTICAL GRADE
DATUM RL -2.0

INVERT LEVEL	2.231	2.268	2.278	2.392	2.403	2.443	2.483	2.523	2.529	2.817	3.162	3.421
DESIGN SURFACE LEVEL	3.422	3.018	3.168	3.223	3.253	3.251	3.253	3.274		3.683	3.957	
EXISTING SURFACE LEVEL	2.859	2.562	2.547	2.099	2.192	2.333	2.612	3.239	3.324	3.891	4.039	4.171
CHAINAGE	0.000	18.798	20.000	34.653	40.000	60.000	80.000	100.000	103.284	120.000	140.000	155.062
HORIZONTAL DATA												

INVERT LEVEL	3.307	3.171	2.848	2.593	1.524	1.516	1.500	2.713	2.898	3.314	3.490	4.058
DESIGN SURFACE LEVEL												
EXISTING SURFACE LEVEL	4.175	4.006	3.695	3.576	3.403	3.355	3.385	3.497	3.648	4.098	4.293	4.808
CHAINAGE	160.000	165.942	180.000	191.075	198.079	200.000	204.074	211.074	220.000	240.000	248.510	252.780
HORIZONTAL DATA												

LONGITUDINAL SECTION SEWER RISING MAIN

SCALE 1:500H
1:50V

VERTICAL
SCALE 1:50 (A1) 0 1 2 3 4 5m
1:100 (A3) 1 0.5

HORIZONTAL
SCALE 1:500 (A1) 0 10 20 30 40 50m
1:1000 (A3) 10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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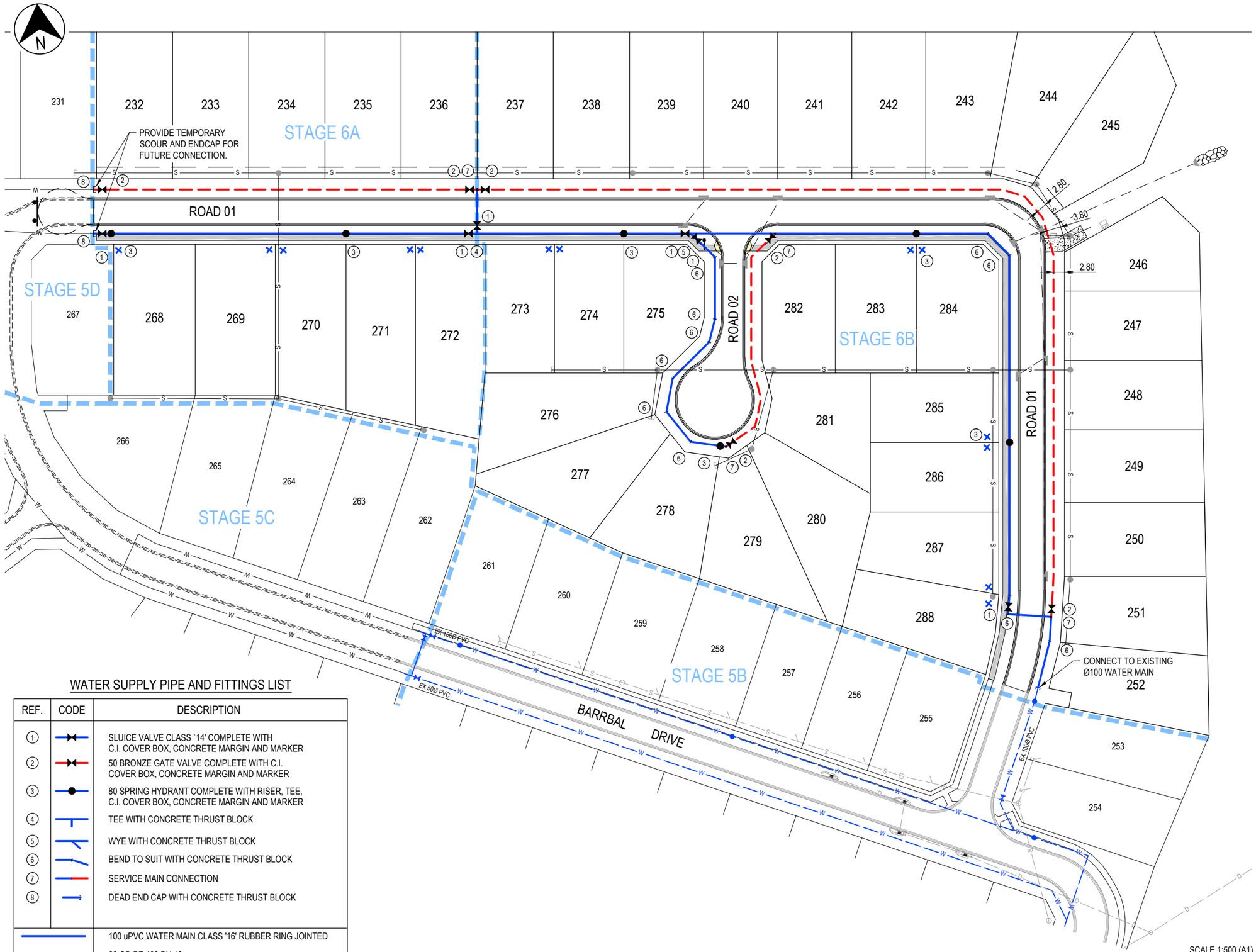
CLIENT JONPA PTY LTD
PROJECT OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE
SEWER RISING MAIN LONGITUDINAL SECTION

SCALE 1:500H, 1:50V (A1)
DRAWING No IH132900-CI-DG-0020
REV A



LEGEND

- STAGE BOUNDARY
- EASEMENT BOUNDARY
- FUTURE WATER SERVICE LOCATION (REFER NOTE 5 ON DG-0002)
- PROPOSED STORMWATER
- PROPOSED SEWER
- EXISTING WATER

NOTE

FOR NOTES REFER DG-0002.

WATER SUPPLY PIPE AND FITTINGS LIST

REF.	CODE	DESCRIPTION
1		SLUICE VALVE CLASS `14' COMPLETE WITH C.I. COVER BOX, CONCRETE MARGIN AND MARKER
2		50 BRONZE GATE VALVE COMPLETE WITH C.I. COVER BOX, CONCRETE MARGIN AND MARKER
3		80 SPRING HYDRANT COMPLETE WITH RISER, TEE, C.I. COVER BOX, CONCRETE MARGIN AND MARKER
4		TEE WITH CONCRETE THRUST BLOCK
5		WYE WITH CONCRETE THRUST BLOCK
6		BEND TO SUIT WITH CONCRETE THRUST BLOCK
7		SERVICE MAIN CONNECTION
8		DEAD END CAP WITH CONCRETE THRUST BLOCK
		100 uPVC WATER MAIN CLASS '16' RUBBER RING JOINTED
		63 OD PE 100 PN 16

SCALE 1:500 (A1)
1:1000 (A3)
0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: WATER RETICULATION

SCALE: 1:500 (A1)
DRAWING No: IH132900-CI-DG-0021
REV: A

DATE: 1/12/2017 3:47:55 PM NAME: MASHFORD, PAUL
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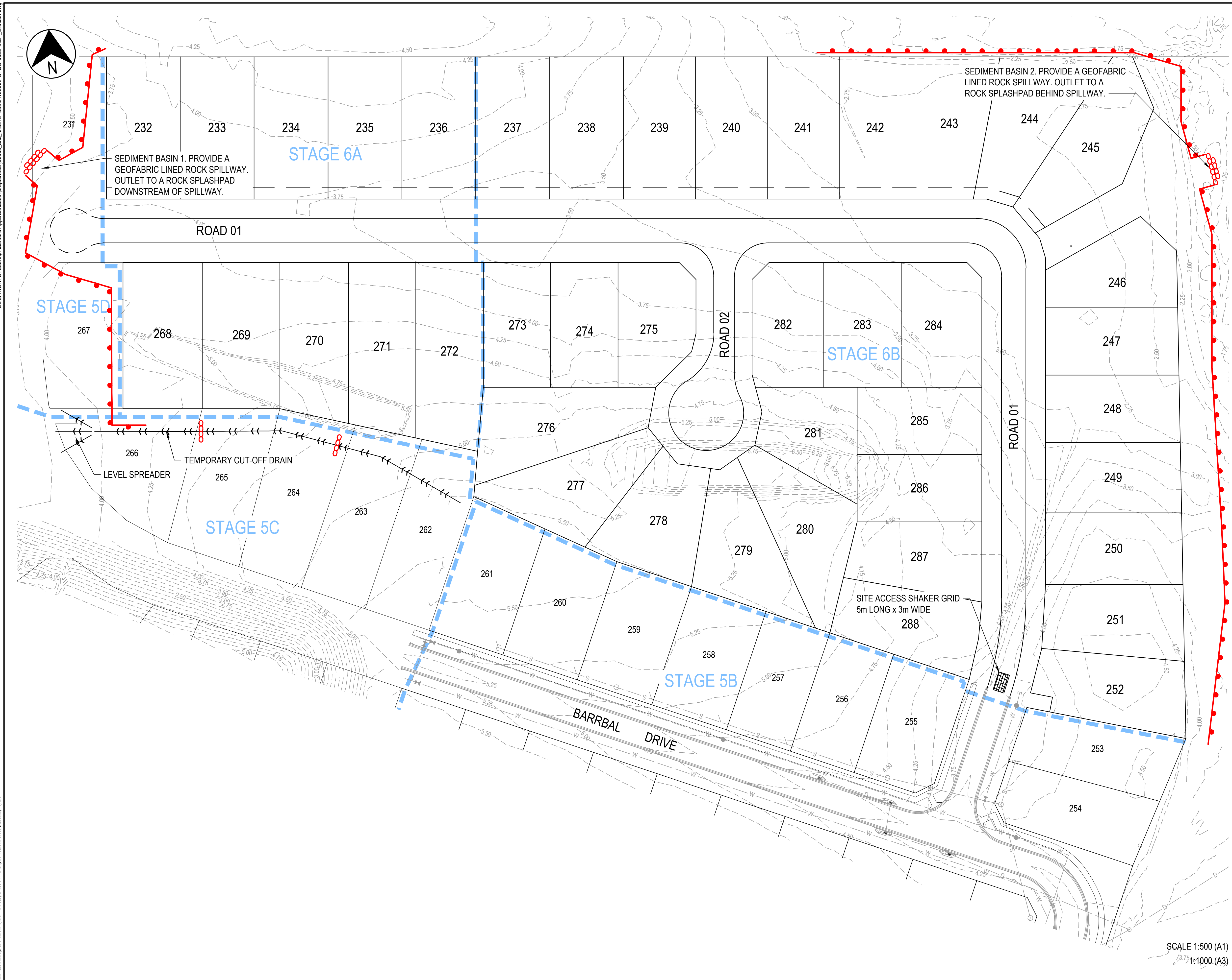

LEGEND

- SILT FENCE
- STAGE BOUNDARY
- EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- TEMPORARY CUT-OFF DRAIN
- ROCK CHECK DAM
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER

NOTE

FOR NOTES REFER DG-0002.

SCALE 1:500 (A1)
1:1000 (A3)
10 5 0 10 20 30 40 50m

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

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CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED: PAM	DESIGN REVIEW: RJC	DATE 01.12.17	DATE 01.12.17

TITLE: EROSION AND SEDIMENT CONTROL STRATEGY
PHASE 1 - TOPSOIL STRIPPING

SCALE: 1:500 (A1) DRAWING No: IH132900-CI-DG-0022 REV: A

N

SEDIMENT BASIN 1. PROVIDE A GEOFABRIC LINED ROCK SPILLWAY. OUTLET TO A ROCK SPLASHPAD DOWNSTREAM OF SPILLWAY.

SEDIMENT BASIN 2. PROVIDE A GEOFABRIC LINED ROCK SPILLWAY. OUTLET TO A ROCK SPLASHPAD BEHIND SPILLWAY.

STAGE 6A

STAGE 6B

STAGE 5D

STAGE 5C

STAGE 5B

ROAD 01

ROAD 02

ROAD 01

BARRBAL DRIVE

LEVEL SPREADER

TEMPORARY CUT-OFF DRAIN

SITE ACCESS SHAKER GRID
5m LONG x 3m WIDE

231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288

LEGEND

- SILT FENCE
- FALL OF LOTS
- BATTER
- STAGE BOUNDARY
- DESIGN SURFACE CONTOURS (0.2m INTERVAL)
- EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- GROUTED STONE PITCHING SCOUR PROTECTION (10m^2 NOMINAL)
- ROCK CHECK DAM
- EASEMENT BOUNDARY
- TEMPORARY CUT-OFF DRAIN
- BATTER BUND
- VISQUEEN LINED BATTER CHUTE
- EXISTING STORMWATER
- EXISTING SEWER
- EXISTING WATER

NOTE

FOR NOTES REFER DG-0002.

SCALE 1:500 (A1)
1:1000 (A3)
0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
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Web: www.jacobs.com

CLIENT: JONPA PTY LTD
PROJECT: OCEAN BREEZE ESTATE - COOYA BEACH - STAGES 6A & 6B

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE: EROSION AND SEDIMENT CONTROL STRATEGY
PHASE 2 - EARTHWORKS

SCALE 1:500 (A1) | DRAWING No. IH132900-CI-DG-0023 | REV A

SEDIMENT BASIN 1. PROVIDE A GEOFABRIC LINED ROCK SPILLWAY. OUTLET TO A ROCK SPLASHPAD DOWNSTREAM OF SPILLWAY.

SEDIMENT BASIN 2. PROVIDE A GEOFABRIC LINED ROCK SPILLWAY. OUTLET TO A ROCK SPLASHPAD BEHIND SPILLWAY.

STAGE 6A

STAGE 6B

STAGE 5D

STAGE 5C

STAGE 5B

ROAD 01

ROAD 02

BARRBAL DRIVE

LEVEL SPREADER

TEMPORARY CUT-OFF DRAIN

SITE ACCESS SHAKER GRID
5m LONG x 3m WIDE

231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288

LEGEND

- SILT FENCE
- PIT PROTECTION MEASURES
- STORMWATER DRAINAGE PIPE
- KERB INLET PIT (OR)
- HEADWALL
- FALL OF LOTS
- BATTER
- STAGE BOUNDARY
- DESIGN SURFACE CONTOURS (0.2m INTERVAL) — 57.0
- EXISTING SURFACE CONTOURS (0.25m INTERVAL) — 57.0
- TIMBER FENCE
- GROUTED STONE PITCHING SCOUR PROTECTION (10m² NOMINAL)
- ROCK CHECK DAM
- EASEMENT BOUNDARY
- TEMPORARY CUT-OFF DRAIN
- BATTER BUND
- VISQUEEN LINED BATTER CHUTE
- TURF STRIPS
- EXISTING STORMWATER (D)
- EXISTING SEWER (S)
- EXISTING WATER (W)

NOTE

FOR NOTES REFER DG-0002.

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

0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

OCEAN BREEZE estate

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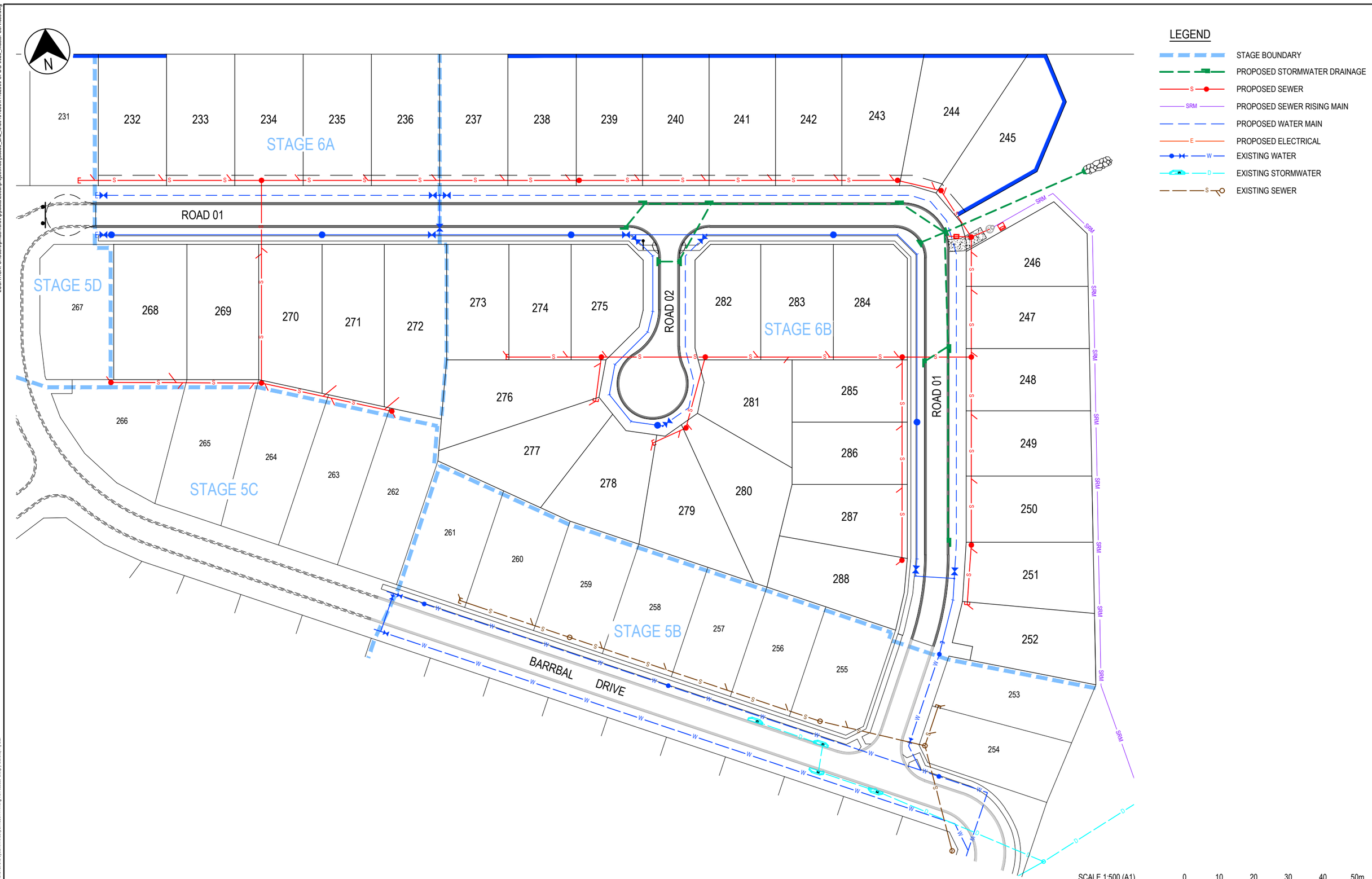
PAM	RJC		

TITLE: EROSION AND SEDIMENT CONTROL STRATEGY
PHASE 3 - ROADWORKS

SCALE: 1:500 (A1) | DRAWING No: IH132900-CI-DG-0024 | REV: A



LEGEND

- STAGE BOUNDARY
- PROPOSED STORMWATER DRAINAGE
- PROPOSED SEWER
- PROPOSED SEWER RISING MAIN
- PROPOSED WATER MAIN
- PROPOSED ELECTRICAL
- EXISTING WATER
- EXISTING STORMWATER
- EXISTING SEWER

SCALE 1:500 (A1)
1:1000 (A3)
0 10 20 30 40 50m
10 5

REV	DATE	DRAWN	REV'D	APP'D	REVISION	DRAWING NUMBER	REFERENCE DRAWING TITLE
A	01.12.17	SAB	RJC	DMc	INITIAL ISSUE		

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SAB	RJB	D.McEWAN	R.J.CARMAN
DESIGNED	DESIGN REVIEW	DATE 01.12.17	DATE 01.12.17
PAM	RJC		

TITLE
MASTER SERVICES PLAN

SCALE 1:500 (A1) | DRAWING No IH132900-CI-DG-0025 | REV A