

9 December 2017

Chief Executive Officer
Douglas Shire Council
PO Box 723
Mossman QLD 4873

Attention: Paul Hoy

Dear Paul,

**APPLICATION FOR DEVELOPMENT PERMIT FOR OPERATIONAL WORKS
MOSSMAN GORGE INFRASTRUCTURE PROJECT**

On behalf of our client, Department of Aboriginal and Torres Strait Islander Partnerships, we wish to submit this application for a Development Permit for Operational Works approval in relation to the Mossman Gorge Infrastructure Project.

The application is comprised of the following documents:

1. DA Form 1;
2. Fee Receipt (to be provided upon payment);
3. Response to Development Approval Conditions;
4. FNQROC Statement of Compliance
5. Engineering Design Drawings;
6. DSC Correspondence 12 July 2016;
7. B&M Correspondence 18 December 2015;
8. Weed Management Plan;
9. Ergon offer for reticulated electricity;
10. Project specification (excerpt from tender document).

We trust the attached application and supporting information is sufficient to allow Council to complete its assessment.

Should you have any queries, do not hesitate to contact this office.

Yours sincerely

TRINITY ENGINEERING AND CONSULTING



Scott Christensen
Project Manager

Encl Mossman Gorge Infrastructure Upgrades – Operational Works Application

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) <i>(individual or company full name)</i>	Department of Aboriginal and Torres Strait Islander Partnerships
Contact name <i>(only applicable for companies)</i>	Scott Christensen
Postal address <i>(P.O. Box or street address)</i>	C/- Trinity Engineering and Consulting Pty Ltd PO Box 7963
Suburb	Cairns
State	Queensland
Postcode	4870
Country	
Contact number	(07) 4040 7111
Email address <i>(non-mandatory)</i>	admin@trinityengineering.com.au
Mobile number <i>(non-mandatory)</i>	
Fax number <i>(non-mandatory)</i>	
Applicant's reference number(s) <i>(if applicable)</i>	

2) Owner's consent
2.1) Is written consent of the owner required for this development application?
<input type="checkbox"/> Yes – the written consent of the owner(s) is attached to this development application <input checked="" type="checkbox"/> 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
			Mossman Gorge Road	Mossman
	Postcode	Lot No.	Plan Type and Number (e.g. RP, SP)	Local Government Area(s)
		100	RP911412	Douglas
b)	Unit No.	Street No.	Street Name and Type	Suburb
			Mossman Gorge Road	Mossman
	Postcode	Lot No.	Plan Type and Number (e.g. RP, SP)	Local Government Area(s)
		152	SR832	Douglas

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)
		<input type="checkbox"/> WGS84 <input type="checkbox"/> GDA94 <input type="checkbox"/> Other:	

☐ Coordinates of premises by easting and northing

Easting(s)	Northing(s)	Zone Ref.	Datum	Local Government Area(s) (if applicable)
		<input type="checkbox"/> 54 <input type="checkbox"/> 55 <input type="checkbox"/> 56	<input type="checkbox"/> WGS84 <input type="checkbox"/> GDA94 <input type="checkbox"/> 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

<input checked="" type="checkbox"/> In or adjacent to a water body or watercourse or in or above an aquifer	
Name of water body, watercourse or aquifer:	Mossman River
<input type="checkbox"/> On strategic port land under the <i>Transport Infrastructure Act 1994</i>	
Lot on plan description of strategic port land:	
Name of port authority for the lot:	
<input type="checkbox"/> In a tidal area	
Name of local government for the tidal area (if applicable):	
Name of port authority for tidal area (if applicable):	
<input type="checkbox"/> On airport land under the <i>Airport Assets (Restructuring and Disposal) Act 2008</i>	
Name of airport:	
<input type="checkbox"/> Listed on the Environmental Management Register (EMR) under the <i>Environmental Protection Act 1994</i>	
EMR site identification:	

<input type="checkbox"/> Listed on the Contaminated Land Register (CLR) under the <i>Environmental Protection Act 1994</i>	
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):*

Construction of civil works associated with infrastructure upgrades

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 aspecta) 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	<input type="checkbox"/> Yes – complete division 1 if assessable against a local planning instrument
Reconfiguring a lot	<input type="checkbox"/> Yes – complete division 2
Operational work	<input checked="" type="checkbox"/> Yes – complete division 3
Building work	<input type="checkbox"/> Yes – complete <i>DA Form 2 – Building work details</i>

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)

- | | |
|--|--|
| <input type="checkbox"/> Subdivision (complete 10)) | <input type="checkbox"/> Dividing land into parts by agreement (complete 11)) |
| <input type="checkbox"/> Boundary realignment (complete 12)) | <input type="checkbox"/> 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?	
<input checked="" type="checkbox"/> Road work <input checked="" type="checkbox"/> Drainage work <input type="checkbox"/> Landscaping <input type="checkbox"/> Other – please specify:	<input checked="" type="checkbox"/> Stormwater <input checked="" type="checkbox"/> Earthworks <input checked="" type="checkbox"/> Signage <input type="checkbox"/> Water infrastructure <input checked="" type="checkbox"/> Sewage infrastructure <input type="checkbox"/> Clearing vegetation
14.2) Is the operational work necessary to facilitate the creation of new lots? (e.g. subdivision)	
<input checked="" type="checkbox"/> Yes – specify number of new lots: <input type="checkbox"/> No	41
14.3) What is the monetary value of the proposed operational work? (include GST, materials and labour)	
\$2,500,000	

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?
<input type="checkbox"/> Yes – a copy of the decision notice is attached to this development application <input type="checkbox"/> Local government is taken to have agreed to the superseded planning scheme request – relevant documents attached <input checked="" type="checkbox"/> 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.
<input checked="" type="checkbox"/> 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:
<input type="checkbox"/> Clearing native vegetation <input type="checkbox"/> Contaminated land (unexploded ordnance)

<input type="checkbox"/> Environmentally relevant activities (ERA) <i>(only if the ERA have not been devolved to a local government)</i> <input type="checkbox"/> Fisheries – aquaculture <input type="checkbox"/> Fisheries – declared fish habitat area <input type="checkbox"/> Fisheries – marine plants <input type="checkbox"/> Fisheries – waterway barrier works <input type="checkbox"/> Hazardous chemical facilities <input type="checkbox"/> Queensland heritage place <i>(on or near a Queensland heritage place)</i> <input type="checkbox"/> Infrastructure – designated premises <input type="checkbox"/> Infrastructure – state transport infrastructure <input type="checkbox"/> Infrastructure – state transport corridors and future state transport corridors <input type="checkbox"/> Infrastructure – state-controlled transport tunnels and future state-controlled transport tunnels <input type="checkbox"/> Infrastructure – state-controlled roads <input type="checkbox"/> Land within Port of Brisbane's port limits <input type="checkbox"/> SEQ development area <input type="checkbox"/> SEQ regional landscape and rural production area or SEQ Rural living area – community activity <input type="checkbox"/> SEQ regional landscape and rural production area or SEQ Rural living area – indoor recreation <input type="checkbox"/> SEQ regional landscape and rural production area or SEQ Rural living area – residential development <input type="checkbox"/> SEQ regional landscape and rural production area or SEQ Rural living area – urban activity <input type="checkbox"/> Tidal works or works in a coastal management district <input type="checkbox"/> Urban design <input type="checkbox"/> Water-related development – taking or interfering with water <input type="checkbox"/> Water-related development – removing quarry material <i>(from a watercourse or lake)</i> <input type="checkbox"/> Water-related development – referable dams <input type="checkbox"/> Water-related development – construction of new levees or modification of existing levees <i>(category 2 or 3 levees only)</i> <input type="checkbox"/> Wetland protection area
Matters requiring referral to the local government: <input type="checkbox"/> Airport land <input type="checkbox"/> Environmentally relevant activities (ERA) <i>(only if the ERA have been devolved to local government)</i> <input type="checkbox"/> Local heritage places
Matters requiring referral to the chief executive of the distribution entity or transmission entity: <input type="checkbox"/> Electricity infrastructure
Matters requiring referral to: <ul style="list-style-type: none"> • 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 <input type="checkbox"/> Oil and gas infrastructure
Matters requiring referral to the Brisbane City Council: <input type="checkbox"/> Brisbane core port land
Matters requiring referral to the Minister under the Transport Infrastructure Act 1994: <input type="checkbox"/> Brisbane core port land <input type="checkbox"/> Strategic port land
Matters requiring referral to the relevant port operator: <input type="checkbox"/> Brisbane core port land (below high-water mark and within port limits)
Matters requiring referral to the chief executive of the relevant port authority: <input type="checkbox"/> Land within limits of another port
Matters requiring referral to the Gold Coast Waterways Authority: <input type="checkbox"/> Tidal works, or development in a coastal management district in Gold Coast waters
Matters requiring referral to the Queensland Fire and Emergency Service: <input type="checkbox"/> 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
<input checked="" type="checkbox"/> Approval <input type="checkbox"/> Development application	ROL396/2014	17/12/2014	Douglas Shire Council
<input type="checkbox"/> Approval <input type="checkbox"/> 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

☒ Yes**Note:** See the *Planning Regulation 2017* for referral requirementsIf 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.

**MOSSMAN GORGE INFRASTRUCTURE PROJECT
RESPONSE TO DEVELOPMENT APPLICATION DECISION NOTICE CONDITIONS**

ASSESSMENT MANAGER CONDITIONS

1. Carry out the approved development generally in accordance with the approved drawing(s) and/or document(s), and in accordance with:
 - a) The specifications, facts and circumstances as set out in the application submitted to Council; and
 - b) The following conditions of approval and the requirements of Council's Planning Scheme and the *FNQROC Development Manual*.

Except where modified by these conditions of approval.

Noted.

Timing of Effect

2. The conditions of the Development Permit must be effected prior to the issue of a Compliance Certificate for the Plan of Survey except where specified otherwise in these conditions of approval.

Noted.

Street Hierarchy

3. For the development the following street hierarchy is applied:
 - a) Lund Street and Bamabubu Street are access streets;
 - b) Jankaji Close, Manjal Close, Walkarr Close are access places; and
 - c) the extension of Lund Street / new Close past the Bamabubu Street exit is an access place.

Noted. Geometry applied to the design is generally consistent with street hierarchy.

Amended Design – Street Layout and Design

4. The street layout and design must be revised to comply with Queensland Streets and the FNQROC Development Manual, to the satisfaction of the Chief Executive Officer. In particular:
 - a) The street hierarchy nominated under Condition 3 above;
Noted. Geometry applied to the design is generally consistent with street hierarchy.
 - b) Following the endorsement of the Traffic Study required under Condition 5 inclusion of upgrades required to the existing road network;
Noted. The design has been completed with consideration to the outcomes of Condition 5.
 - c) Following the endorsement of the Drainage Study required under Condition 6 inclusion of the upgrades required to the existing stormwater infrastructure;
Noted. The design has been completed with consideration to the outcomes of Condition 6.
 - d) Provision of a two (2) metre wide footpath is to be constructed within all Access Streets in accordance with Table D1.3 of the FNQROC Development Manual;
Noted. The design incorporates a 2m wide footpath on all access streets.
 - e) Remove the pedestrian links at the end of Jankaji Close, and Manjal Close and Walkarr Close and incorporate these areas into the neighbouring residential lots;
Noted. The design has incorporated these links into the adjacent lots.
 - f) Provision of a bus stop near Bamabubu Street and Mossman Gorge Road;
We don't believe there is sufficient room to cater for a bus stop near Bamabubu Street. The existing school bus stop is located on Junkurrji Street, between Kankarr

and Lund Street. It is proposed to reconstruct this bus as part of this application. All residents are within 400m of this stop.

- g) A temporary vehicle turnaround at end of all roads where the length of road exceeds 60 metres (i.e. maximum acceptable reversing distance for garbage truck) must be provided. The turning facility must be of sufficient size to turn around a garbage truck, either in a continuous forward movement or by a three-point turn. Alternatively, a common refuse collection area may be provided where suitably located. The location of any proposed common refuse collection area must be identified on the amended plans and approved by the Chief Executive Officer prior to the issue of a Development Permit for Operational Work;
Noted. Kankarr Street West and Lund Street (West) have been design to accommodate three point turn for service vehicles.
- h) Revisit the design of the close, adjacent to Lot 39 and servicing Lots 40 and 41, on the eastern extent of the development. The current design is not supported. The road reserve width and road formation must be upgraded in all locations to comply with the requirements of the FNQROC Development Manual or be redesigned as a shared reciprocal access arrangement to Lots 39, 40, 41 and 53;
Noted. The layout has been redesigned to comply with the requirements of FNQROC and this condition. Lots 39 & 40 obtain access via a common driveway. Lot 41 is accessed from Lund Street (East).
- i) Change the description of 'Lot 53' that is a lot adjacent to the Mossman River from a freehold lot to land dedicated to the State as a Nature Reserve; and
Noted on plans.
- j) Note on the plan that Lot 42 is private community land;
Noted on plans
- k) Compliance with the current version of Council's FNQROC Development Manual – Road Network

The Applicant must engage a suitably qualified and experienced Registered Professional Engineer of Queensland (RPEQ) to assess the existing roads infrastructure (including all aspects of the design as noted in condition 5) against the current engineering standards.

Where deviations from the current *FNQROC Development Manual* standards exist, the Applicant is to:

- i. Identify the non-conformance (location, extent etc).
- ii. Provide details of the works required to bring the specific non-conformances up to current engineering standards.

It should be noted that Council may consider non-standard infrastructure where it can be demonstrated that:

- There is no increased risk to Council accepting the infrastructure (safety, environmental, financial (ie increased maintenance costs or likely replacement costs) over the levels which would be expected and accepted with donation of *FNQROC Development Manual* standard infrastructure; and
- Acceptance of non-standard infrastructure will be undertaken on a case by case basis, once the specific non-conformances have been identified in the report required as part of this condition.

It should be noted that, the acceptance of non-standard infrastructure shall remain at the discretion of the Douglas Shire Council. Where an agreement cannot be reached, the standard *FNQROC Development Manual* infrastructure requirements shall prevail.

The Applicant must provide a set of amended drawings reflecting any changes required from conditions of approvals (including revised traffic and drainage studies). The Applicant must ensure that an appropriately qualified and experienced RPEQ certifies that the design and construction of the road

network infrastructure and associated utilities, signage, lighting etc. proposed to be handed over to Council as part of the donated assets process at plan sealing is in accordance with the *FNQROC Development Manual*, except where an alternative standard has been explicitly agreed between the parties. The Applicant must submit a Statement of Compliance for the Operational Works Design as provided in Appendix A of Section AP 1 of the *FNQROC Development Manual* with the revised set of drawings.

The set of amended drawings must be submitted to Council and endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works. All works must be carried out by the Applicant at no cost to Council in accordance with the approved plans, to the requirements and satisfaction of the Chief Executive Officer prior to the issue of a Compliance Certificate for the Plan of Survey.

Noted. The drawings that form part of this submission reflect the outcomes of the assessment of the development against the FNQROC by the Applicant in December 2015, and the agreement between the Applicant and Council in July 2016.

Traffic Assessment

5. Undertake a detailed traffic assessment in accordance with Council's requirements to identify and assess:

a) Any impacts of the proposed development upon the Council's Road Network. The assessment must include (but not be limited to):

i. All Intersections – Capacity, Geometry and Treatments

The Applicant must demonstrate that the intersections within the proposed reconfiguration of a lot (RoL) and those that will be traversed to directly access the development from Mossman Gorge Road, comply with current engineering standards and the *FNQROC Development Manual*. The Applicant must provide amended plans which show and document the extent of works which are required to ensure compliance with Section D1 (specifically Section D1.12) of the *FNQROC Development Manual*. The amended plans are to identify and nominate all vegetation which requires removal for the safe and efficient movement of vehicles and pedestrians through the proposed development and intersections feeding the development from Mossman Gorge Road;

ii. All Road links – Capacity, Geometry and Form

The Applicant must review all road links within the bounds of the proposed development and those links which link the proposed development to Mossman Gorge Road (Junkurji Street, Lund Road (Western End) and Bamabubu Street. The Applicant must demonstrate that each road link complies with Section D1 (in particular Section D1.10) of the *FNQROC Development Manual* or identify what works are required to be undertaken to ensure that compliance with Section D1 of the *FNQROC Development Manual*. A revised plan showing the extent of works required is to be provided to Council for review and approval, prior to the issue of an Development Permit for Operational Works;

iii. Public Transport Network

The Applicant must demonstrate that the development complies with the requirement for a bus-route and section D1.16 of the *FNQROC Development Manual*;

iv. Garbage Collection / Emergency Vehicle Access;

The Applicant must demonstrate that the development complies with the requirement for a Section D1 of the *FNQROC Development Manual* (in particular sections D1.02, D1.10, D1.12 and D1.14) unless an alternative common area for garbage collection is agreed to by the Chief Executive Officer under Condition 4 above; and

v. Pedestrians and Cyclists

The Applicant must demonstrate that the development complies with the requirement for a bus-route and section D1.19 of the *FNQROC Development Manual*;

- c. Compliance of the existing network infrastructure with current engineering standards and the *FNQROC Development Manual*; and
- d. Determine any mitigation measures required to ameliorate the effects of the proposed development and identify these in revised drawings.

The Applicant must provide a set of amended drawings reflecting any changes required from the traffic study and conditions. The Applicant must ensure that an appropriately qualified and experienced RPEQ certifies that the design and construction of the proposed traffic network, proposed to be handed over to Council as part of the donated assets process, is in accordance with the *FNQROC Development Manual*. The Applicant must submit a Statement of Compliance for the Operational Works Design as provided in Appendix A of Section AP 1 of the *FNQROC Development Manual* with the revised set of drawings.

Noted. The drawings that form part of this submission reflect the outcomes of the assessment of the development against the FNQROC by the Applicant in December 2015, and the agreement between the Applicant and Council in July 2016.

Drainage Study of Site

- 6. Undertake a local drainage study of the site to determine the drainage impacts on upstream and downstream properties and the mitigation measures required to minimise such impacts. In particular, the study must address the following:
 - a. The contributing catchment boundaries;
 - b. The extent of the 100 year ARI flood event in relation to the site both pre and post development;
 - c. Primary and secondary flow paths for the 5, 10, and 100 year ARI flood events;
 - d. Identify any requirement for drainage easements;
 - e. Identify the need and tenure for flood detention areas to ensure a no worsening impact on downstream properties for the entire development;
 - f. Information on the proposed works and any impacts proposed at the drainage outlet from the proposed development;
 - g. Lawful point of discharge;
 - h. Consideration of the following particular requirements:
 - i. Stormwater drainage improvements on the eastern end of the proposed development are required. This includes, but is not limited to resolving the poor drainage in the area at the eastern end of the sports oval (proposed Lot 42);
 - ii. The headwall adjacent to Lund Street needs to be relocated further from the road carriageway;
 - iii. The minimum size RCP to be used within the development is 375mm in accordance with the current requirements of the *FNQROC Development Manual*;
 - iv. Structures must be provided to the western boundary of the land at proposed lots 21, 22 and 23 to mitigate inundation of lots 21, 22 and 23 from overland flows;
 - v. Consideration must be given to the separation of gross pollutants from the storm water prior to it exiting the community; and
 - vi. Easements must be established for the drains passing through allotments, or for stormwater infrastructure which is not on a standard alignment;

- i. Compliance with the current version of Council's FNQROC Development Manual – Stormwater

The Applicant must have an suitably qualified and experienced RPEQ assess the existing infrastructure capacity, condition and performance (where possible) against the current engineering standards as defined by the *FNQROC Development Manual* and associated reference documents (including QUDM).

Where deviations from the current *FNQROC Development Manual* standards exist, the applicant is to:

- i. Identify the non-conformance (location, extent etc.); and
- ii. Provide details of the works required to bring the specific of non-conformances up to current engineering standards.

It should be noted that Council may consider non-standard infrastructure where it can be demonstrated that: -

- There is no increased risk to Council accepting the infrastructure (safety, environmental, financial (ie increased maintenance costs or likely replacement costs) over the levels which would be expected and accepted with donation of *FNQROC Development Manual* standard infrastructure;
- Acceptance of non-standard infrastructure will be undertaken on a case by case basis, once the specific non-conformances have been identified in the report required as part of this condition; and
- The non-standard infrastructure shall be required to be certified as fit-for purpose.

The Applicant must provide a set of amended drawings reflecting any changes required from the drainage study and conditions. The Applicant must ensure that an appropriately qualified and experienced RPEQ certifies that the design and construction of the stormwater system proposed to be handed over to Council as part of the donated assets process at plan sealing is in accordance with the *FNQROC Development Manual*, except where an alternative standard has been explicitly agreed between the parties – in accordance with the provisions outlined above. The Applicant must submit a Statement of Compliance for the Operational Works Design as provided in Appendix A of Section AP 1 of the *FNQROC Development Manual* with the revised set of drawings.

The drainage study and amended drawings must be endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works.

It should be noted that in all cases, the acceptance of non-standard infrastructure shall remain at the discretion of the Chief Executive Officer. Where agreement cannot be reached, the standard *FNQROC Development Manual* infrastructure requirements shall prevail.

Noted. The drawings that form part of this submission reflect the outcomes of the assessment of the development against the FNQROC by the Applicant in December 2015, and the agreement between the Applicant and Council in July 2016.

Existing Creek and Drainage Systems

7. All existing creek systems and drainage areas adjacent to or leading into the Mossman River to the North of the proposed development must be left in their current state, including no channel alterations and no removal of vegetation unless consented to in writing by the Chief Executive Officer.

The Applicant/owner must obtain any necessary approvals from the Department of Natural Resources and Mines for carrying out works in a watercourse.

Noted. The proposed works do not intend to interfere with these areas.

Lawful Point of Discharge

All stormwater from the property must be directed to a lawful point of discharge such that it does not adversely affect surrounding properties or properties downstream from the development to the requirements and satisfaction of the Chief Executive Officer.

Noted. Proposed works maintain the existing points of discharge.

Access to Hatchet or Battleaxe Lots

8. Construct a concrete driveway or other approved surface to battle-axe Lot 40 extending the full length of the access leg from the T-head intersection adjacent, with a Standard Cross-over in accordance with Council Standard Drawing S1015B. Construction of the concrete driveway must be in accordance with Council Standard Drawing S1110.

All works must be carried out to the requirements and satisfaction of the Chief Executive Officer prior to the issue of a Compliance Certificate for the Plan of Survey.

Noted. The design incorporates access crossover and driveway as per this condition.

Service Conduits

9. Provide service conduits to Lot 40 adjacent to the driveway together with associated access pits if necessary, to extend from the front boundary to the end of the access driveway.

All works must be carried out to the requirements and satisfaction of the Chief Executive Officer prior to the issue of a Compliance Certificate for the Plan of Survey.

Noted. The design incorporates service conduit in accordance with this condition.

Street Lighting

10. The following arrangements for the installation of street lighting within the proposed subdivision must be provided prior to the approval and dating of the Plan of Survey:

- a. Prior to the issue of a Compliance Certificate for the Plan of Survey, a Rate 2 lighting scheme is to be prepared by Ergon Energy or its approved consultant and submitted to the Chief Executive Officer for approval. The Rate 2 lighting scheme is to be designed in accordance with the relevant Road Lighting Standard AS/NZS 1158 and the *FNQROC Development Manual*. The applicable lighting category is to be determined from the Road Hierarchy Table D1.1 and the corresponding applicable Lighting Categories Table D8.1 as identified in the *FNQROC Development Manual*.

The design must provide the applicable illumination level specified in the Road Lighting Standard AS/NZS 1158 at the following road elements:

- i. Intersections;
- ii. Pedestrian Refuges;
- iii. Cul-de-sacs; and
- iv. LATM Devices (Including Roundabouts).

LATM Devices are to be shown on the civil layout design, the electrical services and street lighting design must be submitted in accordance with Ergon Energy's latest Distribution Design Drafting Standard;

Noted. The lighting design prepared by SPA consulting forms part of this submission.

- b. Prior to the issue of a Compliance Certificate for the Plan of Survey, written confirmation that the relevant capital contribution required by Ergon Energy has been paid must be submitted, to ensure that the street lighting will be constructed;
- c. Where a new intersection is formed on an existing roadway for the purpose of accessing a new subdivision development, the intersection and existing road approaches must be provided with street lighting for a distance equivalent to at least two spans either side of the intersection to the relevant Lighting Category; and

- d. Where an existing intersection is required to be upgraded as part of a development approval, the intersection and existing road approaches must be provided with street lighting for a distance equivalent to at least two spans either side of the intersection to the relevant Lighting Category.

Water Supply and Sewerage Infrastructure Plan

11. An updated water supply and sewerage infrastructure plan and supporting information including hydraulic network analysis must be submitted demonstrating how the development can be adequately serviced by Council's existing infrastructure.

The analysis must identify any deficiencies or non-compliances of the existing water and sewer networks which are used to service the proposed development. Where noncompliances are identified, the Applicant must modify, repair, replace or design and construct any augmentations or remediation works required to bring the infrastructure up to current engineering standards at no cost to Council.

In particular, the plan must:

- a. Identify the materials that the sewer and water networks are constructed from;
- b. Identify any non-conformances in terms of the performance, design and construction of the infrastructure networks against current standards (*FNQROC Development Manual*);
- c. Identify what works are required to be undertaken to enable certification that the infrastructure is compliant in all regards to the requirements of the *FNQROC Development Manual* (Sections D6 and D7);
- d. Identify any locations where easements would be required to be obtained for water and sewer on non-standard alignments;
- e. Identify any external catchments that will be connected to the internal sewer or water networks; and
- f. Identify any trunk infrastructure external to the proposed subdivision that may require upgrading to accommodate the development.
- g. Compliance with the current version of Council's *FNQROC Development Manual – Water and Sewerage*

The water supply and sewerage infrastructure plan must be endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works.

The Applicant must engage a suitably qualified and experienced RPEQ to assess the infrastructure against the current engineering standards.

Where deviations from the current *FNQROC Development Manual* standards exist, the applicant is to:

- i. Identify the non-conformance (location, extent etc); and
- ii. Provide details of the works required to bring the specific non-conformances up to current engineering standards.

It should be noted that Council may consider non-standard infrastructure where it can be demonstrated that:

- There is no increased risk to Council accepting the infrastructure (safety, environmental, financial (ie increased maintenance costs or likely replacement costs) over the levels which would be expected and accepted with donation of *FNQROC Development Manual* standard infrastructure;
- Acceptance of non-standard infrastructure will be undertaken on a case by case basis, once the specific non-conformances have been identified in the report required as part of this condition; and
- The Applicant must provide a set of amended drawings reflecting any changes required from conditions of approvals. The amended drawings must be submitted to Council and endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works.

It should be noted that in all cases, the acceptance of non-standard infrastructure shall remain at the discretion of the Douglas Shire Council. Where agreement cannot be reached, the standard *FNQROC Development Manual* infrastructure requirements shall prevail.

Prior to the acceptance of works by Council, the Applicant must ensure that an appropriately qualified and experienced RPEQ certifies that the design and construction of the water and sewer infrastructure proposed to be handed over to Council as part of the donated assets process at plan sealing is in accordance with the *FNQROC Development Manual*, except where an alternative standard has been explicitly agreed between the parties – in accordance with the provisions outlined above. The Applicant must submit a Statement of Compliance for the Operational Works Design as provided in Appendix A of Section AP 1 of the *FNQROC Development Manual* with the revised set of drawings.

Noted. The drawings that form part of this submission reflect the outcomes of the assessment of the development against the FNQROC by the Applicant in December 2015, and the agreement between the Applicant and Council in July 2016.

Water Supply and Sewerage Works (External)

12. The Applicant must undertake the following works:

- a. Upgrade, replace or provide any works as are required from Condition 6 (Water Supply and Sewerage Infrastructure Plan)
- b. Undertake the following water supply and sewerage works external to the site to connect the site to existing water supply and sewerage infrastructure:
 - i. Upgrade the sewer pump station on the Eastern extent of the development, located opposite to block number 39, within the Mossman Gorge Road reserve. It should be noted that any upgrade to or construction of a sewerage pump station will require full design drawings and a commissioning plan in accordance with the *FNQROC Development Manual* submitted with the plan of works and will be subject to compliance with the State Purchasing Policy for competitive Tendering;
 - ii. Provide district meters at locations nominated by Douglas Shire Council; and
 - iii. CCTV footage taken after the completion of works must be submitted to Council.

Three (3) copies of a plan of the works must be endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works.

All works must be carried out in accordance with the approved plans, to the requirements and satisfaction of the Chief Executive Officer, prior to the issue of a Compliance Certificate for the Plan of Survey.

Noted. The drawings that form part of this submission reflect the requirements of this condition.

Water Supply and Sewerage Works (Internal)

13. The Applicant must undertake the following works:

- a. Upgrade, replace or provide any works as are required from Condition 12 (Water Supply and Sewerage Infrastructure Plan);
- b. Provide water and sewerage infrastructure free of defects, constructed to current engineering standards and in accordance with Council's *FNQROC Development Manual*; and
- c. Required works are, but not limited to:
 - i. All non-compliances and defects of the sewerage reticulation system as identified in Condition 12 (Water Supply and Sewerage Infrastructure Plan) must be rectified;
 - ii. Provide easements over any water or sewer infrastructure assets that are on non-standard alignments OR relocate the water and sewer assets to be on a standard alignment (as per the *FNQROC Development Manual*);

- iii. The sewerage system must be extended to provide a defect free connection to each existing dwelling. In the case when a dwelling does not exist provide a single internal sewer connection to each lot in accordance with the *FNQROC Development Manual*; and
- iv. If any existing sewer connection is required to be retained but is inadequately sized to service the development, it must be upgraded. Existing sewer connections not retained must be decommissioned.

All works must be designed and constructed in accordance with the *FNQROC Development Manual*.

All works must be carried out in accordance with the approved plans, to the requirements and satisfaction of the Chief Executive Officer prior to the issue of a Compliance Certificate for the Plan of Survey.

Noted. The drawings that form part of this submission reflect the requirements of this condition.

Inspection of Sewers

- 14. CCTV inspections of all constructed sewers must be undertaken for all sewers that will become an asset of Council. The CCTV records must be provided to Council the issue of a Compliance Certificate for the Plan of Survey. An assessment of the CCTV records will be undertaken and any identified defects are to be rectified to the satisfaction of the Chief Executive Officer at no cost to Council.
Noted.

Vegetation Clearing

- 15. Existing vegetation on the subject land must be retained in all areas except those affected by the construction of access driveways, the installation of services as detailed on the approved plans. Any further clearing requires a Development Permit for Operational Works.

Vegetation to be retained is to be identified and adequately fenced off for protection purposes prior to construction work commencing on the site.
Noted.

Wildlife

- 16. Prior to removal of any tree, an inspection must be carried out for any signs of protected wildlife including nests and animal habitat. Should any recent wildlife activity be identified, removal of the tree must not occur until the animal has vacated the area of immediate danger. If the animal does not move from the area of danger, the Queensland Parks and Wildlife Services must be contacted for advice. Important habitat trees should be retained wherever possible.
Noted.

Parkland Protection

- 17. Any common boundaries with the adjacent Mossman Gorge River must be temporarily delineated and fenced off to restrict building access for the duration of construction activity.
Noted.

Weed Management

- 18. A Weed Management Plan for invasive pest species must be submitted to and endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works.
Noted.

Demolish Structures

- 19. All structures not associated with the approved development (including disused services and utilities) must be demolished and/or removed from the subject land prior the issue of a Compliance Certificate for the Plan of Survey.
Noted.

Stockpiling and Transportation of Fill Material

21. Soil used for filling or spoil from the excavation is not to be stockpiled in locations that can be viewed from adjoining premises or a road frontage for any longer than one (1) month from the commencement of works.

Transportation of fill or spoil to and from the site must not occur within:

- a. peak traffic times; or
 - b. before 7:00 am or after 6:00 pm Monday to Friday; or
 - c. before 7:00 am or after 1:00 pm Saturdays; or
 - d. on Sundays or Public Holidays.
- Noted.**
22. Dust emissions or other air pollutants must not extend beyond the boundary of the site and cause a nuisance to surrounding properties.
- Noted.**

Storage of Machinery and Plant

23. The storage of any machinery, material and vehicles must not cause a nuisance to surrounding properties, to the satisfaction of the Chief Executive Officer.
- Noted.**

Access Easement/s

24. Create a reciprocal Access Easement to allow vehicle access and on-site manoeuvring for lots 39, 40, 41 and 53, to the requirements and satisfaction of the Chief Executive Officer. A copy of the easement documents must be submitted to Council for the approval of Council's solicitors at no cost to Council. The approved easement documents must be submitted at the same time as seeking approval and dating of the Plan of Survey and must be lodged and registered with the Department of Natural Resources and Mines in conjunction with the Plan of Survey.
- Noted.**

Sewer Easement/s

25. Create an easement in favour of Council over all sewers on non-standard alignments or within any private lots to be created, to the requirements and satisfaction of the Chief Executive Officer. A copy of the easement documents must be submitted to Council for the approval by Council's solicitors at no cost to Council prior to the issue of a Compliance Certificate for the Plan of Survey. The approved easement documents must be submitted at the same time as seeking approval and dating of the Plan of Survey and must be lodged and registered with the Department of Natural Resources and Mines in conjunction with the Plan of Survey.
- Noted.**

Existing Services

26. Written confirmation of the location of existing services for the land must be provided. In any instance where existing services are contained within another lot, the following applies, either:
- a. Relocate the services to comply with this requirement; or
 - b. Arrange registration of necessary easements over services located within another lot prior to or in conjunction with submission of the application for a Compliance Certificate for the Plan of Survey.
- Noted.**

Electricity Supply

27. Written evidence from Ergon Energy advising if distribution substation/s are required within the development must be provided. If required, details regarding the location of these facilities must be submitted to the Chief Executive Officer accompanied by written confirmation

from Ergon Energy. Details regarding electricity supply must be provided prior to the issue of a Development Permit for Operational Works.
Noted. Ergon offer attached.

Electricity and Telecommunications

28. Written evidence of negotiations with Ergon Energy and the telecommunication authority must be submitted to Council stating that both an underground electricity supply and telecommunications service will be provided to the development prior to the issue of a Compliance Certificate for the Plan of Survey.
Noted. Ergon offer attached. Telstra already exists.

29. Infrastructure Charges

A monetary contribution to Council towards the provision of infrastructure is required in accordance with the Infrastructure Charges Notice attached to this decision. The contribution payable will be in accordance with the Planning Scheme Policy.

Contributions must be paid at the rates applicable at time of payment. Payment is required prior to the issue of a Compliance Certificate for the Plan of Survey.
Noted.

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 MOSSMAN GORGE

Location of Development MOSSMAN GORGE ROAD

Applicant DATSIP

Designer TRINITY ENGINEERING AND CONSULTING

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	
Geotechnical requirements	
Geometric Road Design	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016
Pavements	
Structures / Bridges	N.A.
Subsurface Drainage	
Stormwater Drainage	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016
Site Re-grading	
Erosion Control and Stormwater Management	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016
Pest Plant Management	
Cycleway / Pathways	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016

Landscaping	N.A. Existing landscaping to remain
Water Source and Disinfection/Treatment Infrastructure (if applicable)	N.A.
Water Reticulation, Pump Stations and water storages	Awaiting Concil advice with regard to pump station requirements
Sewer Reticulation and Pump Stations	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016
Electrical Reticulation and Street Lighting	Ergon preparing overhead network design
Public Transport	N.A. - Gated community
Associated Documentation/ Specification	Refer B&M letter 18 Dec 2015, Council letter 12 July 2016 and attached tender documentation.
Priced Schedule of Quantities	Not provided
Referral Agency Conditions	N.A.
Supporting Information (AP1.08)	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016
Other	Refer B&M letter 18 Dec 2015 and Council letter 12 July 2016

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

Designer Trinity Engineering and Consulting **RPEQ No** 8462

Name in Full Paul Charles Steele

Signature **Date** 01.12.2017

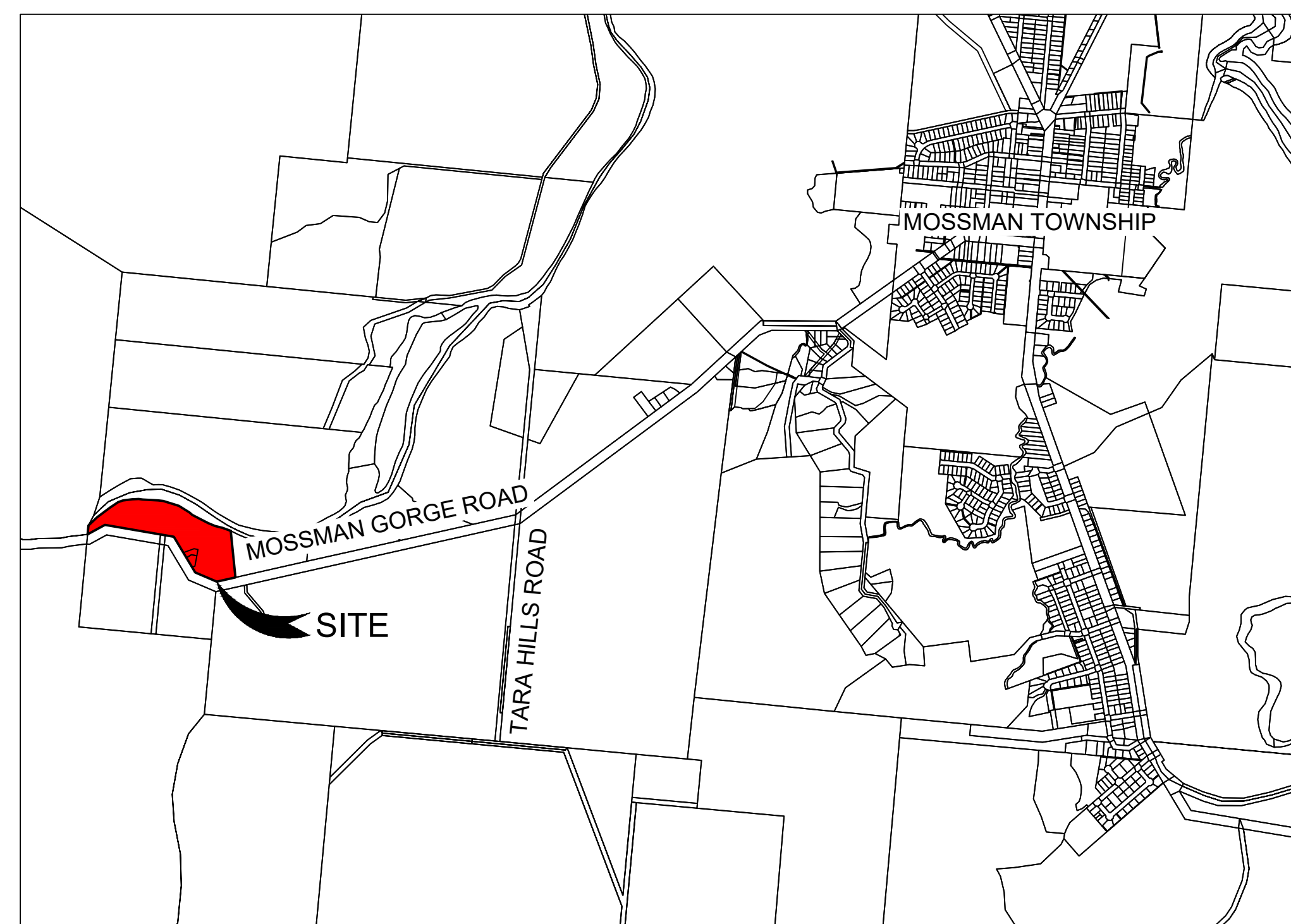


MOSSMAN GORGE

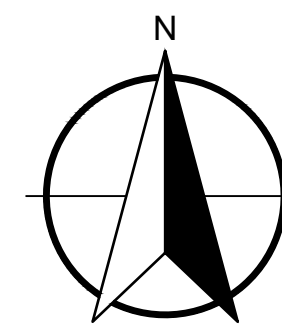
INFRASTRUCTURE UPGRADE

for

DEPARTMENT OF ABORIGINAL AND TORRES STRAIT ISLANDER PARTNERSHIPS

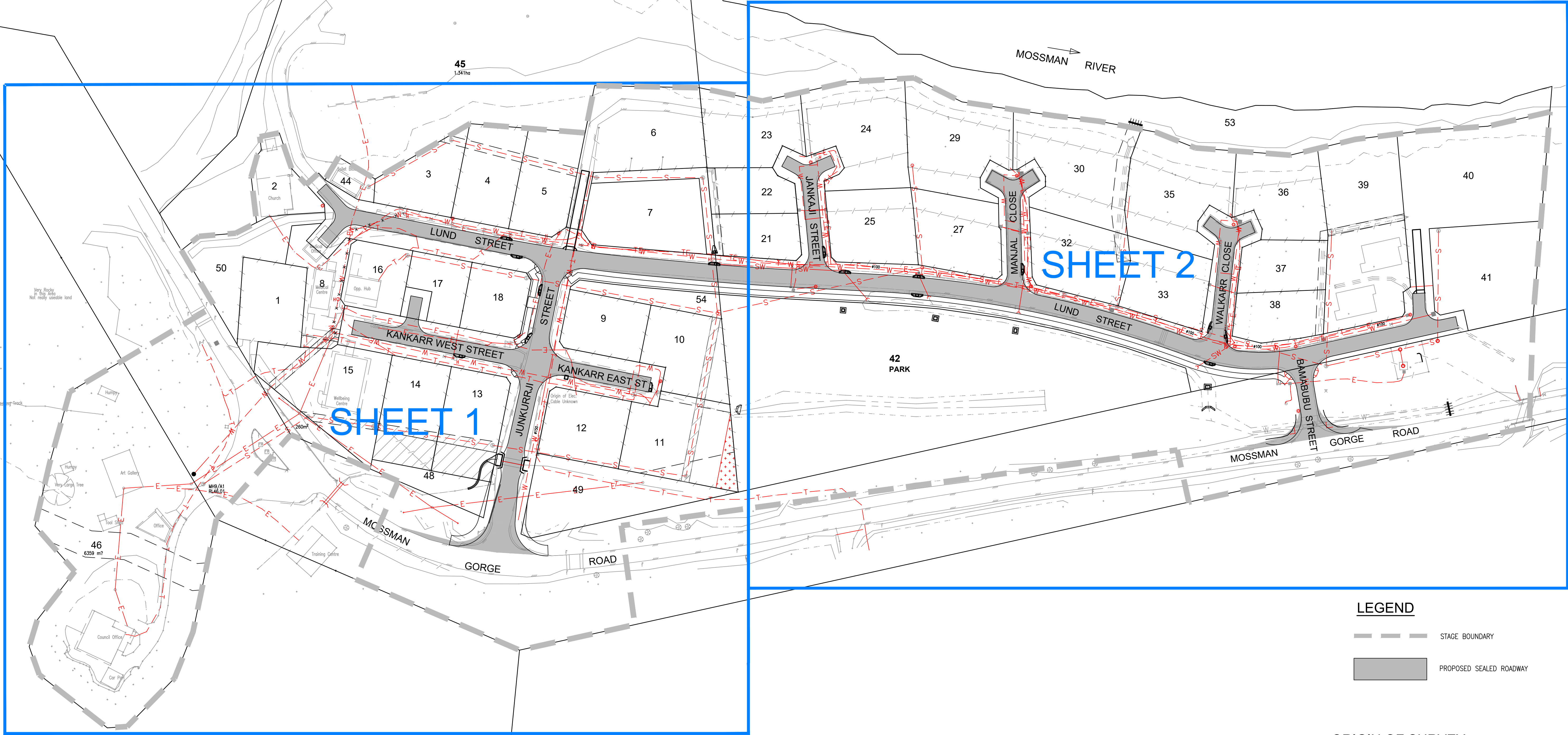
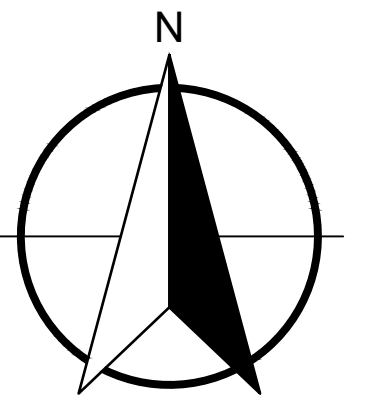


LOCALITY PLAN
NOT TO SCALE



SCHEDULE OF PROJECT DRAWINGS

1020-001	LOCALITY PLAN AND DRAWING SCHEDULE
1020-002	GENERAL ARRANGEMENT
1020-003	ROADWORKS AND STORMWATER PLAN – SHEET 1 OF 2
1020-004	ROADWORKS AND STORMWATER PLAN – SHEET 2 OF 2
1020-005	TYPE CROSS SECTIONS AND CONTROL LINE SETOUT
1020-006	MISCELLANEOUS DETAILS
1020-007	ROAD LONGITUDINAL SECTIONS – SHEET 1 OF 3
1020-008	ROAD LONGITUDINAL SECTIONS – SHEET 2 OF 3
1020-009	ROAD LONGITUDINAL SECTIONS – SHEET 3 OF 3
1020-010	JUNKURRJI STREET ANNOTATED CROSS SECTIONS
1020-011	KANKARR STREET EAST AND KANKARR STREET WEST ANNOTATED CROSS SECTIONS
1020-012	LUND STREET ANNOTATED CROSS SECTIONS – SHEET 1 OF 3
1020-013	LUND STREET ANNOTATED CROSS SECTIONS – SHEET 2 OF 3
1020-014	LUND STREET ANNOTATED CROSS SECTIONS – SHEET 3 OF 3
1020-015	JANKAJI CLOSE, MANJAL CLOSE AND WALKARR CLOSE ANNOTATED CROSS SECTIONS
1020-016	BAMA BUBU ANNOTATED CROSS SECTIONS
1020-017	INTERSECTION SETOUT AND DETAILS – SHEET 1 OF 3
1020-018	INTERSECTION SETOUT AND DETAILS – SHEET 2 OF 3
1020-019	INTERSECTION SETOUT AND DETAILS – SHEET 3 OF 3
1020-020	INTERSECTION LINEMARKING AND SIGNAGE PLAN
1020-021	STORMWATER LONGITUDINAL SECTIONS – SHEET 1 OF 2
1020-022	STORMWATER LONGITUDINAL SECTIONS – SHEET 2 OF 2
1020-023	STORMWATER STRUCTURE DETAILS
1020-024	SEWERAGE RETICULATION PLAN – SHEET 1 OF 2
1020-025	SEWERAGE RETICULATION PLAN – SHEET 2 OF 2
1020-026	SEWERAGE LONGITUDINAL SECTIONS AND DETAILS
1020-027	SEWERAGE PUMP STATION PLAN AND DETAILS
1020-028	WATER RETICULATION PLAN – SHEET 1 OF 2
1020-029	WATER RETICULATION PLAN – SHEET 2 OF 2
1020-030	EROSION AND SEDIMENT CONTROL STRATEGY – SHEET 1 OF 2
1020-031	EROSION AND SEDIMENT CONTROL STRATEGY – SHEET 2 OF 2



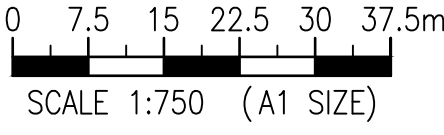
LEGEND

- STAGE BOUNDARY
- PROPOSED SEALED ROADWAY

ORIGIN OF SURVEY

LEVELS DATUM : AHD (D)
ORIGIN OF LEVELS : OPM100980, RL9.392
MERIDIAN : VIDE SR805
ORIGIN OF CO ORDINATES : PSM47211
323030.152 E
8177618.174 N

Revisions			
B	OPERATIONAL WORKS ISSUE	-	07/12/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



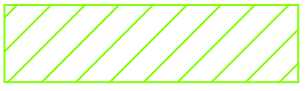

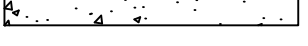
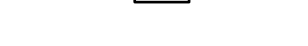
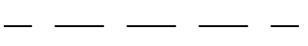











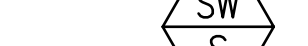






Trinity Engineering and Consulting
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 | Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:750		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		GENERAL ARRANGEMENT	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
			1020-002
		Revision	B



JOINS SHEET 2 OF 2

LEGEND

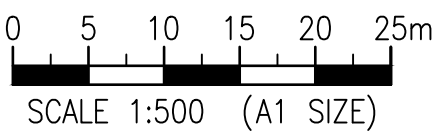
- 
+4.68
+EX5.09
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 
- 

- 2/6
- LINE No. / STRUCTURE No.
- KERB INLET PIT ON GRADE (WITH SMALL EXTENSIONS)
- KERB INLET PIT ON SAG (WITH MEDIUM EXTENSION ON ONE SIDE)
- MODIFIED KERB INLET PIT ON GRADE (WITH SMALL EXTENSION ON ONE SIDE)
- FIELD INLET PIT - TYPE A (REFER FNQROC STANDARD DRG S1070)
- FIELD INLET PIT - TYPE B (REFER FNQROC STANDARD DRG S1070)
- DIRECTION OF FALL ON ALLOTMENTS
- INDICATES STORMWATER (SW) CROSSING OTHER SERVICES eg. (S) SEWER

STORMWATER SETOUT TABLE

STRUCTURE NAME	EASTING	NORTHING
1/1	322895.933	8177741.773
2/1	322899.743	8177735.432
3/1	322908.152	8177722.189
4/1	322903.916	8177704.402
5/1	322917.878	8177689.900
6/1	322948.931	8177685.287
7/1	322981.771	8177678.096
2/1	322878.238	8177698.093
0/4	322973.579	8177737.007
1/4	322974.030	8177732.309

PLAN
SCALE 1:500



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au
Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)

1:500

Drawing is not to be used for construction unless approved.

Drawn
MS

Designed
MS

Client

Project

Title

DATSIP
MOSSMAN GORGE INFRASTRUCTURE UPGRADES
ROADWORKS AND STORMWATER PLAN
SHEET 1 OF 2

Drawing Check

Design Check

Approved

RPEQ

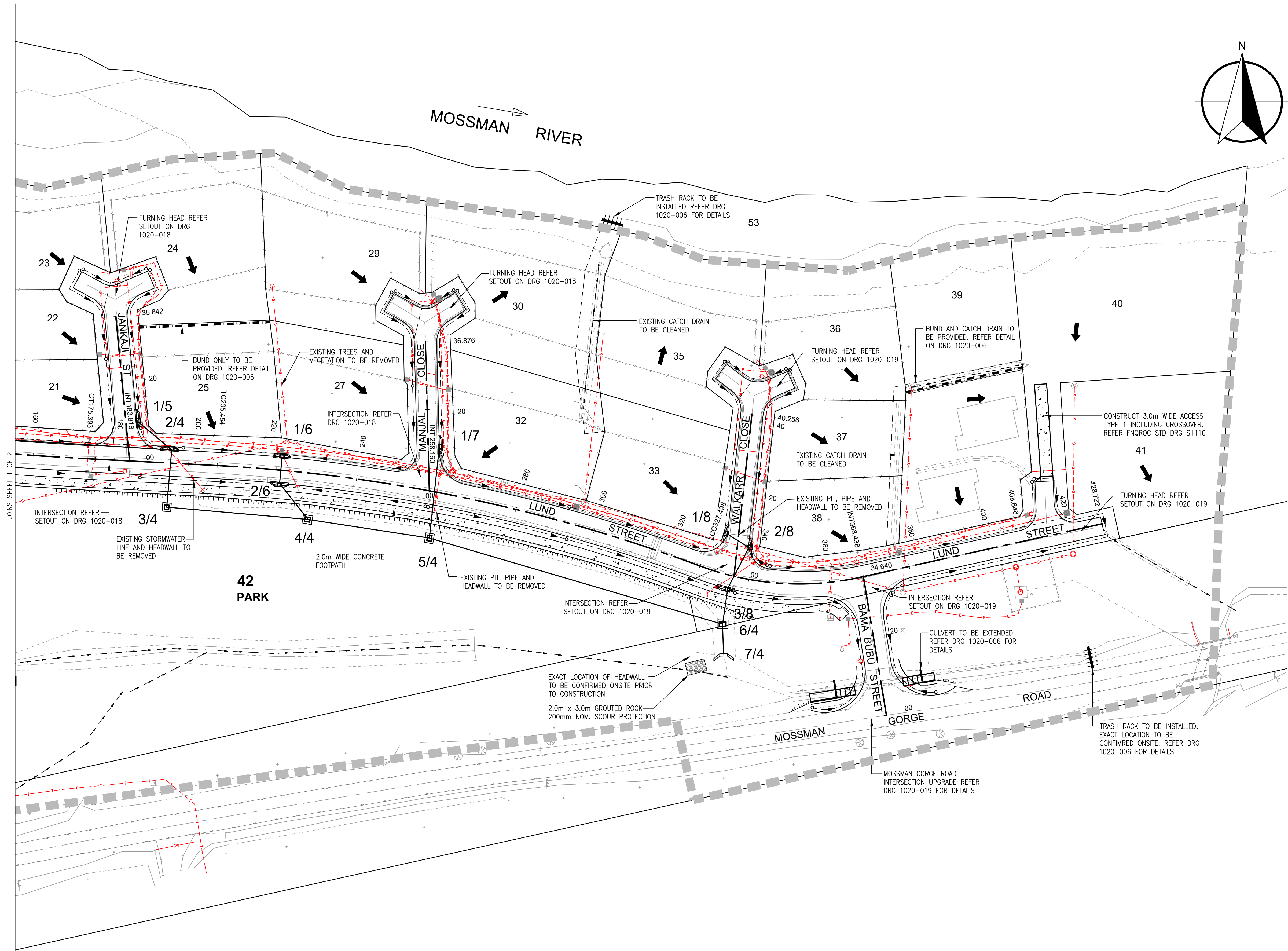
Date

Drawing No.

Revision

1020-003
C

No.	Description	Reviewed	Approved	Date
C	OPERATIONAL WORKS	-	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	-	06/10/17
A	PRELIMINARY ISSUE	-	-	17/08/17



NOTES

- ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
- LOCATION OF ALL EXISTING SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION BY CONTRACTOR THROUGH LIAISON WITH RELEVANT AUTHORITIES.
- DESIGN SURFACE LEVELS SHOWN ARE AFTER ALL EARTHWORKS ARE COMPLETED, INCLUDING 75mm TOPSOILING.
- ALL DESIGN SURFACES ARE TO BE GRADED EVENLY BETWEEN SHOWN LEVELS UNLESS OTHERWISE SHOWN.
- REFER TO FNQROC STANDARD DRAWINGS:
 - S1000 : CONCRETE KERB & CHANNEL
 - S1010 : PUBLIC UTILITIES ON ROADS AND VERGES
 - S1015 : ACCESS CROSSOVERS
 - S1016 : KERB RAMP
 - S1035 : PATHWAYS/BIKEWAYS
 - S1040 : STREET NAME SIGNS
 - S1002 : KERB AND CHANNEL DRAINAGE CONNECTOR
 - S1045 : EXCAVATION, BEDDING AND BACKFILLING OF PRE-CAST BOX CULVERTS
 - S1050 : GRATED KERB INLET PIT - PIPE DIAMETER < 600mm
 - S1060 : KERB INLET GRATE AND FRAME S1070 - FIELD INLET PIT
 - S1075 : RC PIPE HEADWALL - DIA. 375 TO 675mm
 - S1085 : CONCRETE PIPE HEADWALL, WINGWALLS AND APRON
 - S1095 : SUBSURFACE FLUSHING POINTS
- NEW ROADWORKS AND KERBING TO JOIN SMOOTHLY TO EXISTING WORKS. PROVIDE CUT BACK TO EXISTING SEALED ROADS WHERE NECESSARY.
- TRIM AND DRILL SEED ALL FOOTPATHS/ROAD VERGES AFTER FINAL EARTHWORKS AND TOPSOILING IS COMPLETED.
- TOPSOIL STOCKPILE TO BE LOCATED AT LOCATION CONFIRMED BY SUPERINTENDENT.
- 2.0m WIDE CONCRETE PATHWAY TO BE LOCATED AS PER FNQROC STD DRG S1010. KERB RAMP AND ACCESS CROSSOVERS TO BE INSTALLED IN ACCORDANCE WITH FNQROC STD DRGS S1016 AND S1015.
- ENSURE SUBSOIL DRAINS ARE GRADED AT 0.5% MIN. REFER TO DRG 1020-006 FOR SUBSOIL DETAIL.
- FLUSHING POINTS FOR SUBSOIL DRAINAGE TO BE AT THE END OF EACH LINE AND AT MAX 50m SPACING. FLUSHING POINTS SHALL BE LOCATED WITHIN PITS. A SCREW CAP MUST BE PROVIDED TO EACH FLUSHING POINT.
- REFER TO EROSION & SEDIMENT CONTROL STRATEGY DRG 1020-030 AND 1020-031 FOR EROSION AND SEDIMENT CONTROL MEASURES.
- STORMWATER TO DISCHARGE TO TEMPORARY ROCK FILTER DAMS PRIOR TO CONSTRUCTION OF ULTIMATE DRAINAGE NETWORK WITH FUTURE STAGES.
- CONTRACTOR TO CONFIRM ALL OUTLET LEVELS PRIOR TO COMMENCEMENT OF WORKS.
- CONTRACTOR IS TO REINSTATE ALL ALLOTMENT DRIVEWAYS DAMAGED DURING CONSTRUCTION.

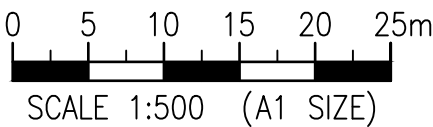
STORMWATER SETOUT TABLE

STRUCTURE NAME	EASTING	NORTHING
2/4	323023.142	8177729.252
3/4	323021.915	8177715.156
4/4	323056.739	8177712.126
5/4	323086.680	8177707.542
6/4	323158.954	8177686.307
7/4	323159.172	8177679.036
1/5	323014.579	8177736.459
1/6	323050.347	8177727.500
2/6	323049.751	8177721.033
1/7	323089.129	8177730.009
1/8	323160.067	8177708.570
2/8	323165.455	8177705.207
3/8	323160.229	8177695.140

PLAN
SCALE 1:500

Printed: 06 December 2017, 11:24 AM File: T:\1020 Mossman Gorge\Drawings\ 1020-004(C).dwg

Revisions			
C	OPERATIONAL WORKS	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	06/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:500		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		ROADWORKS AND STORMWATER PLAN	
		SHEET 2 OF 2	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	
		RPEQ	Date
		Drawing No.	
		1020-004	
		Revision	
		c	

External References: TEC-TITLE-A1_b.dwg ; 1020-X-SURVEY.dwg ; 1020-X-DESIGN.dwg

Printed: 06 December 2017, 11:25 AM File: T:\1020 Mossman Gorge\Drawings\ 1020-005(B).dwg

Revisions			
B	OPERATIONAL WORKS ISSUE	-	07/12/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved Date

External References: TEC-TITLE-A1_b.dwg



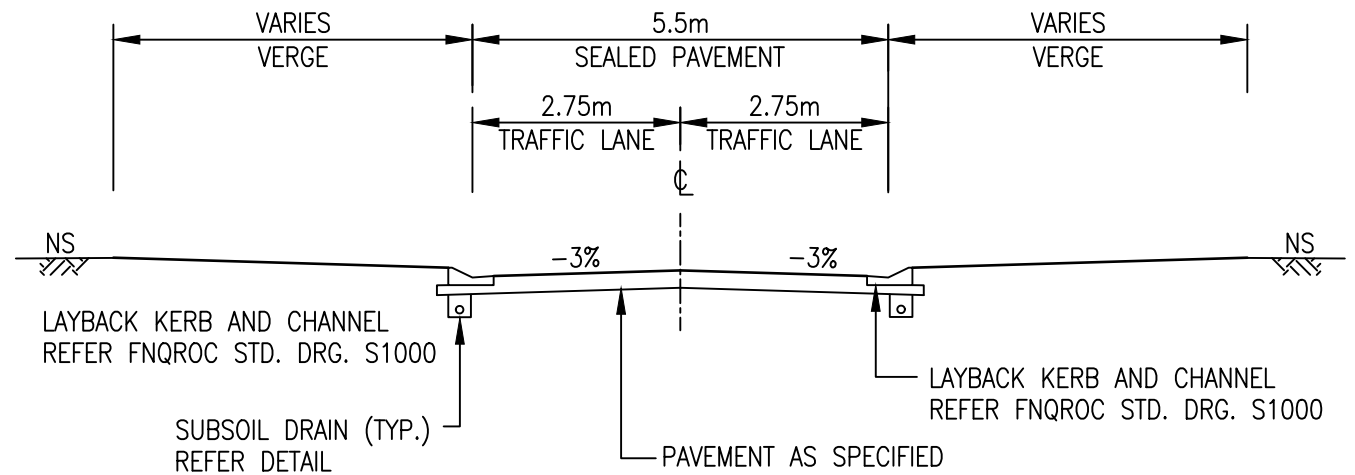
© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

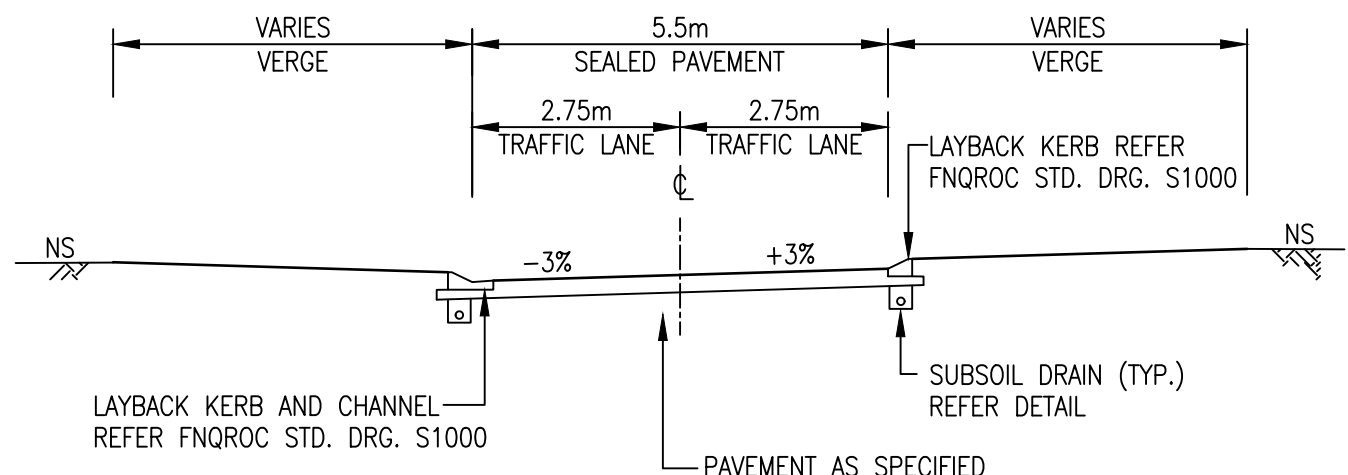
Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111
www.trinityengineering.com.au

Cairns QLD 4870
Email: admin@trinityengineering.com.au

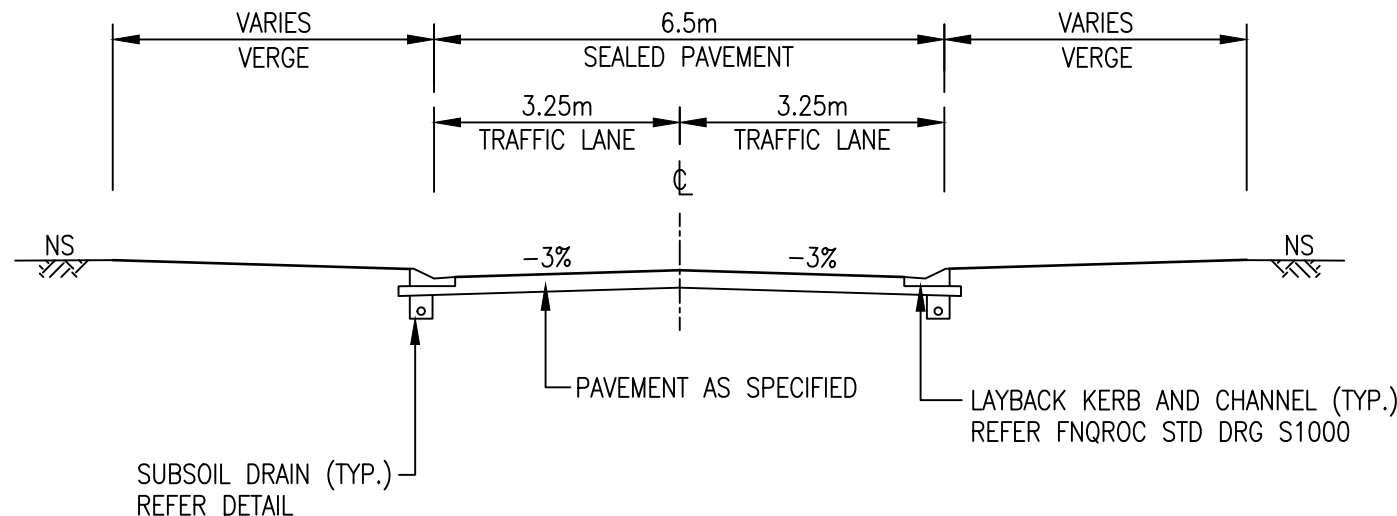
Scale (A1 size)		Client	
1:100		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		TYPE CROSS SECTIONS AND CONTROL LINE SETOUT	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	
		RPEQ	Date
		Drawing No.	Revision
		1020-005	B



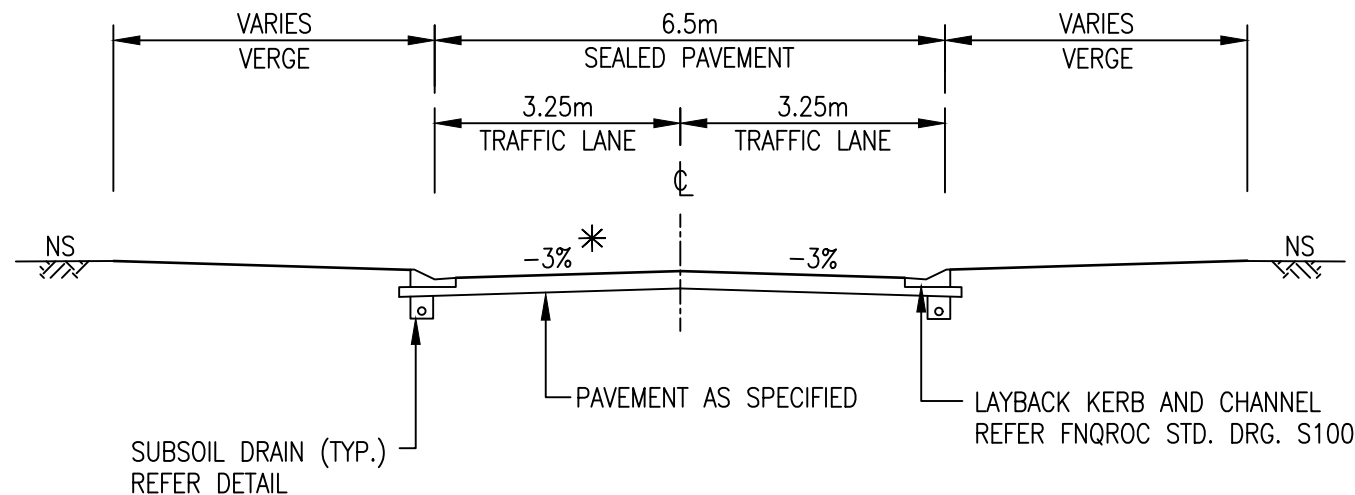
CH 0.000 - CH 114.371
LUND STREET



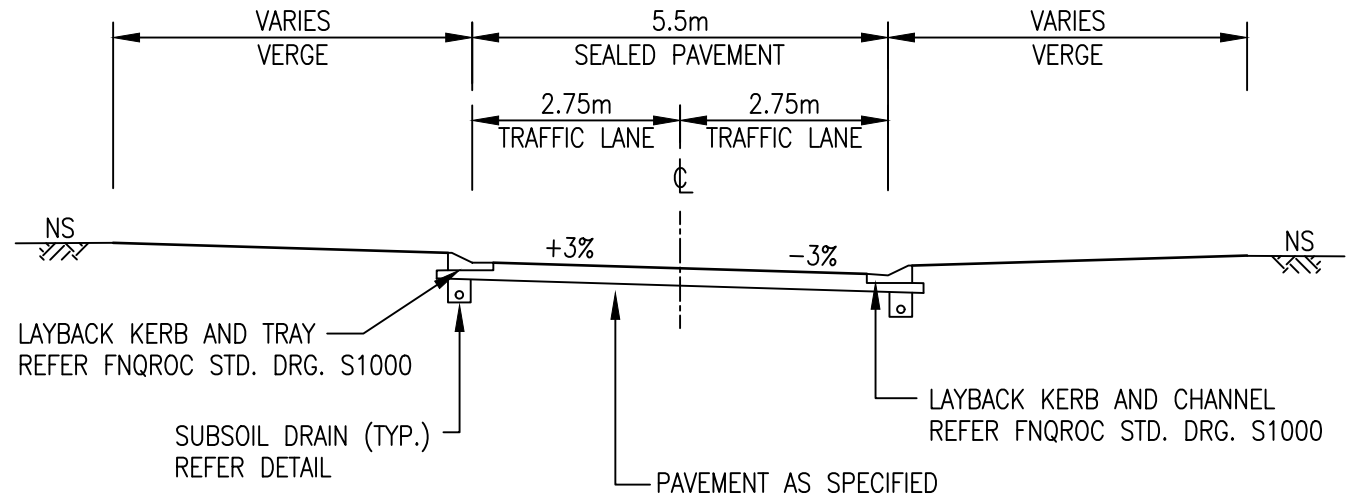
KANKARR STREET (WEST)



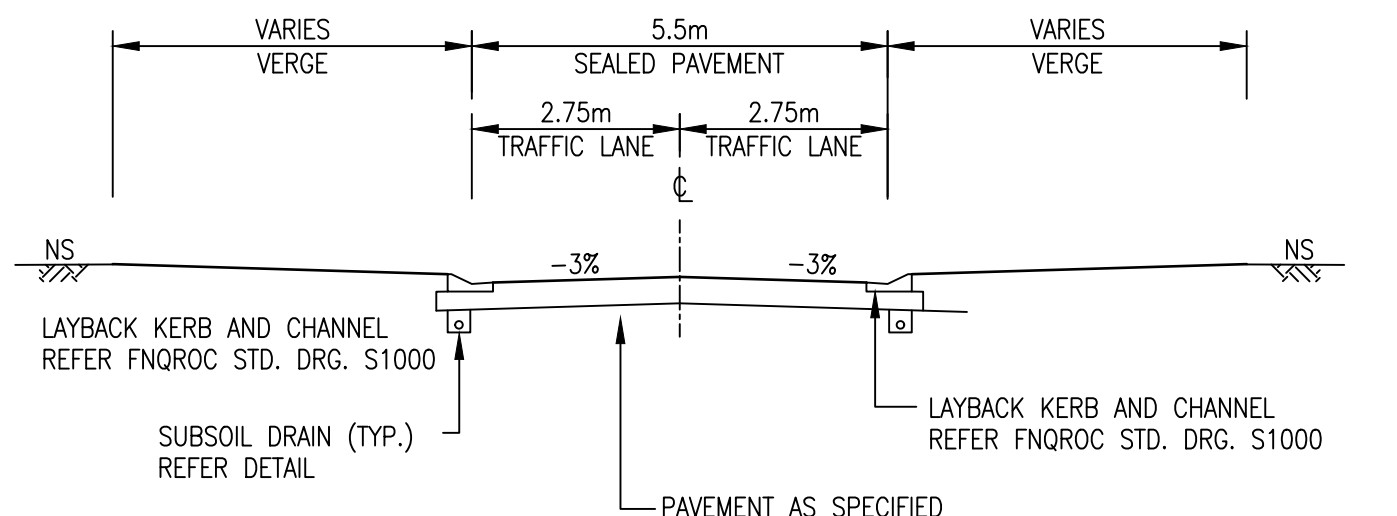
BAMABUBU STREET



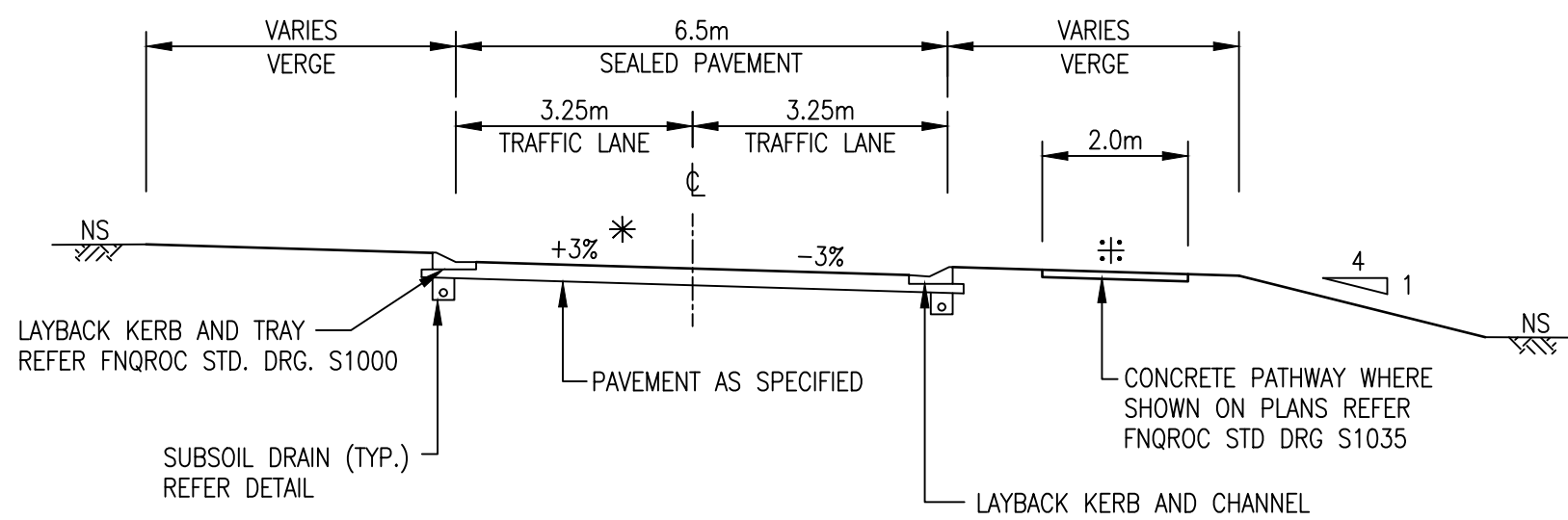
CH 114.371 - CH 225.000
CH 325.000 - CH 385.000
LUND STREET



KANKARR STREET (EAST)

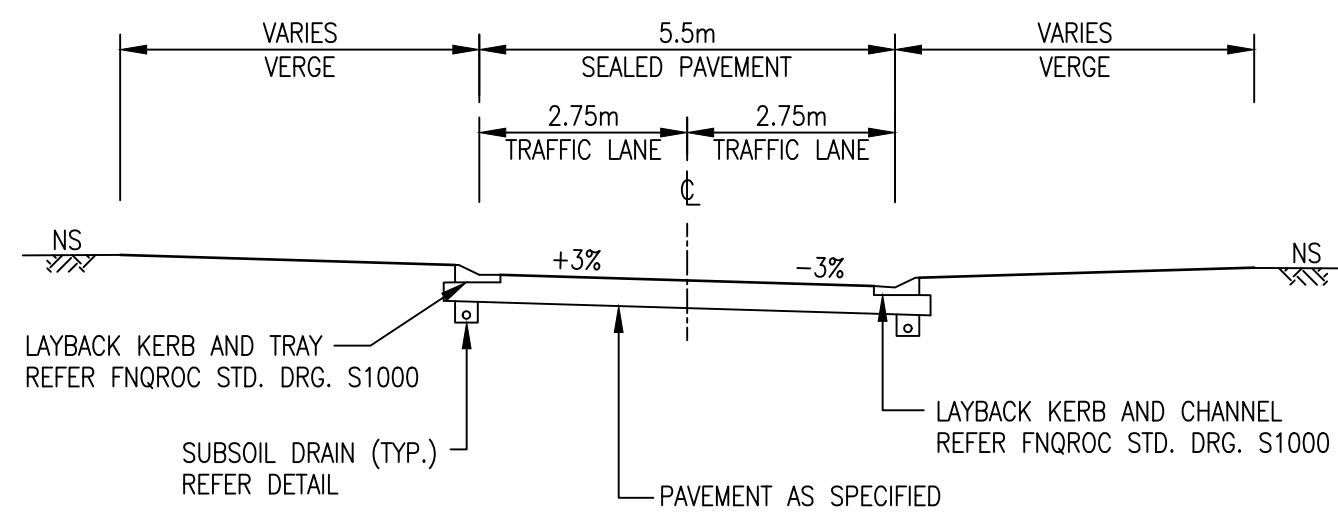


WALKARR CLOSE

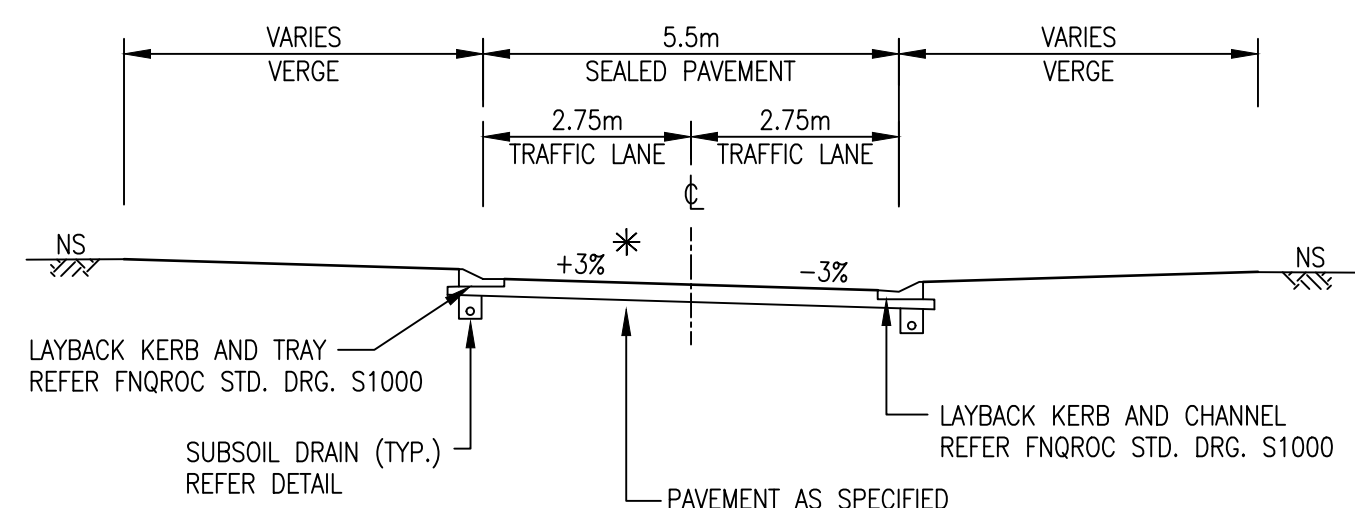


- * TRANSITION CROSSFALL -3% TO +3% FROM CH225 TO CH250.
- * TRANSITION CROSSFALL +3% TO -3% FROM CH300 TO CH325.

CH 250.000 - 300.000
LUND STREET

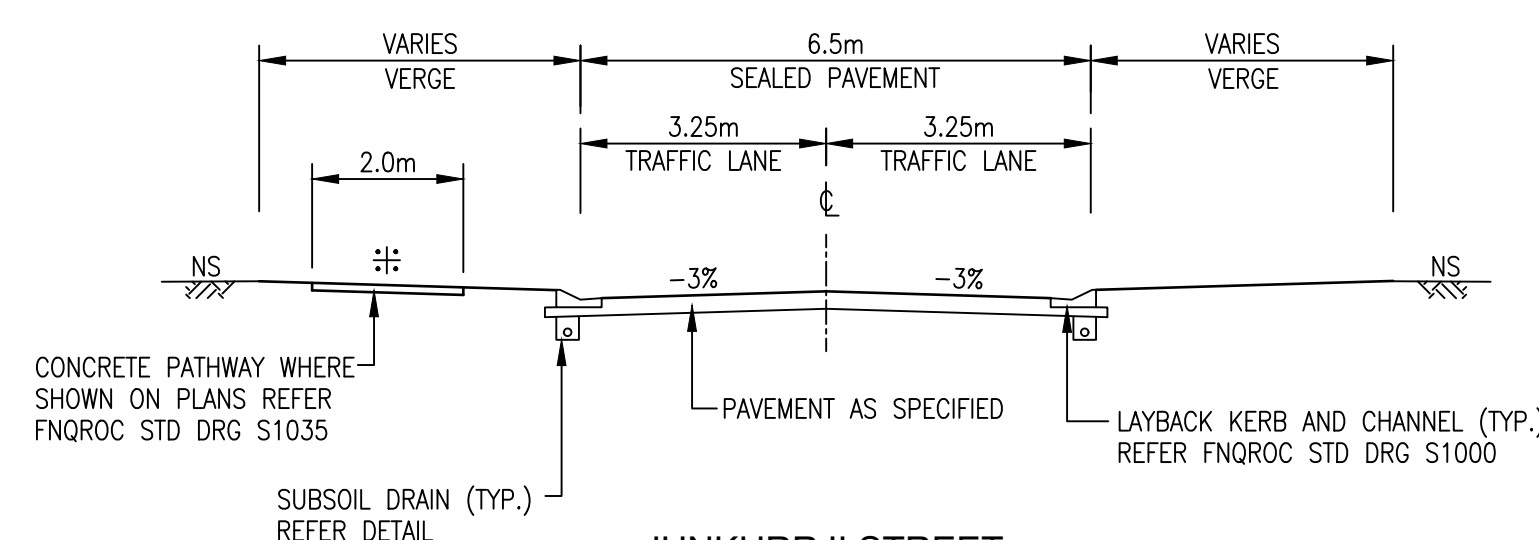


JANKAJI CLOSE
MANJAL CLOSE

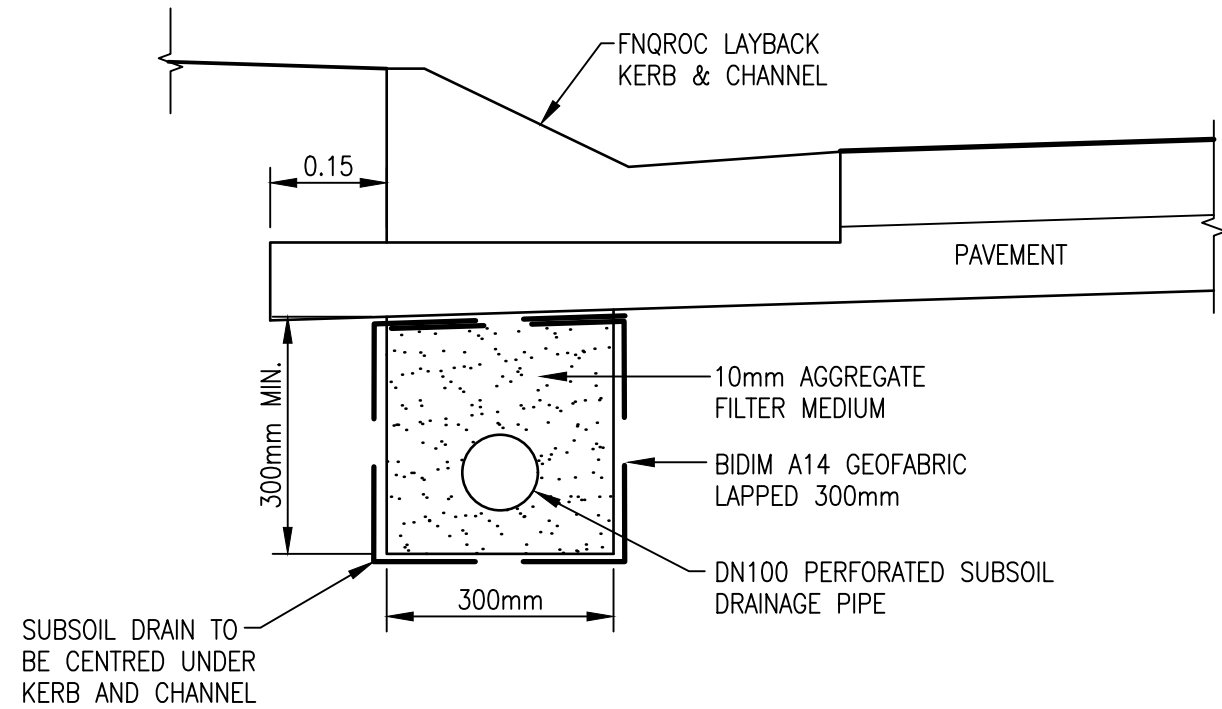


- * TRANSITION CROSSFALL -3% TO +3% FROM CH385 TO CH400

CH 385.000 - 400.000
LUND STREET



JUNKURRJI STREET



SUBSOIL DRAIN

SCALE 1:10

JUNKURRJI STREET CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	322891.067	8177620.489	10°01'34.28"			
TC 28.694	322896.063	8177648.744	10°01'34.28"			
37.740	322897.638	8177657.654		400.000	18.092	2°35'29.18"
CT 46.785	322899.614	8177666.482	12°37'03.46"			
TC 65.440	322903.689	8177664.687	12°37'03.46"			
76.509	322906.107	8177695.488		-1000.000	22.137	1°16'06.02"
CT 87.577	322908.285	8177706.341	11°20'57.44"			
117.503	322914.175	8177735.681	11°20'57.44"			

KANKARR STREET (WEST) CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	322906.044	8177695.501	280°58'43.48"			
69.643	322837.675	8177708.764	280°58'43.48"			

KANKARR STREET (EAST) CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	322906.045	8177695.500	100°58'27.00"			
44.062	322949.300	8177687.112	100°58'27.00"			

LUND STREET CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	322830.913	8177751.584	100°58'45.20"			
TC 69.077	322898.726	8177738.428	100°58'45.20"			
94.228	322923.438	8177733.634		-500.000	50.302	5°45'51.06"
CT 119.379	322948.506	8177731.346	95°12'54.14"			
137.031	322966.084	8177729.741	95°12'54.14"			
156.212	322985.188	8177727.997		-1000.000	38.362	2°11'52.82"
CT 175.393	323004.345	8177726.988	93°01'01.32"			
TC 205.454	323034.364	8177725.406	93°01'01.32"			
231.807	323060.719	8177724.017		400.500	52.706	7°32'24.70"
CC 258.160	323086.663	8177719.181	100°33'26.02"			
292.829	323120.831	8177712.813		400.500	69.338	9°55'10.46"
CC 327.498	323153.391	8177700.655	110°28'36.48"			
347.626	323172.784	8177693.413		-70.000	40.254	32°56'55.32"
CT 367.753	323192.996	8177697.884	77°31'41.16"			
408.646	323232.925	8177706.715	77°31'41.16"			

JANKAJI CLOSE CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	323012.758	8177726.544	354°34'33.02"			
35.842	323009.370	8177762.226	354°34'33.02"			

MANJAL CLOSE CONTROL LINE SETOUT

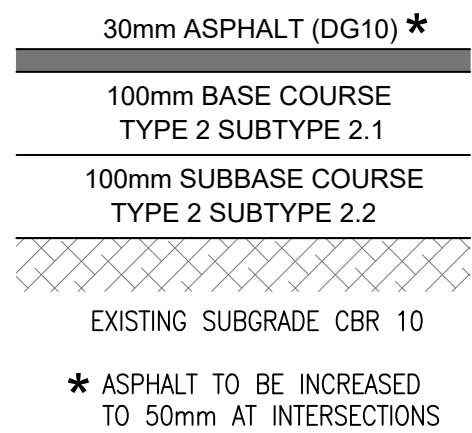
CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	323086.663	8177719.181	358°29'19.42"			
36.876	323085.691	8177756.044	358°29'19.42"			

WALKARR CLOSE CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	323161.765	8177698.112	6°19'15.02"			
40.258	323166.198	8177738.125	6°19'15.02"			

BAMABUBU STREET CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEF. ANGLE
0.000	323199.349	8177663.863	350°33'18.93"			
34.640	323193.665	8177698.033	350°33'18.93"			



- * ASPHALT TO BE INCREASED TO 50mm AT INTERSECTIONS

PAVEMENT DETAILS

NOT TO SCALE

NOTES

- CONCRETE PATHWAYS TO HAVE MAX. CROSSFALL OF 2.5% IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL. VERGE PROFILE MAY NEED TO BE STEEPENED LOCALLY TO FACILITATE FOOTPATH CROSSFALL.



Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM

- Printed: 06 December 2017, 11:27 AM

- Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM

Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM



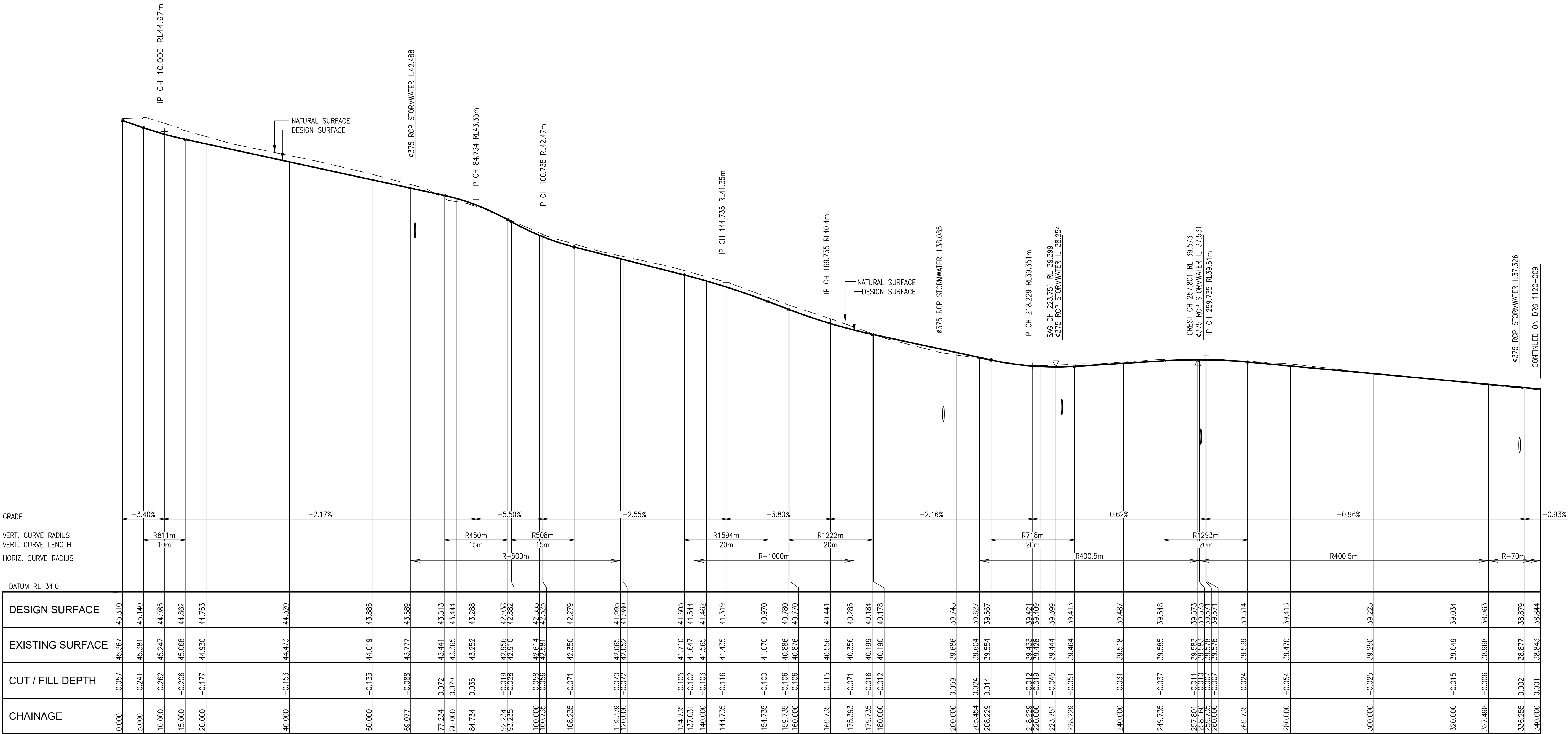
Printed: 06 December 2017, 11:27 AM



Printed: 06 December 2017, 11:27 AM

Printed: 06 December 2017, 11:27 AM

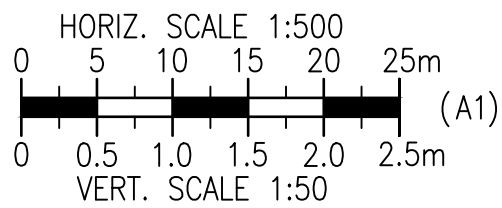
Printed: 06 December 2017, 11:27 AM



LUND STREET LONGITUDINAL SECTION

SCALE 1:500 HOR 1:50 VERT

Revisions					
B	OPERATIONAL WORKS ISSUE	-	-	07/12/17	
A	PRELIMINARY ISSUE	-	-	17/08/17	
No.	Description	Reviewed	Approved	Date	



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

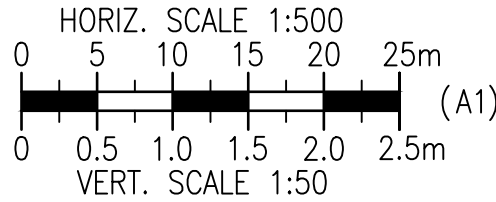


Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
AS SHOWN		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		ROAD LONGITUDINAL SECTION - SHEET 2 OF 3	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
			1020-008
			Revision
			B

Revisions					
B	OPERATIONAL WORKS ISSUE	-	-	07/12/17	
A	PRELIMINARY ISSUE	-	-	17/08/17	
No.	Description	Reviewed	Approved	Date	



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

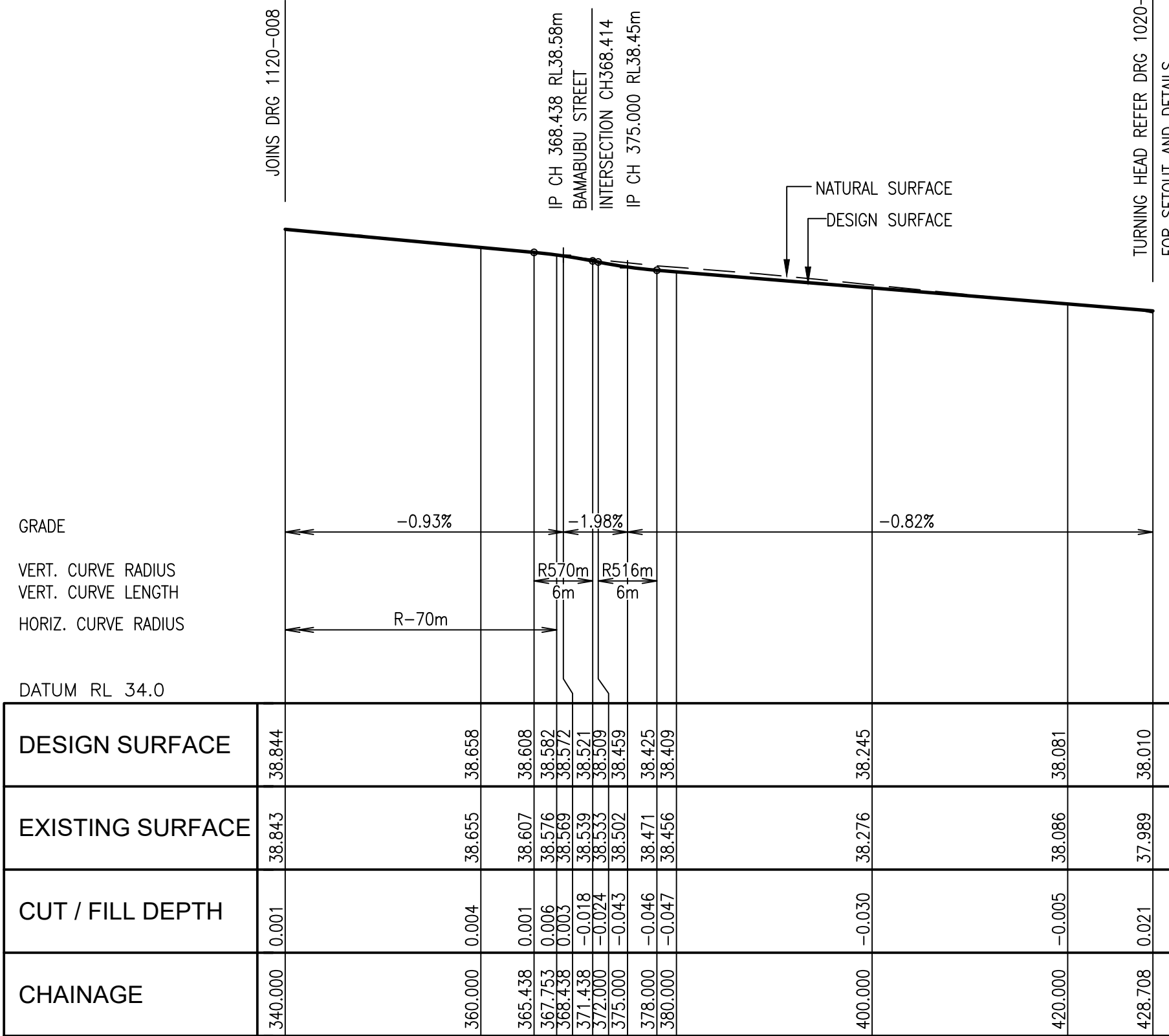


Trinity Engineering and Consulting

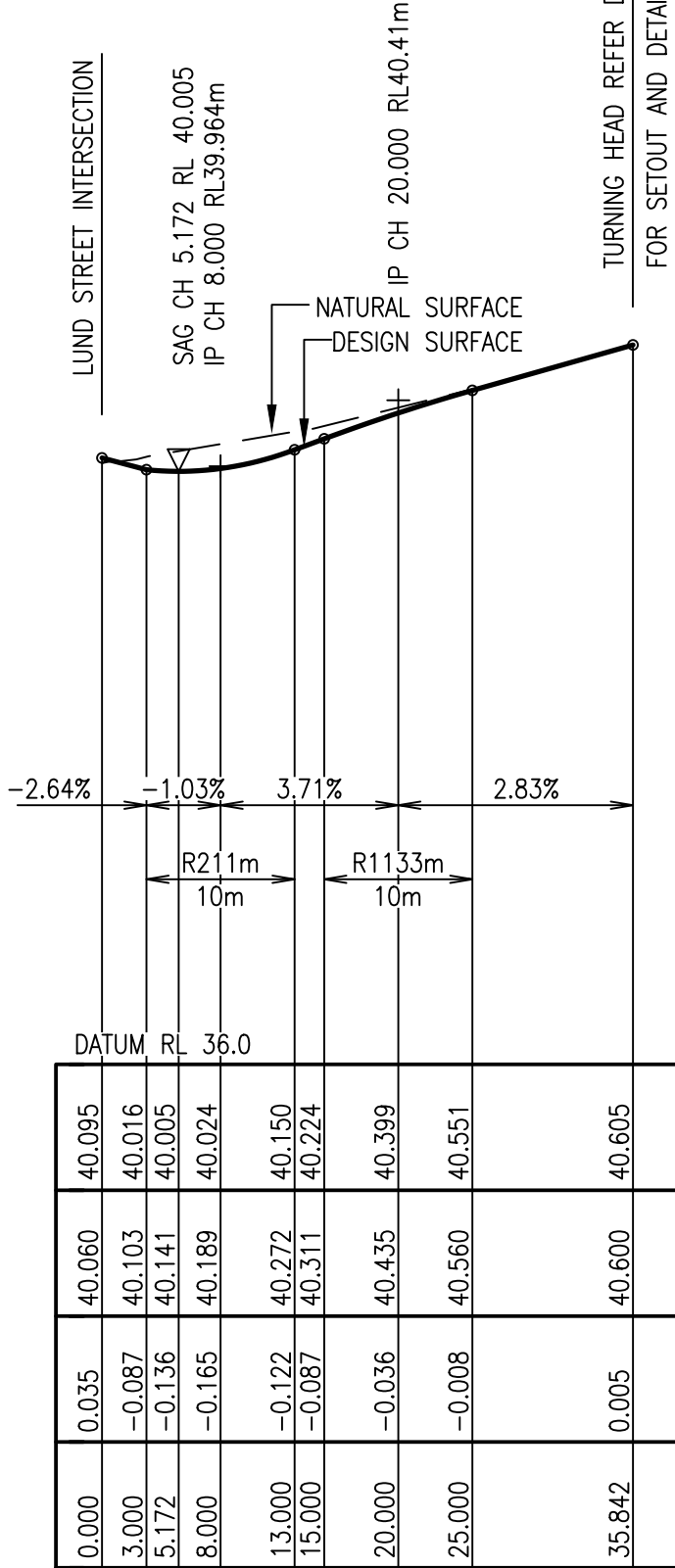
Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

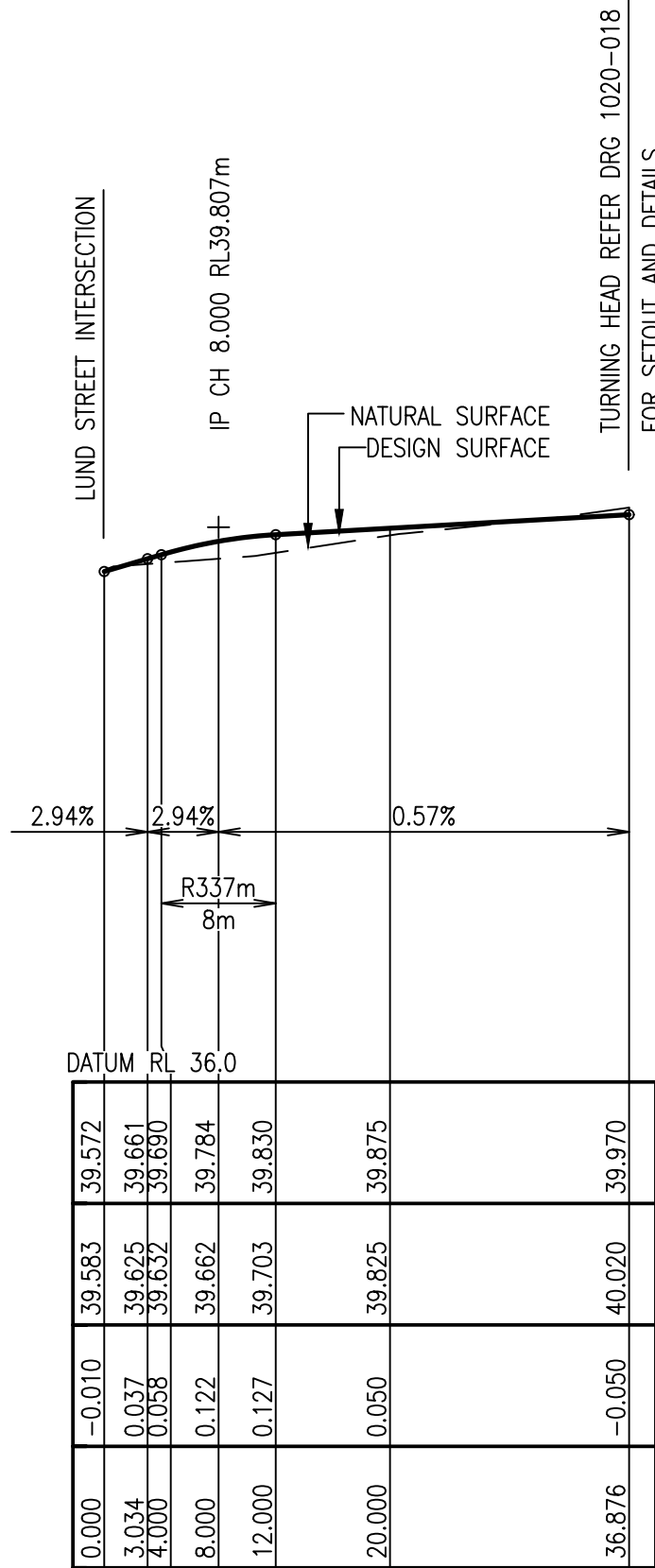
Scale (A1 size)		Client						
1:500 HOR 1:50 VERT		Project						
Drawing is not to be used for construction unless approved.		Title						
		Road Longitudinal Section - Sheet 3 of 3						
Drawn	Designed	Drawing Check	Design Check	Approved	RPEQ	Date	Drawing No.	Revision
MS	MS						1120-009	B



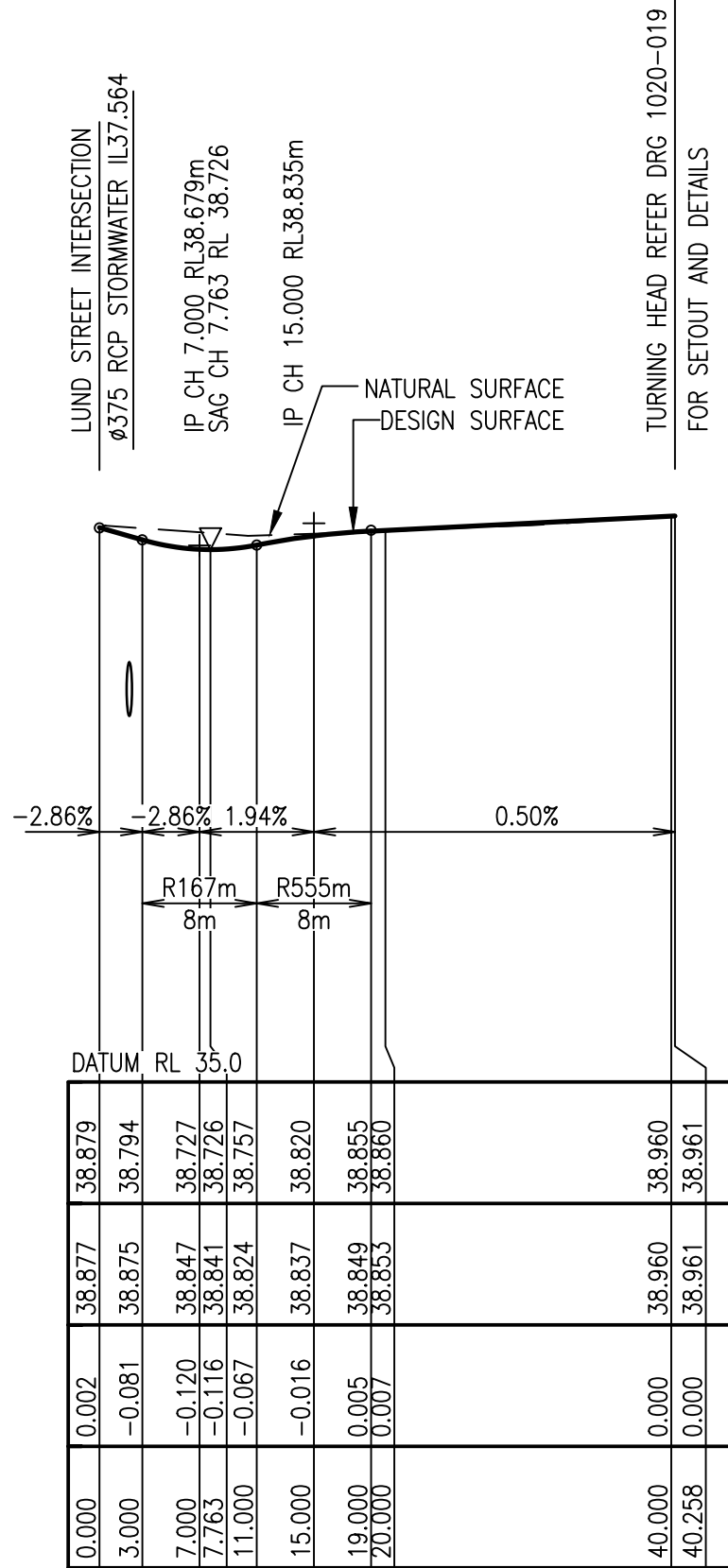
LUND STREET (CH340.000 - END)
SCALE 1:500 HOR 1:50 VERT



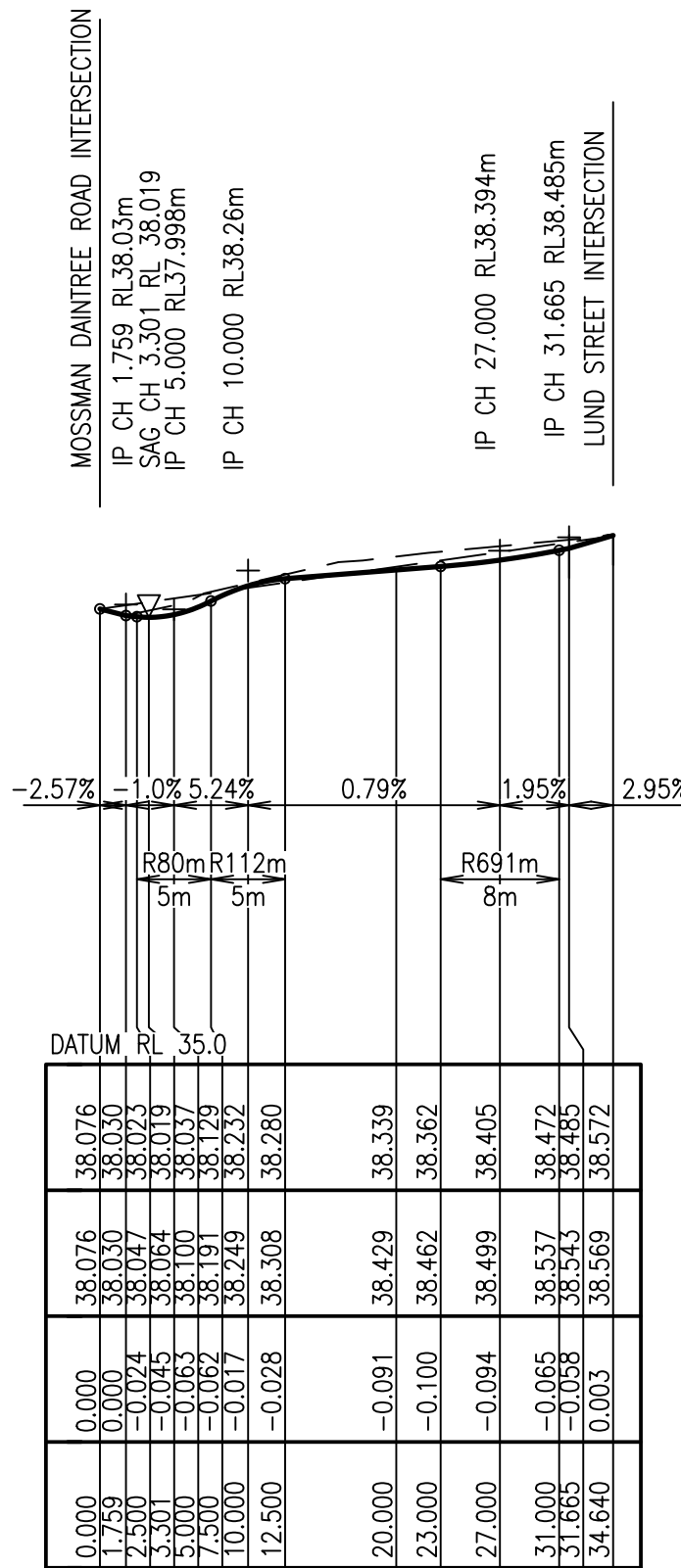
JANKAJI CLOSE
SCALE 1:500 HOR 1:50 VERT



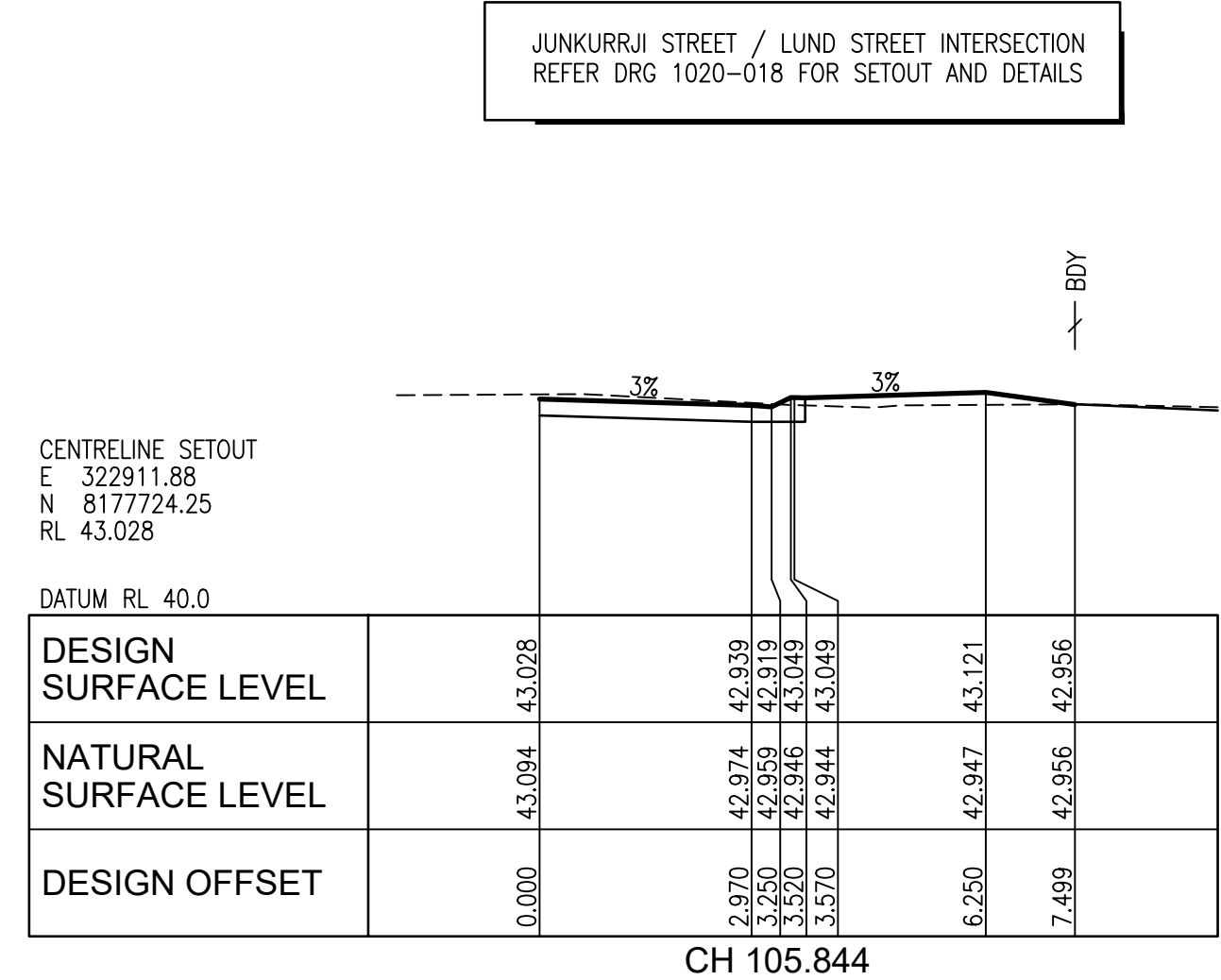
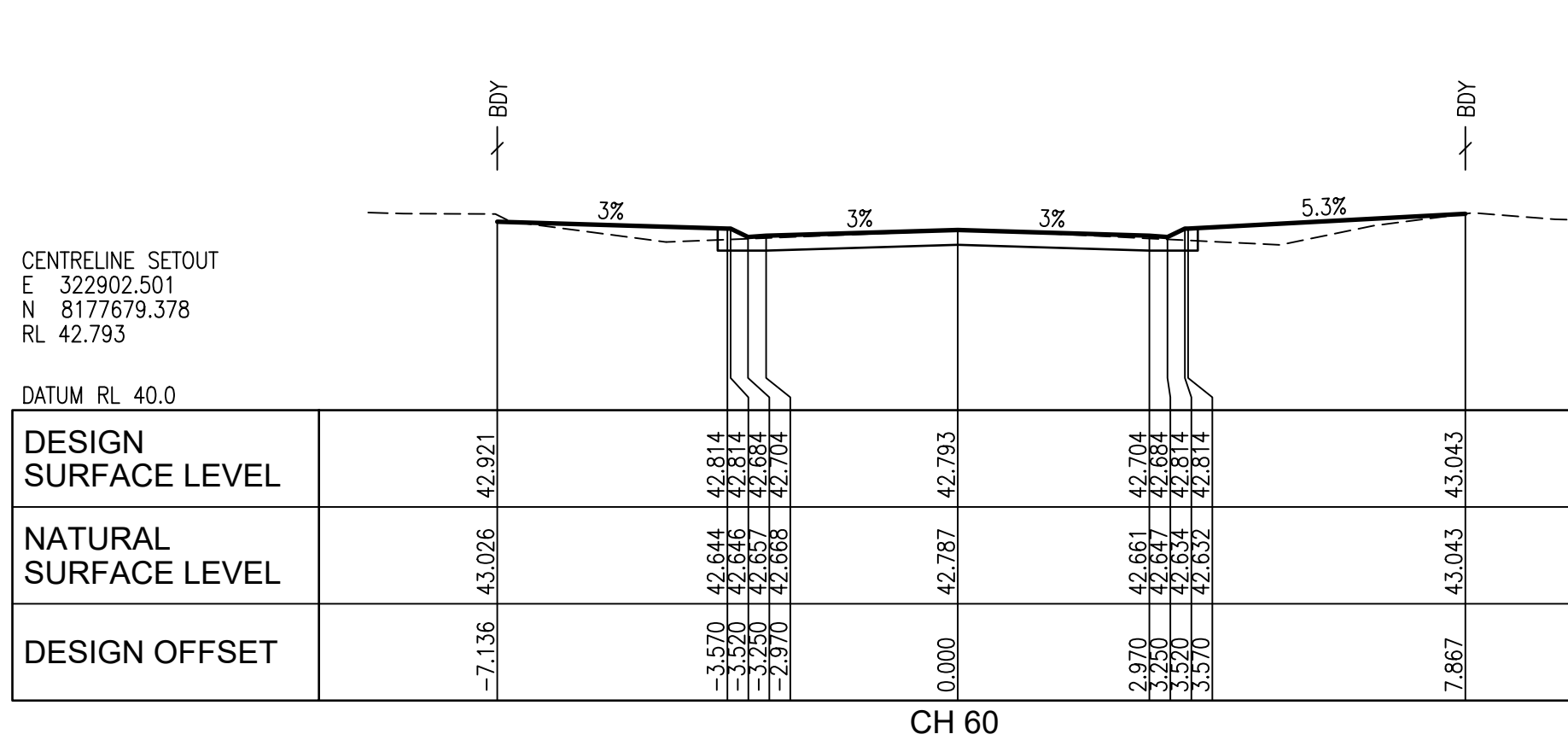
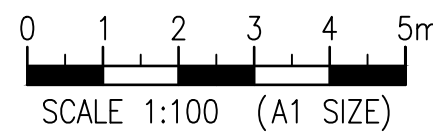
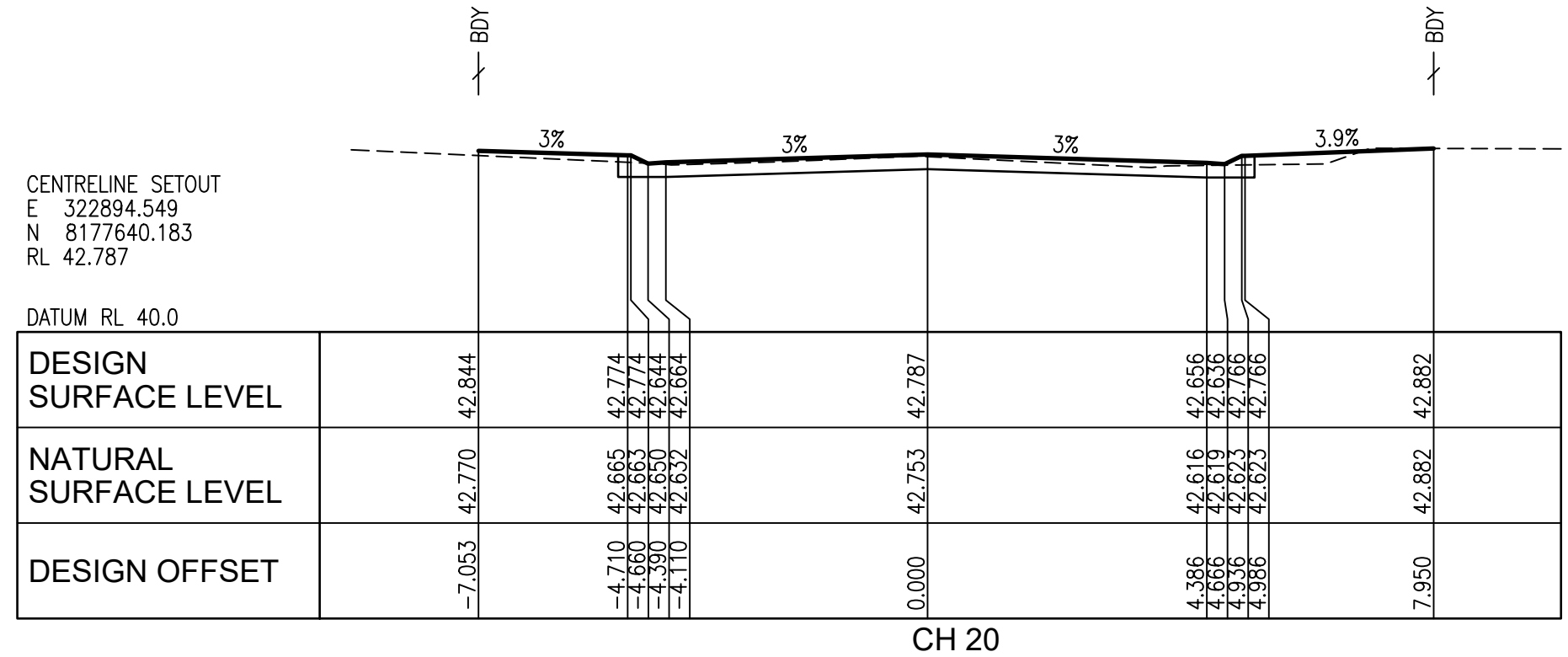
MANJAL CLOSE
SCALE 1:500 HOR 1:50 VERT



WALKARR CLOSE
SCALE 1:500 HOR 1:50 VERT



BAMABUBU STREET
SCALE 1:500 HOR 1:50 VERT



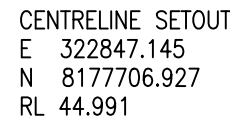
Revisions					
	B	OPERATIONAL WORKS ISSUE	-	-	07/12/17
	A	PRELIMINARY ISSUE	-	-	17/08/17
	No.	Description	Reviewed	Approved	Date

© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

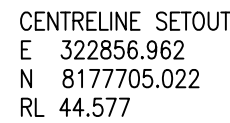


Scale (A1 size) 1:100		Client DATSIP															
		Project MOSSMAN GORGE INFRASTRUCTURE UPGRADES															
Drawing is not to be used for construction unless approved.		Title JUNKURRJI STREET ANNOTATED CROSS SECTIONS															
		Drawn MS		Designed MS		Drawing Check		Design Check		Approved		RPEQ		Date		Drawing No. 1020-010	



DATUM RL 43.0									
DESIGN SURFACE LEVEL		44.928							
NATURAL SURFACE LEVEL		44.928							
DESIGN OFFSET		-7.500							

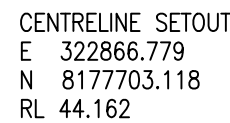
CH 60



DATUM RL 43.0						
DESIGN SURFACE LEVEL		44.644		44.613	44.583	44.577
NATURAL SURFACE LEVEL		44.644		44.504	44.513	44.607
DESIGN OFFSET		-7.499		-3.070	-2.730	0.000

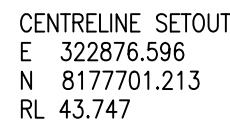
CH 50

REFER DRG 1020-017 FOR SETOUT AND DETAILS

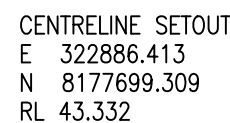


DATUM RL 42.0		
DESIGN SURFACE LEVEL	44.193	44.198
NATURAL SURFACE LEVEL	44.193	44.160
DESIGN OFFSET	-7.499	0.000

CH 40

[illegible]

CH 30



DATUM RL 41.0					
DESIGN SURFACE LEVEL					
NATURAL SURFACE LEVEL					
DESIGN OFFSET	-7.499	43.443	43.443	43.332	43.677

CH 20

KANKARR WEST



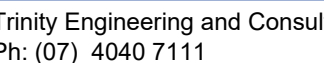
CENTRELINE SETOUT
E 322837.716
N 8177708.756
RL 45.39

CH 69.605



Consulting Pty Ltd
ABN 78 610 181 130

of Trinity Engineering
and Consulting Pty Ltd.



Trinity Engineering and Consulting

Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870

Scale (A1 size)

1:10C

construction unless approved.

[illegible][illegible]

AIN

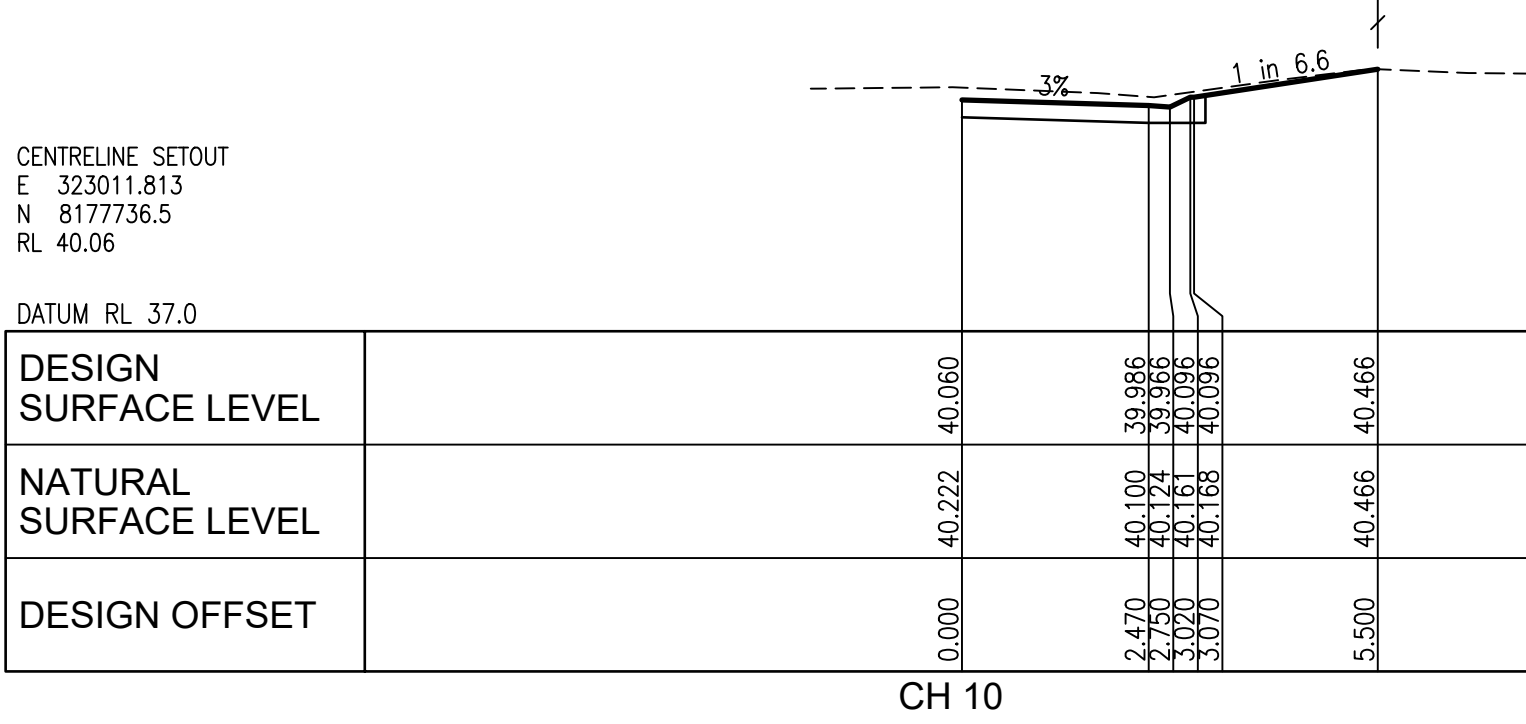
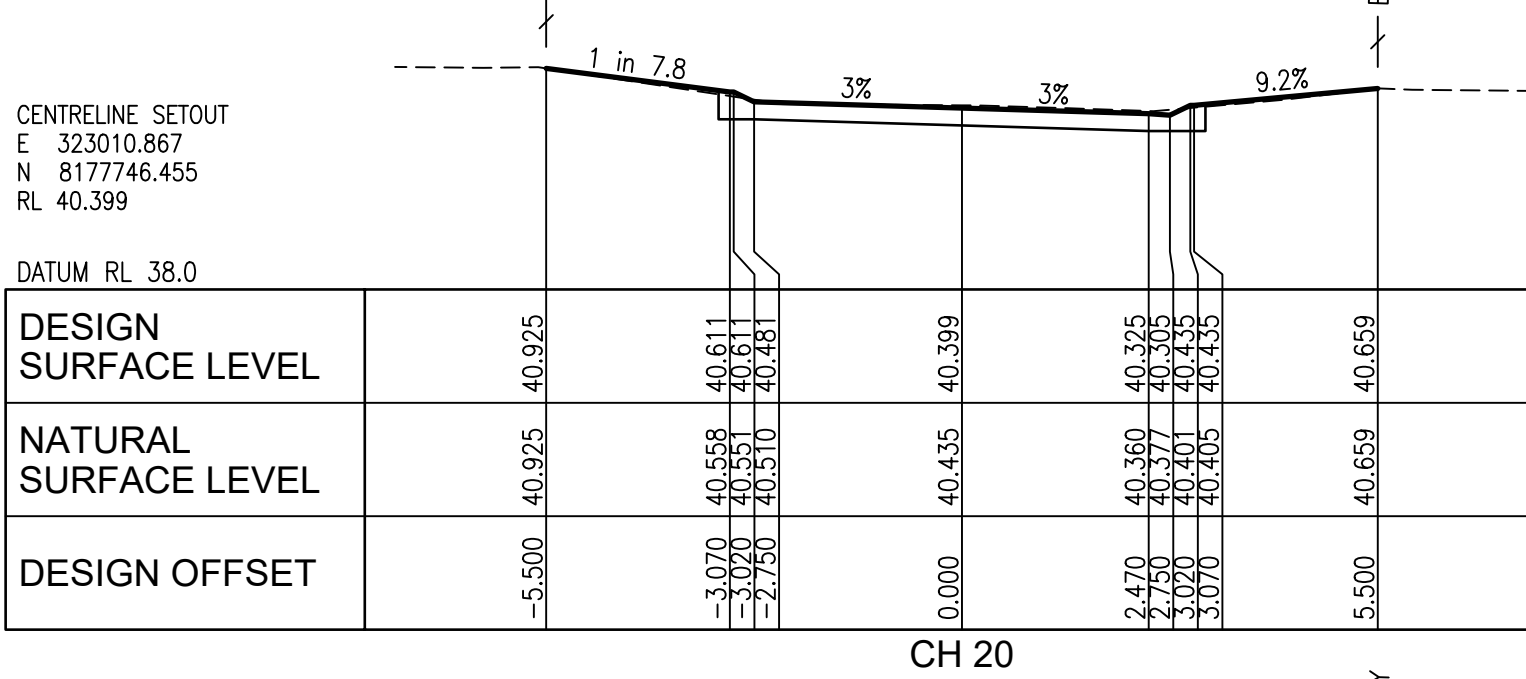
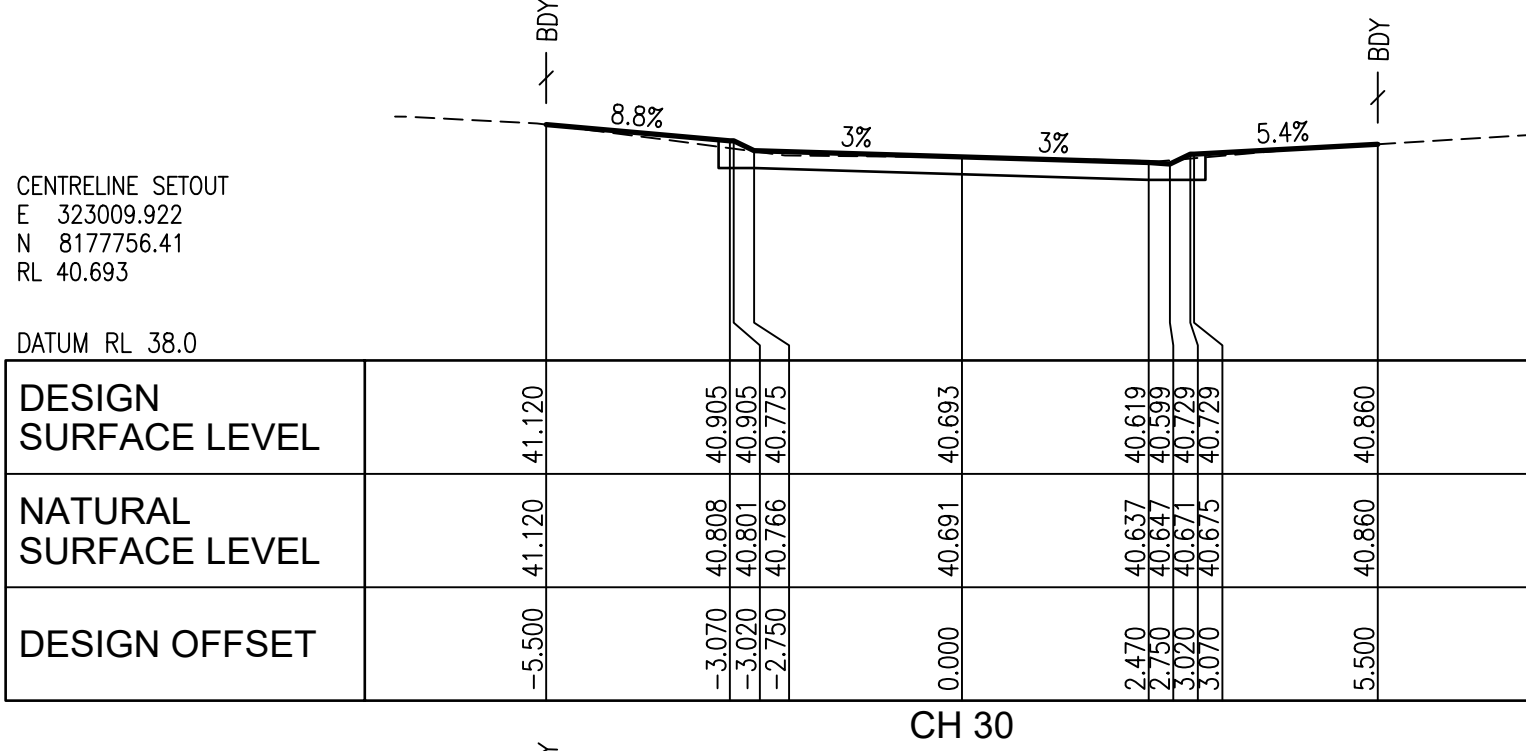
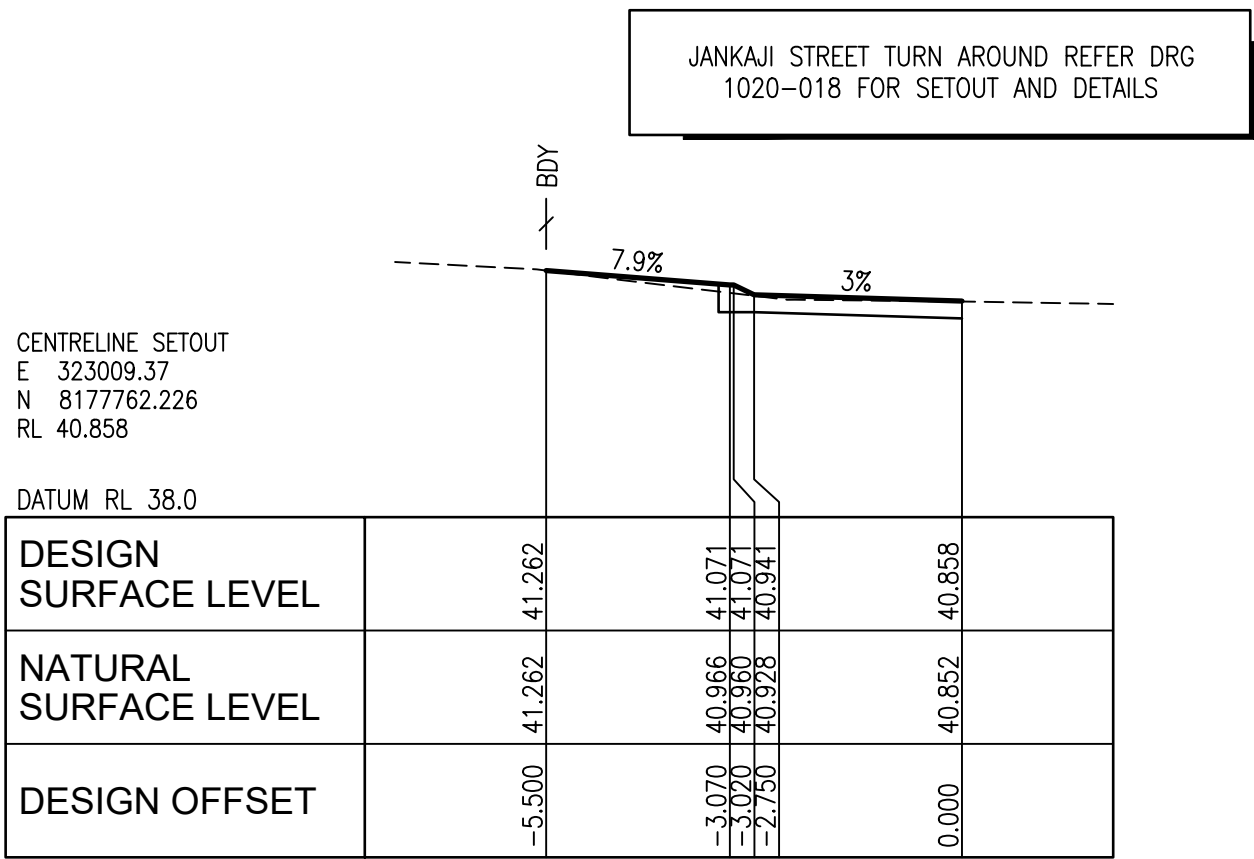
DATA

CRC

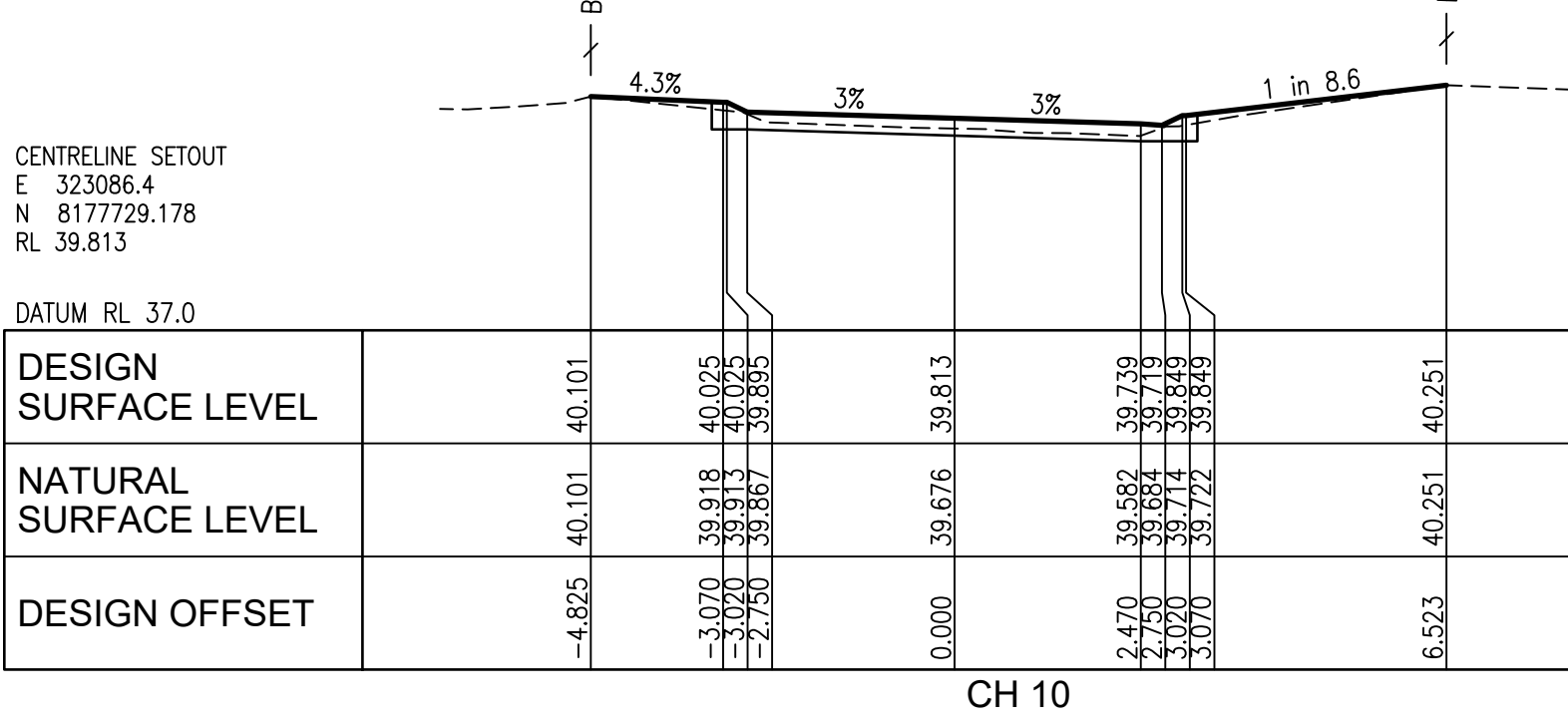
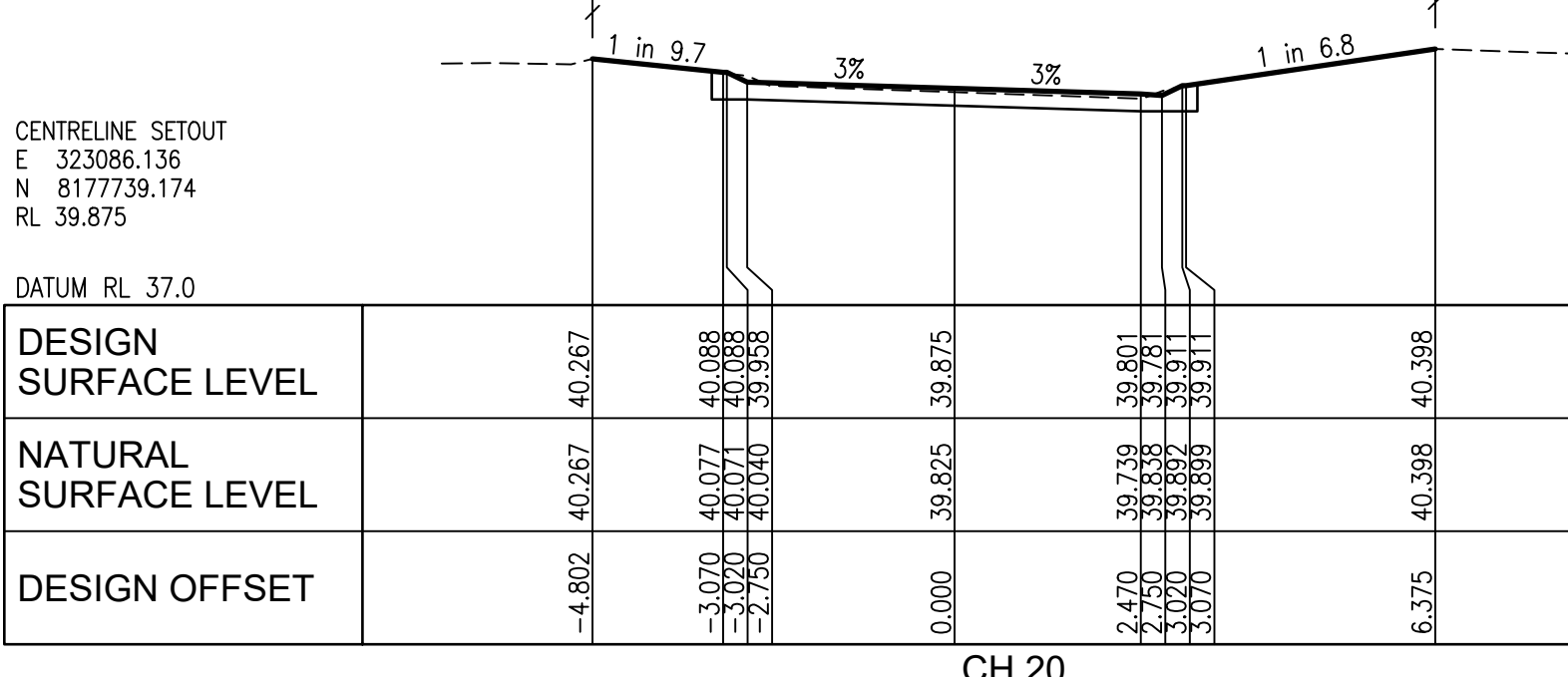
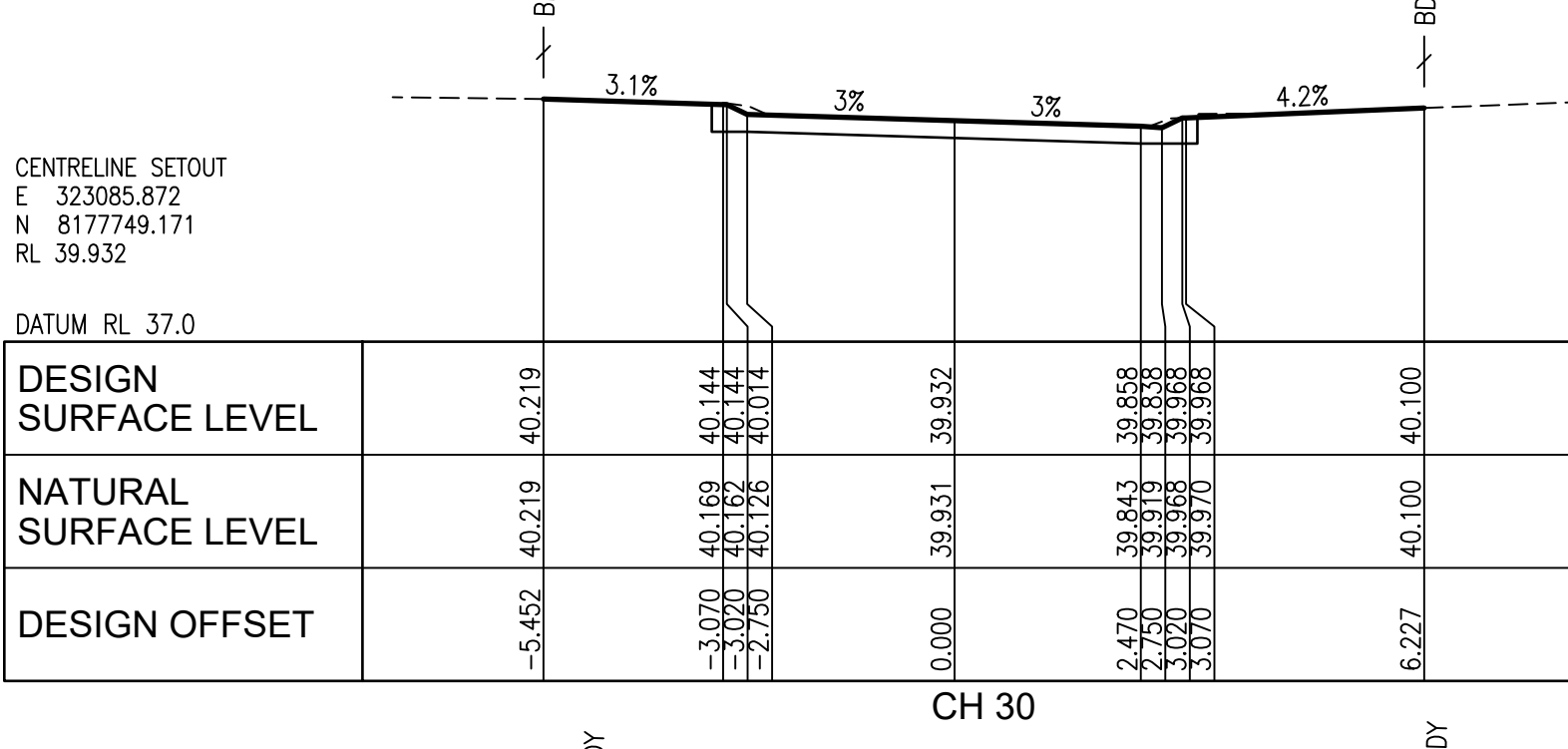
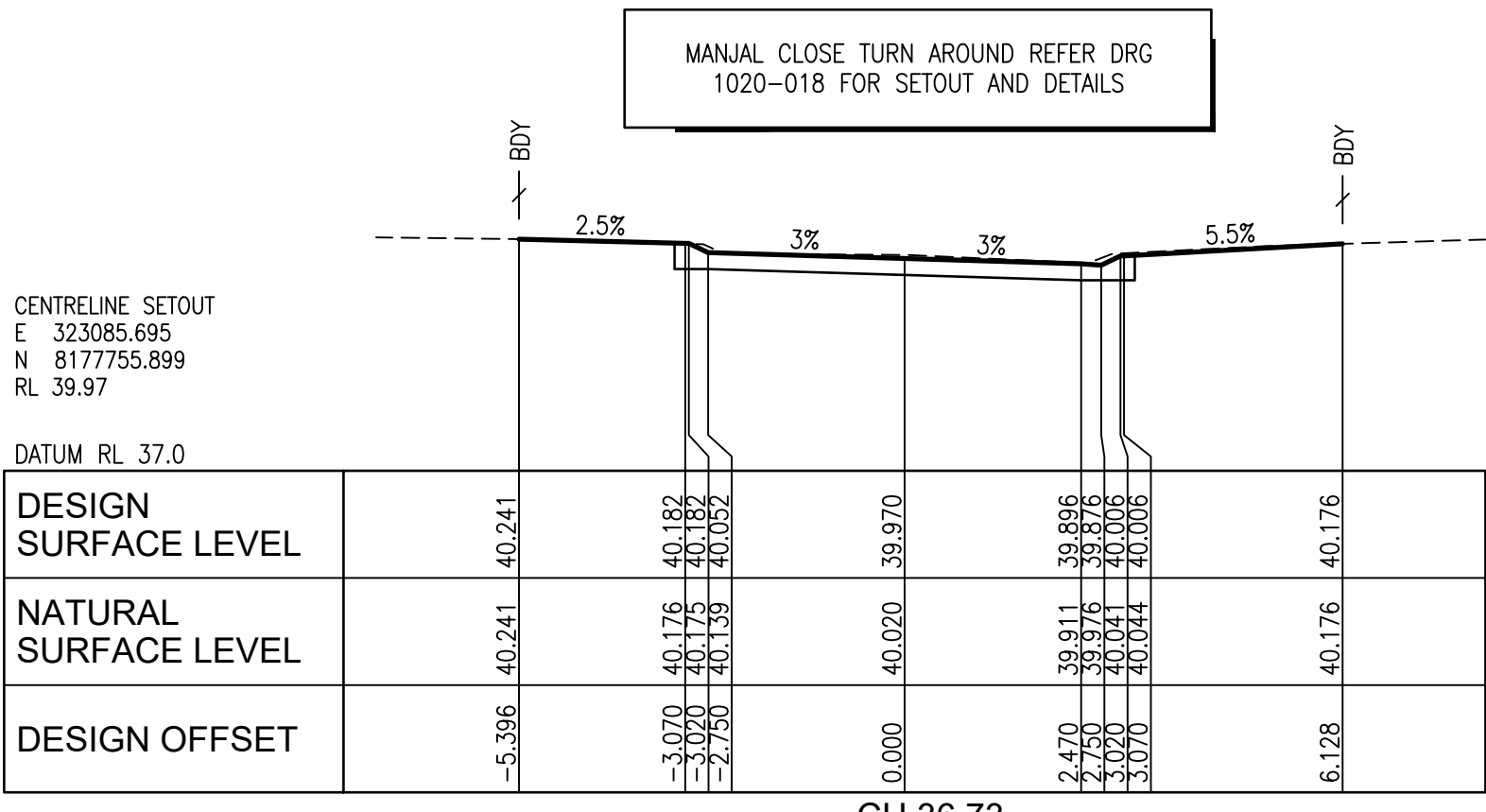
5 SEC

ONS

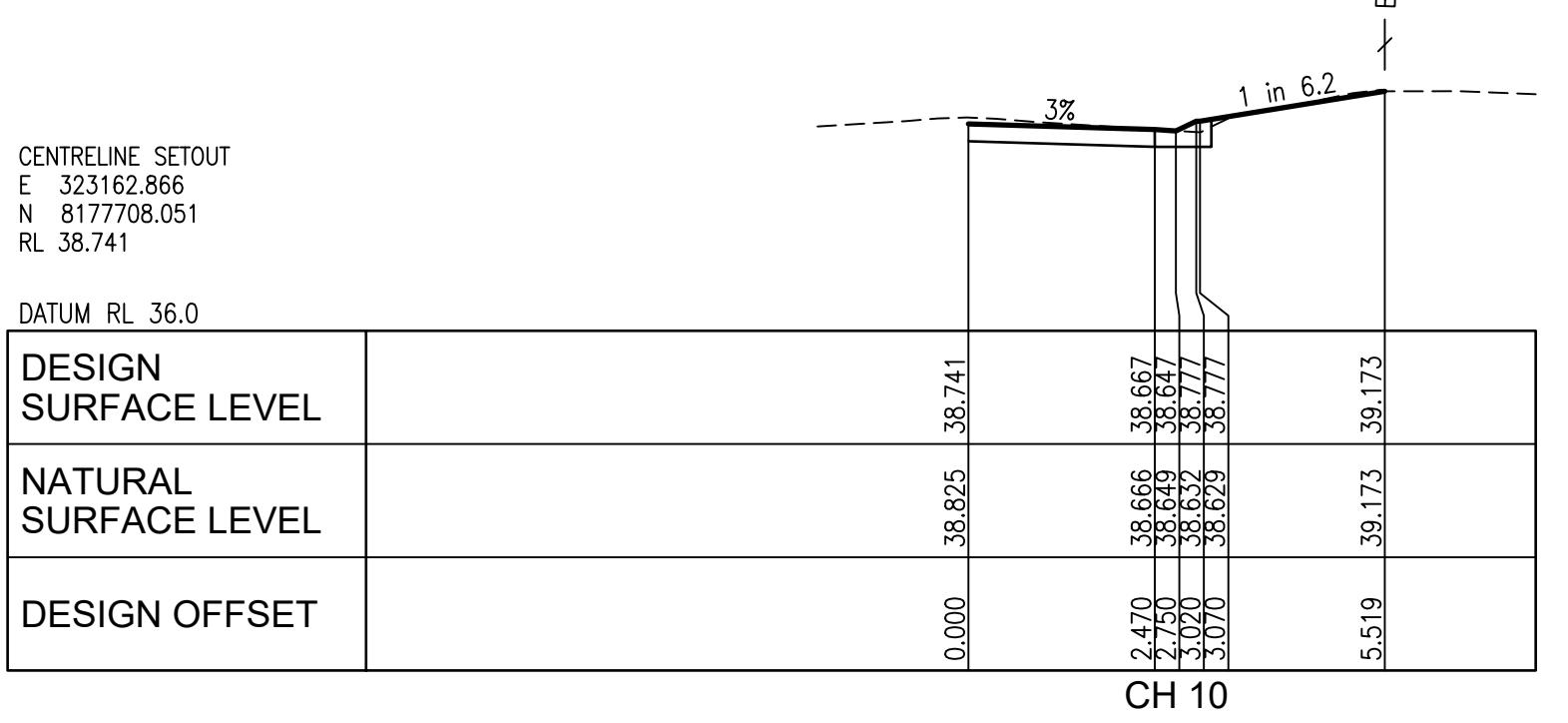
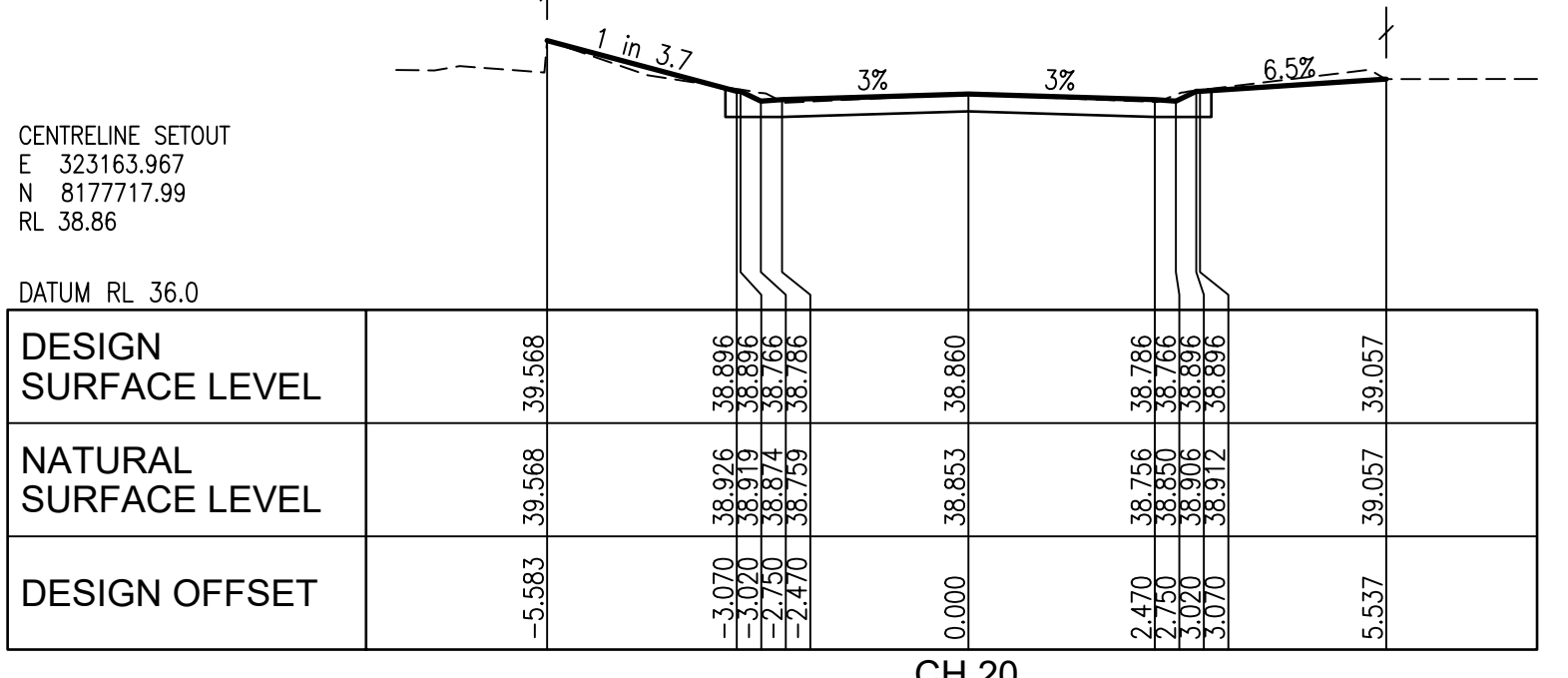
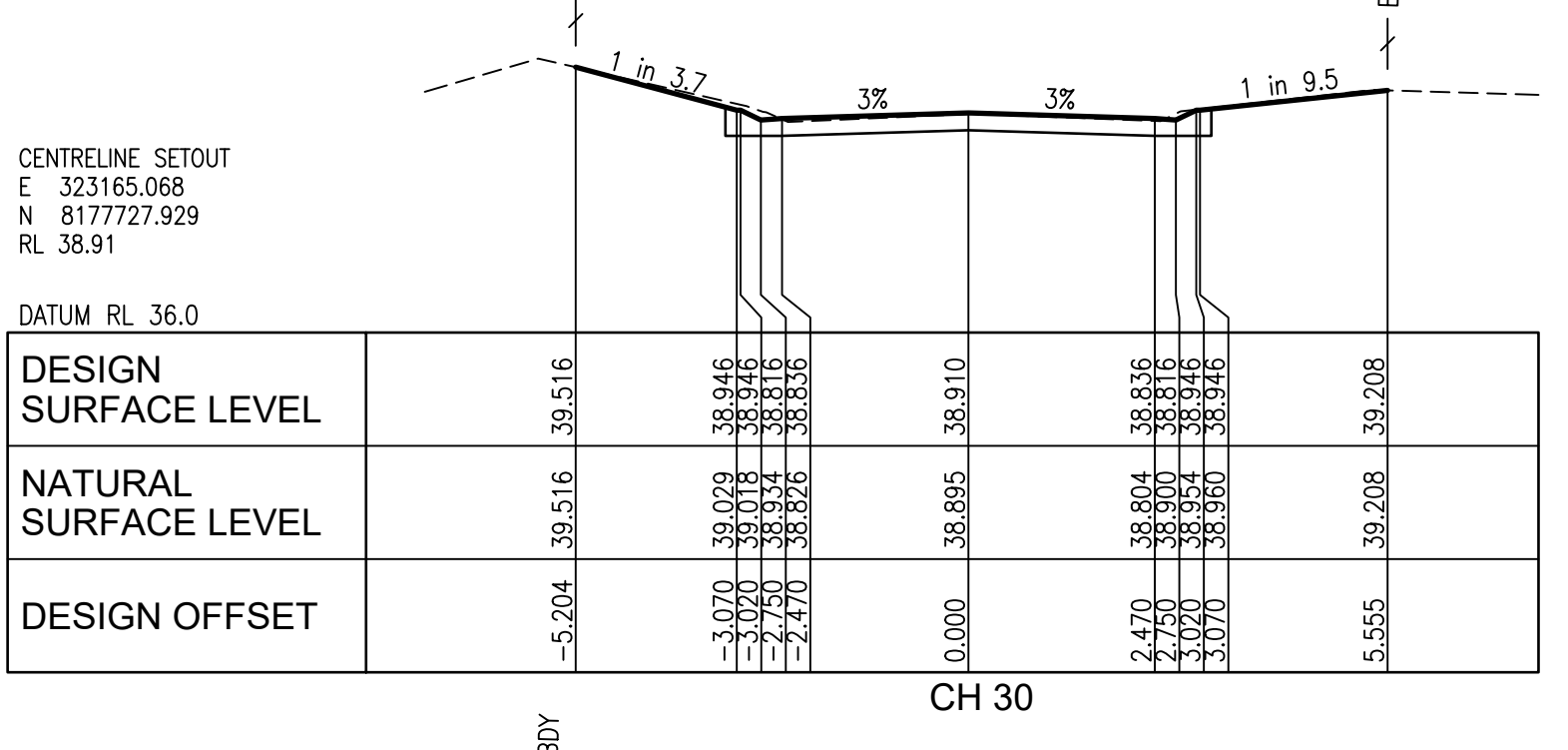
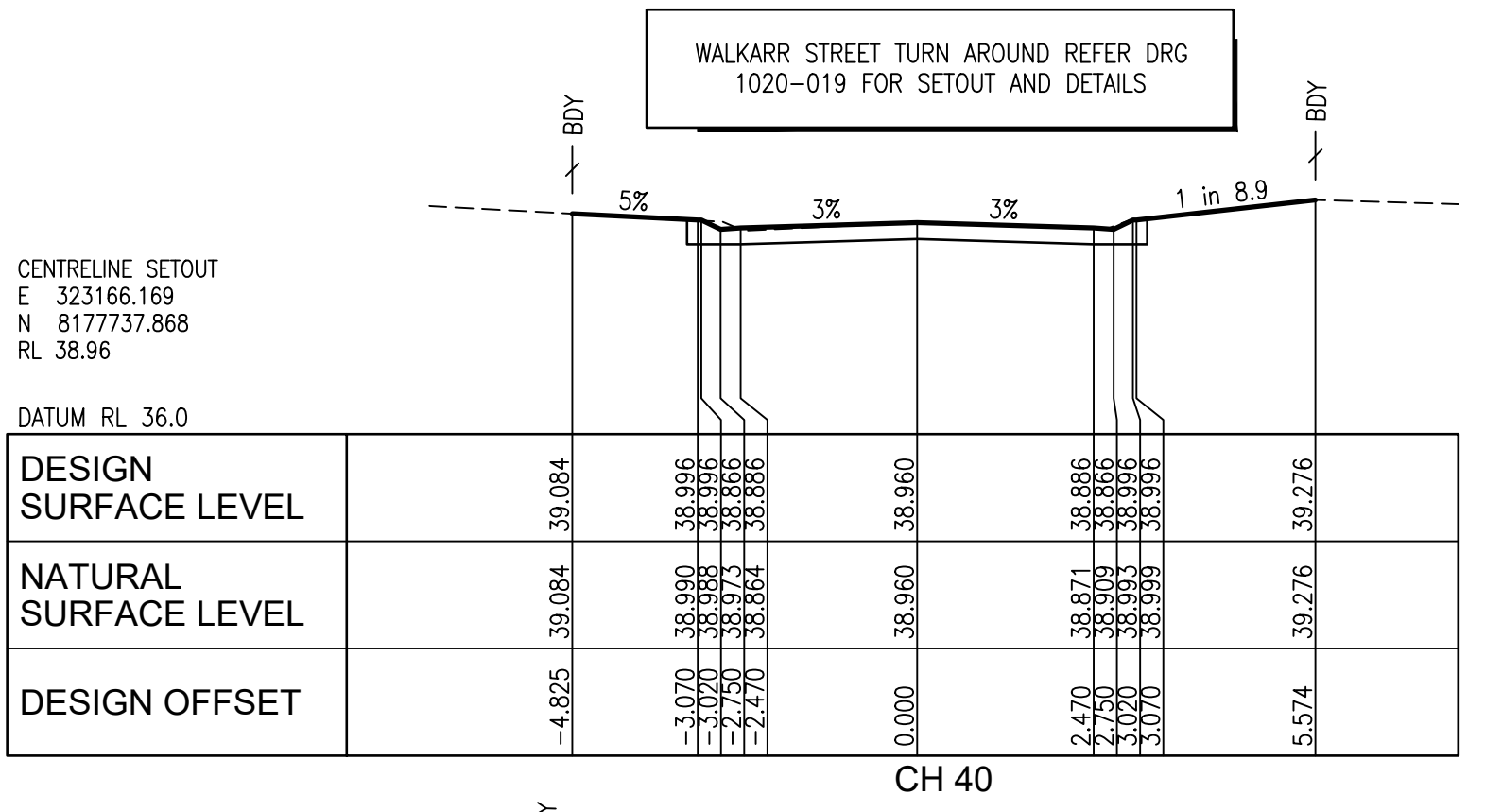
rawing No.
1020-011



JANKAJI CLOSE

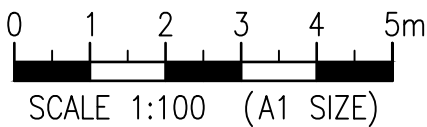


MANJAL CLOSE



WALKARR CLOSE

Revisions			
No.	Description	Reviewed	Approved
B	OPERATIONAL WORKS ISSUE	-	-
A	PRELIMINARY ISSUE	-	-
Date		Date	
07/12/17		17/08/17	



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111
www.trinityengineering.com.au

Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:100		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		JANKAJI CLOSE, MANJAL CLOSE AND WALKARR CLOSE ANNOTATED CROSS SECTIONS	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
		5.519	1020-015
		Revision	B

LUND STREET / BAMA BUBU STREET INTERSECTION
REFER DRG 1020-019 FOR SETOUT AND DETAILS

CENTRELINE SETOUT
E 323195.49
N 8177687.064
RL 38.328

DATUM RL 36.0

DESIGN SURFACE LEVEL		38.428	38.428	
NATURAL SURFACE LEVEL		38.467	38.467	38.439
DESIGN OFFSET	0.000		38.467	38.439

CH 23.52

CENTRELINE SETOUT
E 323196.067
N 8177683.592
RL 38.311

DATUM RL 35.0

[illegible]

CH 20

CENTRELINE SETOUT
E 323197.708
N 8177673.727
RL 38.23

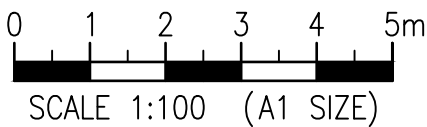
DATUM RL 35.0

[illegible]

CH 10

MOSSMAN GORGE ROAD / BAMA BUBU STREET
INTERSECTION REFER DRG 1020-019 FOR
SETOUT AND DETAILS

Revisions				
	B	OPERATIONAL WORKS ISSUE	-	-
A	PRELIMINARY ISSUE	-	-	17/08/17
No.	Description	Reviewed	Approved	Date



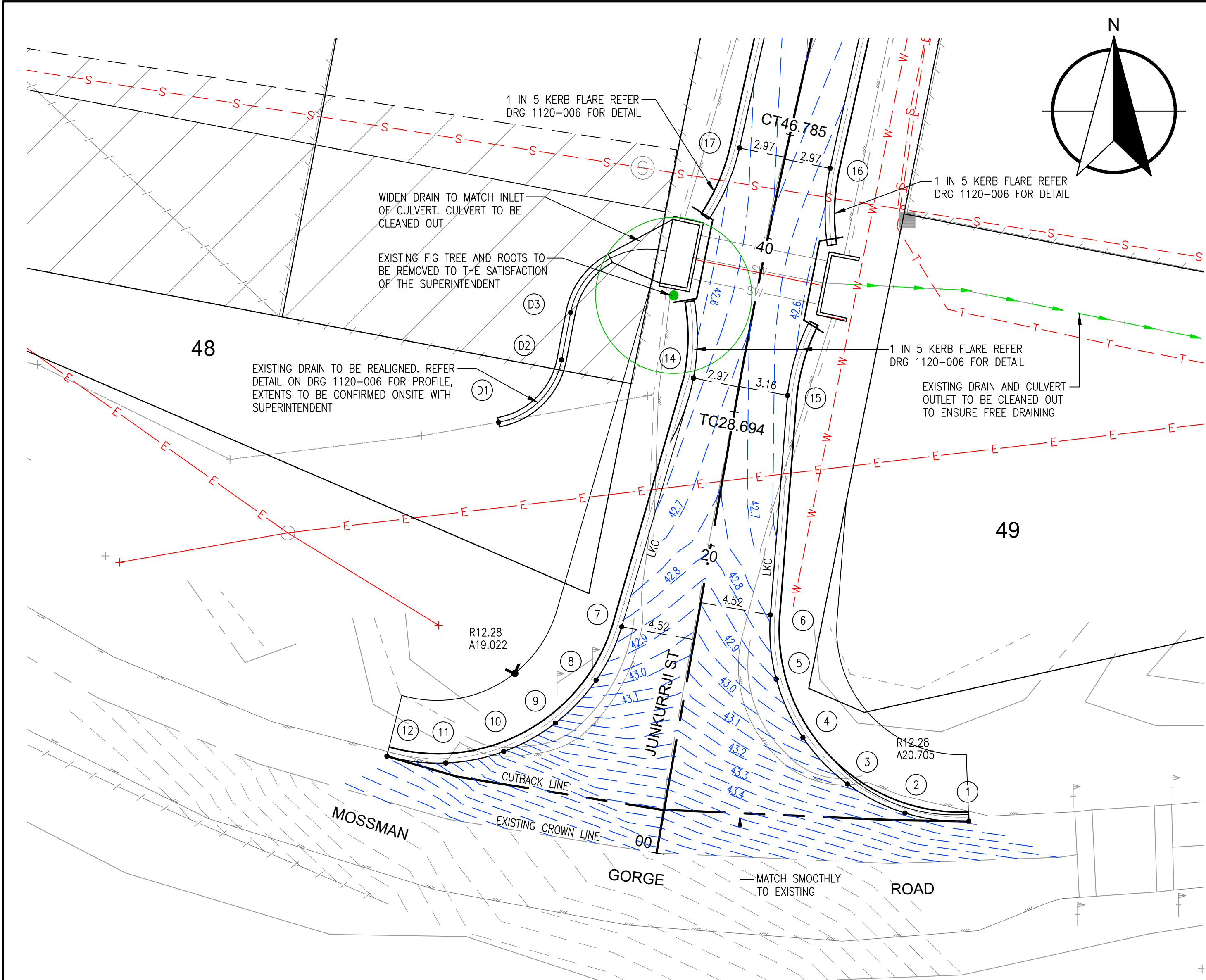
© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



Trinity Engineering and Consulting Pty Ltd Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

Scale (A1 size)		<div>Client</div> <div>DATSIP</div>						
1:100		<div>Project</div> <div>MOSSMAN GORGE INFRASTRUCTURE UPGRADES</div>						
<div>Drawing is not to be used for construction unless approved.</div>		<div>Title</div> <div>BAMA BUBU STREET ANNOTATED CROSS SECTIONS</div>						
Drawn	Designed	Drawing Check	Design Check	Approved	RPEQ	Date	Drawing No.	Revision
MS	MS						1020-016	B



MOSSMAN GORGE ROAD / JUNKURRJI STREET INTERSECTION
SCALE 1:200

LEGEND

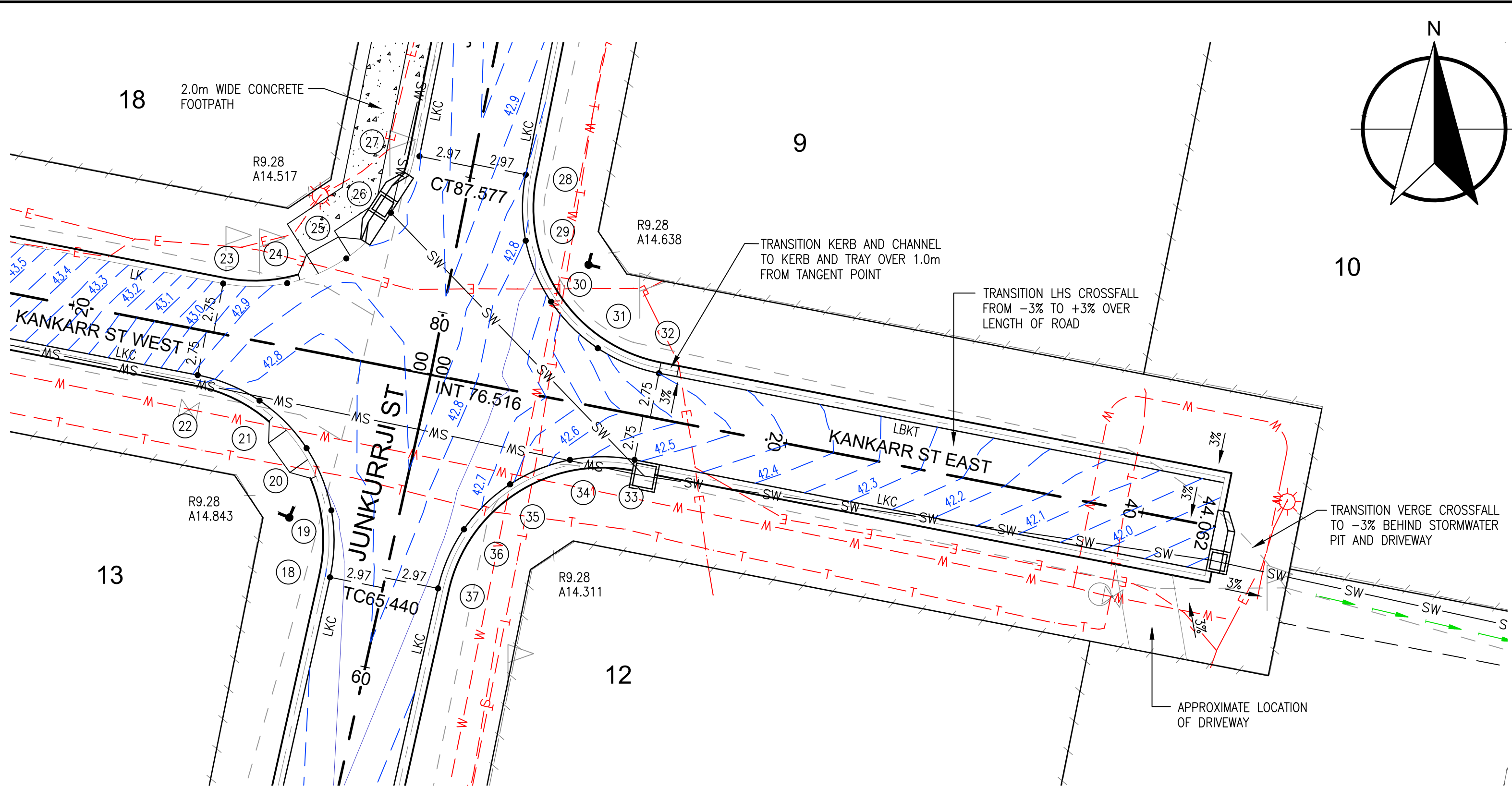
	LAYBACK KERB AND CHANNEL
	LAYBACK KERB
	LAYBACK KERB AND TRAY
	DESIGN SURFACE CONTOUR (0.1m INTERVAL)
	KERB LEVEL
	RADIUS
	ARC LENGTH
	OFFSET FROM ROAD CENTRELINE
	ROAD CHAINAGE
	KERB SETOUT POINT
	STREET SIGN
	2m WIDE CONCRETE FOOTPATH (REFER NOTE 8)
	KERB RAMP
	ACCESS CROSSOVER

NOTES

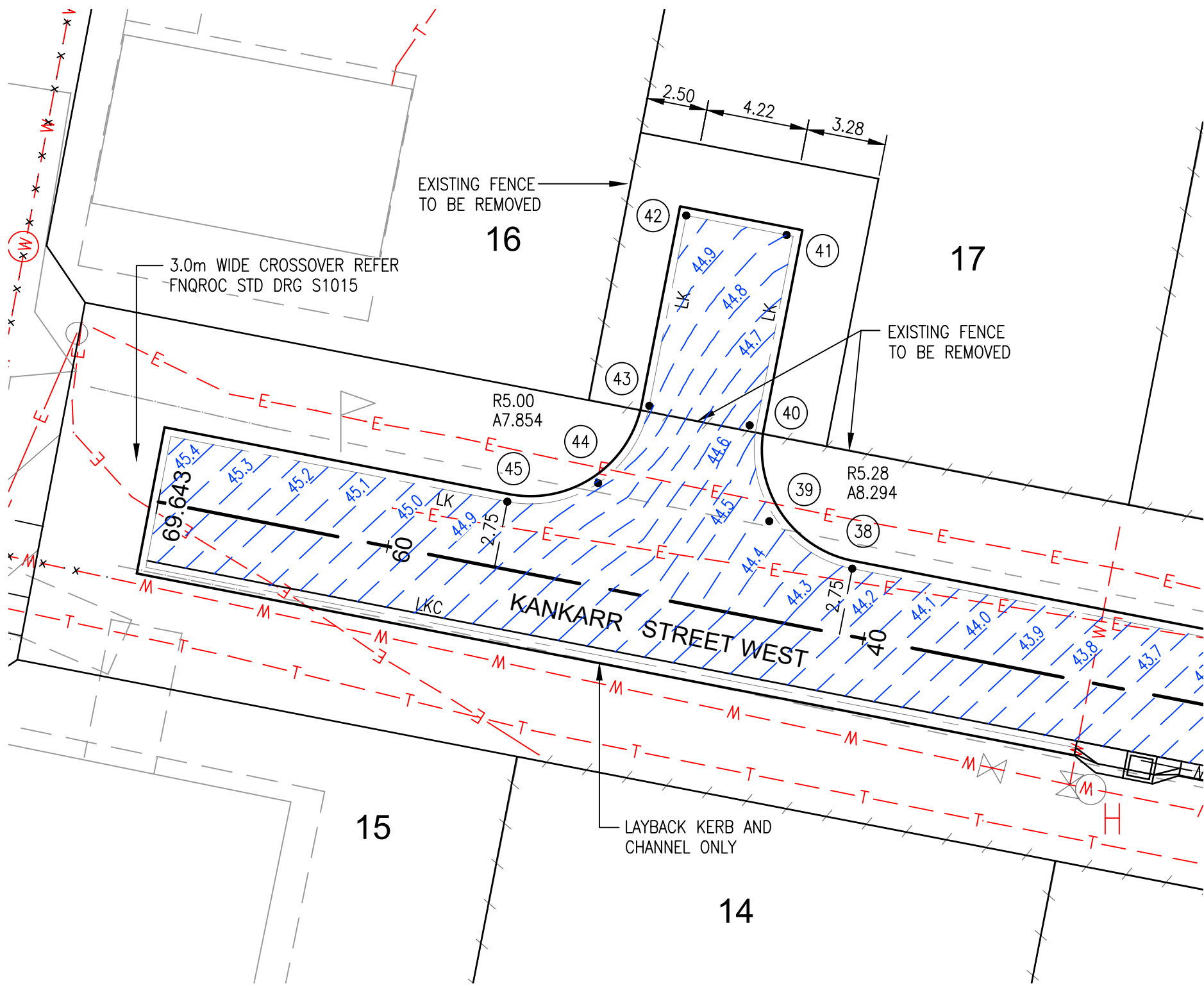
- ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
- KERB LEVELS SHOWN ARE TO LIP OF KERB AND CHANNEL OR PAVEMENT AT FACE OF KERB.
- DIMENSIONS AND KERB RADII SHOWN ARE TO LIP OF KERB AND CHANNEL OR TO FACE OF KERB ONLY.
- KERB LEVELS ARE SHOWN EQUALLY DIVIDED BETWEEN KERB TANGENT POINTS.
- REFER ALSO TO ROAD SETOUT DETAILS FOR COORDINATES OF ROAD CHAINAGES AND TANGENT POINTS.
- REFER TO THE FOLLOWING FNQROC STANDARD DRAWINGS:
S1000 - CONCRETE KERB AND CHANNEL
S1015 - ACCESS CROSSOVERS
S1016 - KERB RAMP
- ASPHALTIC CONCRETE THICKNESS ON ALL ROADS TO BE INCREASED TO 50mm AT ALL INTERSECTIONS.
- 2.0m WIDE CONCRETE PATHWAY TO BE LOCATED AS PER FNQROC STD DRG S1010. KERB RAMPS AND ACCESS CROSSOVERS TO BE INSTALLED IN ACCORDANCE WITH FNQROC STD DRGS S1016 AND S1015.

KERB SETOUT

POINT	EASTING	NORTHING	LEVELS	POINT	EASTING	NORTHING	LEVELS
1	322911.063	8177622.508	43.136	24	322898.208	8177700.528	42.880
2	322906.977	8177623.048	43.185	25	322901.462	8177701.890	42.822
3	322903.300	8177624.909	43.129	26	322903.916	8177704.402	42.818
4	322900.445	8177627.882	42.983	27	322905.492	8177707.517	42.848
5	322898.735	8177631.631	42.847	28	322911.347	8177706.503	42.849
6	322898.362	8177635.736	42.739	29	322911.344	8177702.867	42.798
7	322888.842	8177634.973	42.817	30	322912.738	8177699.509	42.683
8	322887.201	8177631.562	42.966	31	322915.315	8177696.944	42.564
9	322884.599	8177628.812	43.227	32	322918.679	8177695.566	42.499
10	322881.283	8177626.986	43.510	33	322917.337	8177690.795	42.506
11	322877.569	8177626.256	43.820	34	322913.781	8177690.790	42.574
12	322873.809	8177626.692	43.950	35	322910.488	8177689.449	42.657
14	322893.433	8177650.906	42.629	36	322907.941	8177686.968	42.721
15	322899.460	8177649.793	42.624	37	322906.514	8177683.711	42.730
16	322902.180	8177664.333	42.628	38	322866.311	8177706.011	44.286
17	322896.383	8177666.631	42.628	39	322862.887	8177707.965	44.428
18	322900.565	8177684.326	42.726	40	322862.080	8177711.924	44.580
19	322900.640	8177688.011	42.744	41	322863.603	8177719.778	44.850
20	322899.274	8177691.434	42.759	42	322859.460	8177720.582	44.976
21	322896.683	8177694.056	42.775	43	322857.937	8177712.728	44.861
22	322893.276	8177695.463	42.897	44	322855.826	8177709.536	44.811
23	322894.680	8177700.508	43.031	45	322852.076	8177708.772	44.888



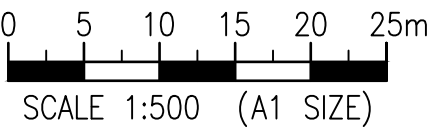
JUNKURRJI STREET / KANKARR STREET INTERSECTION
SCALE 1:200



KANKARR STREET (WEST) TURN AROUND
SCALE 1:200

Printed: 06 December 2017, 11:41 AM
File: T:\1020 Mossman Gorge\Drawings\1020-017(C).dwg

No.	Description	Reviewed	Approved	Date
C	OPERATIONAL WORKS APPLICATION	-	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	-	06/10/17
A	PRELIMINARY ISSUE	-	-	17/08/17



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

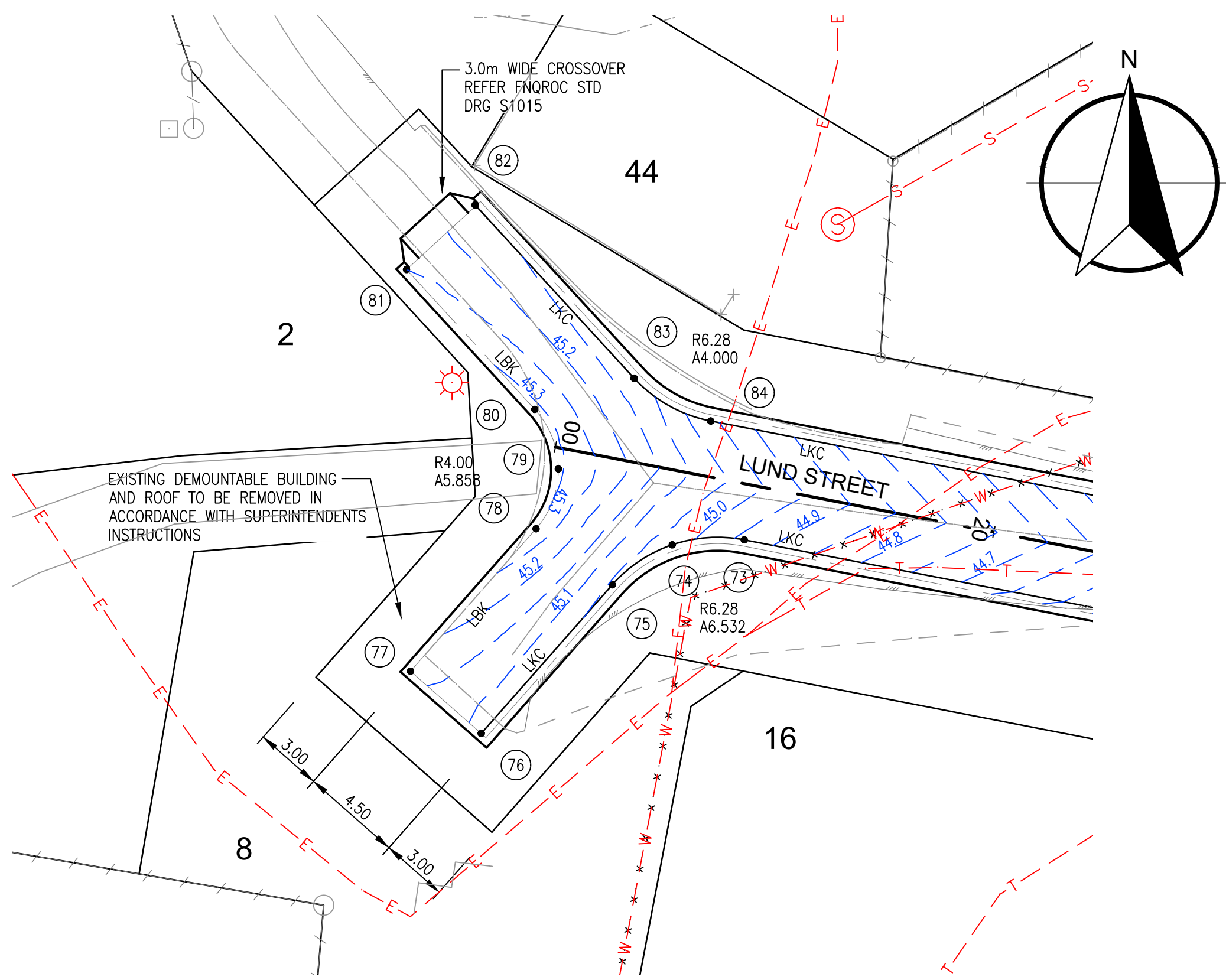
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111
www.trinityengineering.com.au

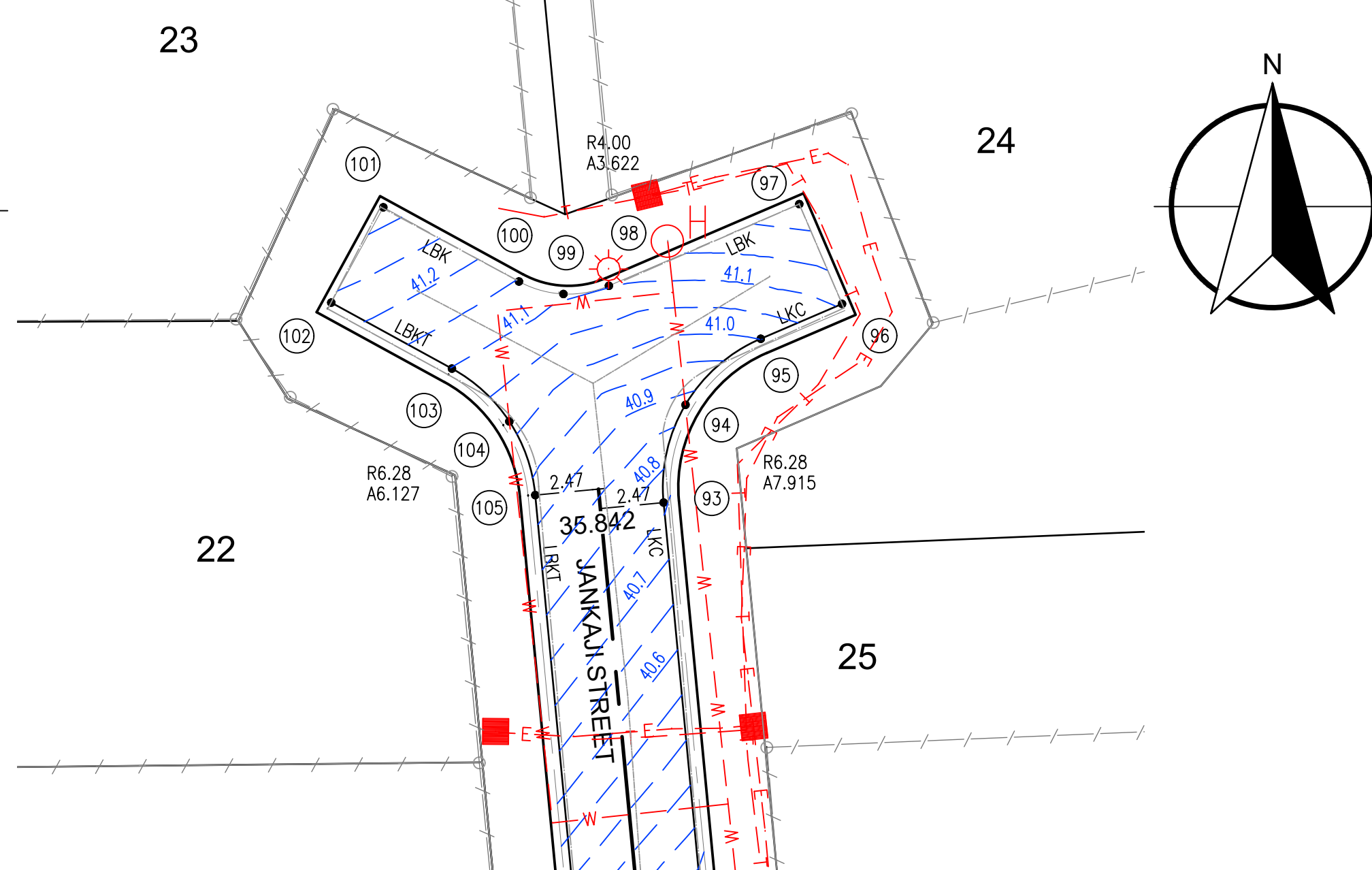
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size) 1:200		Client DATSIP	
Drawing is not to be used for construction unless approved.		Project MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title INTERSECTION SETOUT AND DETAILS SHEET 1 OF 3	
Drawn MS	Designed MS	Drawing Check Design Check Approved	Drawing No. 1020-017
		RPEQ Date	Revision c

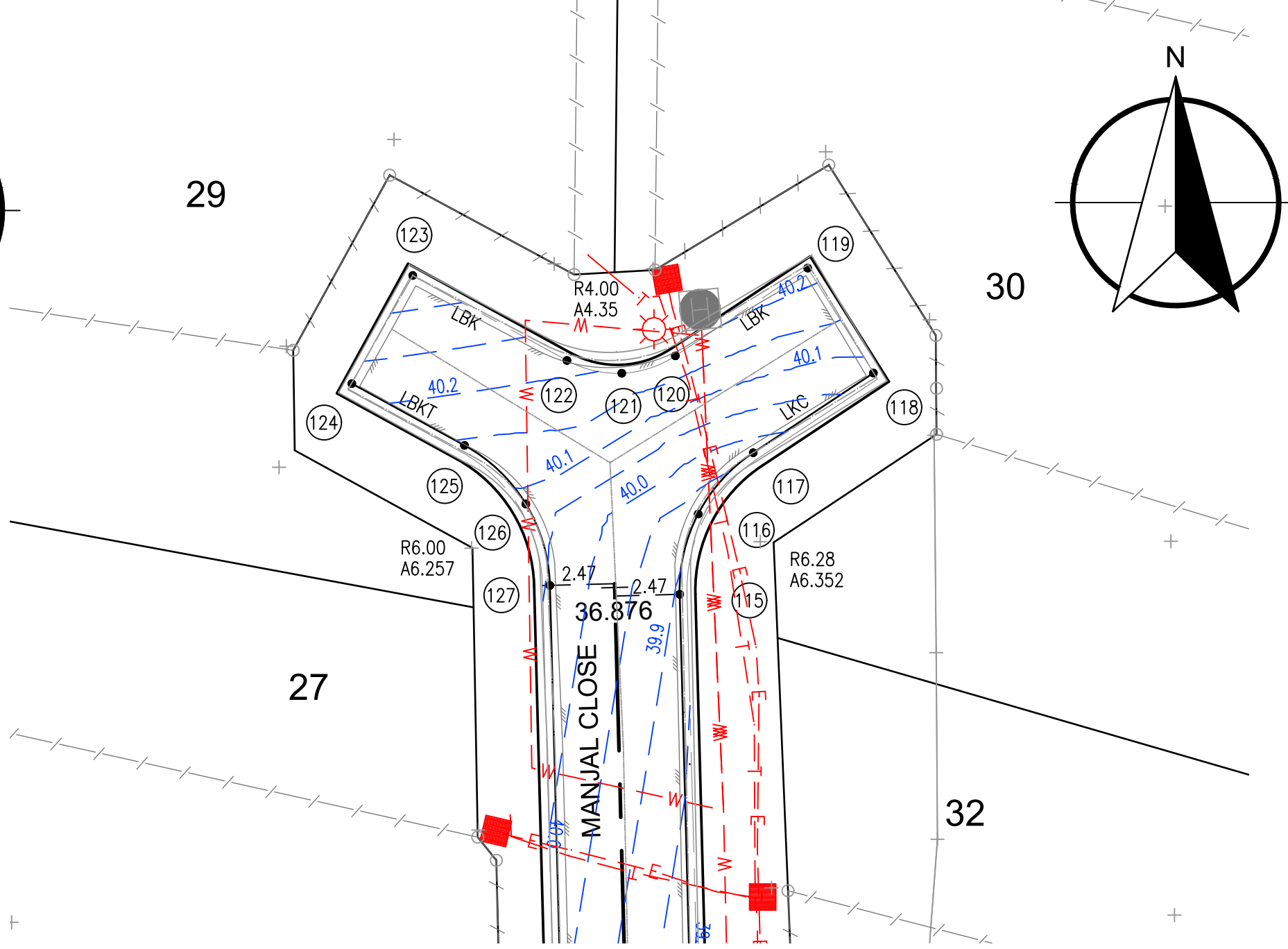
External References: TEC-TITLE-A1_b.dwg; 1020-X-SURVEY.dwg; 1020-X-DESIGN.dwg



LUND STREET (WESTERN) TURN AROUND
SCALE 1:200



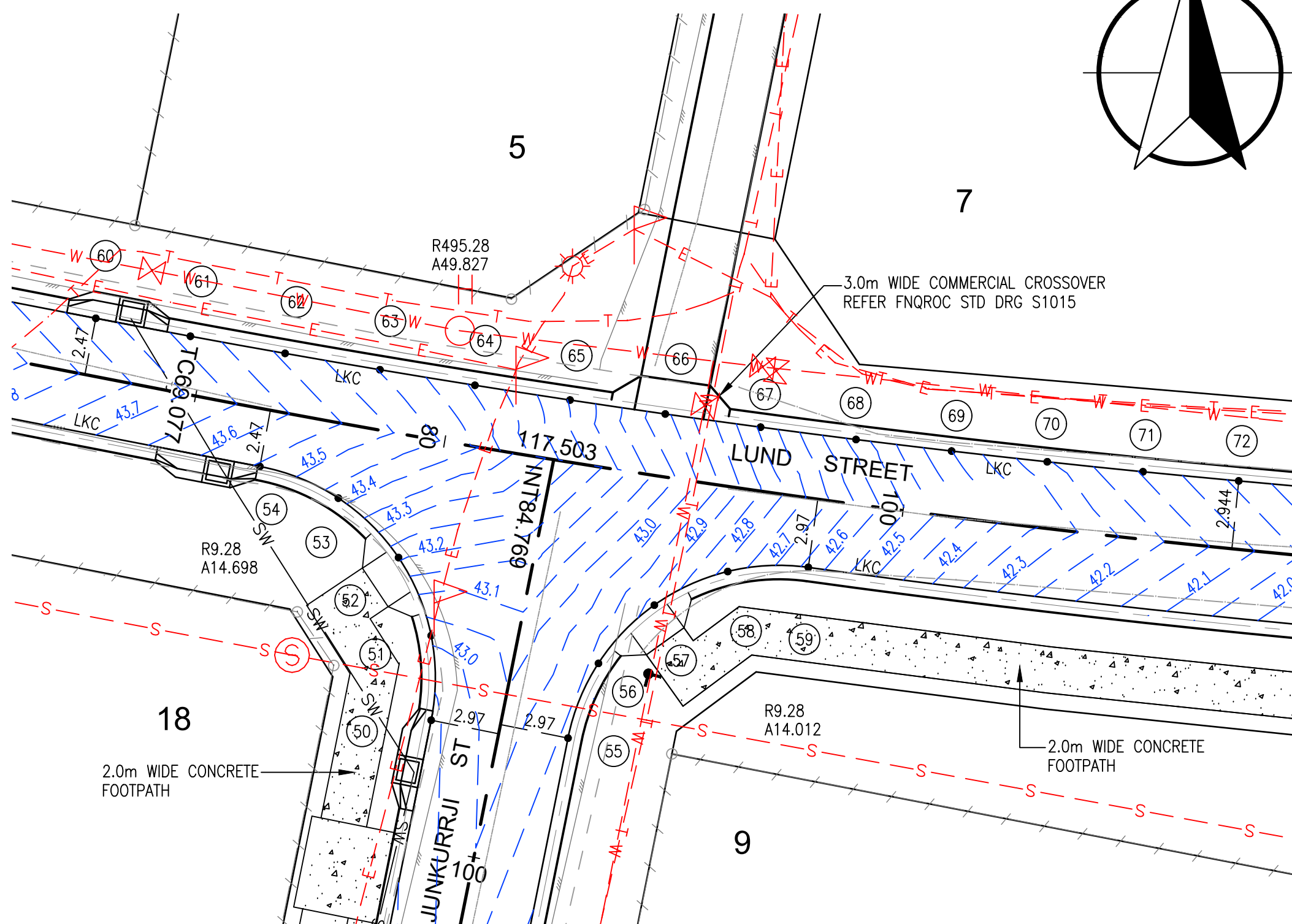
JANKAJI STREET TURN AROUND
SCALE 1:200



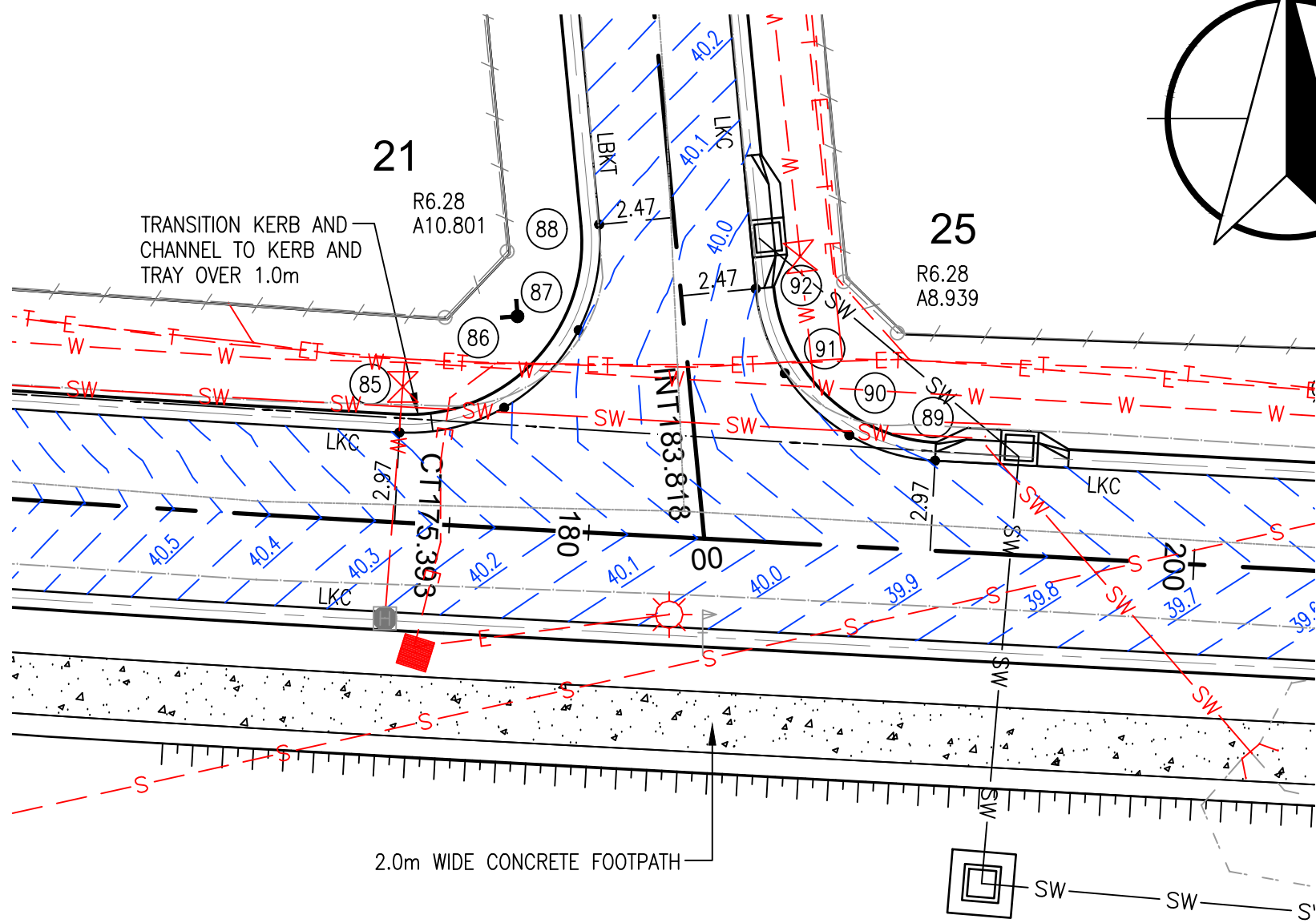
MANJAL CLOSE TURN AROUND
SCALE 1:200

KERB SETOUT

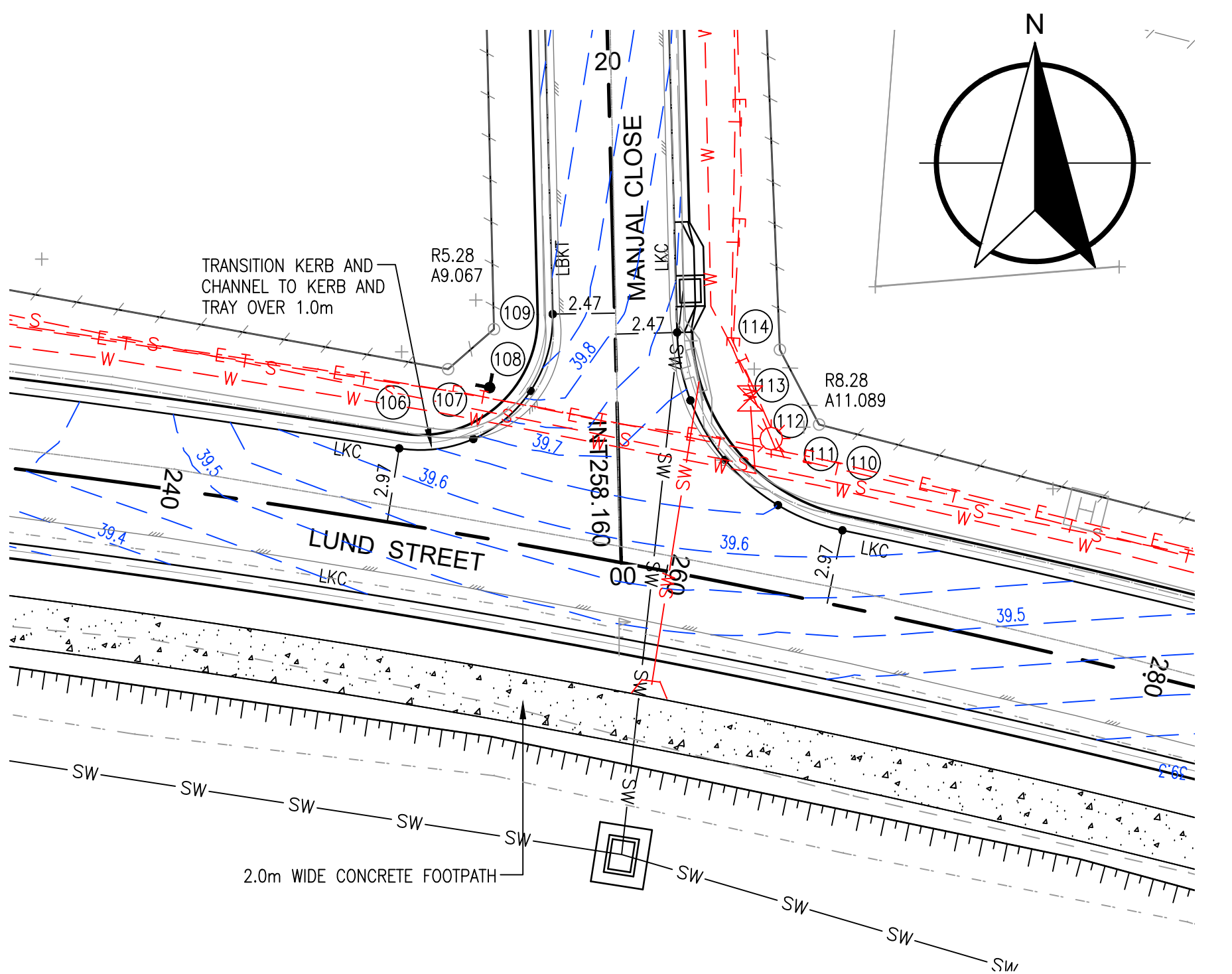
POINT	EASTING	NORTHING	LEVEL	POINT	EASTING	NORTHING	LEVEL	POINT	EASTING	NORTHING	LEVEL
50	322908.888	8177724.437	42.937	80	322829.992	8177753.271	45.313	110	323095.482	8177720.469	39.630
51	322908.889	8177728.088	43.016	81	322824.247	8177759.535	45.250	111	323092.912	8177721.473	39.650
52	322907.481	8177731.456	43.210	82	322827.321	8177762.427	45.166	112	323090.804	8177723.280	39.670
53	322904.883	8177734.021	43.421	83	322834.434	8177764.671	45.113	113	323089.423	8177725.649	39.695
54	322901.497	8177735.385	43.544	84	322837.866	8177762.751	45.013	114	323088.892	8177728.357	39.727
55	322914.792	8177723.666	42.939	85	323002.698	8177730.050	40.243	115	323088.172	8177755.640	39.894
56	322916.106	8177726.891	42.935	86	323006.154	8177730.868	40.157	116	323088.878	8177758.702	39.919
57	322918.516	8177729.405	42.882	87	323008.614	8177733.429	40.102	117	323090.978	8177761.039	39.973
58	322921.682	8177730.853	42.782	88	323009.292	8177736.915	40.150	118	323095.561	8177764.079	40.078
59	322925.160	8177731.033	42.635	89	323020.377	8177729.117	39.845	119	323093.055	8177768.081	40.220
60	322894.421	8177741.779	43.721	90	323017.548	8177729.961	39.891	120	323088.008	8177764.733	40.190
61	322898.500	8177741.005	43.630	91	323015.418	8177732.004	39.910	121	323085.965	8177764.069	40.192
62	322902.586	8177740.266	43.539	92	323014.456	8177734.795	39.950	122	323083.873	8177764.559	40.217
63	322906.678	8177739.561	43.447	93	323011.901	8177761.702	40.763	123	323077.991	8177767.798	40.340
64	322910.776	8177738.890	43.340	94	323012.752	8177765.500	40.880	124	323075.668	8177763.676	40.220
65	322914.879	8177738.253	43.196	95	323015.677	8177768.068	41.001	125	323079.964	8177761.320	40.137
66	322918.987	8177737.651	43.012	96	323018.837	8177769.423	41.107	126	323082.305	8177759.084	40.085
67	322923.100	8177737.084	42.791	97	323017.174	8177773.301	41.234	127	323083.222	8177755.979	40.053
68	322927.218	8177736.550	42.579	98	323009.773	8177770.127	41.103				
69	322931.340	8177736.052	42.401	99	323008.006	8177769.808	41.109				
70	322935.467	8177735.588	42.257	100	323006.277	8177770.294	41.147				
71	322939.597	8177735.159	42.144	101	323001.008	8177773.177	41.324				
72	322943.730	8177734.764	42.037	102	322998.981	8177769.474	41.234				
73	322839.368	8177747.427	44.937	103	323003.672	8177766.908	41.094				
74	322836.146	8177747.207	45.025	104	323005.903	8177764.928	41.017				
75	322833.460	8177745.414	45.041	105	323006.911	8177761.992	40.941				
76	322827.593	8177738.755	45.085	106	323077.809	8177723.738	39.621				
77	322824.427	8177741.545	45.170	107	323080.766	8177724.111	39.690				
78	322830.046	8177747.923	45.285	108	323083.050	8177726.027	39.816				
79	322831.044	8177750.607	45.308	109	323083.931	8177729.089	39.895				



LUND STREET / JUNKURRI STREET INTERSECTION
SCALE 1:200



LUND STREET / JANKAJI STREET INTERSECTION
SCALE 1:200

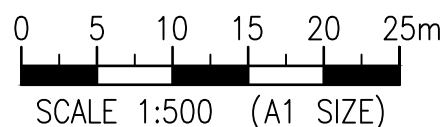


LUND STREET / MANJAL CLOSE INTERSECTION
SCALE 1:200

NOTE

1. REFER DRAWING 1120-017 FOR INTERSECTION LEGEND AND NOTES.

No.	Description	Reviewed	Approved	Date
C	OPERATIONAL WORKS APPLICATION	-	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	-	08/10/17
A	PRELIMINARY ISSUE	-	-	17/08/17



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

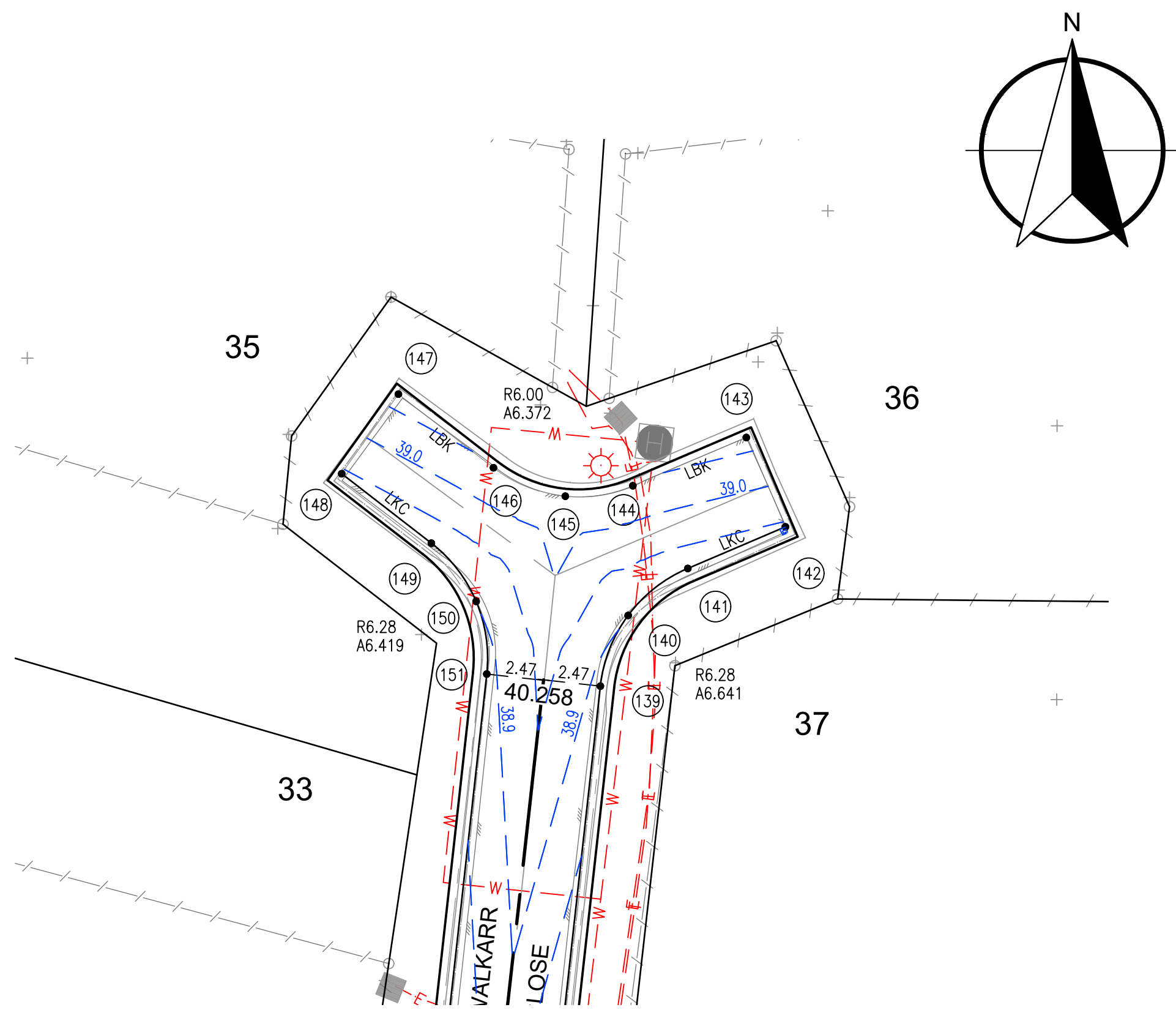
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting

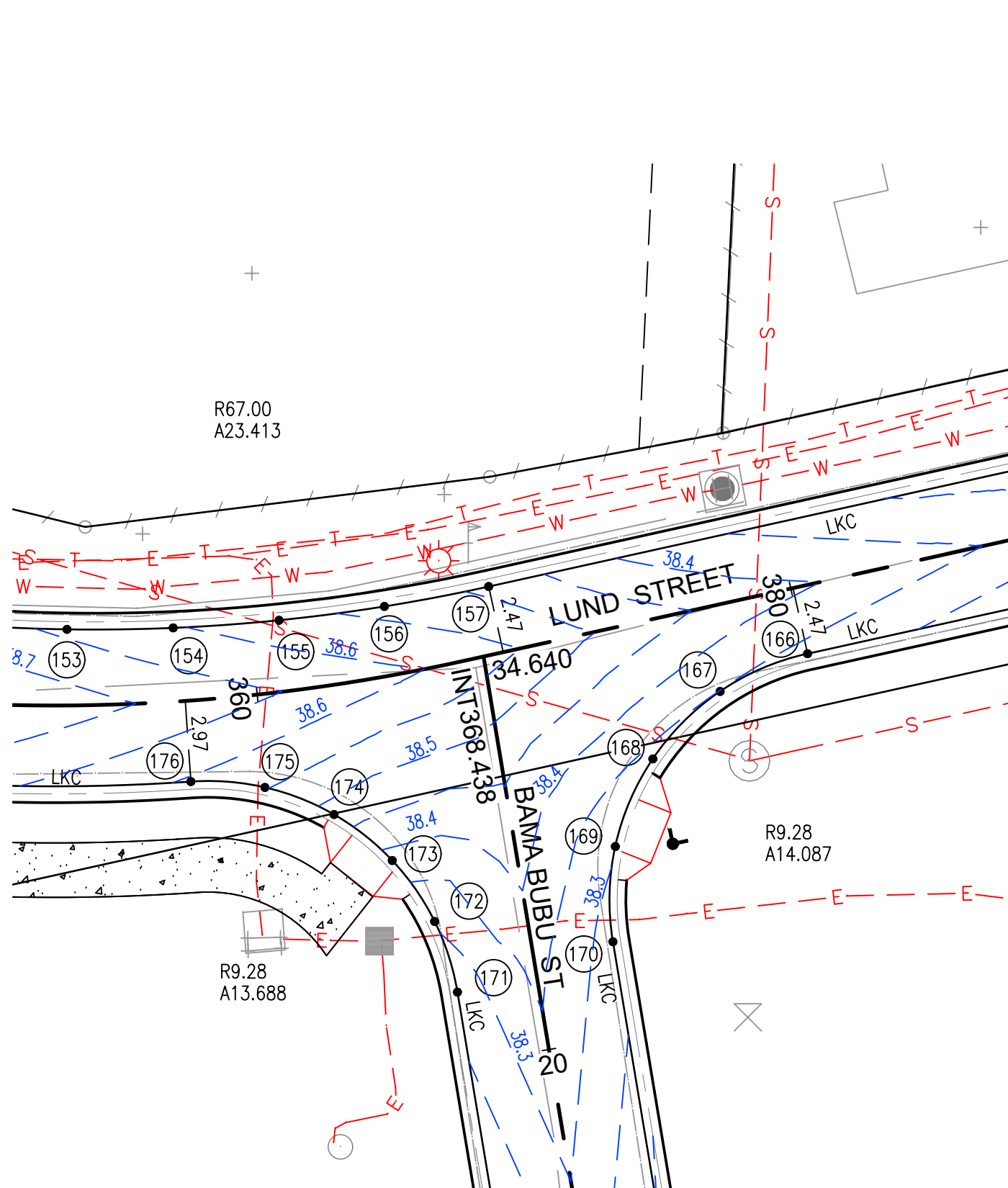
Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111
www.trinityengineering.com.au

Cairns QLD 4870
Email: admin@trinityengineering.com.au

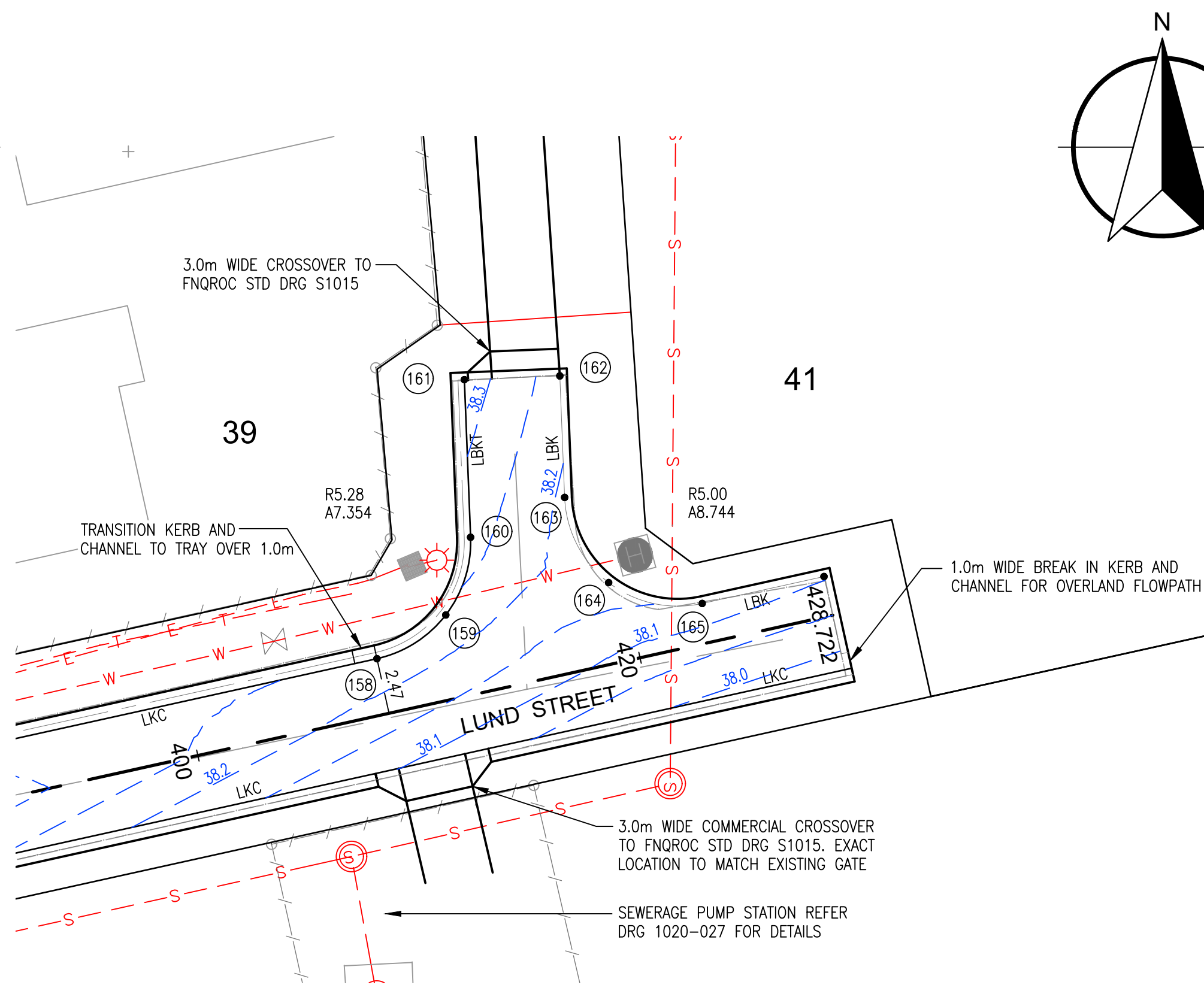
Scale (A1 size) 1:200		Client DATSIP						
		Project MOSSMAN GORGE INFRASTRUCTURE UPGRADES						
Drawing is not to be used for construction unless approved.		Title INTERSECTION SETOUT AND DETAILS SHEET 2 OF 3						
		Drawn MS	Designed MS	Drawing Check	Design Check	Approved	RPEQ	Date



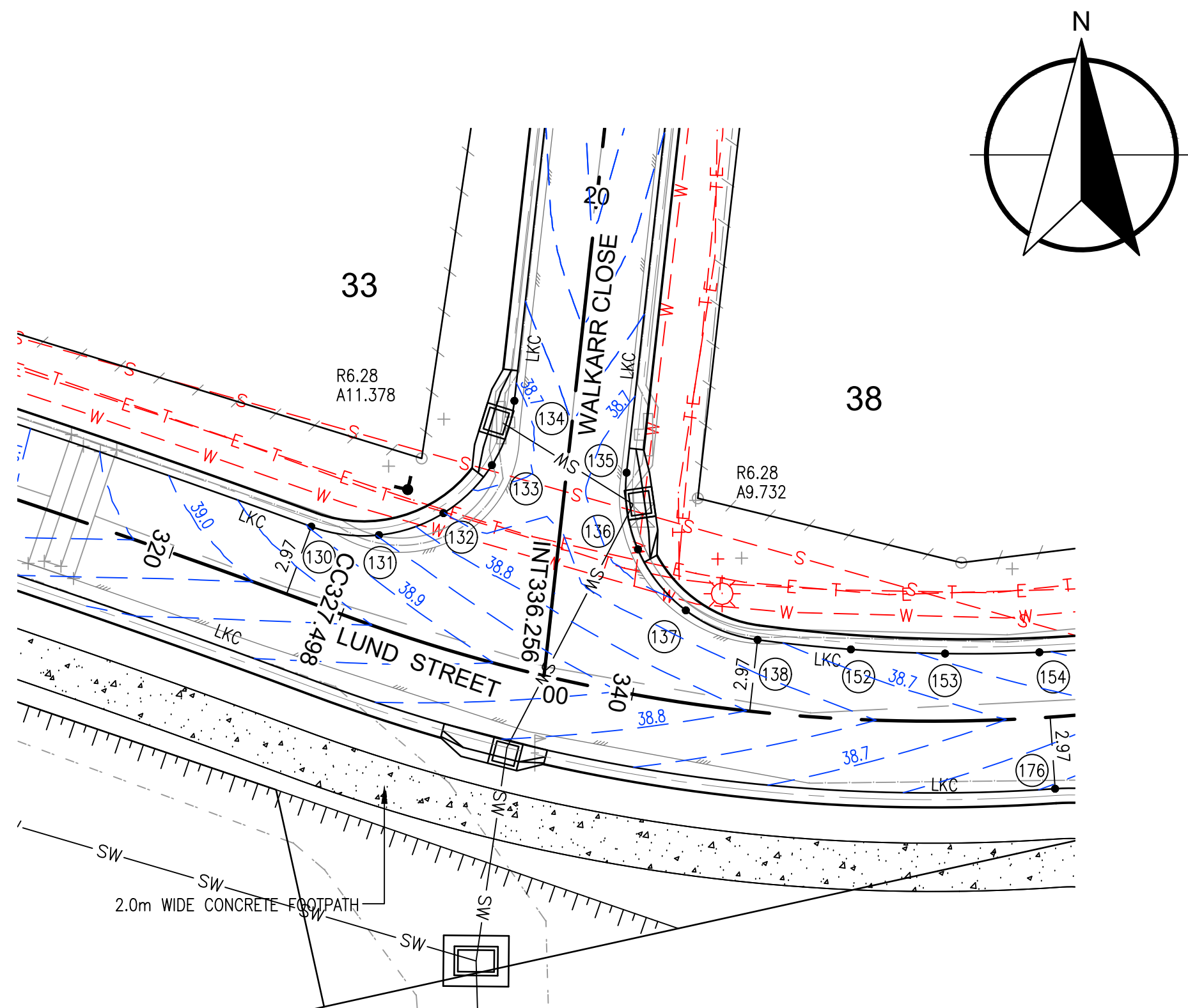
WALKARR CLOSE TURN AROUND
SCALE 1:200



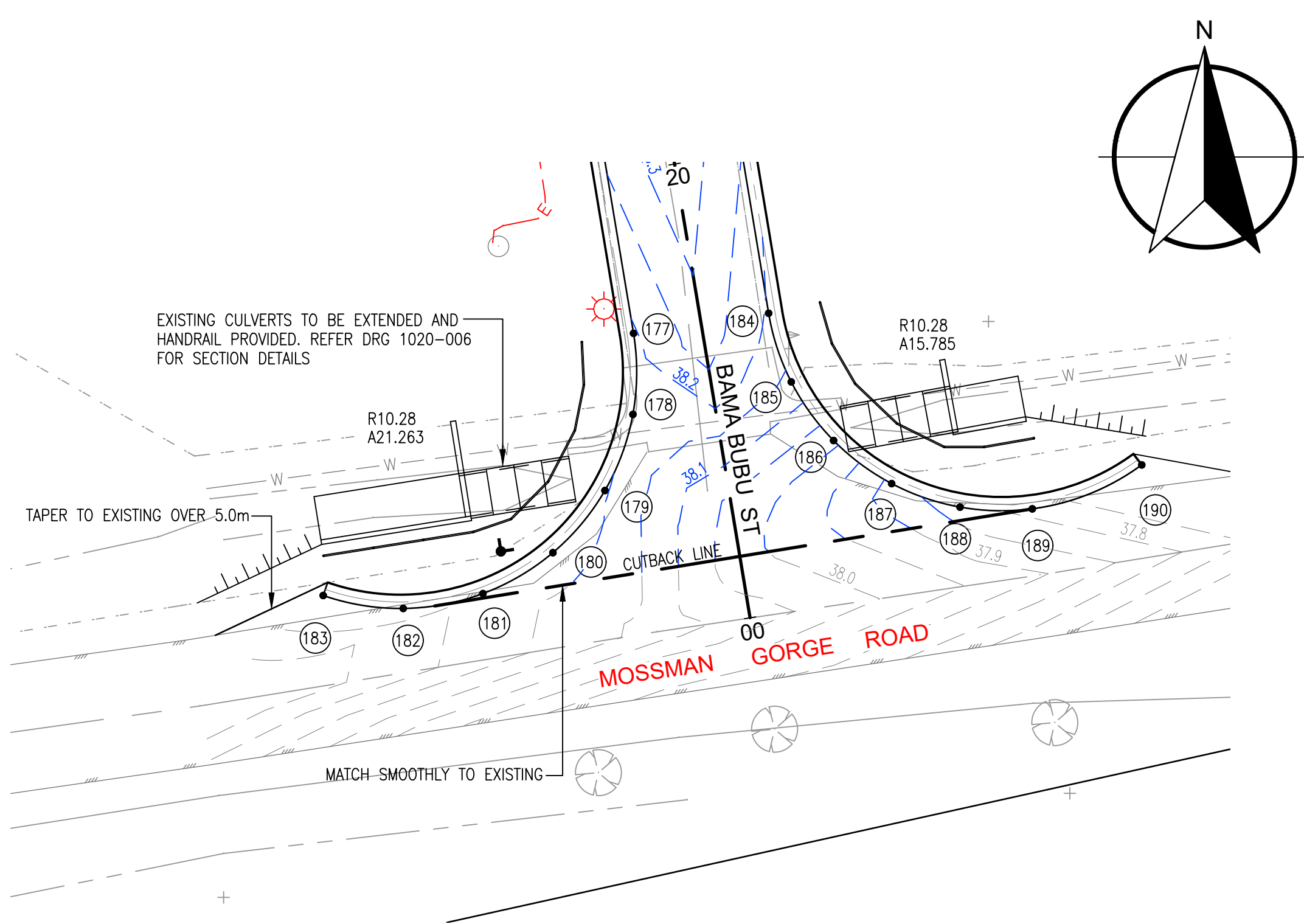
LUND STREET / BAMABUBU STREET INTERSECTION
SCALE 1:200



LUND STREET (EASTERN) TURN AROUND
SCALE 1:200



LUND STREET / WALKARR CLOSE INTERSECTION
SCALE 1:200



MOSSMAN GORGE ROAD / BAMABUBU STREET INTERSECTION
SCALE 1:200

KERB SETOUT

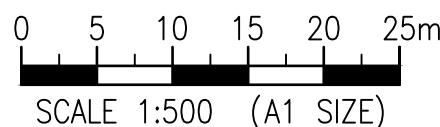
POINT	EASTING	NORTHING	LEVEL	POINT	EASTING	NORTHING	LEVEL
130	323152.138	8177704.285	38.897	160	323236.527	8177714.491	38.269
131	323154.936	8177703.934	38.847	161	323236.251	8177721.454	38.329
132	323157.606	8177704.843	38.752	162	323240.468	8177721.621	38.224
133	323159.809	8177706.828	38.676	163	323240.680	8177716.251	38.190
134	323160.541	8177709.490	38.686	164	323242.624	8177712.489	38.164
135	323165.181	8177705.517	38.654	165	323246.756	8177711.567	38.138
136	323165.654	8177703.344	38.661	166	323205.570	8177698.135	38.334
137	323167.633	8177700.819	38.708	167	323202.356	8177696.748	38.349
138	323170.580	8177699.602	38.710	168	323199.884	8177694.269	38.335
139	323168.653	8177737.853	38.675	169	323198.507	8177691.051	38.306
140	323169.854	8177740.907	38.640	170	323198.420	8177687.551	38.277
141	323172.432	8177742.939	38.604	171	323192.706	8177685.700	38.270
142	323176.653	8177744.738	38.569	172	323191.868	8177688.296	38.309
143	323174.962	8177748.598	38.534	173	323190.311	8177690.536	38.381
144	323170.056	8177746.513	39.045	174	323188.170	8177692.226	38.479
145	323167.136	8177746.061	39.040	175	323185.631	8177693.222	38.554
146	323164.029	8177747.289	39.046	176	323182.912	8177693.435	38.594
147	323159.918	8177750.473	39.070	177	323194.281	8177676.231	38.195
148	323157.468	8177747.033	38.943	178	323194.255	8177672.705	38.185
149	323161.344	8177744.031	38.919	179	323193.038	8177669.395	38.205
150	323163.281	8177741.516	38.903	180	323190.774	8177666.691	38.225
151	323163.740	8177738.375	38.887	181	323187.730	8177664.911	38.232
152	323174.461	8177699.203	38.675	182	323184.263	8177664.265	38.215
153	323178.359	8177699.029	38.640	183	323180.782	8177664.828	38.191
154	323182.261	8177699.083	38.604	184	323200.158	8177677.104	38.194
155	323186.152	8177699.364	38.569	185	323201.142	8177674.117	38.135
156	323190.021	8177699.871	38.534	186	323202.983	8177671.568	38.012
157	323193.853	8177700.603	38.487	187	323205.509	8177669.695	37.888
158	323232.391	8177709.127	38.240	188	323208.482	8177668.672	37.820
159	323235.433	8177711.058	38.245	189	323211.626	8177668.597	37.784
				190	323216.387	8177670.508	37.698

NOTE

1. REFER DRAWING 1120-017 FOR INTERSECTION LEGEND AND NOTES.

Printed: 06 December 2017, 11:46 AM File: T:\1020 Mossman Gorge\Drawings\1020-019(C).dwg

No.	Description	Reviewed	Approved	Date
C	OPERATIONAL WORKS APPLICATION	-	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	-	08/10/17
A	PRELIMINARY ISSUE	-	-	17/08/17



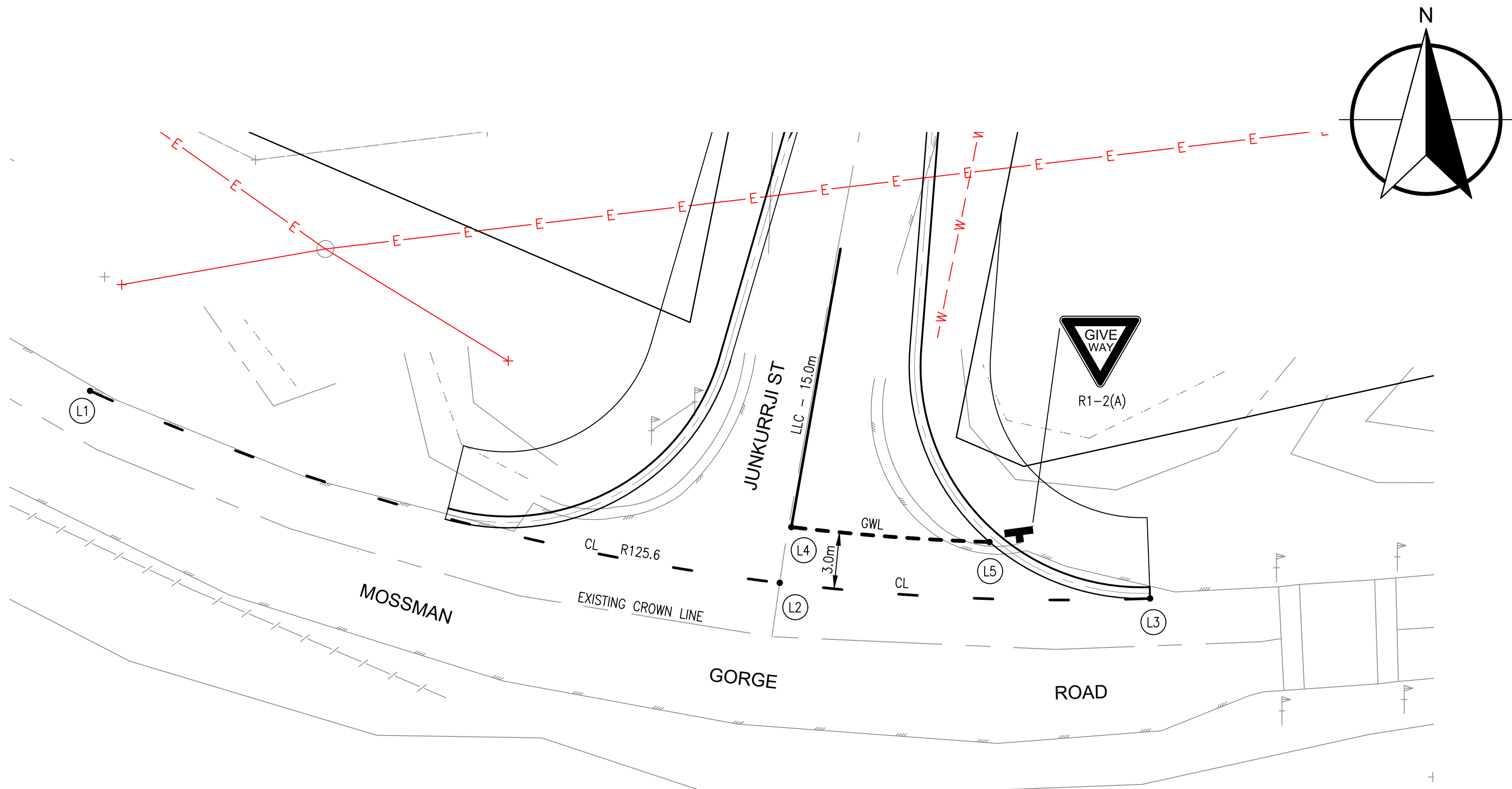
© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

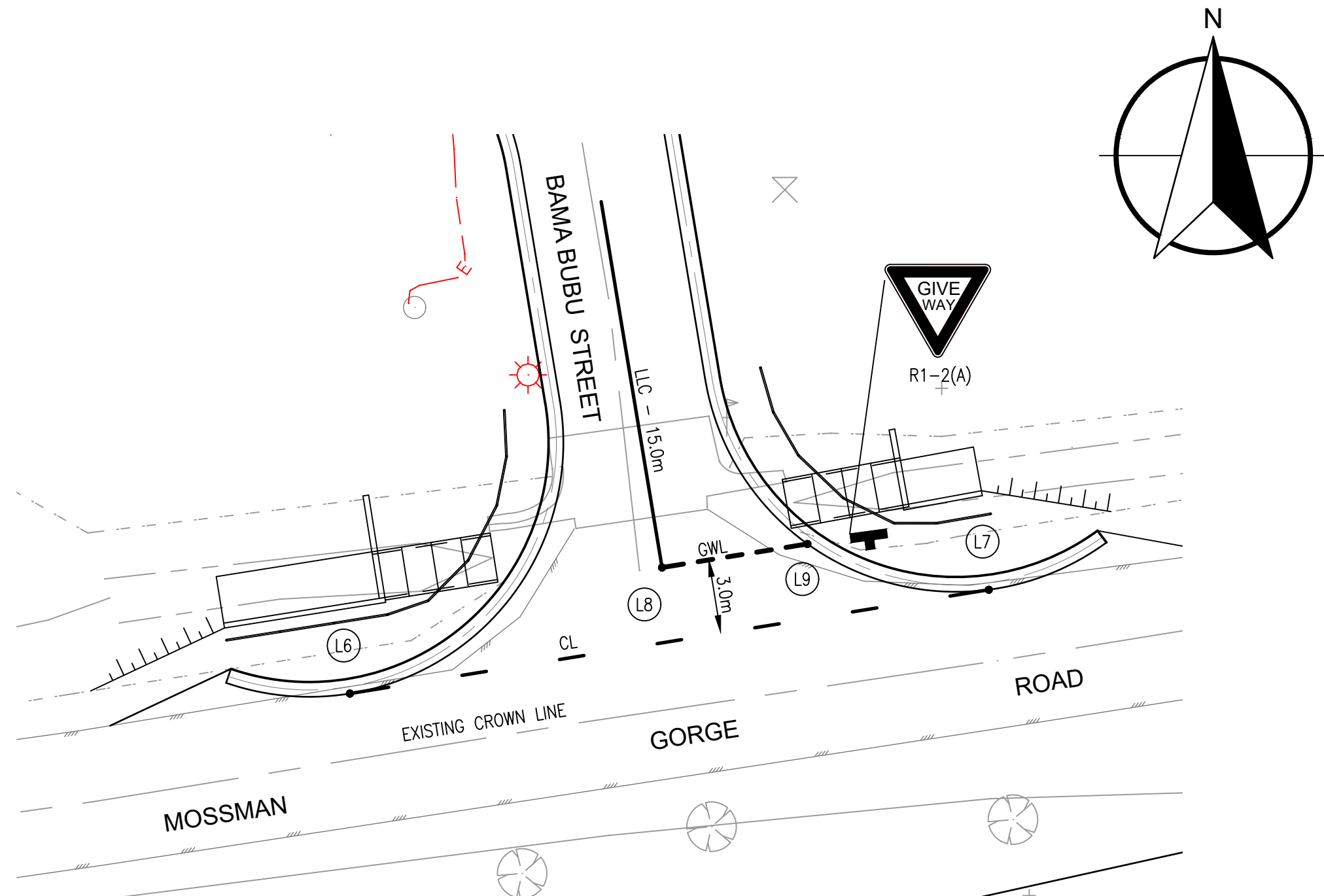
Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 | Cairns QLD 4870
www.trinityengineering.com.au | Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:200		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		INTERSECTION SETOUT AND DETAILS	
		SHEET 3 OF 3	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
			1020-019
		Revision	c

External References: TEC-TITLE-A1_b.dwg; 1020-X-SURVEY.dwg; 1020-X-DESIGN.dwg



MOSSMAN GORGE ROAD / JUNKURRJI STREET INTERSECTION
SCALE 1:200



MOSSMAN GORGE ROAD / BAMA BUBU STREET INTERSECTION
SCALE 1:200

LINEMARKING SETOUT

POINT NO.	EASTING	NORTHING
L 1	322855.013	8177633.487
L 2	322891.479	8177623.335
L 3	322911.063	8177622.508
L 4	322892.093	8177626.283
L 5	322902.571	8177625.492
L 6	323185.790	8177664.397
L 7	323211.626	8177668.597
L 8	323198.412	8177669.496
L 9	323204.291	8177670.448

LINEMARKING DIMENSIONS TABLE

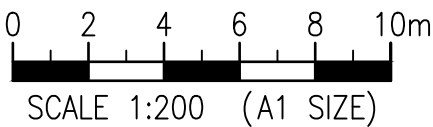
TYPE	DESCRIPTION	LENGTH (mm)	GAP (mm)	WIDTH (mm)
— — — CL	CONTINUITY LINE	1000	3000	200
--- --- GWL	GIVE WAY LINE	600	600	300
————— LLC	LANE LINE CONTINUOUS	—	—	80

NOTES

- ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
- LINEMARKING AND SIGNAGE TO BE WHITE PAINT AND IN ACCORDANCE WITH MUTCD.

Printed: 06 December 2017, 11:49 AM File: T:\1020 Mossman Gorge\Drawings\ 1020-020(B).dwg

Revisions				
B	OPERATIONAL WORKS ISSUE	—	—	07/12/17
A	PRELIMINARY ISSUE	—	—	17/08/17
No.	Description	Reviewed	Approved	Date



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:200		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		LINEMARKING AND SIGNAGE PLAN	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
			1020-020
		Revision	B

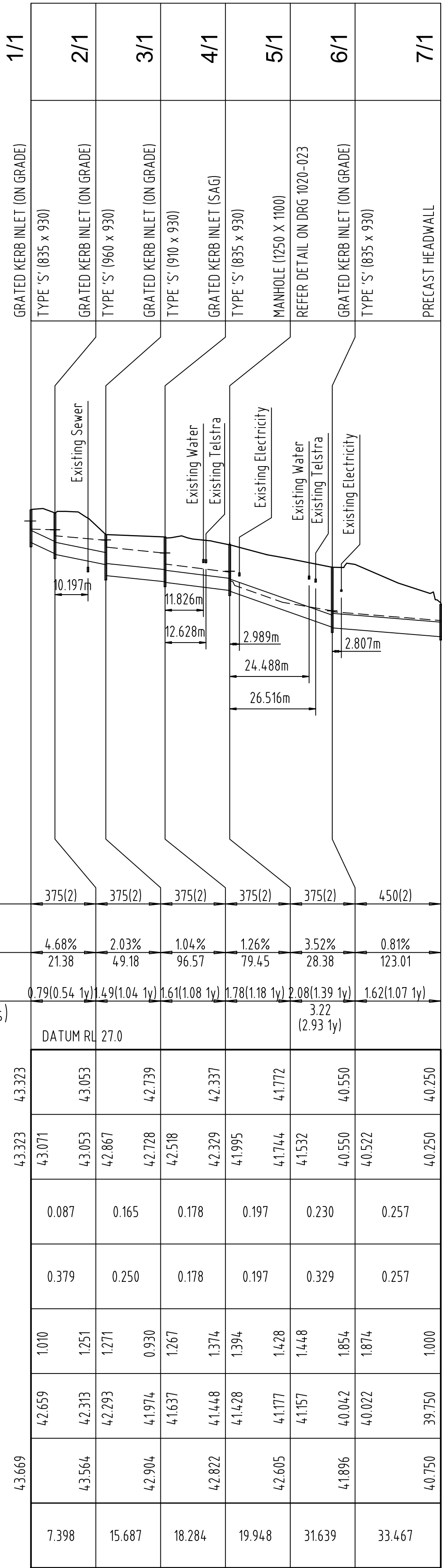
External References: TEC-TITLE-A1_b.dwg ; 1020-X-SURVEY.dwg ; 1020-X-DESIGN.dwg

STRUCTURE NAME
STRUCTURE DESCRIPTION

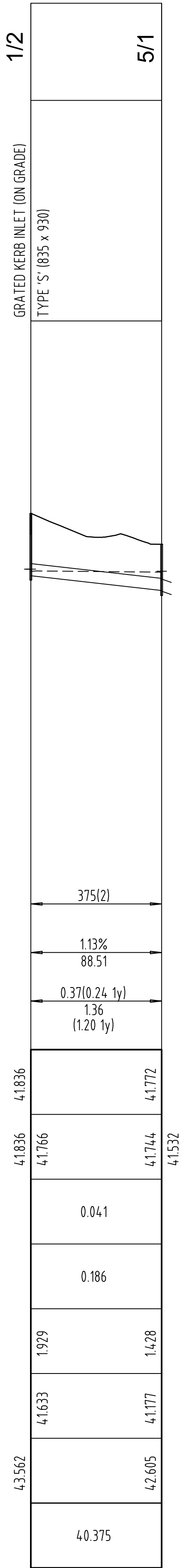
PIPE SIZEmm (Class)
PIPE GRADE %
PIPE SLOPE 1 in X
FULL PIPE FLOW VELOCITY
PART FULL FLOW VELOCITY

WATER LEVEL IN STRUCTURE
HYDRAULIC GRADE LEVEL
PIPE FLOW (Cumecs)
PIPE CAPACITY AT GRADE (Cumecs)
DEPTH TO INVERT
INVERT LEVEL OF DRAIN
DESIGN SURFACE LEVEL
RUNNING CHAINAGE

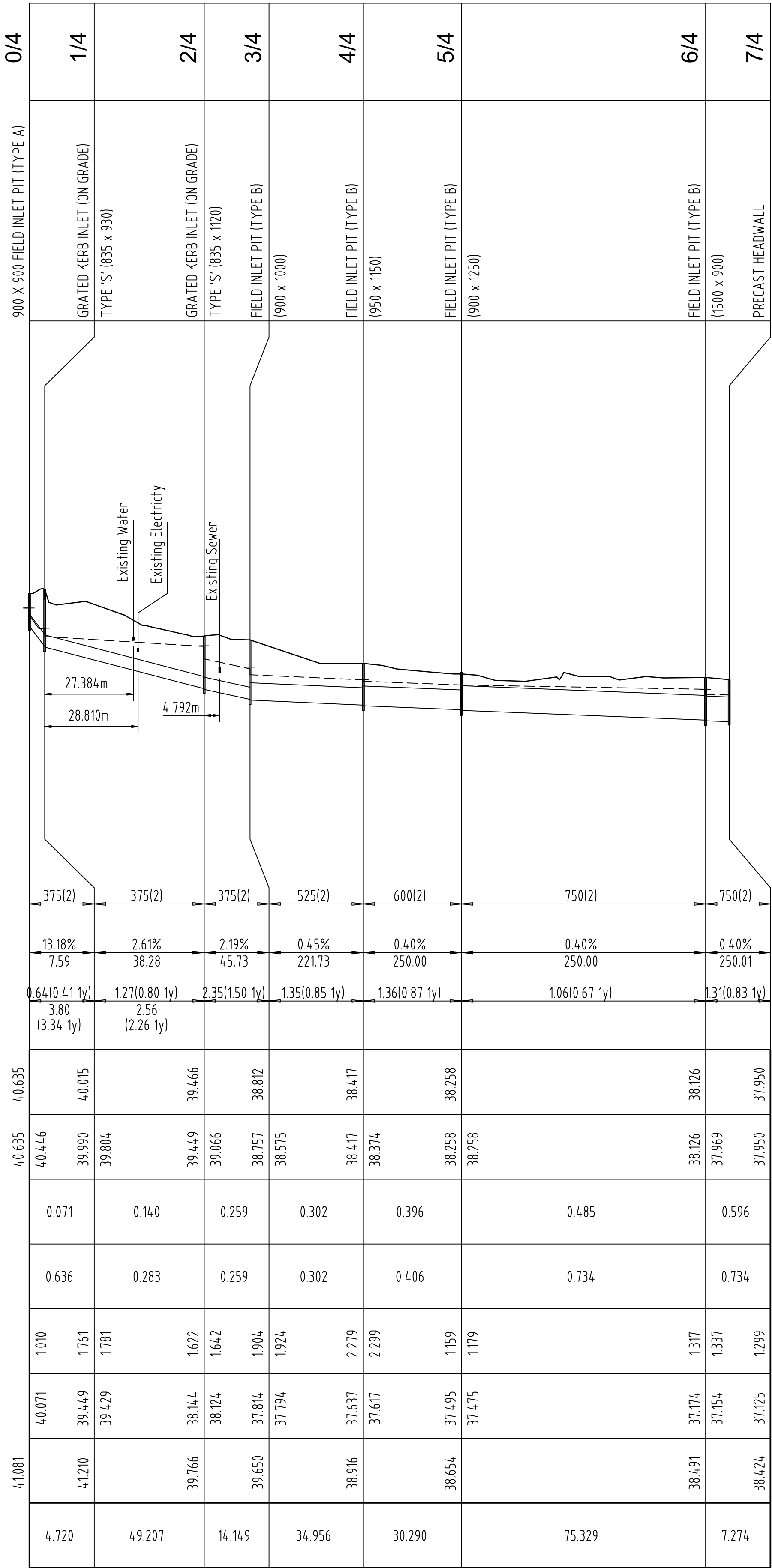
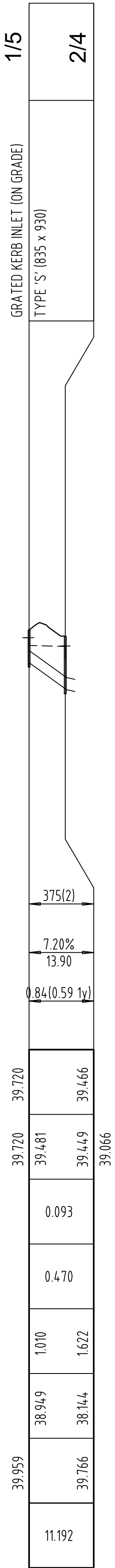
LINE



1

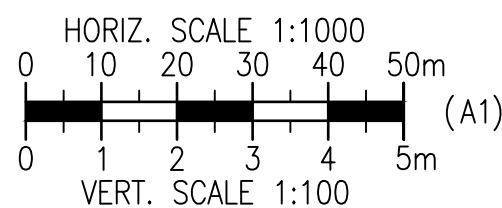


2


$$L_4$$


5

Revisions					
	C	OPERATIONAL WORKS ISSUE	-	-	07/12/17
	B	MISCELLANEOUS AMENDMENTS	-	-	08/10/17
	A	PRELIMINARY ISSUE	-	-	17/08/17
No.	Description	Reviewed	Approved	Date	

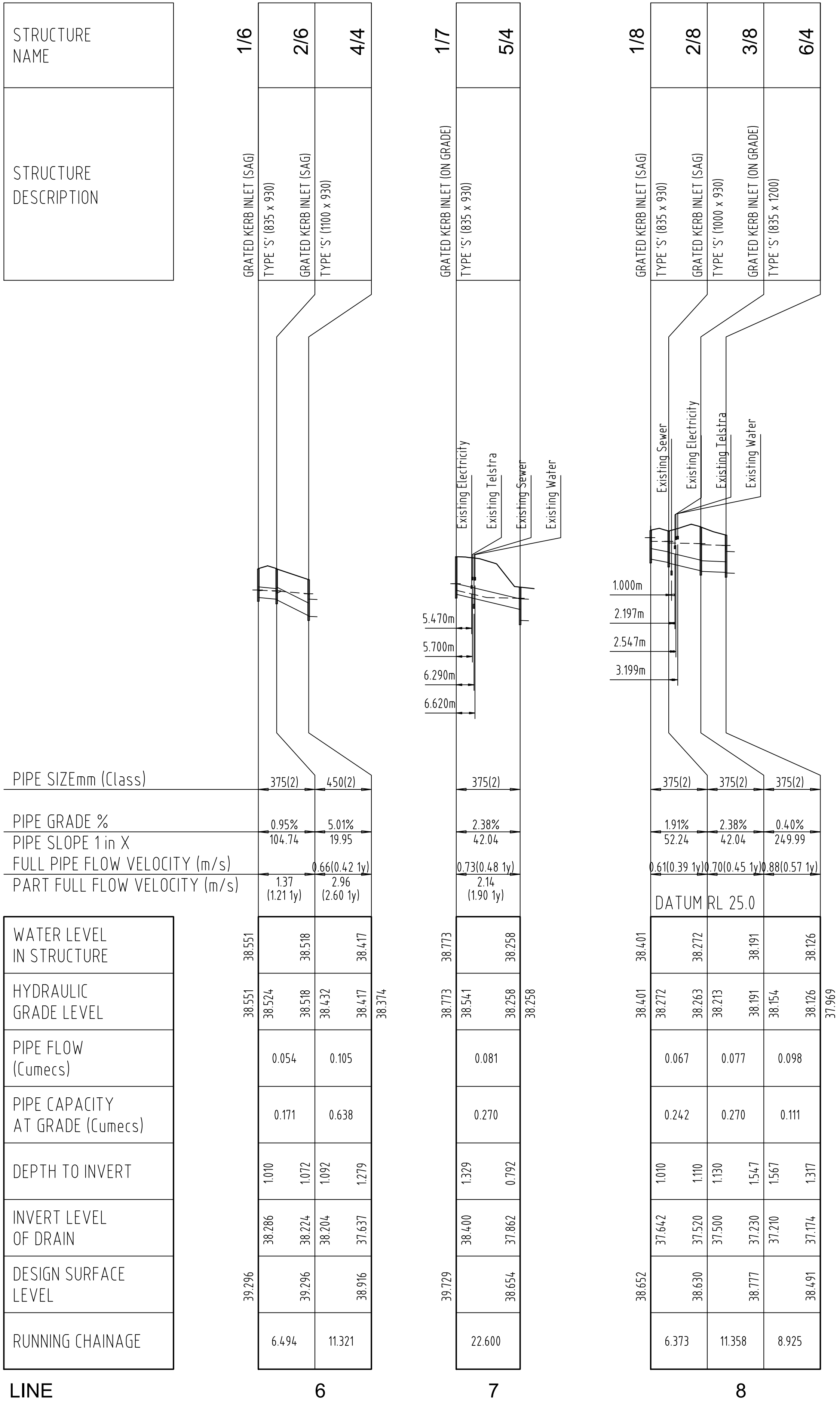


© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

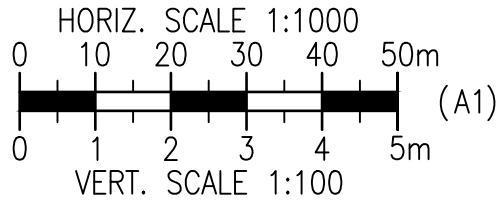
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



Scale (A1 size)		Client						
1:1000 HOR 1:100 VERT		Project						
Drawing is not to be used for construction unless approved.		Title						
		<p align="center">DATSIP</p> <p align="center">MOSSMAN GORGE INFRASTRUCTURE UPGRADES</p> <p align="center">STORMWATER LONGITUDINAL SECTION</p> <p align="center">SHEET 1 OF 2</p>						
Drawn	Designed	Drawing Check	Design Check	Approved	RPEQ	Date	Drawing No.	Revision
MS	MS						1020-021	C



Revisions			
B	OPERATIONAL WORKS ISSUE	-	07/12/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved Date



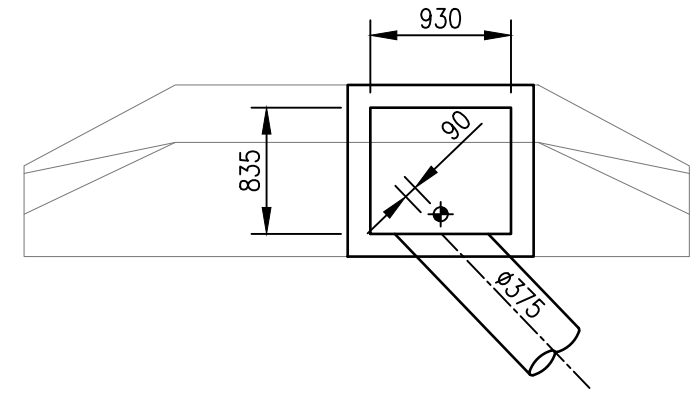
© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

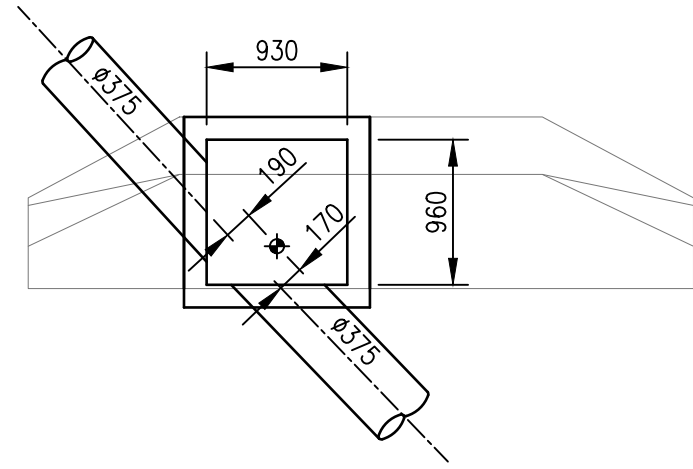
Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

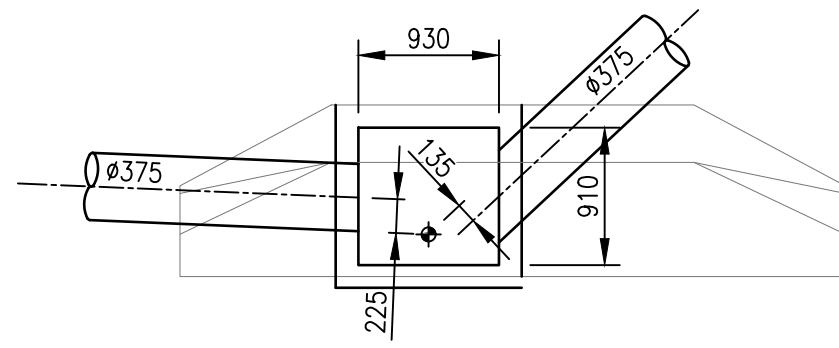
Scale (A1 size)		Client	
1:1000 HOR 1:100 VERT		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		STORMWATER LONGITUDINAL SECTION	
		SHEET 2 OF 2	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	
		RPEQ	Date
		Drawing No.	Revision
		1020-022	B



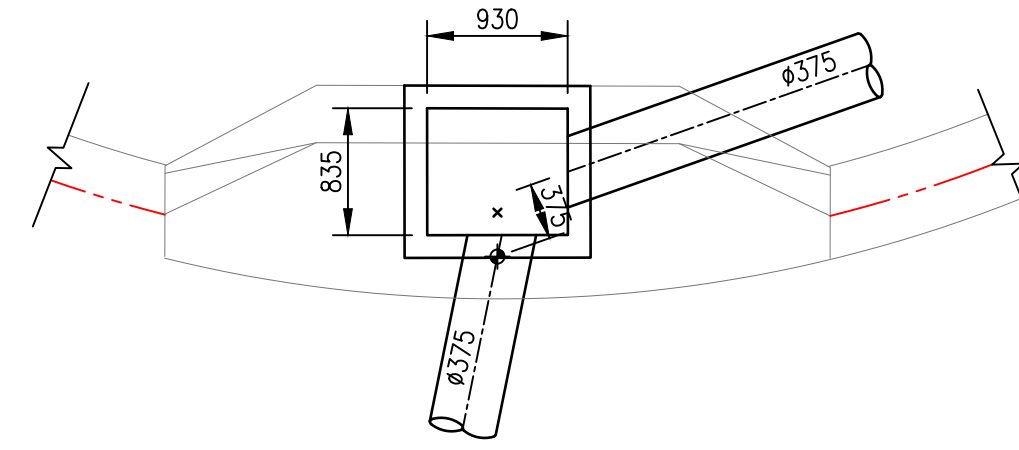
1/1 - 835 x 930



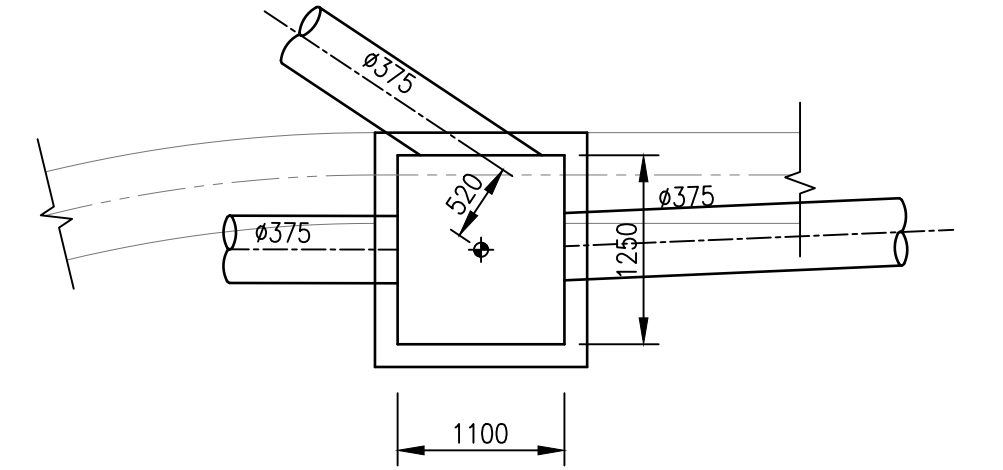
2/1 - 960 x 930



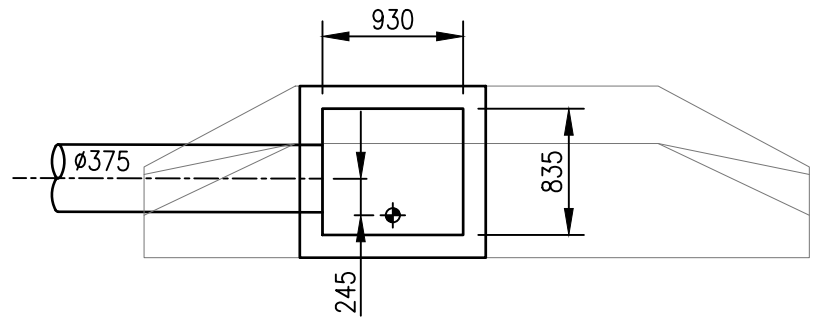
3/1 - 910 x 930



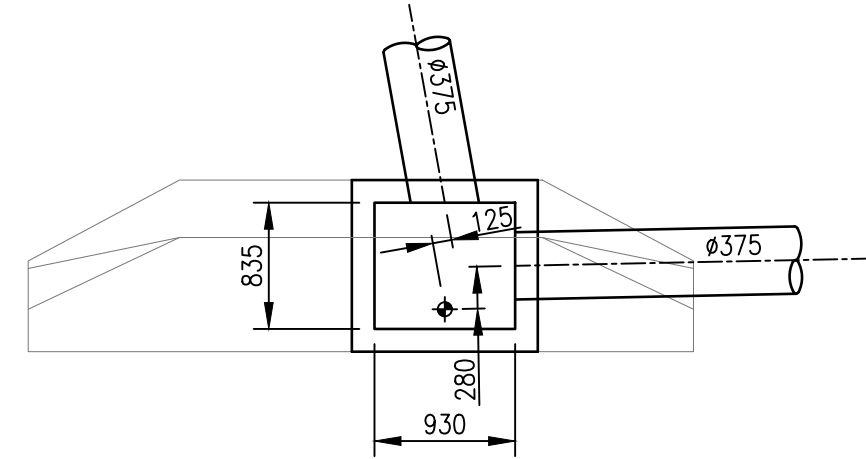
4/1 - 835 x 930



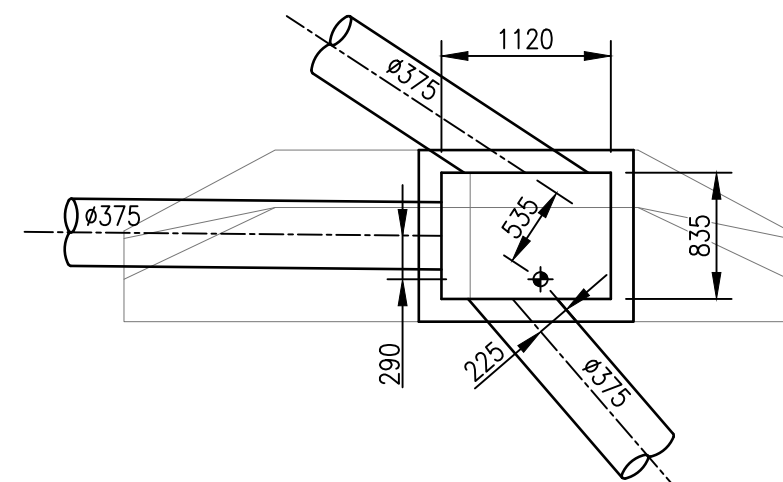
5/1 - 1250 x 1100



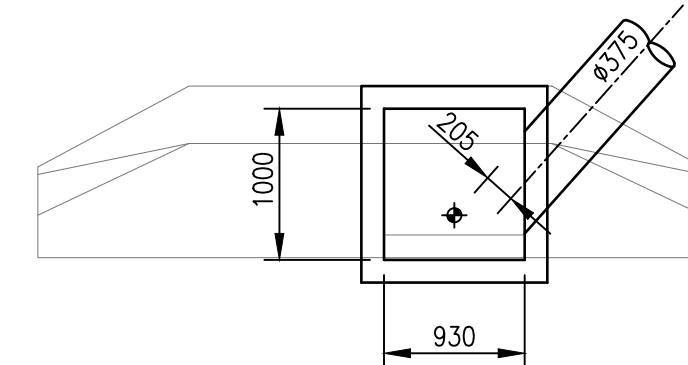
1/2 - 835 x 930



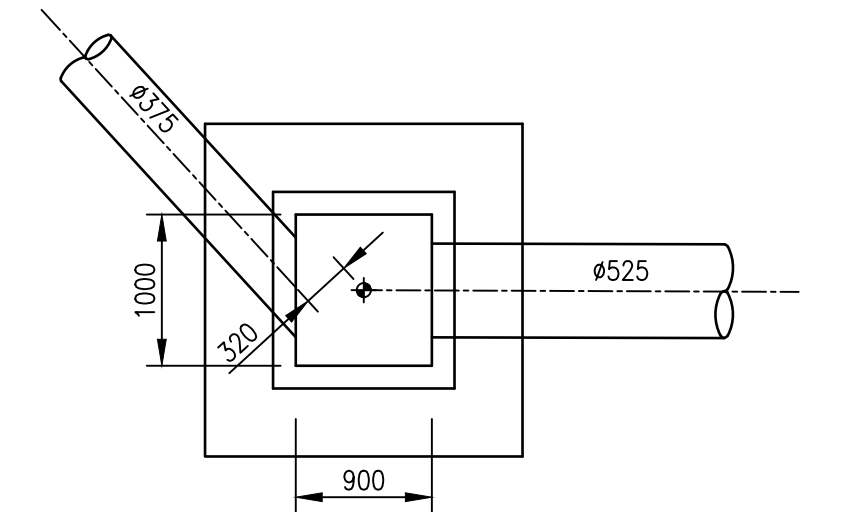
1/4 - 835 x 930



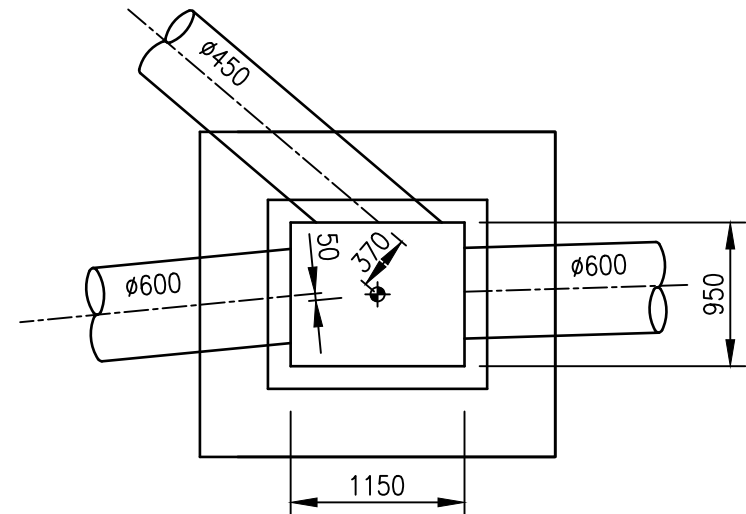
2/4 - 835 x 1120



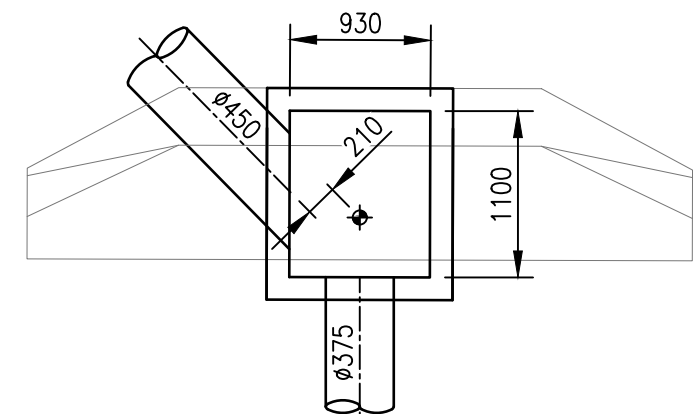
5/1 - 1000 x 930



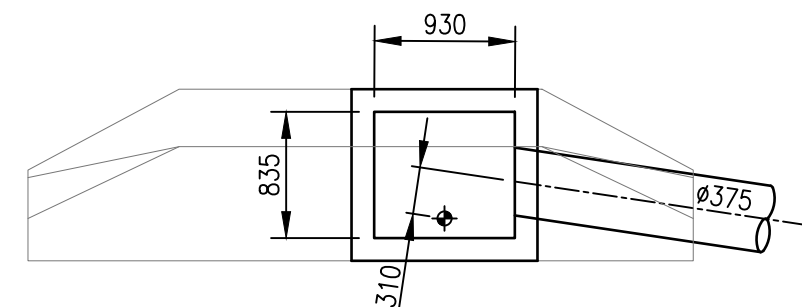
3/4 - 900 x 1000



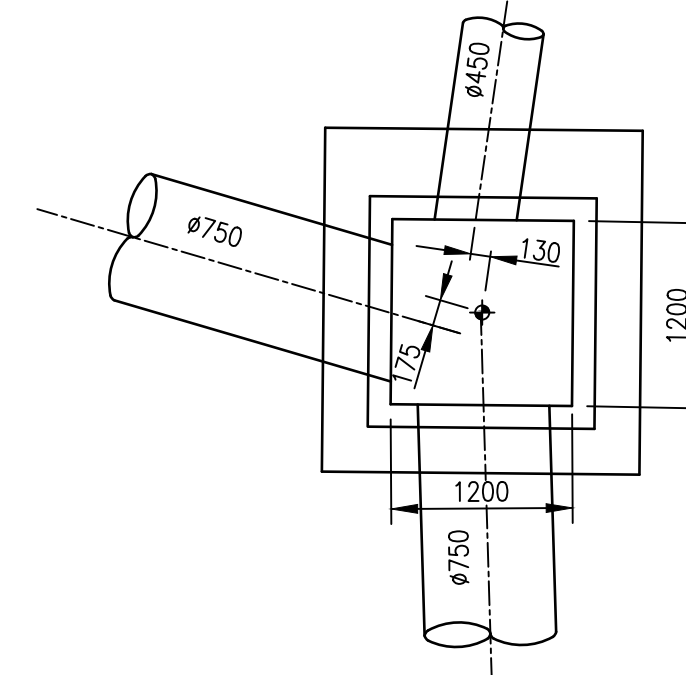
4/4 - 950 x 1150



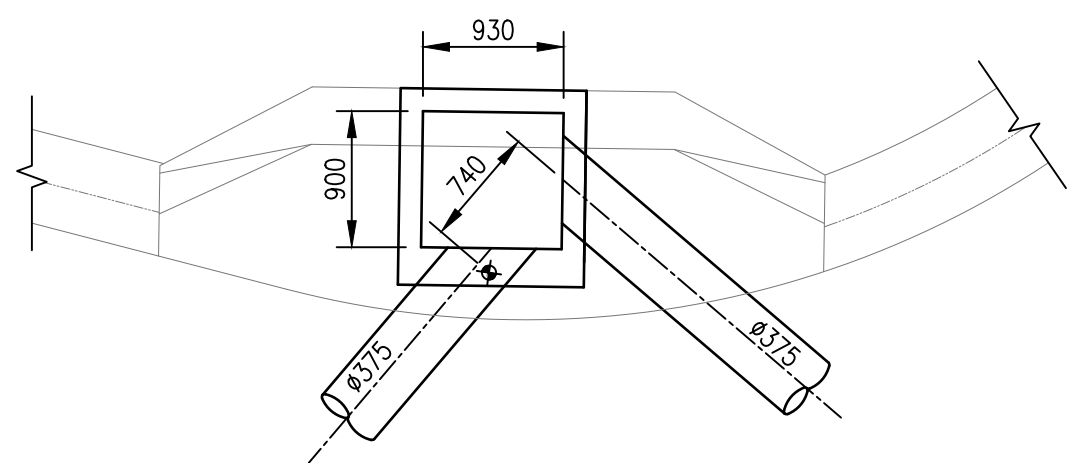
2/6 - 1100 x 930



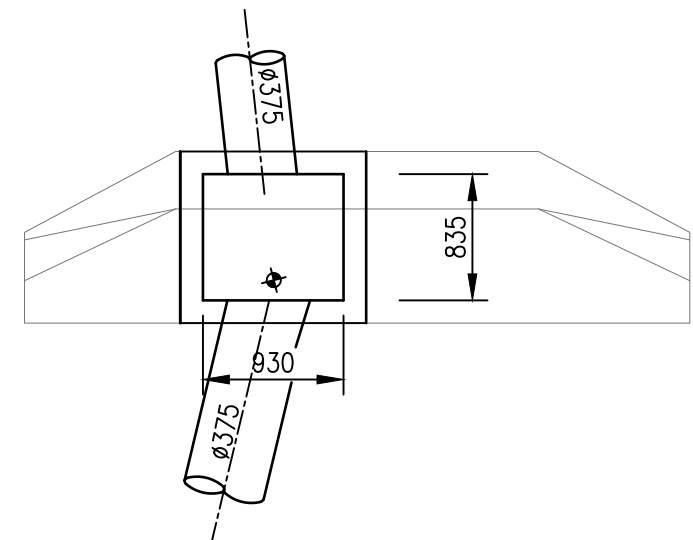
1/7 - 835 x 930



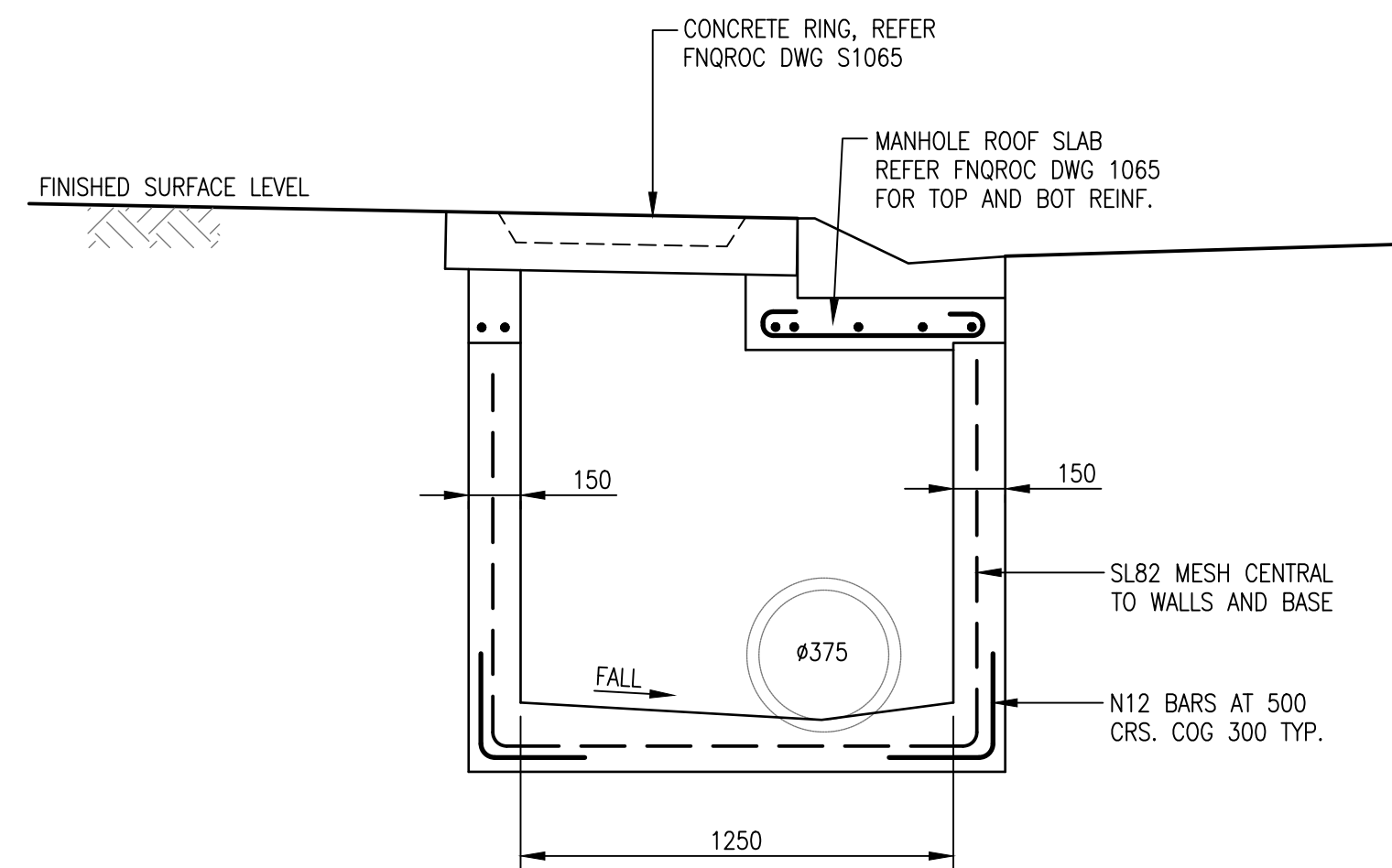
6/4 - 1200 x 1200



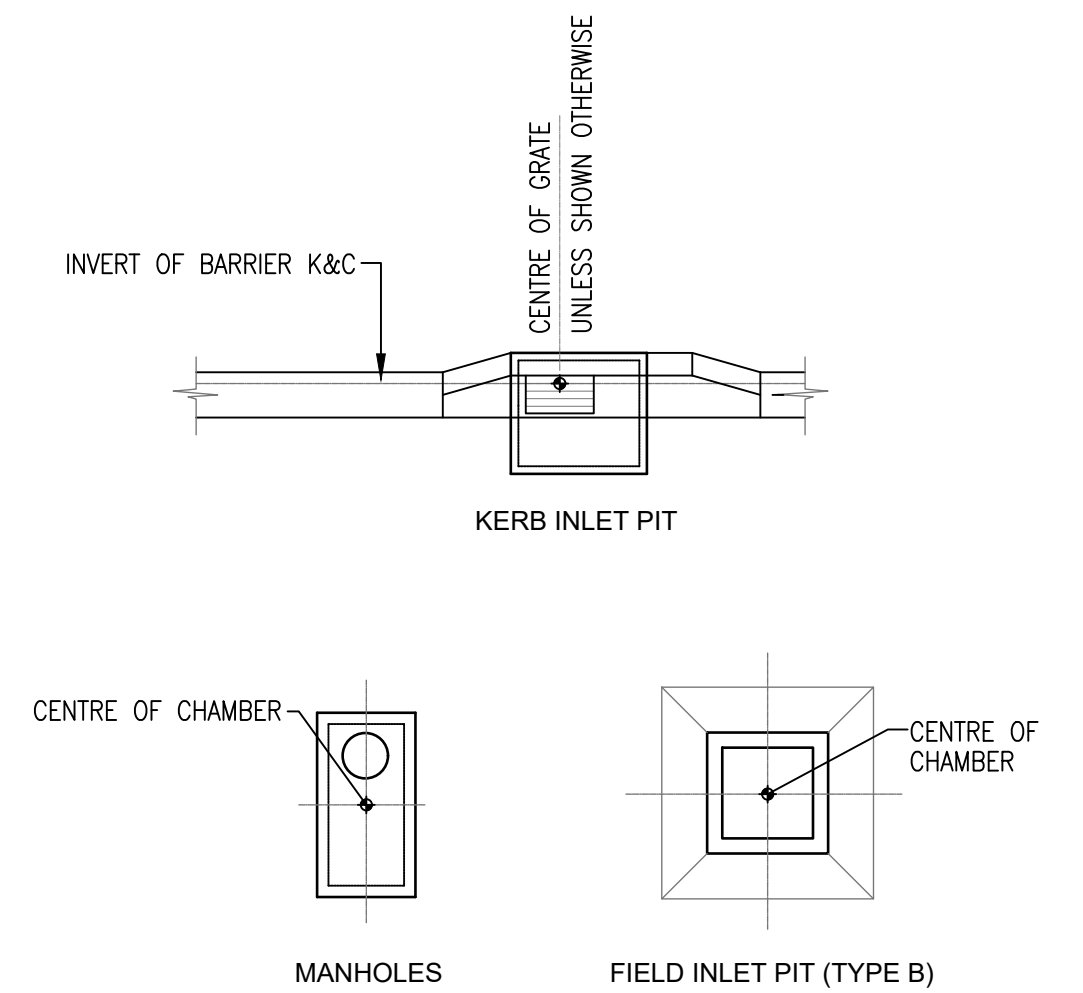
2/8 - 900 x 930



3/8 - 835 x 930



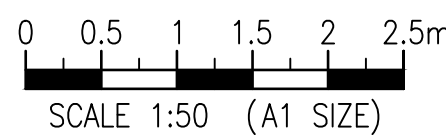
MANHOLE 5/1
SCALE 1:20



◆ SETOUT POINT
DRAINAGE STRUCTURE
SETOUT POINT

Printed: 06 December 2017, 11:52 AM File: T:\1020 Mossman Gorge\Drawings\1020-023(C).dwg

Revisions			
C	OPERATIONAL WORKS ISSUE	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	08/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved Date



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

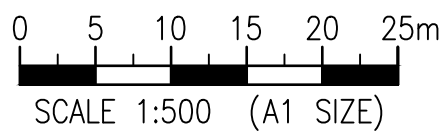
Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client						
AS SHOWN		DATSIP						
Drawing is not to be used for construction unless approved.		Project						
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES						
		Title						
		STORMWATER STRUCTURE DETAILS						
Drawn	Designed	Drawing Check	Design Check	Approved	RPEQ	Date	Drawing No.	Revision
MS	MS						1020-023	C

External References: TEC-TITLE-A1_b.dwg

Revisions			
C	OPERATIONAL WORKS ISSUE	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	08/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



Trinity Engineering and Consulting

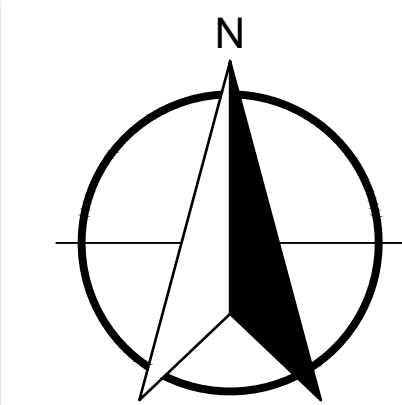
Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:500		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		SEWERAGE RETICULATION PLAN	
		SHEET 1 OF 2	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
			1020-024
		Revision	
		c	



JOINS SHEET 2 OF 2



LEGEND

SEWER PIPE AND MANHOLE

SEWER ENDCAP

HOUSE CONNECTION BRANCH (HCB) AND TYPE

LINE NUMBER / MANHOLE NUMBER

SEWER PUMP STATION

EXISTING SEWER LINE, MANHOLES, PIPE DIAMETER AND INVERT LEVELS

STORMWATER INFRASTRUCTURE

DIRECTION OF FALL ON ALLOTMENTS

STAGE BOUNDARY

INDICATES SEWER (S) CROSSING OTHER SERVICES eg. (SW) STORMWATER

NOTES

1.

ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.

2.

CONTRACTOR TO CONFIRM EXACT LOCATIONS AND LEVELS OF EXISTING SEWER MANHOLES AND CONNECTING PIPES ON SITE PRIOR TO CONSTRUCTION.

3.

SEWER PIPES SHOWN ARE Ø150 uPVC (CLASS SN8) UNLESS NOTED OTHERWISE ON PLAN.

4.

HOUSE CONNECTIONS (HCB'S) FOR SINGLE RESIDENTIAL ALLOTMENTS TO BE Ø100 CONNECTION.

5.

LOCATION OF ALL SEWER MANHOLES TO BE 1.5m OFFSET FROM FRONT PROPERTY BOUNDARY, AND 0.8m OFFSET FROM SIDE AND REAR PROPERTY BOUNDARIES, UNLESS DIMENSIONED OTHERWISE ON PLAN.

6.

MINIMUM LOT DEVELOPMENT LEVELS SHOWN ON PLAN MUST BE TRANSFERRED TO AND SHOWN ON AS-CONSTRUCTED PLANS.

7.

REFER TO FNQROC STANDARD DRAWINGS:
S3000 SEWERAGE MANHOLES
S3005 HOUSE CONNECTION BRANCHES
S3015 SEWER BEDDING - TRENCH DETAILS

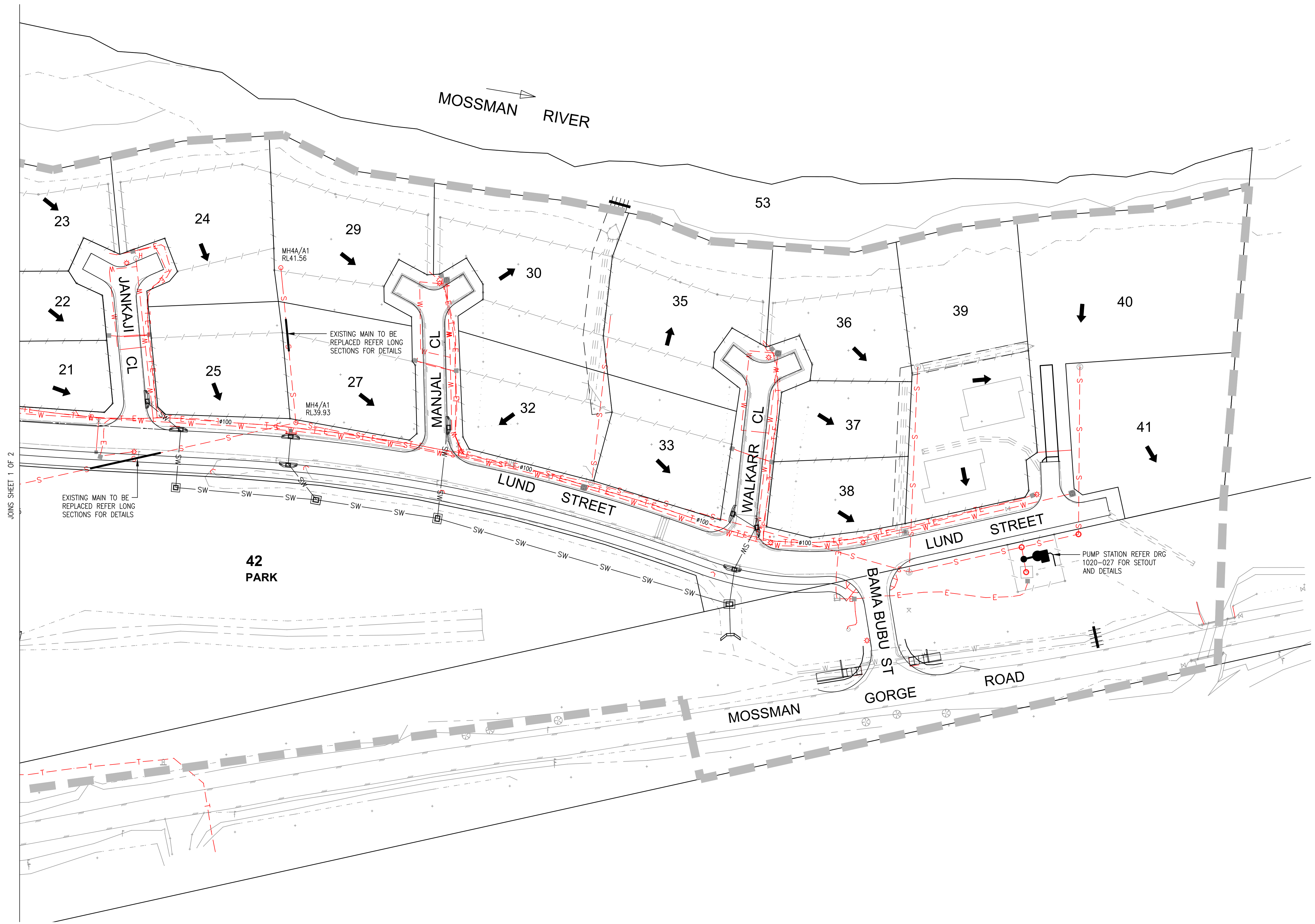
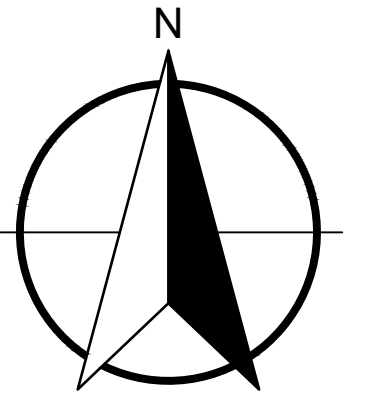
8.

FINISHED LID LEVELS OF SEWER MANHOLES TO STAND 50mm PROUD OF FINISHED SURFACE LEVEL.

9.

REFER TO SEWER LONG SECTIONS DRG 1020-026 FOR LEVELS AND CLEARANCES AT ALL CROSSINGS WITH EXISTING SERVICES.

External References: TEC-TITLE-A1_b.dwg ; 1020-X-SURVEY.dwg ; 1020-X-DESIGN.dwg

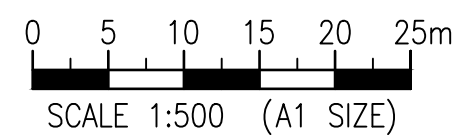


PLAN
SCALE 1:500

NOTE
REFER DRG 1020-024 FOR SEWERAGE RETICULATION LEGEND AND NOTES.

Printed: 06 December 2017, 11:54 AM File: T:\1020 Mossman Gorge\Drawings\1020-025(C).dwg

Revisions			
C	OPERATIONAL WORKS ISSUE	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	06/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved

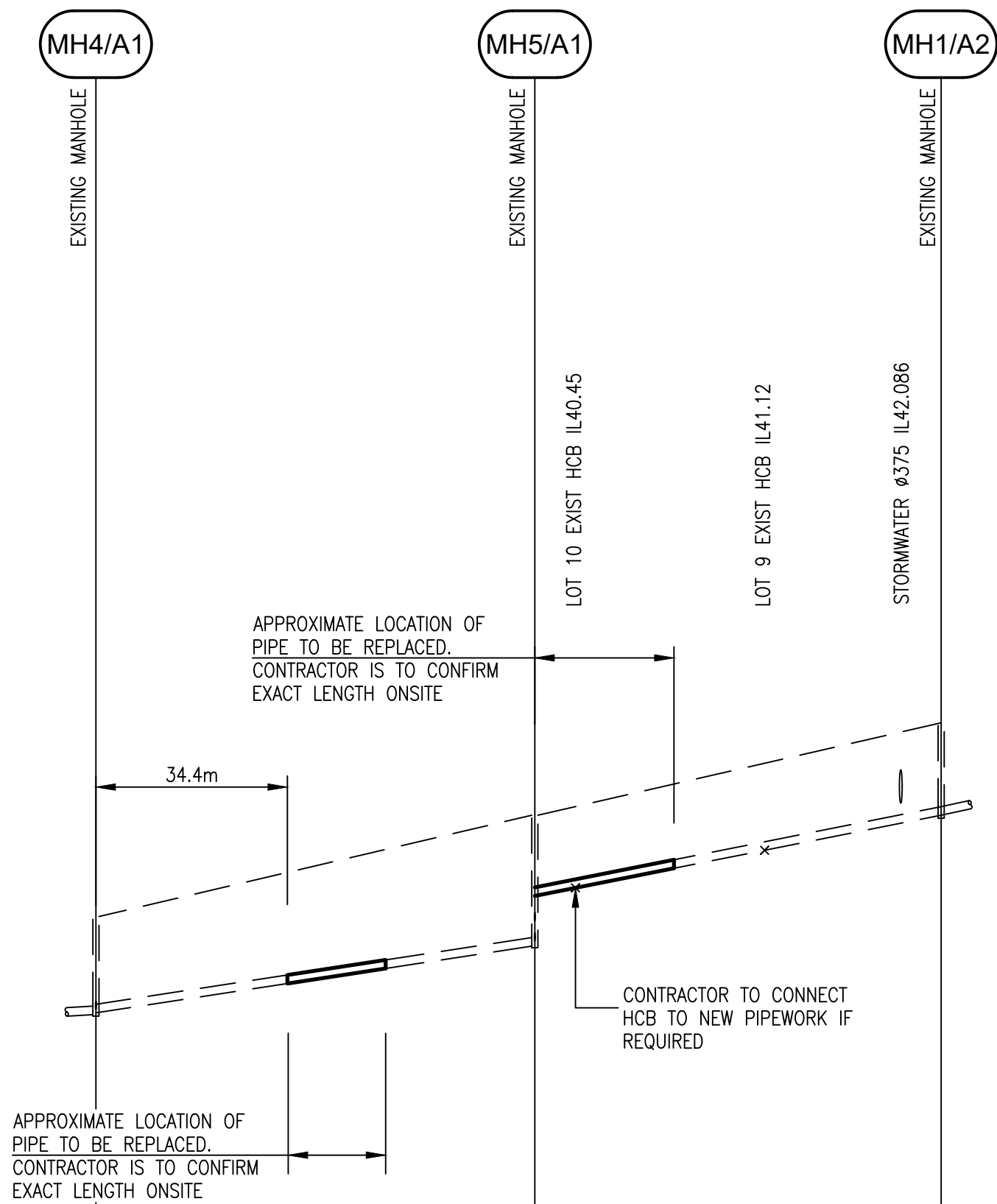


© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

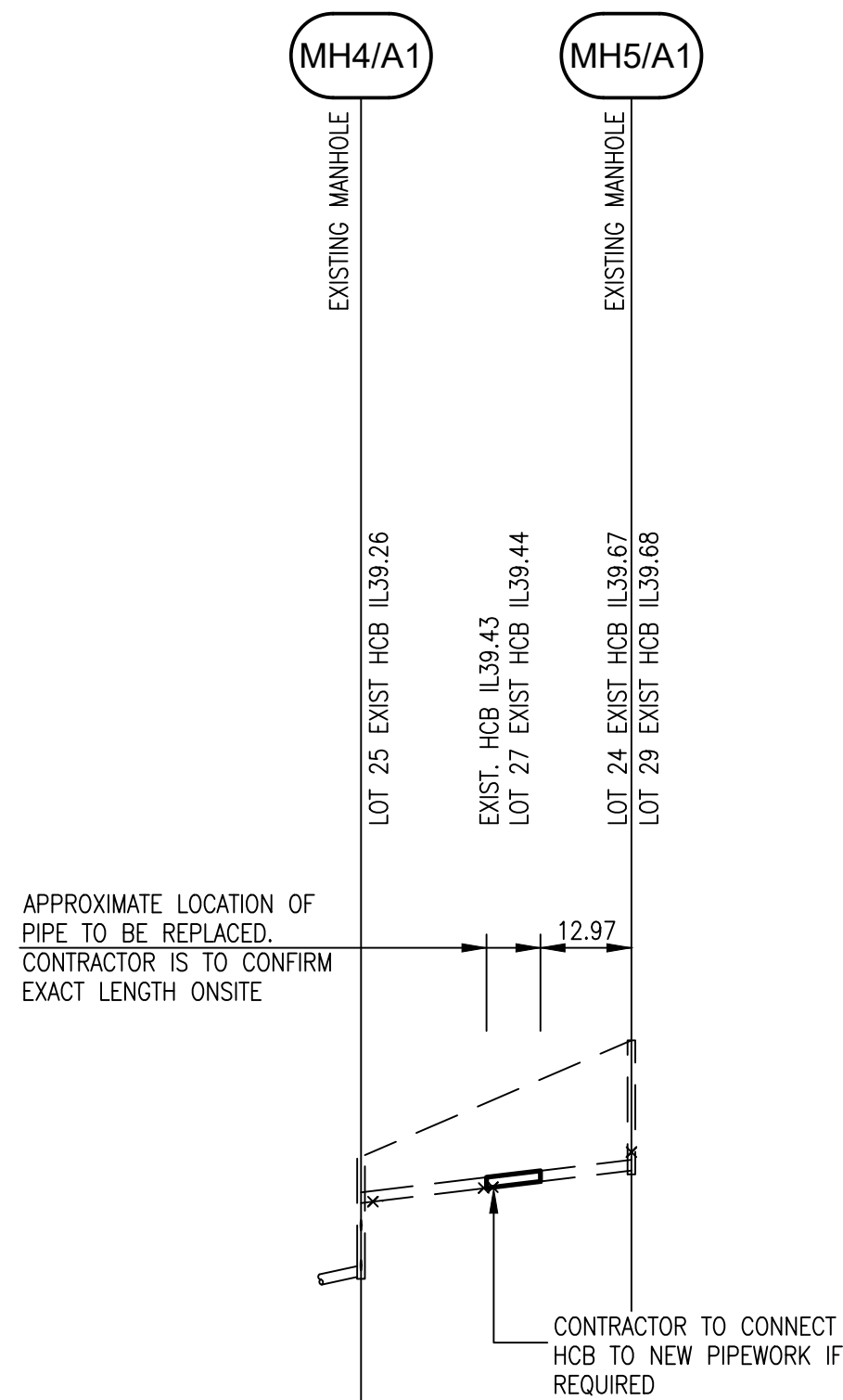
Scale (A1 size)		Client	
1:500		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		SEWERAGE RETICULATION PLAN	
		SHEET 2 OF 2	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Drawing No.
			1020-025
		Revision	C

External References: TEC-TITLE-A1_b.dwg ; 1020-X-SURVEY.dwg ; 1020-X-DESIGN.dwg



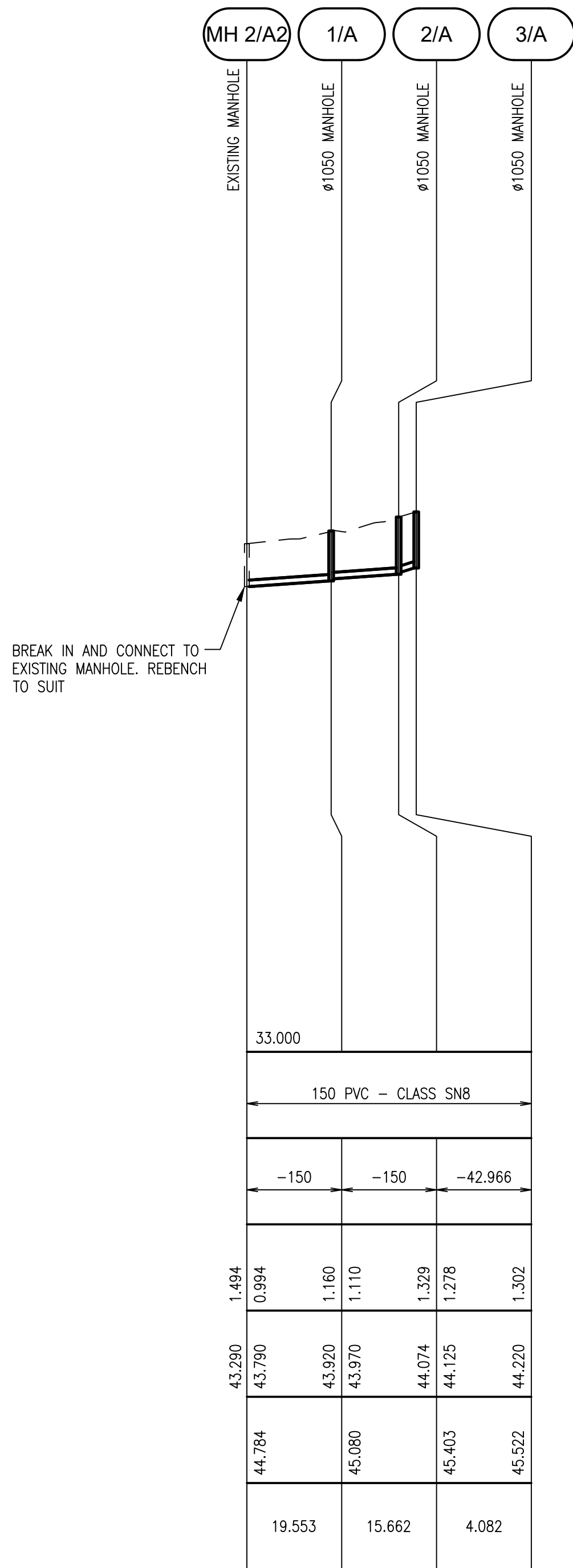
DATUM	32.000	
PIPE DATA	150 PVC – CLASS SN8	
GRADE (1 IN ...)	65	50
DEPTH TO INVERT	1.770 1.730	2.340 1.450
INVERT LEVEL	38.160 38.200	39.410 40.300
DESIGN SURFACE	39.930	41.750
PIPE LENGTH	78.850	72.990

EXISTING LINE A2



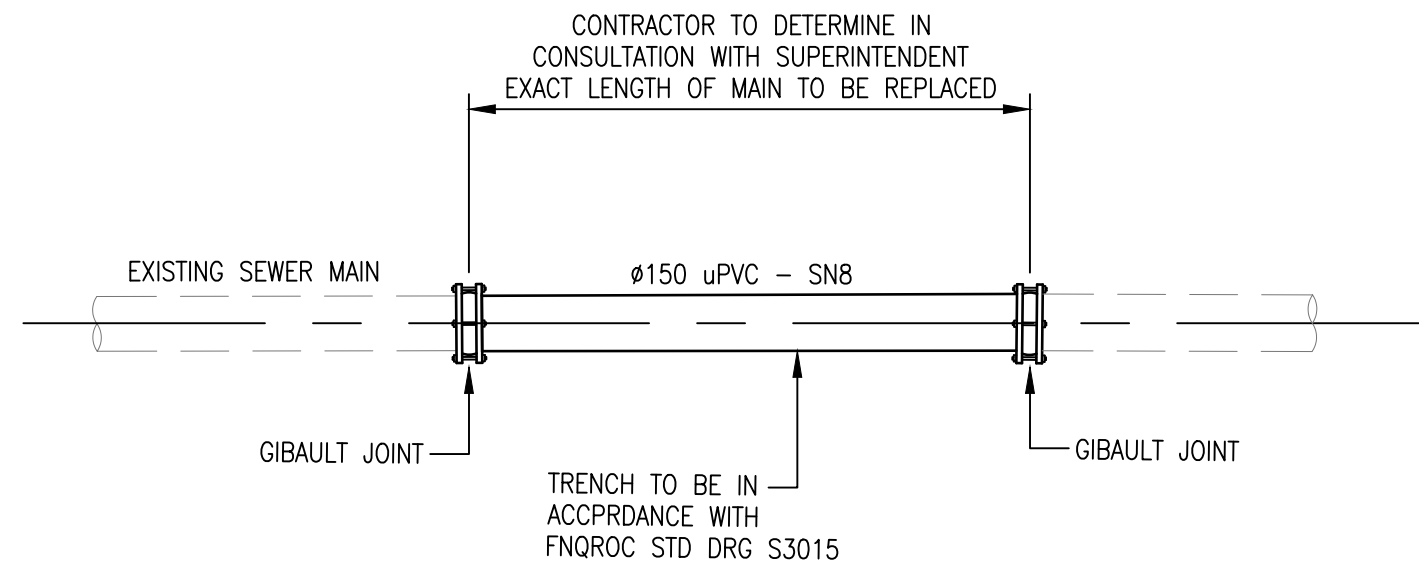
DATUM	32.000	
PIPE DATA	150 PVC – CLASS SN8	
GRADE (1 IN ...)	94	
DEPTH TO INVERT	1.770 0.690	1.910
INVERT LEVEL	38.160 39.240	39.650
DESIGN SURFACE	39.930	41.560
PIPE LENGTH	38.57	

EXISTING LINE 4a



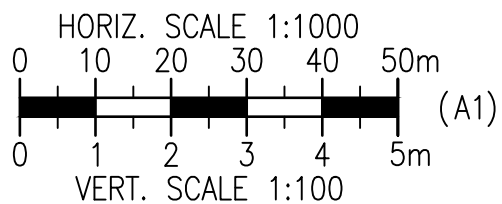
DATUM	33.000	
PIPE DATA	150 PVC – CLASS SN8	
GRADE (1 IN ...)	-150	-150
DEPTH TO INVERT	1.494 0.994	1.160 1.110
INVERT LEVEL	43.290 43.790	43.920 43.970
DESIGN SURFACE	44.784	45.080
PIPE LENGTH	19.553	15.662

LINE A



EXISTING MAIN CUTOUT
SCALE 1:20

Revisions				
C	OPERATIONAL WORKS ISSUE	-	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	-	06/10/17
A	PRELIMINARY ISSUE	-	-	17/08/17
No.	Description	Reviewed	Approved	Date



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

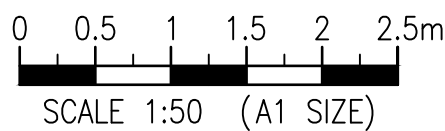
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Ph: (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:1000 HOR 1:100 VERT		Project	
Drawing is not to be used for construction unless approved.		Title	
Drawn		Design	
MS		MS	
Drawing Check	Design Check	Approved	RPEQ
Date	Drawing No.	Revision	
	1020-026	C	

Revisions			
C	OPERATIONAL WORKS ISSUE	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	06/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved Date

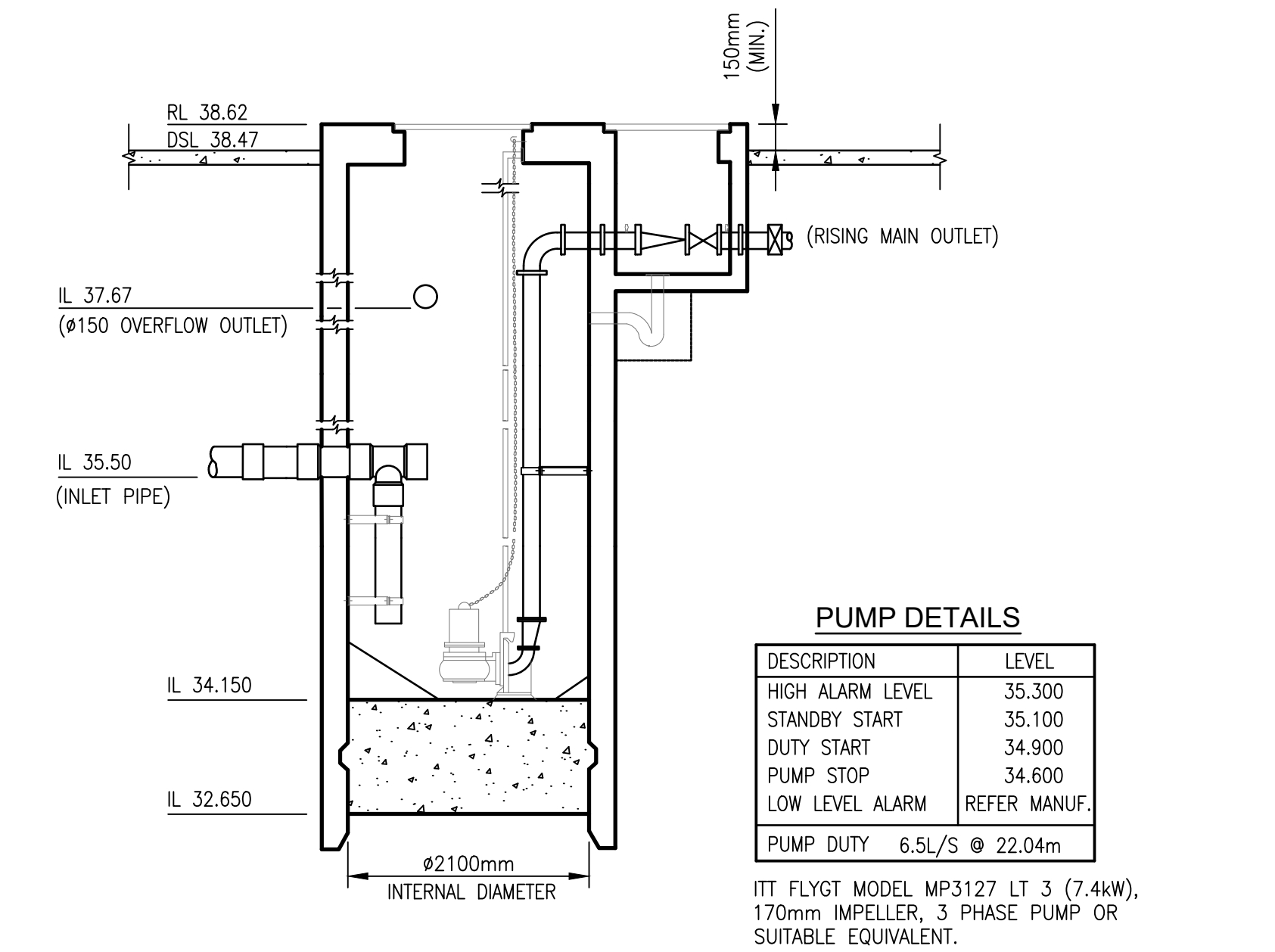


© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

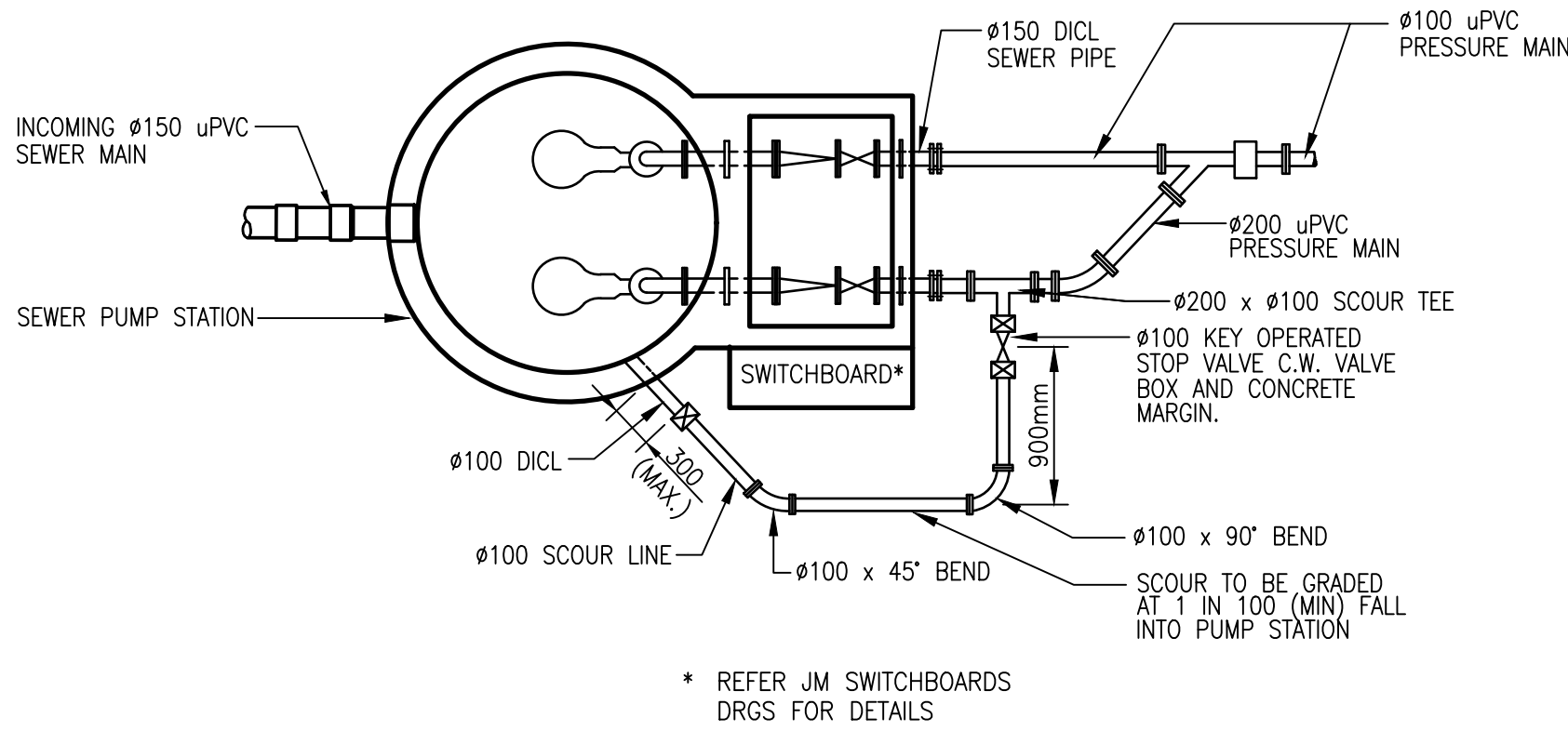
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

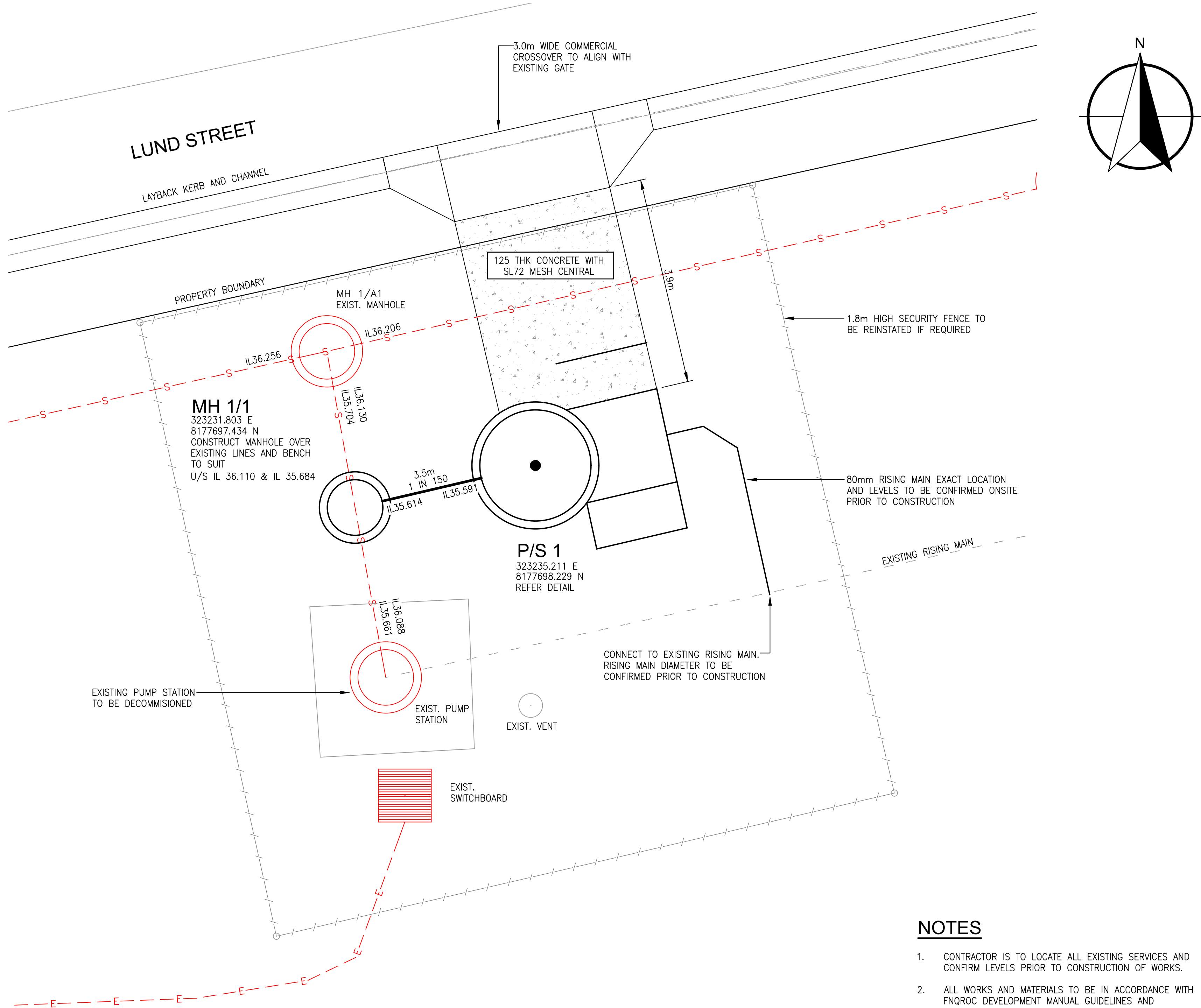
Scale (A1 size)		Client									
AS SHOWN		DATSIP									
Drawing is not to be used for construction unless approved.		Project									
		Title									
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES									
		SEWERAGE PUMP STATION PLAN AND DETAILS									
Drawn	Designed	Drawing Check	Design Check	Approved	RPEQ	Date	Drawing No.	Revision			
MS	MS						1020-027	C			



SEWER PUMP STATION LEVELS
NOT TO SCALE (SCHEMATIC ONLY)



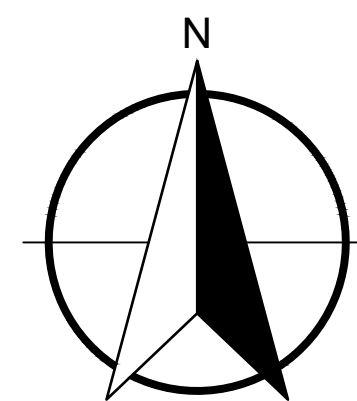
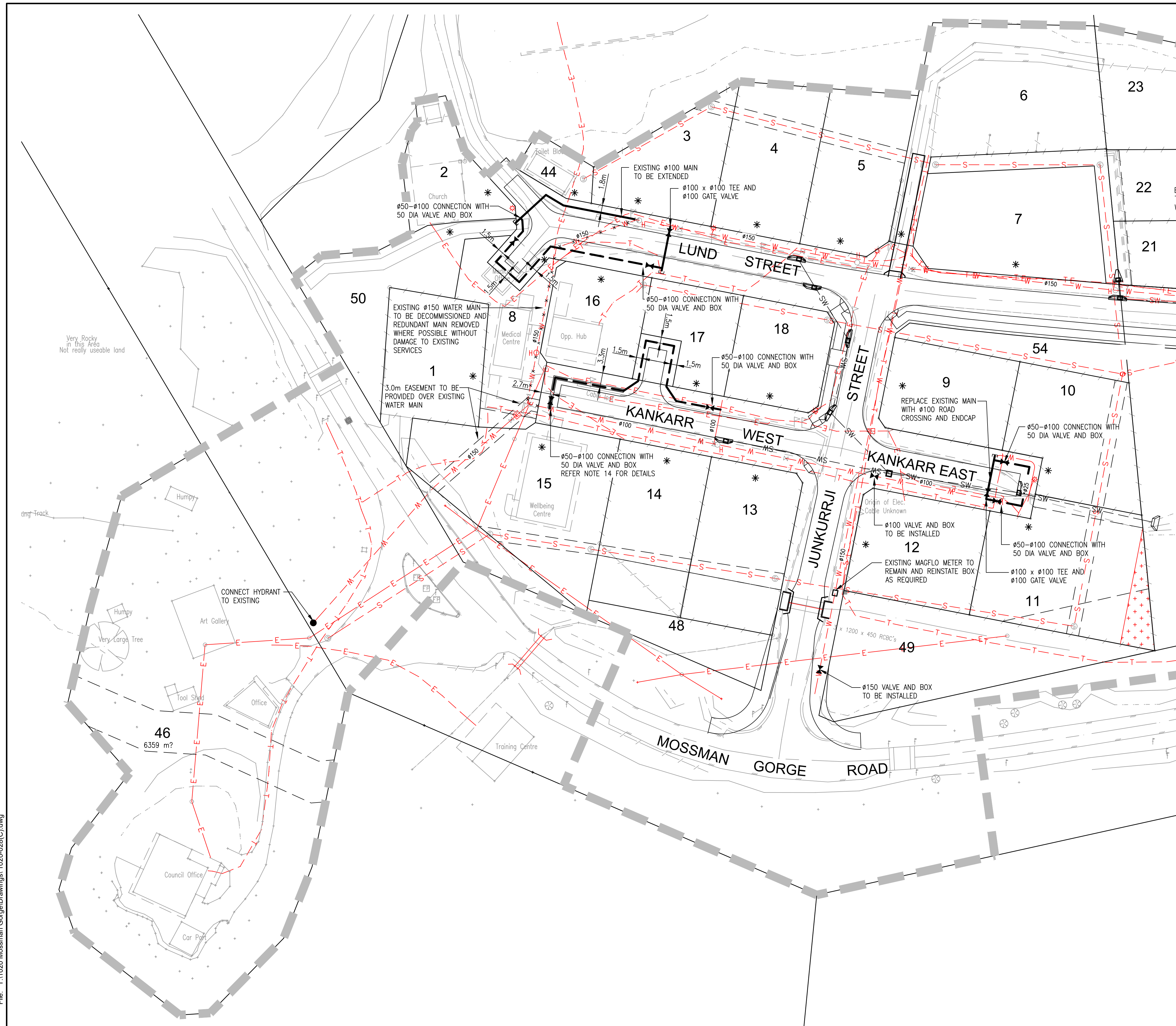
SEWER PUMP DETAIL
NOT TO SCALE (SCHEMATIC ONLY)

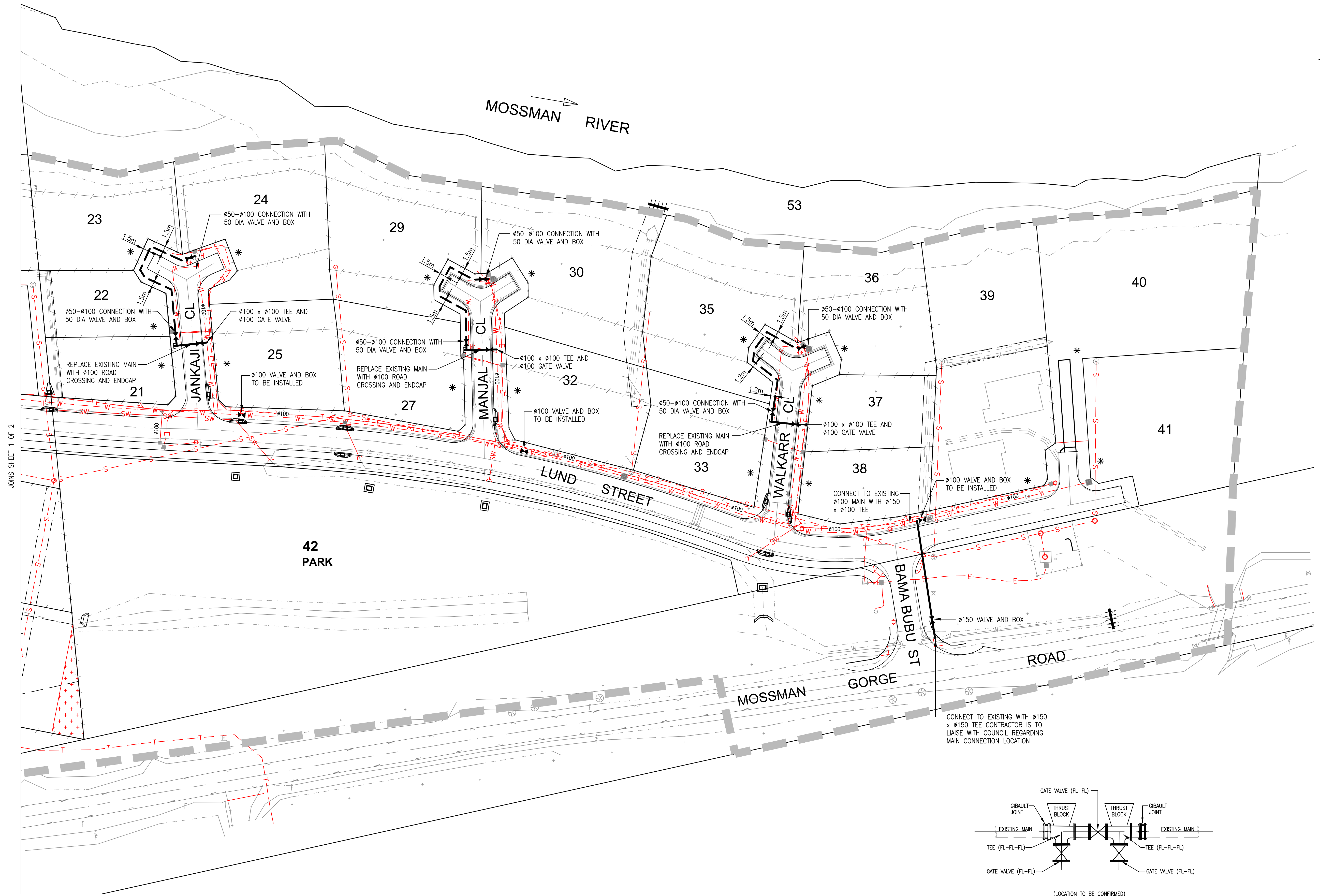
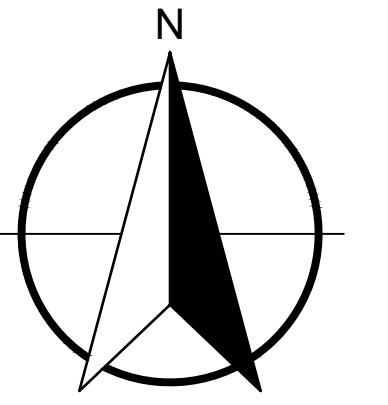


SEWERAGE PUMP STATION PLAN
SCALE 1:50

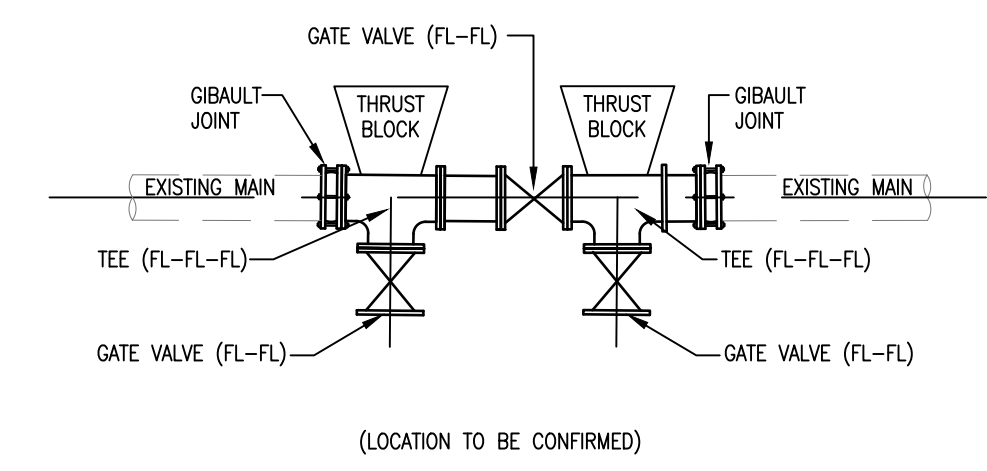
NOTES

- CONTRACTOR IS TO LOCATE ALL EXISTING SERVICES AND CONFIRM LEVELS PRIOR TO CONSTRUCTION OF WORKS.
- ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
- REFER TO FNQROC STD DRGS:
S2015 THRUST BLOCK DETAILS
S2016 WATER RETICULATION BEDDING DETAILS
S3000 SEWERAGE MANHOLE DETAILS
S3015 SEWER BEDDING – TRENCH DETAILS
S3025 SEWERAGE PUMP STATION PRECAST UNITS
S3030 SEWERAGE PUMP STATION DETAILS
- PUMP STATION TO BE CONSTRUCTED IN ACCORDANCE WITH FNQROC STANDARD DRAWINGS S3025, S3030 AND SPECIFICATION.
- ACCESS HATCHES MUST SATISFY DOUGLAS SHIRE COUNCIL'S REQUIREMENTS.
- ALL WORKS TO BE IN ACCORDANCE WITH THE LATEST FNQROC SPECIFICATIONS.
- MINIMUM DEPTH OF COVER TO SEWER RISING MAIN SHALL BE AS PER FNQROC DEVELOPMENT MANUAL SECTIONS D7.19 AND D6.11.



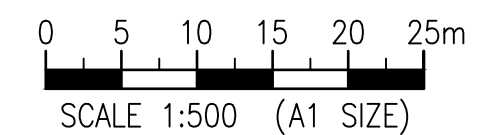


PLAN
SCALE 1:500



NOTES
REFER TO DRG 1020-028 FOR LEGEND AND NOTES.

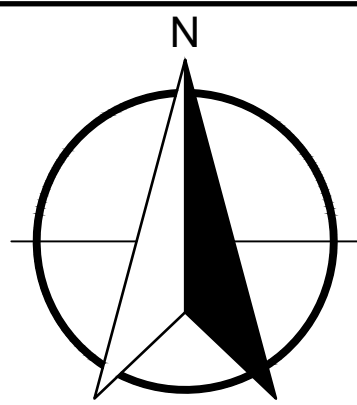
Revisions			
No.	Description	Reviewed	Approved
B	OPERATIONAL WORKS ISSUE	-	07/12/17
A	PRELIMINARY ISSUE	-	17/08/17



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:500		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		WATER RETICULATION LAYOUT	
		SHEET 2 OF 2	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	RPEQ
		Date	Revision
		1020-029	B



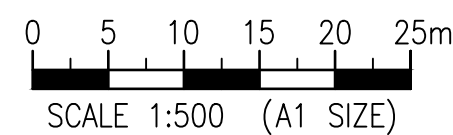
LEGEND

- STAGE BOUNDARY
- CHECK DAMS, 0.3m HIGH PLACED ROCK
- DIRECTION OF FALL ON LOTS
- BATTER TOE/TOP
- MULCH BANK
- CATCH DRAIN
- STABILISED ENTRY
- SEDIMENT BASIN AND NUMBER (REFER TABLE FOR SIZES)
- SEDIMENT FENCE
- OVERLAND FLOW PATH
- SANDBAG KERB INLET PIT
- FIELD INLET TRAP

NOTES

- NO WORKS TO COMMENCE ON SITE UNTIL CONTRACTORS EROSION AND SEDIMENT CONTROL PLAN IS APPROVED BY CAIRNS REGIONAL COUNCIL.
- ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
- CONTRACTOR TO NOTE REQUIREMENTS AND RESPONSIBILITIES FOR SEDIMENT AND EROSION CONTROL AS PER FNQROC & CONTRACT SPECIFICATION.
- TOPSOIL STOCKPILES TO BE LOCATED AS ADVISED BY SUPERINTENDENT AND SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE APPROVED ACCORDINGLY.
- MOVEMENT OF CONSTRUCTION EQUIPMENT SHALL BE LIMITED TO THE AREA OF WORK AND EXISTING ROADS.
- ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED AND MAINTAINED AFTER EACH STORM EVENT AND AT REGULAR INTERVALS.
- EACH LOT TO HAVE SINGLE ACCESS POINT ONLY UNLESS DIRECTED OTHERWISE BY SUPERINTENDENT.
- CONTOURS SHOWN ARE NATURAL SURFACE CONTOURS PRIOR TO ANY BULK EARTHWORKS TAKING PLACE.
- PROVIDE MULCH TO TOP OF BATTERS.
- CATCH DRAINS AND SEDIMENT TRAPS TO BE CONSTRUCTED PRIOR TO COMMENCEMENT OF WORKS.
- ALL VEHICLES LEAVING THE SITE MUST EXIT VIA WASHDOWN FACILITY.
- DEPTHS FOR CLEARING, GRUBBING AND STRIPPING TO BE CONFIRMED DURING THE EARLY STAGES OF SITE CLEARING. ANY VARIATIONS TO THE DEPTHS NOMINATED ON THE ENGINEERING DRAWINGS TO BE APPROVED BY THE SUPERINTENDENT.

PLAN
SCALE 1:500



© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130

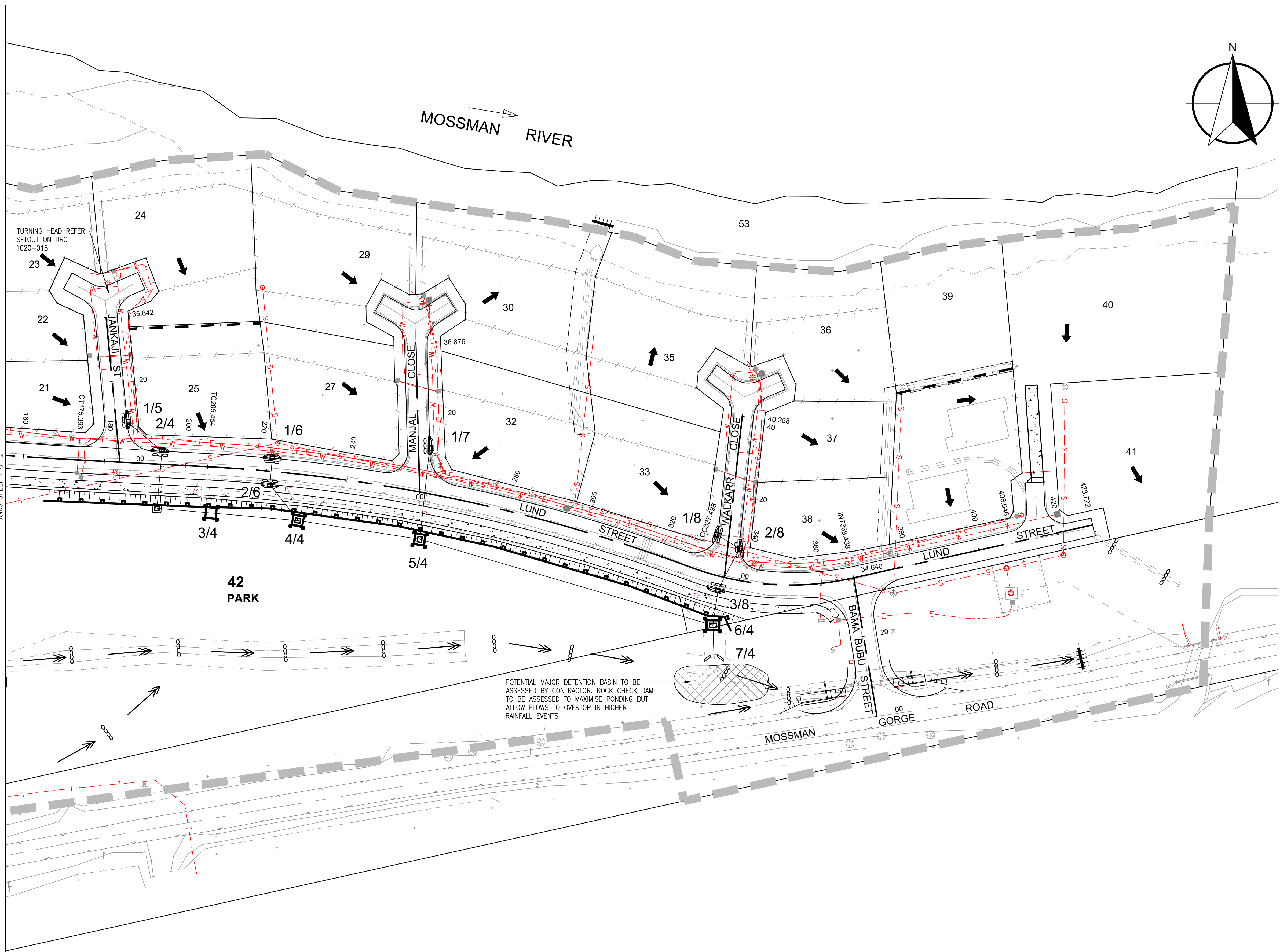
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.



Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

Scale (A1 size)		Client	
1:500		DATSIP	
Drawing is not to be used for construction unless approved.		Project	
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES	
		Title	
		EROSION AND SEDIMENT CONTROL PLAN	
		SHEET 1 OF 2	
Drawn	Designed	Drawing Check	Design Check
MS	MS	Approved	
		RPEQ	Date
		Drawing No.	Revision
		1020-030	C

Revisions			
C	OPERATIONAL WORKS ISSUE	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	08/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved
			Date

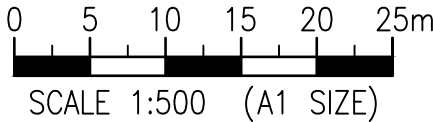


PLAN
SCALE 1:500

NOTE
REFER TO DRG 1020-030 FOR LEGEND AND NOTES.

Printed: 06 December 2017, 12:03 PM File: T:\1020 Mossman Gorge\Drawings\ 1020-031 (C).dwg

Revisions			
C	OPERATIONAL WORKS ISSUE	-	07/12/17
B	MISCELLANEOUS AMENDMENTS	-	08/10/17
A	PRELIMINARY ISSUE	-	17/08/17
No.	Description	Reviewed	Approved

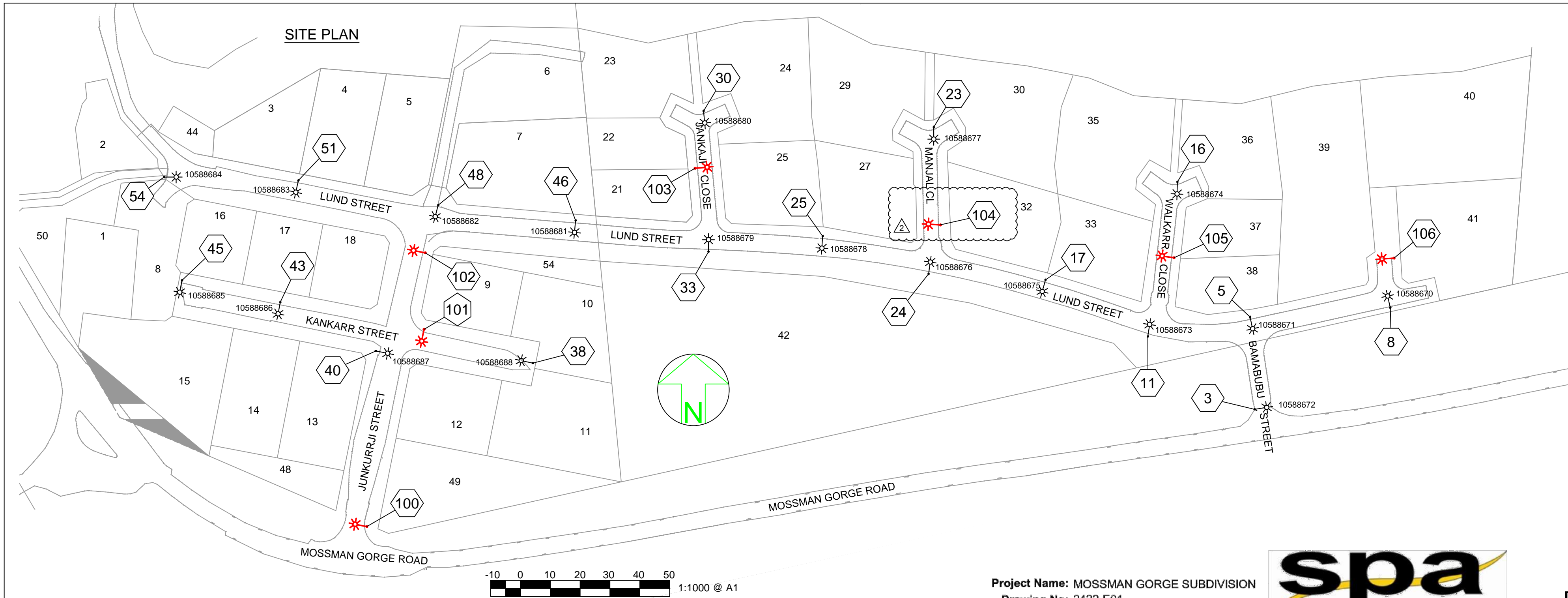


© Trinity Engineering and Consulting Pty Ltd
ABN 78 610 181 130
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
Ph: (07) 4040 7111 Cairns QLD 4870
www.trinityengineering.com.au Email: admin@trinityengineering.com.au

Scale (A1 size)		Client					
1:500		DATSIP					
Drawing is not to be used for construction unless approved.		Project					
		MOSSMAN GORGE INFRASTRUCTURE UPGRADES					
		Title					
		EROSION AND SEDIMENT CONTROL PLAN					
		SHEET 2 OF 2					
Drawn	Designed	Drawing Check	Design Check	Approved	RPEQ	Date	Revision
MS	MS						
		Drawing No.		Revision			
		1020-031		c			

External References: TEC-TITLE-A1_b.dwg; 1020-X-SURVEY.dwg; 1020-X-DESIGN.dwg



WORKPLAN NOTES

- STREETLIGHT POLE FOOTINGS SHALL BE LOCATED PERPENDICULAR TO THE KERB AND SQUARE FROM THE FRONT BOUNDARY PEG ENSURING NO CONFLICT WITH FUTURE DRIVEWAYS, UNLESS DETAILED OTHERWISE. WHERE DIMENSIONS ARE SHOWN, THEY TAKE PRECEDENCE OVER GRID COORDINATES.
- THERE ARE 26x32W CFL MAXI URBAN MINOR ROAD STREETLIGHTS ON RATE 2.
- STREETLIGHT DESIGN TO AS1158 CATEGORY P4 FOR ALL ROAD.
- MINOR STREETLIGHTS - THE DEVELOPER SHALL SUPPLY AND INSTALL STREETLIGHT BASES. FOUNDATION DEPTH IS 1200mm FOR MINOR STREETLIGHTS. REFER TO LIGHTING CONSTRUCTION MANUAL DRAWING 1-6-4-1 & 2. FOR ALL FOOTPATHS, CENTRELINE OF STREETLIGHT SHALL BE 0.82m FROM THE INVERT OF KERB AND CHANNEL.
- THE LIGHTING DESIGN INCLUDES AN ALLOWANCE FOR CONSTRUCTION TOLERANCE OF LIGHT POLES SUCH THAT ANY STREETLIGHT CAN BE POSITIONED UP TO A MAXIMUM OF ±350mm LONGITUDINALLY FROM THE POSITION SHOWN AND UP TO 100mm MAXIMUM FURTHER AWAY FROM KERB EDGE, INCLUDING POLES WITH GRID COORDINATES, AND STILL MAINTAIN COMPLIANCE.

Project Name: MOSSMAN GORGE SUBDIVISION
Drawing No: 2422-E01

Council: Douglas Shire Council



I certify this design meets the compliance requirements of AS/NZS 1158.3.1:2005

Jane Errey RPEQ 6863

LUMINAIRE / POLE / PHOTOMETRIC INFORMATION TABLE			
Category	P4	Road Surface Luminaire Type	R3
Luminaire Type	Urban - Singl	Luminaire Wattage	CF32
Pole Height (m)	5.5	Luminaire Outreach (m)	0.3
Foundation Depth (mm)	1200	Outreach (m)	Standard 1.5m
Upcast	5	Uplift (m)	2
Mounting Height (m)	7.5	Cleaning / Replacement	36 Months
Lamp	SUB 32CFL PEC LYNX	Pollution Level	Medium
Photometric File	206243.cie	IP Rating	IP6x
Lamp Type	Compact Fluorescent	LLMF	0.82
Lumens	2400	MF	0.71

LIMITING LTPs			
Min Av E _h	0.85	Min E _h Maint	0.14
Lamp Type	4	U _p Maint	10

HAS COMPLIANCE WITH THE FOLLOWING ELEMENTS BEEN MET?	
Is compliance with the maximum permissible spacing achieved on all straights and curves?	YES
For curved sections, does a straight line joining successive luminaires lie within the road reserve or is at least one luminaire located within the hatched area, as shown in figure 3.1?	YES
Has a luminaire associated with one of the intersecting roads been located within the hatched area shown in figure 3.1, and where differing levels of Category P lighting are provided, the luminaire is a type that complies with the higher lighting category?	YES
For Tee-intersections, has the first luminaire in the joining road been located no more than 50% of the maximum spacing detailed in clause 3.2.1 from the limits of the junction defined by the prolongation of the property lines?	YES
Where pedestrian refuges are located on roads requiring category P lighting, is the maintained horizontal illuminance over the surface of the refuge, within the design area shown in figure 3.3, not less than 3.5 Lux?	N/A
Do maximum spacing for luminaires in cul-de-sacs comply with Clause 3.2.1.and are the provisions of Clauses 3.2.5.2, 3.2.5.3 or 3.2.5.4 met?	N/A
Lighting design compliance is conditional on all lights being operational.	
Is the maintained horizontal illuminance over the surface not be less than 3.5 lux for the design areas defined below:	Modelling Software Used:
Roundabouts	N/A
LATMDs	N/A
PlaPcat	

ROAD INFORMATION TABLE				RESULTS TABLE				ELEMENTS FOR THIS ROAD							
Road Name	Road Reserve Width (m)	Distance to Kerb (m)	Offset (m)	Spacing Value from PlaPal S	Min Av E _h	Min E _h Maint	U _p Maint	Straights Single Sided	Straights Staggered	Curves (Straights or Staggered)	T-Inter sections	Pedestrian Refuges	LATMDs	Cul-de-sacs	Round abouts
LUND STREET (STN 51)	15	3.27	4.27	64.9	0.85	0.14	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 51)	15	3.27	4.27	64.9	0.85	0.14	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 11)	15	10.13	11.13	53.8	0.85	0.15	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 33)	15	7.55	8.55	61.5	0.85	0.16	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 24)	15	6.76	7.76	63.2	0.85	0.15	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNKURRJI STREET (STN 100)	15	4.58	5.58	65.2	0.85	0.14	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNKURRJI STREET (STN 102)	15	3.42	4.42	65	0.85	0.15	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KINKARR STREET	15	4.28	5.28	63.7	0.87	0.14	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
JANKAJ CLOSE	11	3.17	4.17	65.1	0.98	0.14	4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MANJAL CLOSE	11.72	3.71	4.71	59.4	0.93	0.14	4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
WALKARR CLOSE	11.14	3.03	4.03	65.3	0.97	0.14	4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

STN NO	SITE LABEL	ACTION	CONSTRUCTION CODE	RATE	TARIFF OWNER	MOUNTING HEIGHT (m)	REMARKS
3	10588672	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
5	10588671	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
8	10588670	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
11	10588673	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
16	10588674	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
17	10588675	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
23	10588677	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
24	10588676	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
25	10588678	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
30	10588680	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
33	10588679	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
38	10588688	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
40	10588687	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
43	10588686	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
45	10588685	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
46	10588681	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
48	10588682	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
51	10588683	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
54	10588684	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
100		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
101		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
102		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
103		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
104		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LOCATE LIGHT AS CLOSE AS PRACTICABLE TO NORTHERN SIDE OF DRIVEWAY LOT 32
105		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
106		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	

2	22/04/14	LIGHT 104 MOVED PAST DRIVEWAY	JE				
1	16/04/14	FOR APPROVAL	HL				
Code	Date	Description	Revised	Code	Date	Description	Approved

CLIENT: BLACK & MORE (CAIRNS)
PO BOX 999
NORTH CAIRNS QLD 4870
Ph. 07 4031 9944 Fax 07 4031 9914
CIVIL ENGINEER
BLACK & MORE (CAIRNS)
PO BOX 999
NORTH CAIRNS QLD 4870
Ph. 07 4031 9944 Fax 07 4031 9914



Tel: (07) 4032 3311 Fax: (07) 4032 5633
PO Box 664N North Cairns QLD 4870
Email Address - admin@spaconconsulting.com.au
A business unit of SPA Consulting Engineers (QLD) Pty Ltd a.c.n. 016444416

LEGEND
--- HV DUCT
--- LV DUCT
--- LIGHTING DUCT
--- 35mm sq ANNEALED BARE COPPER EARTH
----- CABLE EXISTING
----- CABLE PLANNED
----- CABLE RECOVER
----- EQUIPMENT EXISTING
----- EQUIPMENT RECOVER
----- EQUIPMENT PLANNED
SUBSTATION
HV ISOLATING DEVICE
LV ISOLATING DEVICE
NORMAL PILLAR
CROSS ROAD PILLAR
LINKING PILLAR
COMMERCIAL/ INDUSTRIAL PILLAR
DISTRIBUTION CABINET
STREETLIGHT
EARTH
POLE

Drawing Title	Date	APRIL, 2014
MOSSMAN GORGE SUBDIVISION LIGHTING DESIGN SITE PLAN & SCHEDULE NOTES & CERTIFICATE	Scale	1:1000 @ 1A
	Drawn	HL
	Approved	JE
	Sheet	1 OF 1
Project Description MOSSMAN GORGE COMMUNITY MOSSMAN GORGE ROAD, MOSSMAN	ERGON Project Number 769605	SPA Drawing Number 2422-E01
	Revision	2

YOUR REF:
OUR REF: ROL 396/2014 (774338)

12 July 2016

DATSIP
C/- Trinity Engineer & Consulting
Level 1 / 10 Grafton Street
CAIRNS QLD 4870

Attention: Mr Scott Christensen

Dear Sir

**ADVICE TO ASSIST WITH DEFINING SCOPE OF WORK TO SATISFY
CONDITIONS OF DEVELOPMENT PERMIT ROL396/2014 - MOSSMAN
GORGE COMMUNITY**

This letter refers to the meeting between Douglas Shire Council Officers and the Department in the presence of their consultants, Trinity Engineering & Consulting on 4th February 2016.

The discussion centred on the project scope that Council considers will be needed to satisfy conditions of the Development Permit to reconfigure the land dated 17 December 2014.

The outcomes/agreements discussed at the meeting are as listed below and generally in accordance with the plans being Sketch 7019-5 and Sketch 7019-6. It is noted that Trinity Engineering and Consulting Pty Ltd (TEC) has provided updated Sketches that now form Revision C. TEC has advised that the amendments are for corrections on the title blocks only. Copies of the Revision C Sketches are attached to this letter.

The following sections outline Council's position regarding the infrastructure requirements that arise from conditions of approval to reconfigure the land.

Sewerage

Council Officers confirm that it is not Council's expectation that the existing sewer system be replaced. The non-standard alignments will be accepted by Council, (with the easements as proposed on the attached sketches).

The sewer must be extended to service the new lots not currently serviced. Identified defects are to be reconfirmed on site and repaired prior to handover to Council. It is understood that identified defects are notated on the Sketches

attached however further CCTV is required to be undertaken and reviewed during the construction phase.

Where defects are identified in the non-Council infrastructure items such as house drains, Council will be seeking to have a commitment on these being rectified.

The main pump station is to be decommissioned and replaced with a new FNQROC compliant pump station.

Please note that the amalgamation of Lots 44 and 45 is likely to be supported subject to the Building Classification of the existing structure and confirmation as to whether there is an established need for a sewer connection. In the event there is no need for a sewer connection, there will be no requirement for the provision of a private pump station at this point in time. Council would require this further advice prior to confirming its final position in relation to this matter.

Water Supply

It is confirmed that construction of loop mains at the ends of the cul-de-sac/stub roads will be required being generally in accordance with the scope proposed on Sketches 5 and 6.

Please note that Council Officers are of the view that there are no specific concerns that Council is currently aware of with the remainder of the existing water supply system.

It is noted that the water main alignments within the proposed road reserves are not consistent with the current FNQROC standard alignments. However, Council considers that they will be acceptable in this instance.

As discussed at the meeting, additional valves and hydrants are required and it is Council's understanding that these are generally consistent with the proposed additional works shown on the Sketches. However final review of this detail will take place at the Operational Works application phase of the development.

It is also advised that the water supply network be re-assessed based on further pressure and flow testing and subsequent network modelling of the reticulation system. This revised network modelling will ultimately determine if a booster pump station is required between the reservoir in Mossman and the Mossman Gorge Community. It is understood that the current Sketches of the work scope do not currently show a water Booster Pump Station and Council notes that this may be an additional scope should the network modelling confirm its requirement.

It is also confirmed that the proposed additional connection and meter on Barna Bubu Street may be reconsidered and is not specifically required by Council.

It was also noted in discussions that the condition of non-Council water infrastructure items i.e private water services will need to be further investigated in the vicinity of proposed Lot 46 being south-west from Mossman Gorge Road. Council Officers have responded to a number of leaks in this area in the past.

In addition, Council will also require that the construction specification include an assessment of the individual tapping bands when the water meters are installed to each dwelling.

Road Works

Construction

In order to comply with conditions of the Development Permit, a full reconstruction of the roads will be required due to concerns held with respect to the thickness of the existing pavement and the extent of disturbance that will be undertaken to the roads associated with the provision of storm water and other services. The view is held that the reconstruction of the road is a practical approach to the restoration and reinstatement following these works.

Reserve Widths

With respect to proposed road reserve widths, Council Officers will support the proposed reserves being accepted, including the Jankaji, Manjal and Walkarr tee heads.

Please note that the carport must be removed from the western end of Lund Street to facilitate the proper operation of that "Tee-head".

In relation to the discussions regarding the bus route through the community, Council's preference is for the pavement width to be increased for the loop Junkurji-Lund-Bama Bubu Streets. It is noted that this may increase the width of the carriageway in some locations compared with the current road. Further supporting information and analysis must be provided at the time of seeking a Development Permit for Operational Works in order to justify the carriageway width proposed.

Storm water Drainage

Council confirms that the proposed upgrade to the stormwater system as currently shown in the Sketches is considered to generally meet the requirements of the planning approval conditions.

This includes:

- New storm water along Junkurji Street to pick up runoff from Junkurji, Lund and Kankarr Streets;
- Upgrade of drainage on Lund Street and replacement of open drain near park/sports field; and
- Provision of concrete inverts and/or Lining of open drains to improve drainage and limit ponding.

It is understood that Department seeks to retain some flexibility with the requested upgrades to the three road crossing culverts being across Mossman Gorge Road, under Junkurji Street and Bama Bubu Street.

Revised hydraulic calculations to show acceptable operation of the culvert/roadway when flows over top the road must be provided at the time of seeking Operational Works approval. Council confirms that the Queensland Urban Drainage Manual (QUDM) requirements in this regard must be met.

Summary

The identified works are generally those works shown on the Sketches identified as:

- 7019-5 Revision C (Dated May 2016); and
- 7019-6 Revision C (Dated May 2016).

Subject to those items specifically identified above and subject to the assessment of an Operational Works application, the extent of works as illustrated in the above drawings (and as attached) are considered to satisfy conditions of the Development Permit to reconfigure the land.

Should you require further assistance on this matter please contact Neil Beck by telephone on (07) 4099 9451.

Yours faithfully



Paul Hoyer
General Manager Operations

[illegible]

• <http://www.oxfordjournals.org/doi/10.1093/oxfordjournals.oxfam.a011549>

DATsIP

MOSSMAN GORGE INFRASTRUCTURE UPGRADES

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED DATE 05-03-2001 BY 60322 UCBAW/STP

20	12 MAY 2010	12 MAY 2010	SKETCH 7019-5
----	-------------	-------------	---------------



Trinity Engineering
and Consulting

THE UNIVERSITY OF
MICHIGAN LIBRARY
ANN ARBOR, MICHIGAN 48106-1000
TEL: 734 763 7000 FAX: 734 763 7001
WWW: WWW.LIBRARY.MICHIGAN.EDU

1000

1111

0. 17 25 26 27
0.17 25 26 27

$$= -\frac{1}{N} \sum_{i=1}^N \log p(\mathbf{x}_i | \mathbf{y}_i)$$



18 December 2015

Our ref: Mossman Gorge Community

File ref: C1507019

Scott.christensen@blackm.com

www.blackm.com

General Manager Operations
Douglas Shire Council
PO Box 723
Mossman QLD 4873

Attention: Paul Hoyer

**RECONFIGURING A LOT (1 LOT INTO 19 LOTS) L100 GORGE ROAD, MOSSMAN GORGE
INTERPRETATION OF WORKSCOPE TO ACHIEVE COUNCIL APPROVAL FOR DEVELOPMENT
CONDITIONS**

Dear Paul

This advice has been prepared by Black & More (Engineers) on behalf of the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP), in relation to the proposed development at Lot 100 on RP911412, Mossman Gorge.

This letter and its attachments seeks to confirm the infrastructure works required by Council, to achieve compliance with the development conditions for the Mossman Gorge Community.

The intent of this letter is to give DATSIP surety of the proposed infrastructure upgrades (identified herein) considered acceptable to Douglas Shire Council. This surety will then enable the proposed development to proceed.

We make reference to Council's decision notice for reconfiguring a lot dated 16 December 2014. This advice seeks to directly address the following conditions.

- Condition 5 being a Traffic Assessment;
- Condition 6 being a Drainage Study of Site; and
- Condition 12 being a Water Supply and Sewerage Infrastructure Plan.

Non Compliance Assessment

To address conditions 5, 6 & 12 the existing infrastructure has been audited for compliance/non-compliance with FNQROC Development Manual Version 6 where possible.

The assessment of infrastructure compliance/non-compliance is tabulated in **Attachment 3** of this letter.

As constructed survey, LIDAR ground survey, CCTV, condition testing and site observations were used as the basis of the audit.

Non Compliance Acceptability

The acceptability of the assessed non-compliance, was determined in consultation with Douglas Shire Council's Consultant Engineer (PDR Engineers) in various meetings and discussions throughout the course of the infrastructure assessment.

These meetings and discussions formed the basis for the scope of the infrastructure works understood to be required by Council to meet the development conditions.

Management | Engineering | Excellence

Infrastructure Works Proposed

As previously mentioned, the assessment of infrastructure works proposed to achieve an acceptable level of compliance with FNQROC has been developed in consultation with Council's Consulting Engineer (PDR Engineers).

Our understanding of the infrastructure works proposed by Douglas Shire Council are listed in **Attachment 1**.

Further, plans detailing our understanding of the location and extent of the works is enclosed in **Attachment 2**.

Conclusion

We trust the infrastructure works identified in this letter and its attachments correctly summarises Council's position on the infrastructure required for compliance with the development approval conditions to the satisfaction of Douglas Shire Council for the Mossman Gorge Community.

Our Client requests that Council confirms the following;

1. This advice currently confirms the workscope Council requires to address development approval conditions 5, 6 & 12 for Lot 100 on RP911412, Mossman Gorge;
2. Council acceptability of the infrastructure works identified in this advice;
3. The infrastructure works identified in this advice correctly identify the scope Council requires to achieve an acceptable level of compliance with FNQROC; and
4. Douglas Shire Council will be supportive of the proposed development on the basis of completion of the identified infrastructure works.

Please do not hesitate to contact our office should you have any queries.

Yours sincerely
BLACK & MORE



Scott Christensen
Project Manager

Encl: Attachment 1 –Infrastructure Works Required by Council
Attachment 2 – Location & Extent of Proposed Infrastructure Works (Sketch 7019-5 Rev B & Sketch 7019-6 Rev B)
Attachment 3 – Tabulated Assessment of Infrastructure Compliance/Non-compliance

ATTACHMENT 1

Tabulated Infrastructure Works Required by Council to Achieve Compliance with
Development Approval Conditions

Mossman Gorge Community Infrastructure FNQROC Compliance/Non-compliance Assessment
Works Required by Council to Achieve Compliance with Development Approval Conditions

Stormwater Drainage

Condition	FNQROC Compliance requirements	Locations	Action Required
Drain through lot	Drain contained in easements	Lot 46, 8, 14, 13, 11, 10, 21, 22, 30, 32, 36, 37, 38	Provide easements
Discharge to adjacent lot	Inter-allotment drainage	Lot 13, 14, 21, 22, 23, 24, 33, 35, 37, 38, 39	Provide bunds/catch drains
		Lot 23	Extend drain (north)
Stormwater piping	Condition, Q5 flows	Lund St	Replace/Upgrade pipes
GPTs required for culvert 3 and drain 10	Trash rack required at Culvert 3 and Drain 10	Culvert 3	Provide Trash Rack for culvert 3 and drain 10
Blockage	Q10 flows	Culvert 2	Remove Obstruction/Vegetation
Roads	Conveyance of major flow	-	-
Underground piping system along Lund street	Piped Q5 flows (QUDM/FNQROC)	Pipe 5	Duplicate road crossing
		Drain 7	Remove Drain 7 and replace with an underground system
Drain Capacity (Overland Flow)	Convey Q100 Flows	-	Increase capacity and define drains
Culvert	Conveyance of flows in excess of minor storm event	Culvert 1, 2, 3	-
Underground water system (Lund St West/Kankarr St West)	Conveyance of flows in excess of minor storm event	Lund St West/Kankarr St West	Supply underground drainage with pits

Sewerage Reticulation

Condition	FNQROC Compliance requirements	Locations	Action Required
Sewer through lot	Easements	Lot 3, 4, 5, 10, 11, 13, 14, 15	Provide easements
Pump Station	FNQROC compliance	-	Replace Pump Station
Roots in HCB	-	Lot 12	Remove roots
Standard alignment	No concern	-	-
Manhole drop and Junction angle	No concern	-	-
Grade (> 1 in 150)	No concern	-	-
Sewer control levels	Ensure each lot has a connection. Building envelope for each lot	Lot 6, 11, 23, 24, 29, 30, 35, 36, 39, 40, 45, 46, 53	Sewer lot controls noted on rates notice
Pipe Deformations	No deformations	HCB Lot 17, MH1/A2 - 5/A1, MH5/A1 - 4/A1, MH4a/A1 - 4/A1	Replace all pipes with deformations
Gravity Sewer Network	Capacity	-	-
No sewer connection	New sewer pipe	Lot 1, 2, 8	Extend sewer
	Private pump station required	45	Amalgamate lot 44 & 45 to provide connection to lot 45

Water Reticulation

Condition	FNQROC Compliance requirements	Locations	Action Required
Water Reticulation through lot	Easements required	Lot 8, 15	Provide easements
Pipe Inner diameter <50mm	Replace all pipes below 50mm	Kankarr St East, Jankaji Cl, Manjal Cl, Walkarr	Replace pipes
Pipe loops	Add new pipe loops	Lund St West, Kankarr St West	Add new pipes
Hydrants	Hydrant required	Lot 46	Add hydrant
Valves	Additional valves required	Adjacent to Lots 48, 12, 25, 38, 39 and Bamabubu St	Add valves
Pressure main	Install 150mm pressure main and flow meter	Bamabubu St	Install pressure main and flow meter
Alignment	No concern	-	-
Pressure	Firefighting and water Pressure 22m head, 15 L/s	-	Booster pump station (Subject to pressure test results at operational works phase)

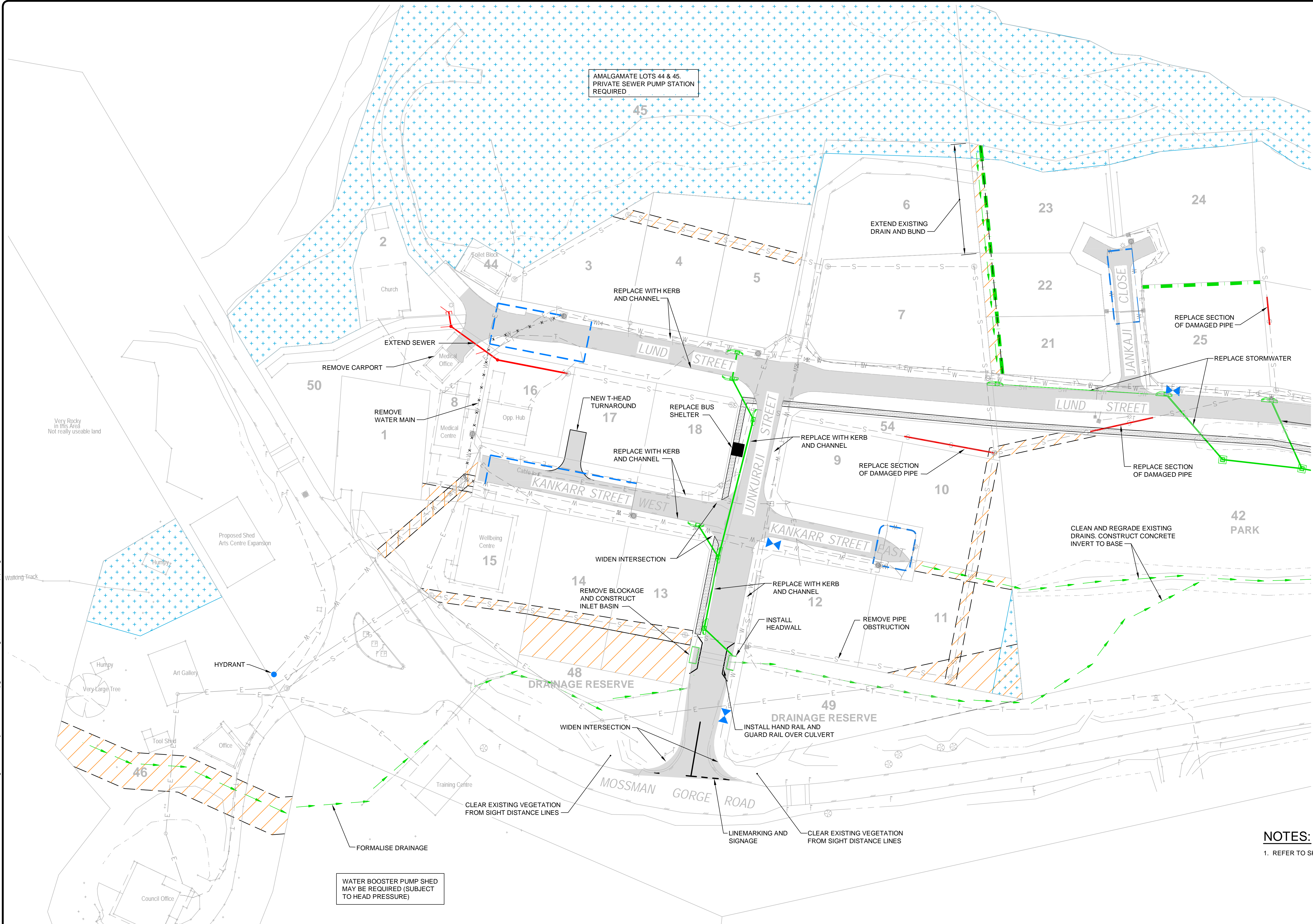
Roads and Intersections

Condition	FNQROC Compliance requirements	Locations	Action Required
Min. Reserve Width	No concern	-	-
Minimum Kerb Returns	No concern	-	-
T-Head Radii/Leg length	No concern	-	-
Sight distance	Minimal sight distance, vegetation blocking	Mossman Gorge Road/Junkurrji St	Remove vegetation
Line Marking/Signage	Major intersections missing line marking/signage	Mossman Gorge Road/Junkurrji St/Bamabubu St	Add signage (Give way) and line marking
Footpath	Footpath required on Access Streets	Bamabubu St, Junkurrji St, Central Lund St	Install footpath
Surface treatment/condition	Condition, Re-surface required (AC)	-	Asphalt Surfacing (30mm)
Lighting	Street lighting to AS.	-	Refer to SPA Lighting design
Carriageway Width	Bus Route on Access Streets/Major Intersections	Bamabubu St, Junkurrji St, Central Lund St	Widen Bamabubu and Junkurrji intersections
Pavement thickness	FNQROC (200mm)	All Roads	Increase pavement to 200mm
Kerbing	FNQROC (Semi Mountable)	All Roads	Replace kerbing
T-head Carport	FNQROC	Lund St West	(WCS) Recover T-head
No T-head Kankarr West	FNQROC	Kankarr St West	Form new T-head in lot 17

To be read in connection with Sketch 7019-5[B] & 7019-6[B]

ATTACHMENT 2
Location & Extent of Require Infrastructure Works
(Sketch 7019-5 Rev B & Sketch 7019-6 Rev B)

Printed: 18 December 2015, 3:57 PM File: K:\C1207019 Mossman Gorge Community Infrastructure Upgrades\Drawings\7019-SKETCH-005(B).dwg



NOTES:
1. REFER TO SKETCH 7019-6 FOR LEGEND.

0 5 10 15 20 25m
SCALE 1:500 (A1 SIZE)

© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

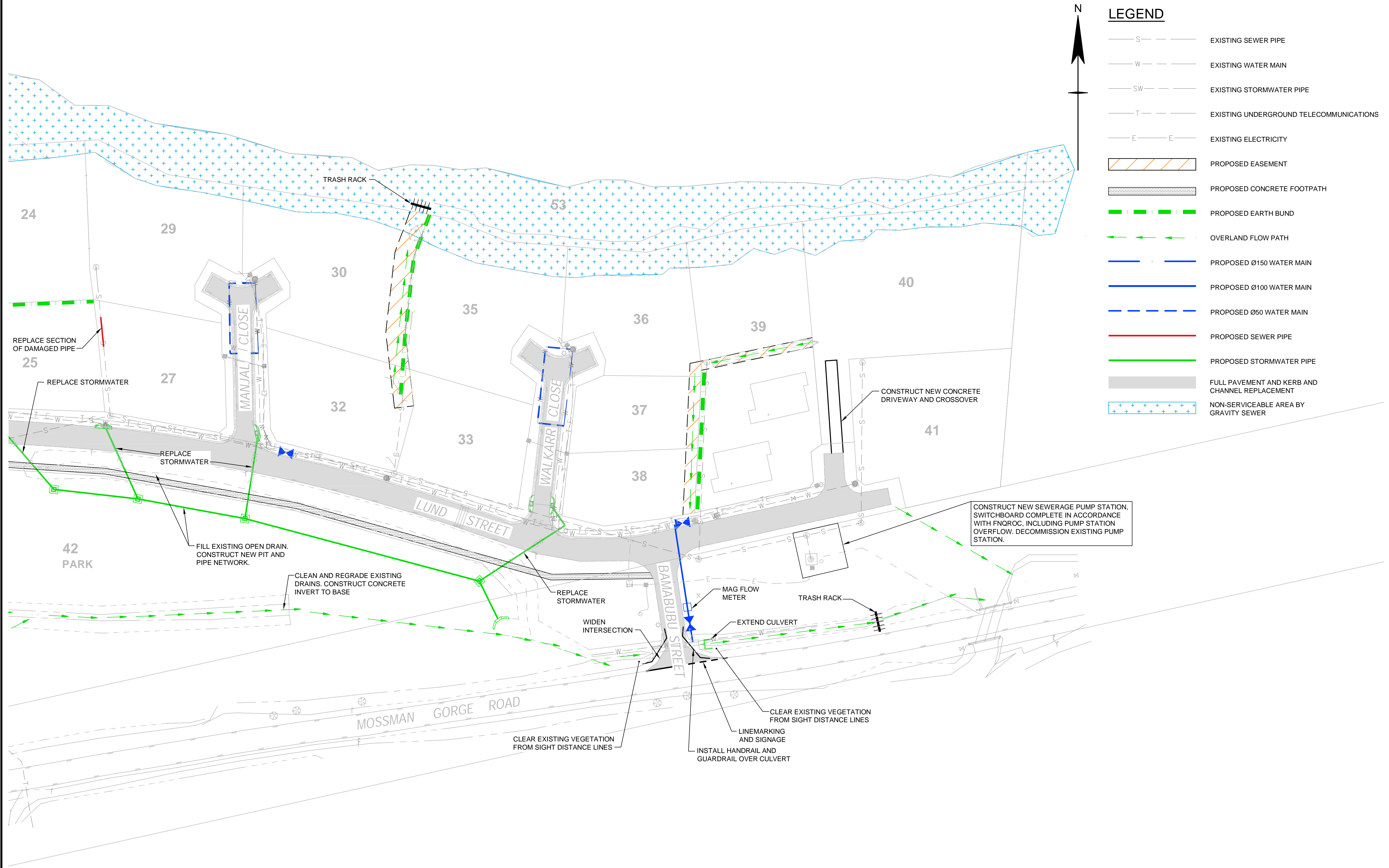


Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

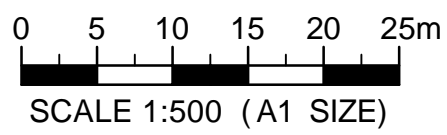
DATSIP
MOSSMAN GORGE INFRASTRUCTURE UPGRADES
INFRASTRUCTURE WORKS REQUIRED BY COUNCIL TO ACHIEVE COMPLIANCE WITH DEVELOPMENT APPROVAL SHEET 2 OF 2

SKETCH 7019-5		
Date	Project Number	
MAY 2015	7019	
Drawing Size	Scale (A1 size)	Revision
A1	1:500	B

Printed: 18 December 2015, 3:57 PM File: K:\C\1207019 Mossman Gorge Community Infrastructure Upgrades\Drawings\7019-SKETCH-006(B).dwg

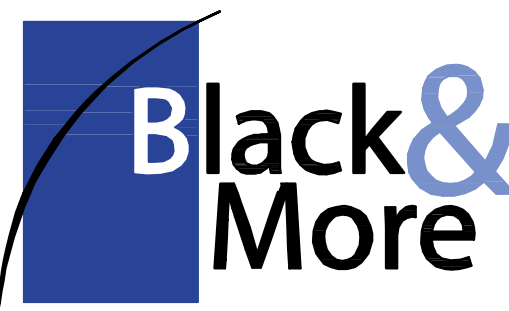


- LEGEND**
- S — — — — — EXISTING SEWER PIPE
 - W — — — — — EXISTING WATER MAIN
 - SW — — — — — EXISTING STORMWATER PIPE
 - T — — — — — EXISTING UNDERGROUND TELECOMMUNICATIONS
 - E — — — — — EXISTING ELECTRICITY
 - [Hatched Box] PROPOSED EASEMENT
 - [Stippled Box] PROPOSED CONCRETE FOOTPATH
 - [Green Dashed Line] PROPOSED EARTH BUND
 - [Green Arrow] OVERLAND FLOW PATH
 - [Blue Solid Line] PROPOSED Ø150 WATER MAIN
 - [Blue Solid Line] PROPOSED Ø100 WATER MAIN
 - [Blue Dashed Line] PROPOSED Ø50 WATER MAIN
 - [Red Solid Line] PROPOSED SEWER PIPE
 - [Green Solid Line] PROPOSED STORMWATER PIPE
 - [Grey Box] FULL PAVEMENT AND KERB AND CHANNEL REPLACEMENT
 - [Blue Cross-hatched Box] NON-SERVICEABLE AREA BY GRAVITY SEWER



External References: B&M-TITLE-SKETCH-A1_e.dwg ; 7019-X-SURVEY.dwg ; 7019-X-DESIGN.dwg

© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.



Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

DATSIP
MOSSMAN GORGE INFRASTRUCTURE UPGRADES
INFRASTRUCTURE WORKS REQUIRED BY COUNCIL TO ACHIEVE COMPLIANCE WITH DEVELOPMENT APPROVAL SHEET 2 OF 2

SKETCH 7019-6		
Date	Project Number	
MAY 2015	7019	
Drawing Size	Scale (A1 size)	Revision
A1	1:500	B

ATTACHMENT 3

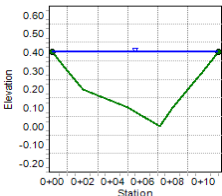
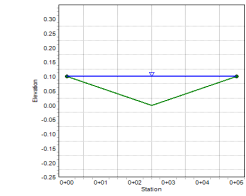
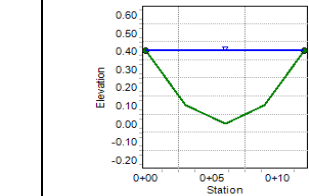
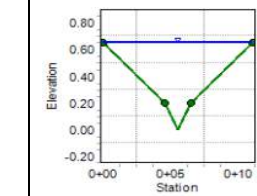
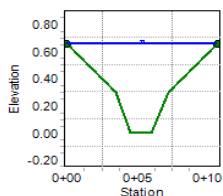
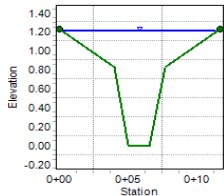
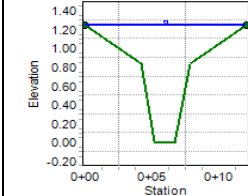
Tabulated Assessment of Infrastructure Compliance/Non-compliance

Item 1

Stormwater Drainage Audit

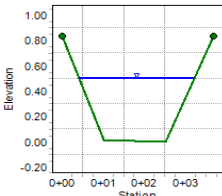
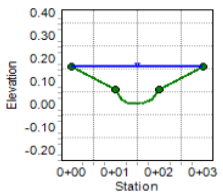
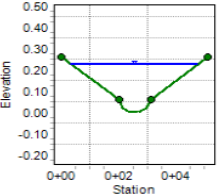
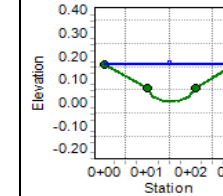
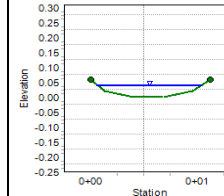
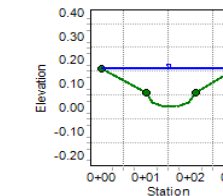
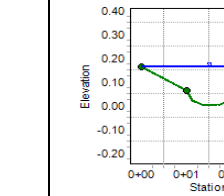
Table 1

Above Ground Drainage Paths

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual						
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual						
Infrastructure ID	Drain 1a	Drain 1b (before culvert 2)	Drain 2	Drain 3	Drain 4	Drain 5	Drain 6
Type	natural drainage line	natural drainage line	man made drain	man made drain	man made drain	man made	road side table drain
Materials & Construction	natural drainage line	natural drainage line	grass lined	grass lined with concrete invert	grass lined	grass lined	grass lined
Longitudinal Gradient	6.50%	2.50%	2.50%	1.80%	1.60%	0.97%	0.75%
Drain Profile (Maintenance)	See Cross section	Triangular 0.1m deep 0.1V:5H sides	Triangular 0.1m deep 0.1V:3H sides	Triangular 0.2m deep 1V:5H sides	Trapezoid 1.5m base 1V:3H sides	Trapezoid 1.5m base 1V:1H sides	Trapezoid 1.5m base 1V:1H
Required Capacity (100 year ARI Event)	4.59 m3/s	4.59 m3/s	4.59 m3/s	5.68 m3/s	5.56 m3/s	7.55 m3/s	7.71 m3/s
Channel Capacity / Easement Capacity*	6.54 m3/s	0.15 m3/s	5.37 m3/s	5.62 m3/s	5.37 m3/s	7.75 m3/s	7.76 m3/s
Capacity	100 year ARI	<1 year ARI	100 year ARI	50 year ARI	50 year ARI	100 year ARI	100 year ARI
100 year ARI Velocity	2.67 m/s	0.61 m/s	1.79 m/s	1.80 m/s	1.64 m/s	1.59 m/s	1.43 m/s
100 year ARI Flow Depth	0.40 m	-	0.40 m	0.65 m	0.65 m	1.20 m	1.25 m
Freeboard	0 m (<0.3 m)	-	0 m (<0.3 m)	0 m (<0.3 m)	Park	Road	Road
Extent of Flows in excess of existing drainage profile	Inundation of the office in lot 46. 11m Flow width	Bypass flow contained in Mossman Gorge Road Reserve 5m defined flow width	Inundation of part lot 48 and 13 (Easement proposed in these below elevation RL 42.5m 12m Flow width	Inundation part Lot 11 15m Flow width Easement Required	10.67m Flow width (Park)	At RL 38.1m flows bypass crown of Mossman Gorge Road. Lund St - RL 38.5m 11.67m Flow width	Flow bypass over Mossman Gorge Road
Drain Cross Section (with Easement)							
Access Rights (Land Tenure)	Proposed Freehold Land	Proposed Road Reserve	Proposed Drainage Reserve	Proposed Drainage Reserve	Proposed Park	Proposed Road Reserve	Proposed Road Reserve
Recommendation	1. Increase capacity of drain to convey 100 year ARI event. 2. Provide drainage easement in Lot 46	1. Increase capacity of drain to convey 100 year ARI event, to allow flow into culvert.	1. Increase capacity of drain to convey 100 year ARI event. 2. Provide drainage easement in lots 13 and 14. 3. Confirm house floor level to determine freeboard	1. Increase capacity of drain to convey 100 year ARI event. 2. Confirm house floor level to determine freeboard	1. Accept drain sides steeper than 1V:4H	1. Increase capacity of drain to convey 100 year ARI event.	1. Increase capacity of drain to convey 100 year ARI event.

*Confirm profile exists for full extent of drain.

Table 1

Legend							
Infrastructure ID	Drain 7	Drain 8	Drain 9	Drain 10	Drain 11	Drain 12	Drain 13
Type	road side table drain	inter-allotment drain	inter-allotment drain	inter-allotment drain	inter-allotment drain	inter-allotment drain	inter-allotment drain
Materials & Construction	grass lined	concrete lined	concrete lined	concrete lined	concrete lined	concrete lined	concrete lined
Longitudinal Gradient	1.20%	2.80%	1.38%	0.30%	1.67%	0.98%	3.44%
Drain Profile (Maintenance)	Trapezoid 1.5m base 1V:1H	Spoon 0.06m deep 1m top width	Spoon 0.06m deep 1m top width	Spoon 0.06m deep 1m top width	Spoon 0.06m deep 1m top width	Spoon 0.06m deep 1m top width	Spoon 0.06m deep 1m top width
Required Capacity (100 year ARI Event)	1.30 m3/s	0.21 m3/s	0.45 m3/s	0.07 m3/s	0.03 m3/s	0.13 m3/s	0.19 m3/s
Channel Capacity / Easement Capacity*	3.39 m3/s	0.26 m3/s	0.45 m3/s	0.09 m3/s	0.07 m3/s	0.17 m3/s	0.32 m3/s
Capacity	100 year ARI	100 year ARI	100 year ARI	100 year ARI	100 year ARI	100 year ARI	100 year ARI
100 year ARI Velocity	1.22 m/s	1.65 m/s	0.89 m/s	0.37 m/s	1.27 m/s	0.66 m/s	1.24 m/s
100 year ARI Flow Depth	0.50 m	0.16 m	0.23 m	0.16 m	0.06 m	0.16 m	0.16 m
Freeboard	0.33 m	-	-	-	0.00 m	-	-
Extent of Flows in excess of existing drainage profile		3m wide flow	Need further detail on bund (Flows to be contained in lot 7 and bund to protect 21, 22)	Flow 3m wide	-	Flow 3m wide	Extends into drainage reserve Flow 3m wide
Drain Cross Section (with Easement)							
Access Rights (Land Tenure)	Proposed Road Reserve	Proposed Freehold Land	Proposed Freehold Land	Proposed Freehold Land	Proposed Freehold Land	Proposed Freehold Land	Proposed Road Reserve
Recommendation	1. Accept drain sides steeper than 1V:4H 2. Refer to pipes assessment (may need deep drain or piping of drain)	1. Increase capacity of drain to convey 100 year ARI event. 2. Provide drainage easement in Lot 10 and 11 3. Confirm house floor level to determine freeboard	1. Increase capacity of drain to convey 100 year ARI event. 2. Provide drainage easement in Lots 21 & 22 3. Confirm house floor level to determine freeboard	1. Increase capacity of drain to convey 100 year ARI event. 2. Provide drainage easement in Lot 30, 32 3. Confirm house floor level to determine freeboard 4. Trash Rack is desirable		1. Increase capacity of drain to convey 100 year ARI event. 2. Provide Bund to rear of Lot 37, 38 3. Confirm house floor level to determine freeboard	1. Increase capacity of drain to convey 100 year ARI event.

*Confirm profile exists for full extent of drain

Table 2 Underground Stormwater Drainage System

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual

Infrastructure ID	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5
Location	Lund Street	Lund Street	Lund Street	Lund Street	Lund Street
Condition	replacement required (identified by CCTV)	replacement required (identified by CCTV)	replacement required (identified by CCTV)	replacement required (identified by CCTV)	replacement required (identified by CCTV)
Size	300mm (<375mm)	375mm	300mm (<375mm)	300mm (<375mm)	375mm
Material & Construction	Reinforced Concrete Pipe	Reinforced Concrete Pipe	Reinforced Concrete Pipe	Reinforced Concrete Pipe	Reinforced Concrete Pipe
Longitudinal Gradient	4.10%	1.77%	1.80%	1.60%	0.60%
Required Capacity (5 year ARI including road flows)	0.22 m3/s	0.06 m3/s	0.13 m3/s	0.16 m3/s	0.31 m3/s
Capacity	0.197m3/s (<0.22)	0.24 m3/s	0.097m3/s (<0.13)	0.118m3/s (<0.16)	0.136m3/s (<0.31)
Capacity	2 year ARI (<5 year)	100 year ARI	2 year ARI (<5 year)	2 year ARI (<5 year)	Less than 1 year (<5 year)
100 year ARI discharge	0.45 m3/s	0.11 m3/s	0.25 m3/s	0.32 m3/s	0.64 m3/s
Barrel Velocity	2.78 m/s	2.21 m/s	1.37 m/s	1.68 m/s	1.23 m/s
Flows in excess of 5 year ARI	Flow contained within road reserve	Flow contained within road reserve	Flow contained within road reserve	Flow contained within road reserve	Flow contained within road reserve
Access (Land Tenure)	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve
Public Safety	Inlet grate installed	Culvert headwall near edge of road carriageway	Culvert headwall near edge of road carriageway	no outlet grate	no outlet grate
Recommendation	1. Replace pipe due to size and conditions*	1. Replace pipe due to conditions*	1. Replace pipe due to size and conditions*	1. Replace pipe due to size and conditions*	1. Replace pipe due to size and conditions*

*Increased size may dictate downstream levels and additional works

Table 3

Culverts in Roadways

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual		
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual		
Infrastructure ID	Culvert 1	Culvert 2	Culvert 3
Roadway	Mossman Gorge Road	Junkurrji Street	Bamabubu Street (Mossman Gorge Road)
Type	2/600mm	3/1200x450mm	1800x750mm
Material & Construction	Reinforced Concrete Pipe	Reinforced Concrete Box Culvert	Reinforced Concrete Box Culvert
Longitudinal Gradient	2.83 %	0.47 %	0.73 %
Required Capacity (10 year ARI event)	2.65 m3/s	2.65 m3/s	4.40 m3/s
Design Capacity	2.06 (<2.65)	3.45 m3/s	4.89 m3/s
Design immunity	2 year ARI (<10 year ARI)	10 year ARI	10 year ARI
Barrel Velocity in 10 year ARI Event	3.65 m/s	1.96 m/s	2.40 m/s
100 year ARI Event	4.58 m3/s	4.58 m3/s	7.56 m3/s
Flow Bypassing Culvert	2.52 m3/s	1.93 m3/s	3.16 m3/s
Flow in excess of 10 year ARI event	Bypass flows contained in Mossman Gorge Road Reserve	Headwater inundates Lot 13 and 14.	Bypass flows contained in Bamabubu Street and Mossman Gorge Road
GPTs	-	Required	-
Access & Maintenance (Land Tenure)	Existing Road Reserve	Proposed Road Reserve	Existing Road Reserve
Recommendations	Note: Culvert not in footprint of proposed development	1. Construct earth bund along rear of Lot 13 and 14 or provide easement 2. Remove tree obstructing inlet	Note: Culvert not in footprint of proposed development

Table 4

Road Flows

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual				
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual				
Point of Reference ID	1	2	3	4	5
Location	Junkurrji Street	Kankarr Street (West)	Kankarr Street (East)	Lund Street #1	Lund Street #2
Longitudinal Gradient	0.50 %	3.20 %	1.56 %	2.37 %	2.37 %
Minor Design Storm (5 year ARI Event)	0.085 m3/s	0.053 m3/s	0.040 m3/s	0.239 m3/s	0.060 m3/s
Required Capacity (100 year ARI Event)	0.172 m3/s	0.108 m3/s	0.081 m3/s	0.486 m3/s	0.121 m3/s
Capacity (Road Reserve)	0.045 (<0.172)	0.108 m3/s	0.219 m3/s	0.854 m3/s	0.609 m3/s
Capacity	1 year ARI (<100 year)	100 year ARI	100 year ARI	100 year ARI	100 year ARI
Flow Depth	0.06	0.05	0.05	0.08	0.1
Zero Depth at Crown	no	yes	yes	yes	yes
Flow Width	6.28 m	1.86 m	2.02 m	2.25 m	2.25 m
Flow width around kerb return	n/a	n/a	n/a	2.25 m	n/a
Flow Velocity (5 year ARI Event)	0.49 m/s	0.88 m/s	0.63 m/s	1.29 m/s	1.29 m/s
d*v Product	0.03	0.04	0.03	0.10	0.13
Flow Contained in Road Reserve	No	Yes	Yes	Yes	Yes
Freeboard to Adjoin Properties	Greater than 300mm	Greater than 300mm	Less than 50mm above top of kerb	Greater than 300mm	Greater than 300mm
Access Rights (Land Tenure)	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve
Recommendation	1. Accept minor storm capacity less than 5 year ARI 2. Apply kerbs to roadside			1. Accept flow width around kerb return greater than 1m	

Table 4

Legend

Point of Reference ID	6	7	8	9	10
Location	Lund Street #3	Lund Street #4	Lund Street #5	Lund Street #6	Jankaji Close
Longitudinal Gradient	1.44 %	1.21 %	1.24 %	1.00 %	2.34 %
Minor Design Storm (5 year ARI Event)	Majority of Road flows overtop crown to Drain 7 due to no kerb on southern side of Lund St			0.125 m3/s	0.051 m3/s
Required Capacity (100 year ARI Event)				0.255 m3/s	0.255 m3/s
Capacity (Road Reserve)				0.389 m3/s	0.398 m3/s
Capacity				100 year ARI	100 year ARI
Flow Depth				0.10 m	0.13 m
Zero Depth at Crown				yes	one way cross fall. Flow at top of kerb
Flow Width				2.43 m	3.45 m
Flow width around kerb return				n/a	3.45 m
Flow Velocity (5 year ARI Event)				0.73 m/s	1.66 m/s
d*v Product				0.07	0.22
Flow Contained in Road Reserve				Yes	Yes
Freeboard to Adjoin Properties				Greater than 300mm	Greater than 300mm
Access Rights (Land Tenure)	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve
Recommendation			1. Accept flow width around kerb return greater than 1m		1. Accept flow width around kerb return greater than 1m

Table 4

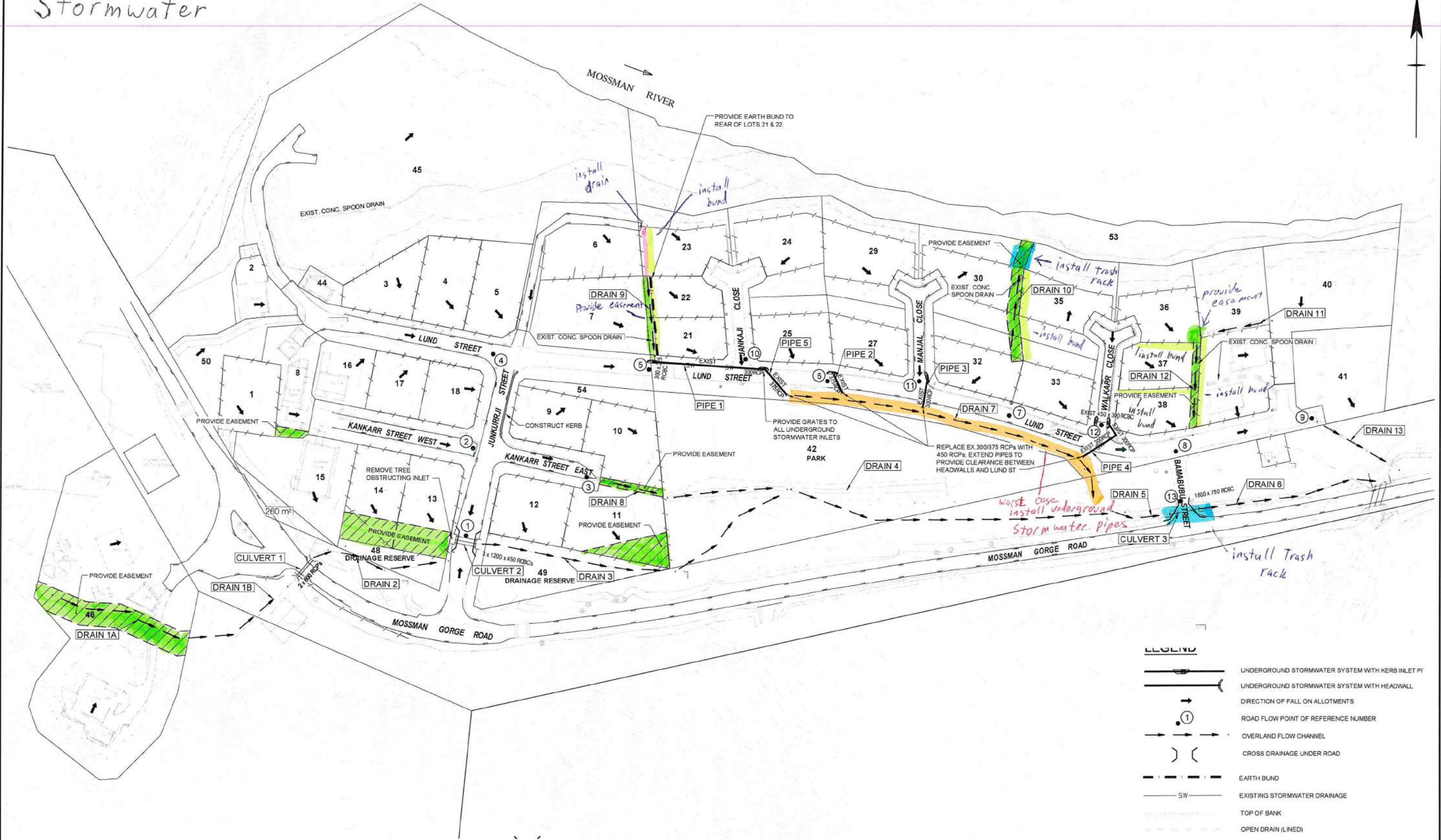
Legend

Point of Reference ID	11	12	13
Location	Manjal Close	Walkarr Close	Bamabubu Street
Longitudinal Gradient	1.11 %	0.45 %	0.55 %
Minor Design Storm (5 year ARI Event)	0.090 m3/s	0.115 m3/s	0.024 m3/s
Required Capacity (100 year ARI Event)	0.104 m3/s	0.223 m3/s	0.049 m3/s
Capacity (Road Reserve)	0.352 m3/s	0.305 m3/s	0.226 m3/s
Capacity	100 year ARI	100 year ARI	100 year ARI
Flow Depth	0.13 m	0.13 m	0.10 m
Zero Depth at Crown	one way cross fall. Flow at top of kerb	yes	yes
Flow Width	3.45 m	2.24 m	1.58 m
Flow width around kerb return	3.45 m	2.24 m	n/a
Flow Velocity (5 year ARI Event)	1.18 m/s	0.62 m/s	0.34 m/s
d*v Product	0.15	0.08	0.03
Flow Contained in Road Reserve	Yes	Yes	Yes
Freeboard to Adjoin Properties	Greater than 300mm	Greater than 300mm	Greater than 300mm
Access Rights (Land Tenure)	Proposed Road Reserve	Proposed Road Reserve	Proposed Road Reserve
Recommendation	1. Accept flow width around kerb return greater than 1m	1. Accept flow width around kerb return greater than 1m	Note: Road not in footprint of proposed development

Table 5 Lot Surface Gradient and Lawful Point of Discharge Test

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual				
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual				
Proposed Allotment	Proposed Land Tenure	Surface Gradient	Lawful Point of Discharge Test		Recommendation
			Proposed Tenure of Discharge Location	Actionable Nuisance Caused by Discharge Location *	
Lot 1	Freehold land	2.7%	Freehold land	No	1. Provide drainage path and drainage easement through proposed Lot 8
Lot 2	Freehold land	3.3%	Road Reserve	No	
Lot 3	Freehold land	3.3%	Road Reserve	No	
Lot 4	Freehold land	2.8%	Road Reserve	No	
Lot 5	Freehold land	3.9%	Road Reserve	No	
Lot 6	Freehold land	6.0%	Freehold Land	No	1. Provide drainage easement over existing allotment drain in Lot 21, 22 & 23
Lot 7	Park	7.0%	Freehold Land	No	1. Provide drainage easement over existing allotment drain in Lot 21 & 22
Lot 8	Freehold land	4.7%	Road Reserve	No	
Lot 9	Freehold land	1.5%	Park	No	
Lot 10	Freehold land	3.2%	Park	No	
Lot 11	Freehold land	5.4%	Park	No	
Lot 12	Freehold land	5.6%	Drainage Reserve	No	
Lot 13	Freehold land	2.8%	Drainage Reserve	No	
Lot 14	Freehold land	5.0%	Drainage Reserve	No	
Lot 15	Freehold land	10.0%	Road Reserve	No	
Lot 16	Freehold land	2.7%	Road Reserve	No	
Lot 17	Freehold land	2.5%	Road Reserve	No	
Lot 18	Freehold land	3.2%	Road Reserve	No	
Lot 21	Freehold land	2.0%	Road Reserve	No	
Lot 22	Freehold land	3.1%	Road Reserve	No	
Lot 23	Freehold land	1.9%	Road Reserve	No	Extend Drain 9, Bund and easement into lot
Lot 24	Freehold land	4.3%	Freehold Land	No	
Lot 25	Freehold land	2.6%	Road Reserve	No	
Lot 27	Freehold land	1.7%	Road Reserve	No	
Lot 29	Freehold land	1.8%	Road Reserve	No	
Lot 30	Freehold land	2.0%	Park	No	
Lot 32	Freehold land	1.8%	Road Reserve	No	
Lot 33	Freehold land	1.6%	Road Reserve	No	
Lot 35	Freehold land	2.4%	Road Reserve	No	
Lot 36	Freehold land	2.1%	Freehold Land	No	1. Provide drainage easement over drain connection
Lot 37	Freehold land	1.2%	Freehold Land	No	1. Provide drainage easement over existing allotment drain in Lot 38
Lot 38	Freehold land	1.4%	Road Reserve	No	
Lot 39	Freehold land	2.9%	Road Reserve	No	
Lot 40	Freehold land	0.8%	Road Reserve	No	
Lot 41	Freehold land	2.8%	Road Reserve	No	
Lot 42	Park	2.1%	Road Reserve	No	1. Re-grade eastern end of sports field to ensure free draining
Lot 44	Park	9.2%	Road Reserve	No	
Lot 45	Freehold land	2.8%	Drainage Reserve	No	
Lot 46	Freehold land	2.9%	Freehold land (Native Title)	No	1. Provide drainage easement over existing natural drainage line in Lot 46
Lot 48	Drainage Reserve	4.2%	Road Reserve	No	
Lot 49	Drainage Reserve	4.5%	Road Reserve	No	
Lot 50	Park	2.8%	Road Reserve	No	
Lot 53	Park	2.8%	Drainage Reserve	No	
Lot 54	Park	2.1%	Road Reserve	No	

Stormwater



PLAN
SCALE 1:750

PRELIMINARY ONLY

© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.



Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

DEPARTMENT OF ABORIGINAL AND TORRES
STRAIT ISLANDER MULTICULTURAL AFFAIRS
MOSSMAN GORGE INFRASTRUCTURE UPGRADES
**2014 AUDIT
STORMWATER DRAINAGE
PROPOSED WORKS**

SKETCH 7019-3

Date	MARCH 2015	Project Number	7019
Drawing Size	A1	Scale (A1 size)	1:750
Revision	A		

0 7.5 15 22.5 30 37.5m
SCALE 1:750 (A1SIZE)

Item 2

Sewerage Reticulation Audit

2015 Sewer Reticulation Audit

Legend	Compliant with FNOROC Development Manual and Queensland Urban Drainage Manual
	Not Compliant with FNOROC Development Manual and Queensland Urban Drainage Manual

Manhole	Manhole D/S	Diameter (mm)	Grade (FNOroc 1:100 first MH and 1 in 150 elsewhere)	Capacity (EDC)	Manhole Type	Pipe Materials	RL Top (m)	Invert Level (m)	Cover (min 600mm)	Length (max 100m)	Manhole, Drop and Junction Angle (FNOroc S3000 drawings)	Access Rights (Land Tenure)	Standard Alignment (m)		CCTV	Recommendation
													Min	Max		
9/A1	8/A1	150	1 in 100	317	Concrete	PVC	46.01	43.75	2.11	46.87	-	Road Reserve	N/A	N/A	No defects	-
8/A1	7A/A1	150	1 in 178 (>1 in 150)	236	Concrete	PVC	45.55	43.23	2.17	24.86	-	Freehold Land	0.25	16 (>0.8)	No defects	Grade acceptable, subject to Council approval (Steeper than 1:180)
7A/A1	7/A1	150	1 in 27	448	Concrete	PVC	43.9	43.02	0.73	45.35	-	Freehold Land	12.3 (>0.8)	13.7 (>0.8)	No defects	Provide Easement (lots 13/14)
7/A1	6/A1	150	1 in 101	284	Concrete	PVC	42.58	41.34	1.09	73.63	-	Freehold Land	0.2	1.25 (>0.8)	Roots growing at connection to lot 12	Remove roots
6/A1	5/A1	150	1 in 101	284	Concrete	PVC	41.45	40.47	0.83	62.47	-	Freehold Land	1.96 (>0.8)	20 (>0.8)	Paper cup blocking sewer	Subject to Council approval, Provide Easement
5/A1	4/A1	150	1 in 65	366	Concrete	PVC	41.75	39.41	2.19	78.85	-	Park/Freehold Land	Located in park (lot 42) and road reserve		Pipe shape deformation at 58m from 5/A1, pipe losing circular shape	Subject to Council approval, Provide Easement
4/A1	3/A1	150	1 in 144	259	Concrete	PVC	39.93	38.16	1.62	74.7	-	Road Reserve	Road Reserve		No defects	Recommend Council Accept
3/A1	2/A1	150	1 in 82	317	Concrete	PVC	39.67	37.59	1.93	81.66	-	Freehold Land	0	0.3	No defects	Recommend Council Accept
2/A1	1/A1	150	1 in 97	317	Concrete	PVC	38.63	36.55	1.93	28.5	2a/A1 branch entering with acute angle 75° (<90°), Drop ≤40mm	Park	Park		No defects	Subject to Council Approval
1/A1	Pump Station	-	-	-	Concrete	-	38.44	36.21	2.08	-	-	Road Reserve	Road Reserve		No defects	Recommend Council Accept
Pump Station	-	-	-	-	-	-	38.47	-	-	-	-	Road Reserve	Road Reserve		-	
2/A2	1/A2	150	1 in 31	448	Concrete	PVC	44.69	43.29	1.25	45.54	-	Freehold Land	1.88 (>1.5)	2 (>1.5)	Joint deformation in closed junction at 28.06m from 1/A2 at 7 o'clock	Subject to Council Approval
1/A2	5/A1	150	1 in 50	448	Concrete	PVC	43.41	41.75	1.51	72.99	-	Park	Located in park (lot 54)		Horizontal deformation at 13.57m at 4 o'clock from 5/A1 MH, Vertical deformation at 0.5m, at 12 o'clock from 5/A1	Replace pipe
4/A3	3/A3	150	1 in 45	448	Concrete	PVC	45.39	44	1.24	35.74	-	Freehold Land	1.3 (>0.8)	7.7 (>0.8)	No defects	Recommend Council Accept
3/A3	2/A3	150	1 in 43	448	Concrete	PVC	44.66	43.16	1.35	56.3	-	Freehold Land	7.7 (>0.8)	15 (>0.8)	No defects	Provide Easement
2/A3	1/A3	150	1 in 23	448	Concrete	PVC	42.84	41.81	0.88	40	-	Freehold Land	Located in park (lot 7)		No defects	Recommend Council Accept
1/A3	5/A1	150	1 in 98	317	Concrete	PVC	41.43	40.01	1.27	51.2	Branch enters with acute angle 84° (<90°) Drop = 80mm	Freehold Land	Located in park (lot 7)		No defects	Subject to Council Approval
4a/A1	4/A1	150	1 in 94	317	Concrete	PVC	41.56	39.65	1.76	38.57	-	Freehold Land	1.3 (≤0.8)	1.6 (≤0.8)	Vertical deformation at 27.6m from U/S	Replace pipe
3A/A1	3/A1	150	1 in 135	259	Concrete	PVC	39.98	38.12	1.71	42	-	Freehold Land	0	3 (≤0.8)	No defects	Recommend Council Accept
2a/A1	2/A1	150	1 in 71	366	Concrete	PVC	38.81	37.35	1.31	50.87	-	Freehold Land	1.51 (≤0.8)	1.54 (≤0.8)	No defects	Recommend Council Accept
2/A4	1/A4	150	1 in 97	317	Concrete	PVC	38.29	36.81	1.33	41.44	-	Freehold Land	1.2 (≤0.8)	3.46 (≤0.8)	No defects	Recommend Council Accept
1/A4	1/A1	150	1 in 171 (>1 in 150)	236	Concrete	PVC	38.37	36.29	1.93	14.4	-	Park	Park		No defects	Recommend Council Accept (Steeper than 1:180)

2015 Sewer Audit

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual

Lowest Lot RL and Longest Run

Proposed Allotment	Proposed Land Tenure	HCB	Lot Can be Serviced	Connection IL (m)	Lowest Lot RL (m)	Run Length (m)	Slope Depth (+0.55) (m)	Required (lowest) RL to comply	Difference (req RL and lowest lot RL)	Recommendations
Lot 1	Freehold land	Y	Y	43.28	46.10	40.01	1.22	44.50	1.60	Accept
Lot 2	Freehold land	N (proposed)	Y	44.22	46.00	26.00	0.98	45.20	0.80	Provide HCB
Lot 3	Freehold land	Y	Y	43.40	44.50	31.67	1.08	44.48	0.02	Accept
Lot 4	Freehold land	Y	Y	42.76	43.70	31.96	1.08	43.84	-0.14	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 5	Freehold land	Y	Y	42.21	43.40	29.56	1.04	43.25	0.15	Accept
Lot 6	Freehold land	Y	Y	40.08	42.00	54.24	1.45	41.53	0.47	Accept
Lot 7	Park	Y	Y	39.80	41.40	60.74	1.56	41.36	0.04	Accept
Lot 8	Freehold land	N (proposed)	Y	44.30	45.50	46.90	1.33	45.63	-0.13	Provide HCB
Lot 9	Freehold land	Y	Y	41.12	42.40	46.76	1.33	42.45	-0.05	Accept
Lot 10	Freehold land	Y	Y	40.45	41.30	42.60	1.26	41.71	-0.41	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 11	Freehold land	Y	Y	40.41	41.20	31.20	1.07	41.48	-0.28	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 12	Freehold land	Y	Y	40.84	42.10	30.00	1.05	41.89	0.21	Accept
Lot 13	Freehold land	Y	Y	41.36	42.90	35.85	1.15	42.51	0.39	Accept
Lot 14	Freehold land	Y	Y	42.25	43.20	35.36	1.14	43.39	-0.19	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 15	Freehold land	Y	Y	43.09	43.90	38.85	1.20	44.29	-0.39	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 16	Freehold land	Y	Y	43.29	45.00	27.31	1.01	44.30	0.70	Accept
Lot 17	Freehold land	Y	Y	42.78	44.40	34.82	1.13	43.91	0.49	Accept
Lot 18	Freehold land	Y	Y	41.80	43.50	33.16	1.10	42.90	0.60	Accept
Lot 21	Freehold land	Y	Y	39.70	40.90	42.31	1.26	40.96	-0.06	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 22	Freehold land	Y	Y	40.00	48.30	40.90	1.23	41.23	7.07	Accept
Lot 23	Freehold land	N (MH)	Y	39.80	42.00	41.90	1.25	41.05	0.95	Confirm Lot is connected via HCB. Accept.
Lot 24	Freehold land	Y	Y	39.67	41.20	56.34	1.49	41.16	0.04	Accept
Lot 25	Freehold land	Y	Y	39.26	40.10	49.41	1.37	40.63	-0.53	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 27	Freehold land	Y	Y	39.44	40.10	56.03	1.48	40.92	-0.82	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 29	Freehold land	Y	Y	39.68	40.40	55.22	1.47	41.15	-0.75	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 30	Freehold land	Y	Y	38.70	39.90	37.80	1.18	39.88	0.02	Accept
Lot 32	Freehold land	Y	Y	38.69	39.70	45.34	1.31	40.00	-0.30	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 33	Freehold land	Y	Y	38.01	39.20	43.87	1.28	39.29	-0.09	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 35	Freehold land	Y	Y	38.12	39.60	41.83	1.25	39.37	0.23	Accept
Lot 36	Freehold land	Y	Y	37.29	38.80	50.26	1.39	38.68	0.12	Accept
Lot 37	Freehold land	Y	Y	37.00	38.80	49.85	1.38	38.38	0.42	Accept
Lot 38	Freehold land	Y	Y	36.74	38.70	50.09	1.38	38.12	0.58	Accept
Lot 39	Freehold land	Y	Y	37.35	38.50	58.43	1.52	38.87	-0.37	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 40	Freehold land	Y	Y	36.89	38.90	70.81	1.73	38.62	0.28	Accept
Lot 41	Freehold land	Y	Y	36.51	38.00	62.85	1.60	38.11	-0.11	Accept
Lot 42	Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Lot 44	Park (toilet block)	Y	Y	44.04	45.00	14.05	0.78	44.82	0.18	Accept
Lot 45	Freehold land	N (proposed)	Y	N/A	N/A	N/A	N/A	N/A	N/A	Amalgamate Lot 44 & 45. Private Pump Required
Lot 46	Freehold land	Y	Y	43.75	46.50	192.00	3.75	47.50	-1.00	Accept based on lowest lot level in vicinity of gravity sewer. Lot can be serviced
Lot 48	Drainage Reserve	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Lot 49	Drainage Reserve	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Lot 50	Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Lot 53	Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Lot 54	Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

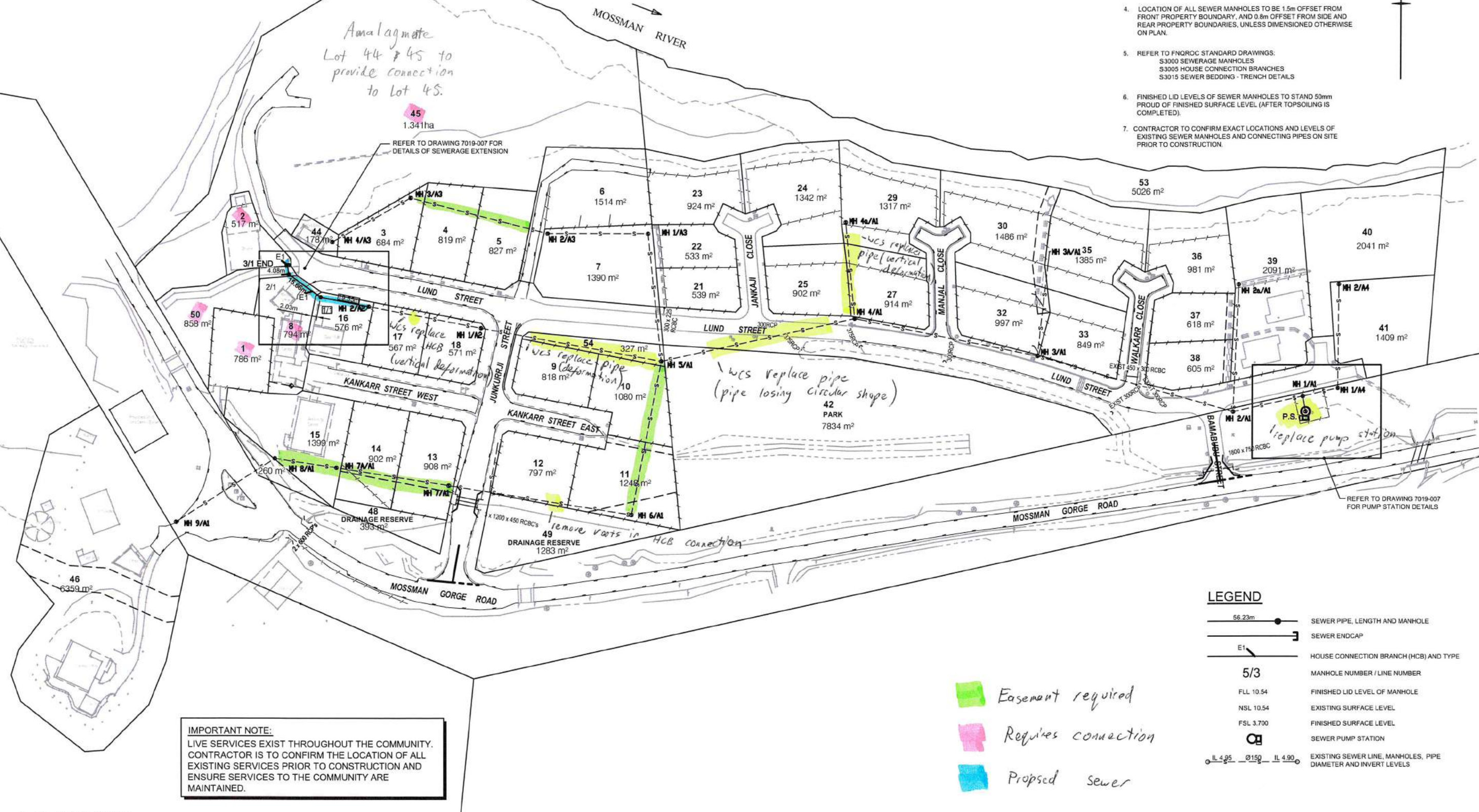
Sewer Audit Overview

Analgamate Lot 44 & 45 to provide connection to Lot 45.

REFER TO DRAWING 7019-007 FOR DETAILS OF SEWERAGE EXTENSION

NOTES

1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. SEWER PIPES SHOWN ARE Ø150 uPVC (CLASS SN8) UNLESS NOTED OTHERWISE ON PLAN.
3. HOUSE CONNECTIONS (HCB'S) FOR SINGLE ALLOTMENTS TO BE Ø100 CONNECTION.
4. LOCATION OF ALL SEWER MANHOLES TO BE 1.5m OFFSET FROM FRONT PROPERTY BOUNDARY, AND 0.8m OFFSET FROM SIDE AND REAR PROPERTY BOUNDARIES, UNLESS DIMENSIONED OTHERWISE ON PLAN.
5. REFER TO FNQROC STANDARD DRAWINGS:
S3000 SEWERAGE MANHOLES
S3005 HOUSE CONNECTION BRANCHES
S3015 SEWER BEDDING - TRENCH DETAILS
6. FINISHED LID LEVELS OF SEWER MANHOLES TO STAND 50mm PROUD OF FINISHED SURFACE LEVEL (AFTER TOPSOILING IS COMPLETED).
7. CONTRACTOR TO CONFIRM EXACT LOCATIONS AND LEVELS OF EXISTING SEWER MANHOLES AND CONNECTING PIPES ON SITE PRIOR TO CONSTRUCTION.



IMPORTANT NOTE:
LIVE SERVICES EXIST THROUGHOUT THE COMMUNITY. CONTRACTOR IS TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES PRIOR TO CONSTRUCTION AND ENSURE SERVICES TO THE COMMUNITY ARE MAINTAINED.

LEGEND

- 56.23m SEWER PIPE, LENGTH AND MANHOLE
- E1 SEWER END CAP
- HOUSE CONNECTION BRANCH (HCB) AND TYPE
- 5/3 MANHOLE NUMBER / LINE NUMBER
- FLL 10.54 FINISHED LID LEVEL OF MANHOLE
- NSL 10.54 EXISTING SURFACE LEVEL
- FSL 3.700 FINISHED SURFACE LEVEL
- SEWER PUMP STATION
- IL 4.95 Ø150 IL 4.90 EXISTING SEWER LINE, MANHOLES, PIPE DIAMETER AND INVERT LEVELS

- Easement required
- Requires connection
- Proposed sewer

0 7.5 15 22.5 30 37.5m
SCALE 1:750 (A1 SIZE)

File: K:\1207019 Mossman Gorge Community Infrastructure Upgrades\7019-006(A) - Sewerage scope of works.dwg

Printed: 01 May 2015, 4:20 PM

Revisions			
No.	Description	Reviewed	Date
A	ISSUED FOR TENDER	SC	20/06/14

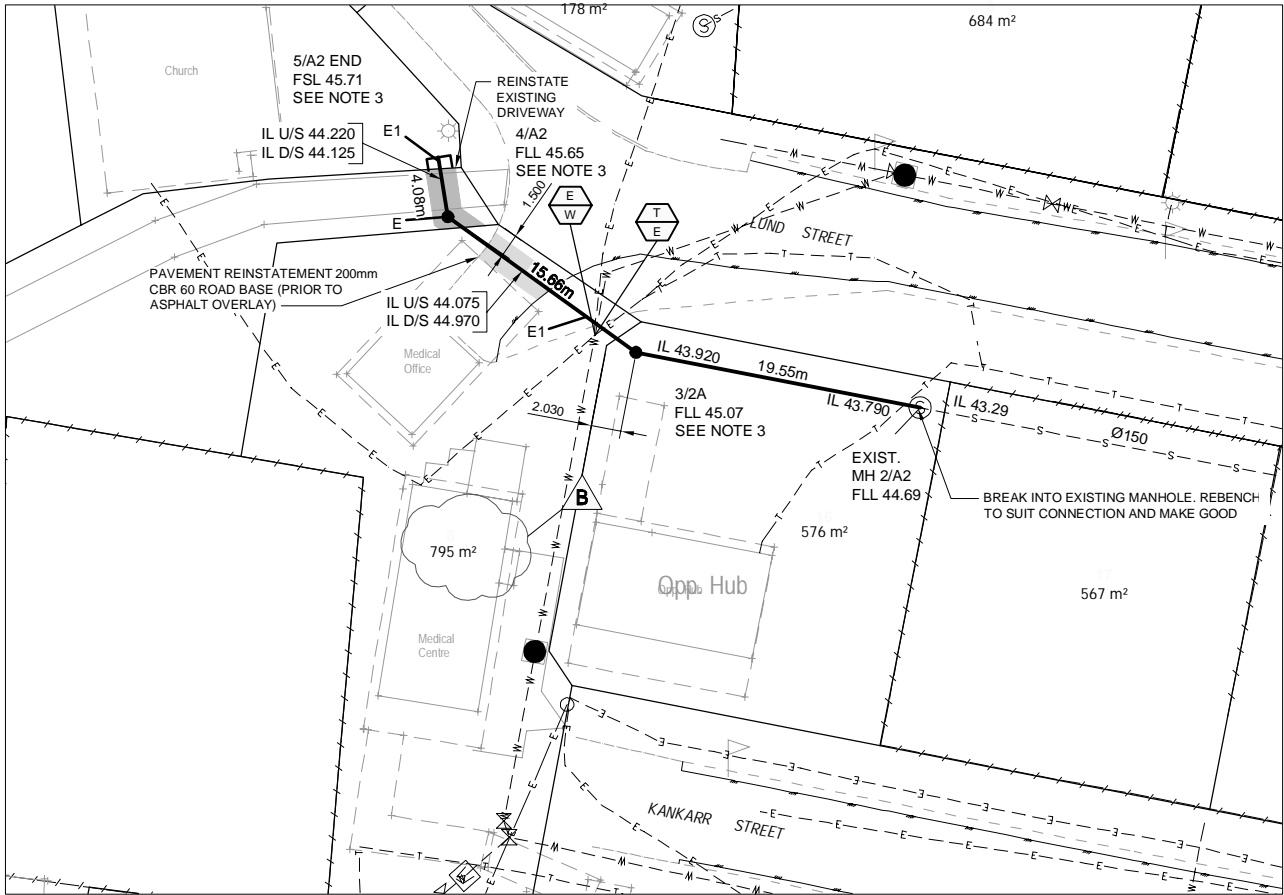
© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Black & More
ABN 24 845 447 493
93 Digger St. Cairns North QLD 4870
PO Box 999H Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

DEPARTMENT OF ABORIGINAL AND TORRES STRAIT ISLANDER MULTICULTURAL AFFAIRS MOSSMAN GORGE INFRASTRUCTURE UPGRADES			
Drawn	NDC	Approved	Date
Designed	GAS	Design Check	RPEQ
Drawing is not to be used for construction unless approved			

Drawing Title SEWERAGE PLAN SHEET 1 OF 2			
Drawing Size	Scale (A1 size)	Drg No	Revision
A1	1:750	7019-006	A

External References: B&M-TITLE-A1_e.dwg; 7019-X-SURVEY.dwg; 7019-X-DESIGN.dwg



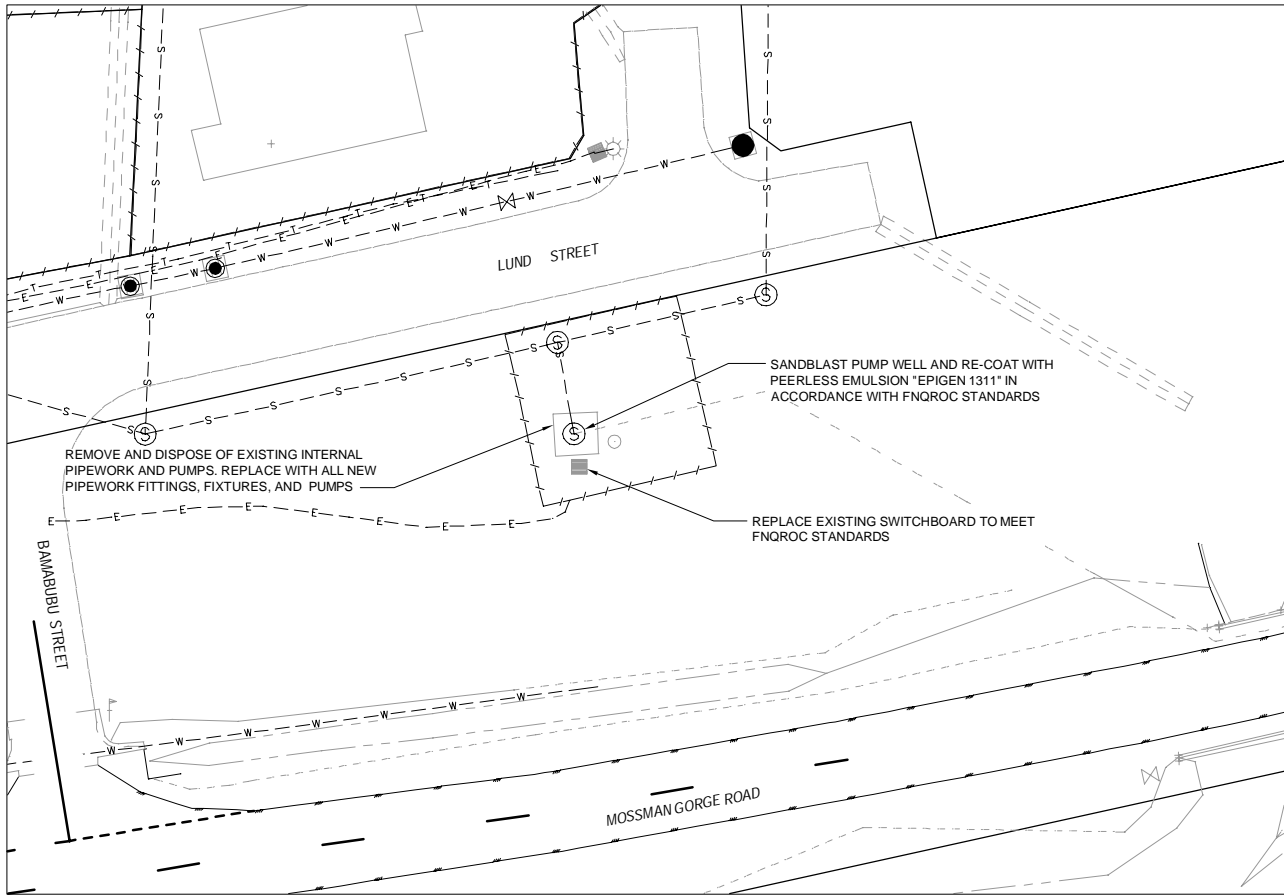
LUND STREET (WEST) - DETAILED SEWERAGE EXTENSION

SCALE 1:250

NOTES

- CONTRACTOR IS TO LOCATE EXISTING SEWER HOUSE CONNECTIONS AND CONSTRUCT NEW HOUSE DRAINS IN THEIR INDIVIDUAL LOTS AND CONNECT TO THE NEW SEWER.
- CONTRACTOR IS TO PROVIDE A WORK METHOD STATEMENT FOR COUNCIL APPROVAL FOR WITH THE PUMP STATION UPGRADE. WORK METHOD STATEMENT SHALL GIVE CONSIDERATION TO DECOMMISSIONING OF EXISTING PUMP STATION AND MINIMISING DISRUPTION TO EXISTING SERVICES.
- CONTRACTOR IS TO CONFIRM THE FINISHED SURFACE LEVEL OF ALL NEW MANHOLES AND END OF LINES, AND CONFIRM LOTS WILL BE CONTROLLED PRIOR TO CONSTRUCTION.

IMPORTANT NOTE:
LIVE SERVICES EXIST THROUGHOUT THE COMMUNITY. CONTRACTOR IS TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES PRIOR TO CONSTRUCTION AND ENSURE SERVICES TO THE COMMUNITY ARE MAINTAINED.



PUMP STATION DETAILS

SCALE 1:250

LEGEND

56.23m	SEWER PIPE, LENGTH AND MANHOLE	— E — E —	EXISTING ELECTRICAL CABLE (ABOVE GROUND), AND ELECTRICAL POLE.
E1	SEWER ENDCAP	— E — E —	EXISTING ELECTRICAL CABLE (UNDER GROUND)
5/3	HOUSE CONNECTION BRANCH (HCB) AND TYF	— W — — W — —	EXISTING WATER MAIN, HYDRANT, AND STOP VALVE
FLL 10.54	MANHOLE NUMBER / LINE NUMBER	— T — T —	EXISTING TELSTRA CABLE (UNDER GROUND)
NSL 10.54	FINISHED LID LEVEL OF MANHOLE	IL 4.95 — Ø150 — IL 4.90	EXISTING SEWER LINE, MANHOLES, PIPE DIAMETER AND INVERT LEVELS
FSL 3.700	EXISTING SURFACE LEVEL	— SW —	EXISTING STORMWATER
SW	FINISHED SURFACE LEVEL		PAVEMENT REINSTATEMENT 200mm CBR 60 ROAD BASE (PRIOR TO ASPHALT OVERLAY)
SW	SEWER PUMP STATION		2m WIDE CONCRETE INVERT
SW	INDICATES SEWER (S) CROSSING OTHER SERVICES AND (SW) STORMWATER	— / / / / /	EXISTING FENCE LINE
		—	EXISTING STREET LIGHT

File: K:\C1207019 Mossman Gorge Community Infrastructure Upgrades\Drawings\Temp\7019-007(B).dwg

Printed: 31 March 2015, 9:28 AM

No.	Description	Reviewed	Approved	Date
B	LOT AREAS ADJUSTED	SC	-	04/07/14
A	ISSUED FOR TENDER	SC	-	20/06/14

© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Black & More
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

Client	DEPARTMENT OF ABORIGINAL AND TORRES STRAIT ISLANDER MULTICULTURAL AFFAIRS			
Project	MOSSMAN GORGE INFRASTRUCTURE UPGRADES			
Drawn	NDC	Drawing Check	Approved	Date
Designed	GAS	Design Check	RPEQ	
Drawing is not to be used for construction unless approved				

Drawing Title	SEWERAGE PLAN SHEET 2 OF 2		
Drawing Size	Scale (A1 size)	Drg No	Revision
A1	AS SHOWN	7019-007	B

Inspection report / Inspection: 1

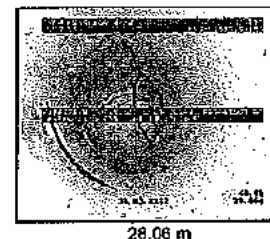
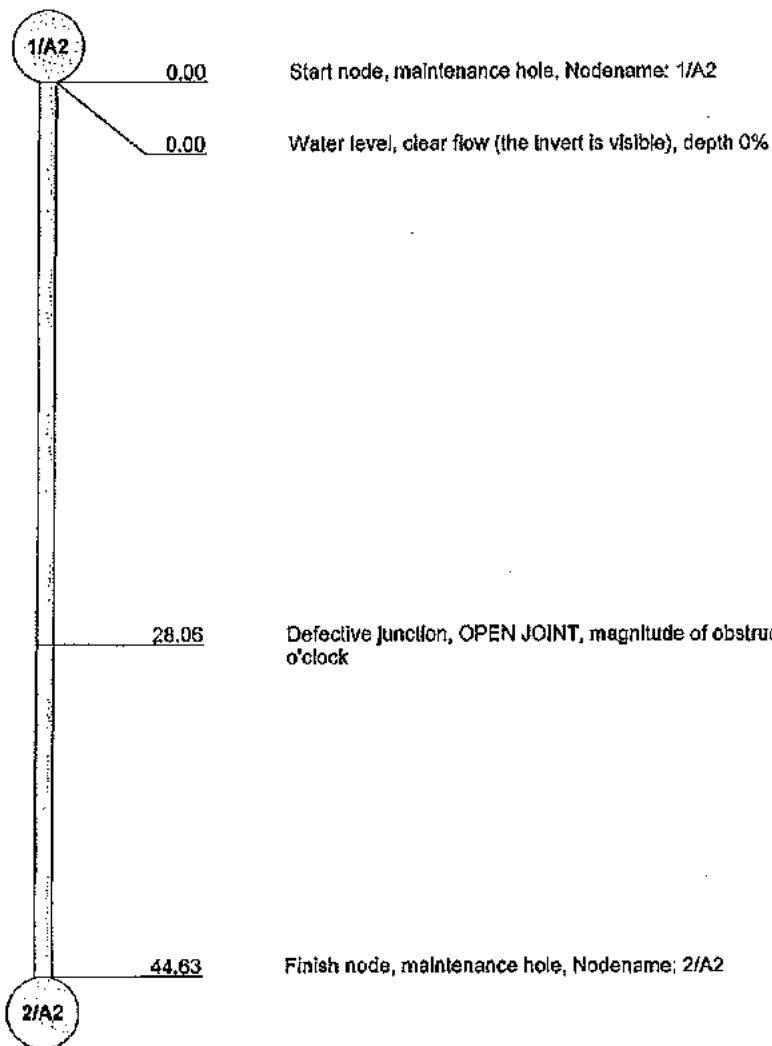
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator: Shane Overlack	Section number: 8	Pipe Asset Id: 1308382
Method of Inspection:	Cleaning: cleaned	Criticality:	Drawing Number 8053-4	Re-line Material:	MH Depth 1.6

Town/suburb: Location: Location type:	MOSSMAN LUND ST.	Catchment: Asset Owner: Job No.: Flow control:	US MH.: DS MH.: Section length : Survey Dir :	2/A2 1/A2 44.93 m upatream
---	---------------------	---	--	-------------------------------------

Purpose of inspection :	Structural exam	Shape :	
Use of sewer:	Sewage	Dia/Height:	150 mm
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticised

Remarks :

1:380 Position Observation



28.06 m

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

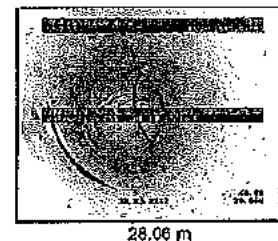
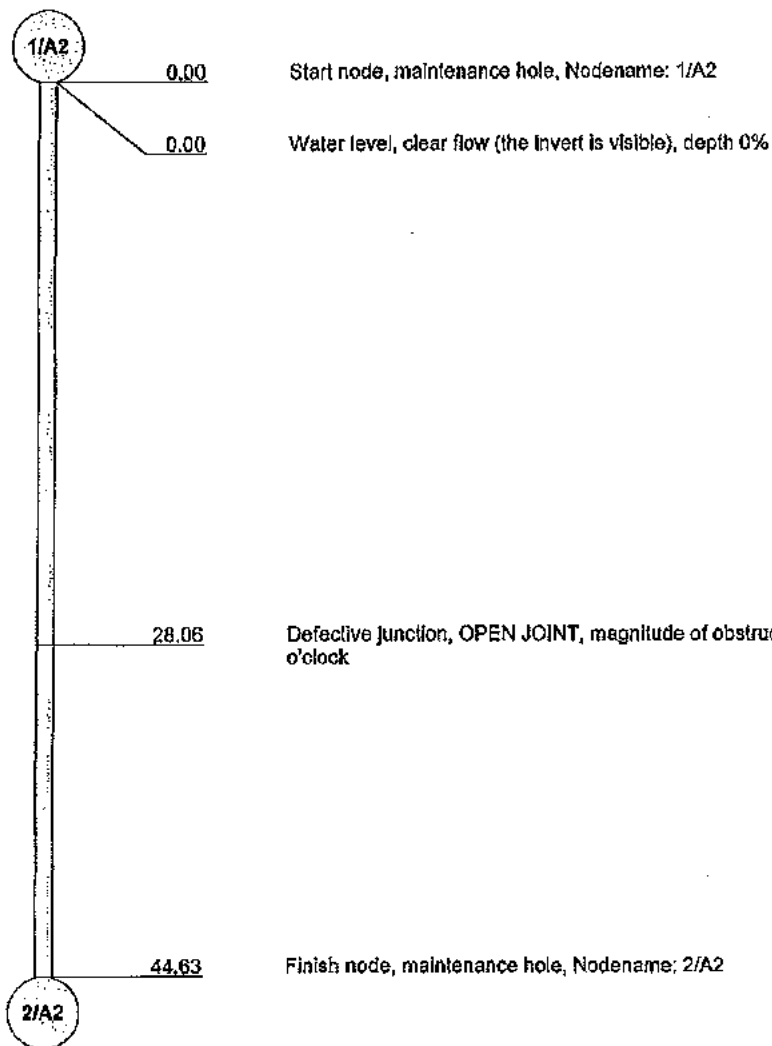
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator: Shane Overlack	Section number: 8	Pipe Asset Id: 1308382
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6063-4	Re-line Material:	MH Depth 1.6

Town/suburb: Location: Location type:	MOSSMAN LUND ST.	Catchment: Asset Owner: Job No.: Flow control:	US MH.: DS MH.: Section length : Survey Dir :	2/A2 1/A2 44.63 m upstream
---	---------------------	---	--	-------------------------------------

Purpose of inspection :	Structural exam	Shape :	
Use of sewer:	Sewage	Dia/Height:	150 mm
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticised

Remarks :

1:380 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

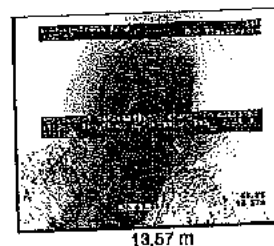
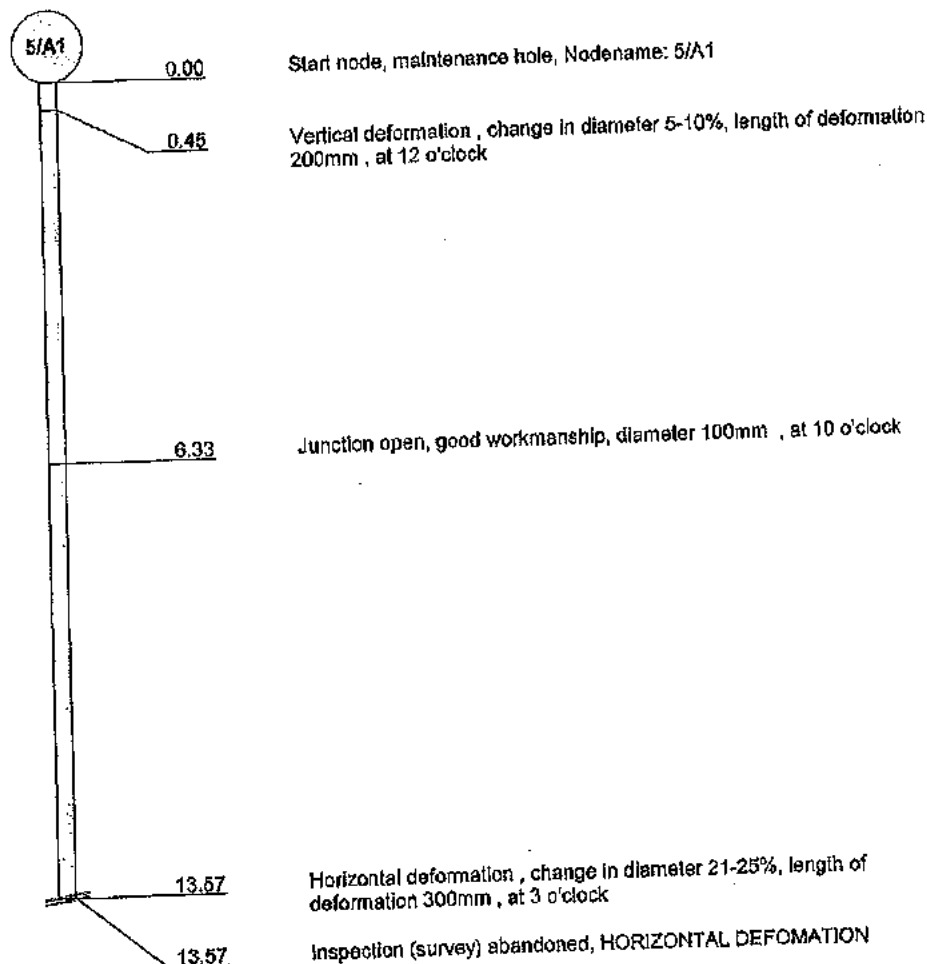
Date: 9/30/2012	Asset owner's job ref.:	Project Name:	Operator: Shane Overlack	Section number: 10	Pipe Asset Id: 1308383
Method of Inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Re-line Material	MH Depth 2.1

Town/suburb: Location: Location type:	mooseman LUND ST. Flow control	Catchment: Asset Owner: Job No.:	US MH.: DS MH.: Section length: Survey Dir.:	1/A2 5/A1 72.99 m upstream
---	--------------------------------------	--	---	-------------------------------------

Purpose of inspection:	Structural exam	Shape:	160 mm
Use of sewer:	Sewage	Dia/Height:	
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticlead

Remarks:

1:120 Position Observation



13.57 m

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
2	195	14.36	195	5	0	0	0	0	1

Inspection report / Inspection: 1

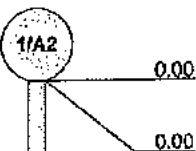
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator: Shane Ovarlack	Section number: 9	Pipe Asset Id: 1308383
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.6

Town/suburb: Location: Location type:	MOSSMAN LUND ST.	Catchment: Asset Owner: Job No.: Flow control:	US MH.: DS MH.: Section length: Survey Dir.:	1/A2 5/A1 72.99 m downstream
---	---------------------	---	---	---------------------------------------

Purpose of inspection:	Structural exam	Shape:	
Use of sewer:	Sewage	Dia/Height:	150 mm
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticised

Remarks:

1:465 Position Observation



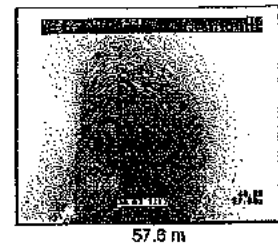
Start node, maintenance hole, Nodename: 1/A2

Water level, clear flow (the invert is visible), depth 5%

Junction open, good workmanship, diameter 100mm , at 2 o'clock

Horizontal deformation , change in diameter 21-25%, length of deformation 300mm , at 9 o'clock

Inspection (survey) abandoned, HORIZONTAL DEFORMATION



57.9 m

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	165	2.86	165	5	0	0	0	0	1

Inspection report / Inspection: 1

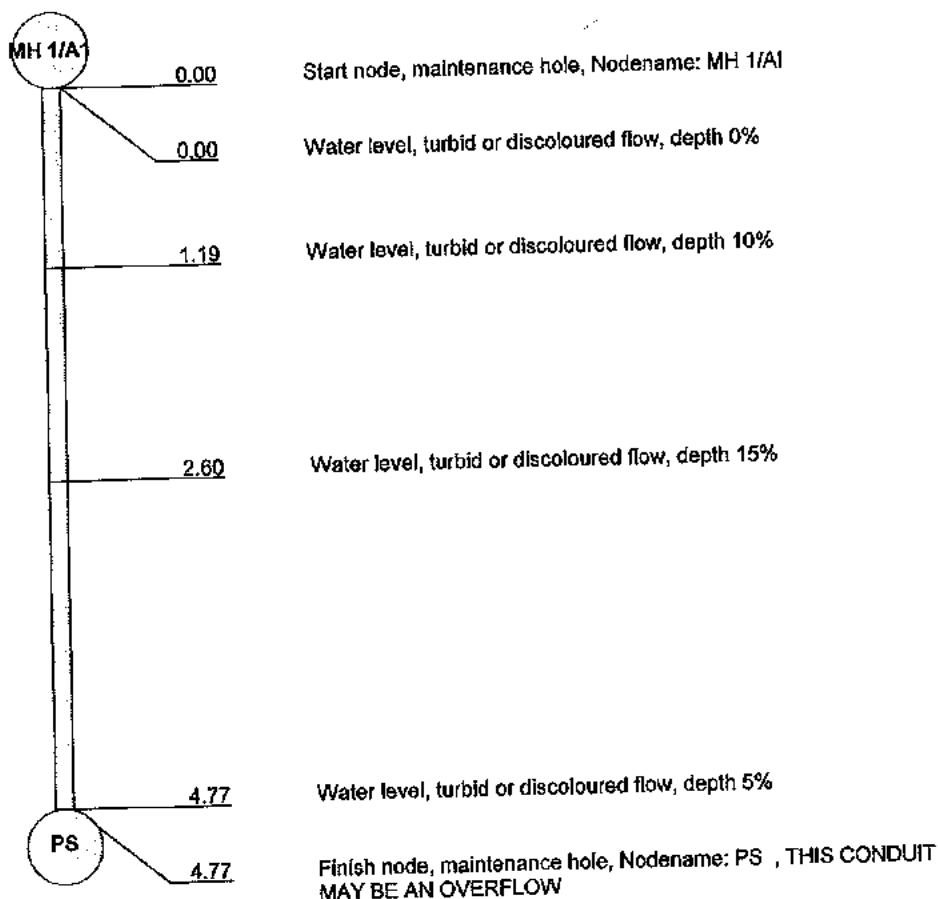
Date: 4/2/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Gralner	Section number: 24	Pipe Asset Id: 3081742
Method of inspection:	Cleaning: not cleaned	Criticality:	Drawing Number 6053-5	Reline Material	MH Depth 2.4

Town/suburb: Location: Location type:	MOSSMAN LUND ST	Catchment: Asset Owner: Job No.: Flow control:	US MH.: DS MH.: Section length : Survey Dir :	MH 1/A1 PS 4.77 m downstream
---	--------------------	---	--	---------------------------------------

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	150 mm PVC-Plasticised
---	--	--	---------------------------

Remarks :

1:50 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

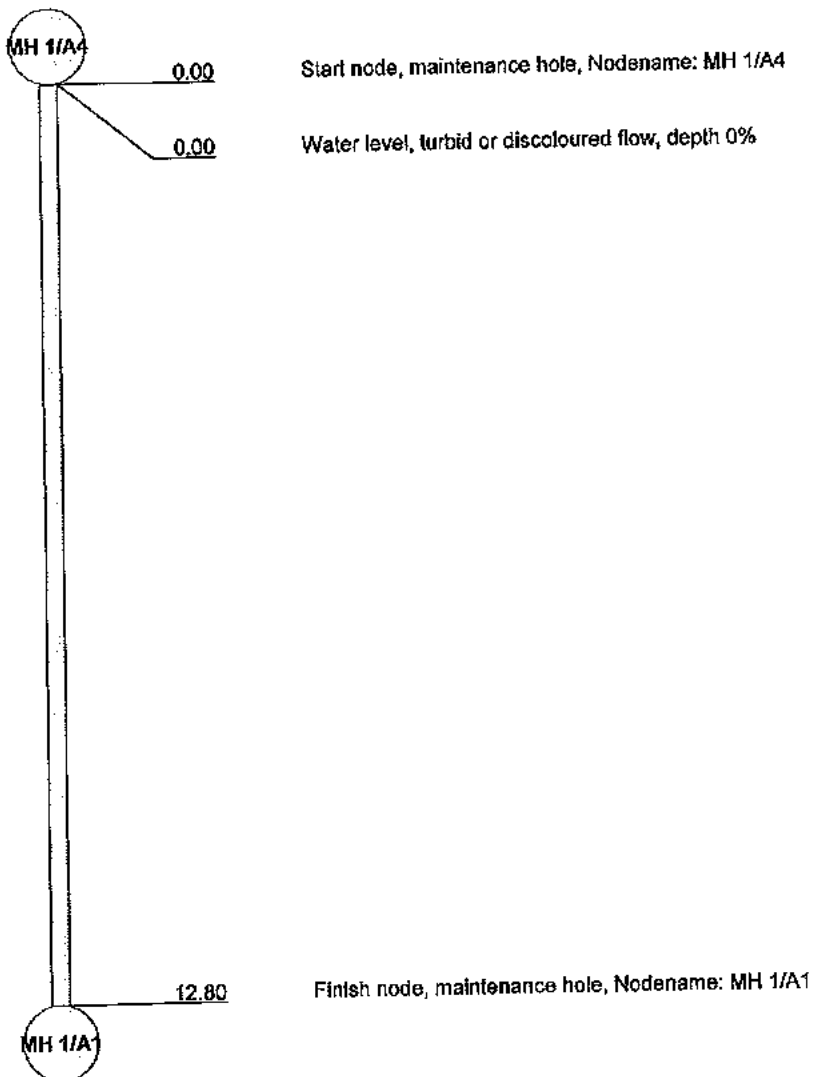
Date: 4/2/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Graflner	Section number: 23	Pipe Asset Id: 1308384
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-5	Reline Material	MH Depth 1.8

Town/suburb: Location: Location type:	MOSSMAN LUND ST	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	MH 1/A4 MH 1/A1 12.80 m downstream
---	--------------------	--	--	---

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	 150 mm PVC-Plasticised
---	--	--	-----------------------------------

Remarks :

1:105 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

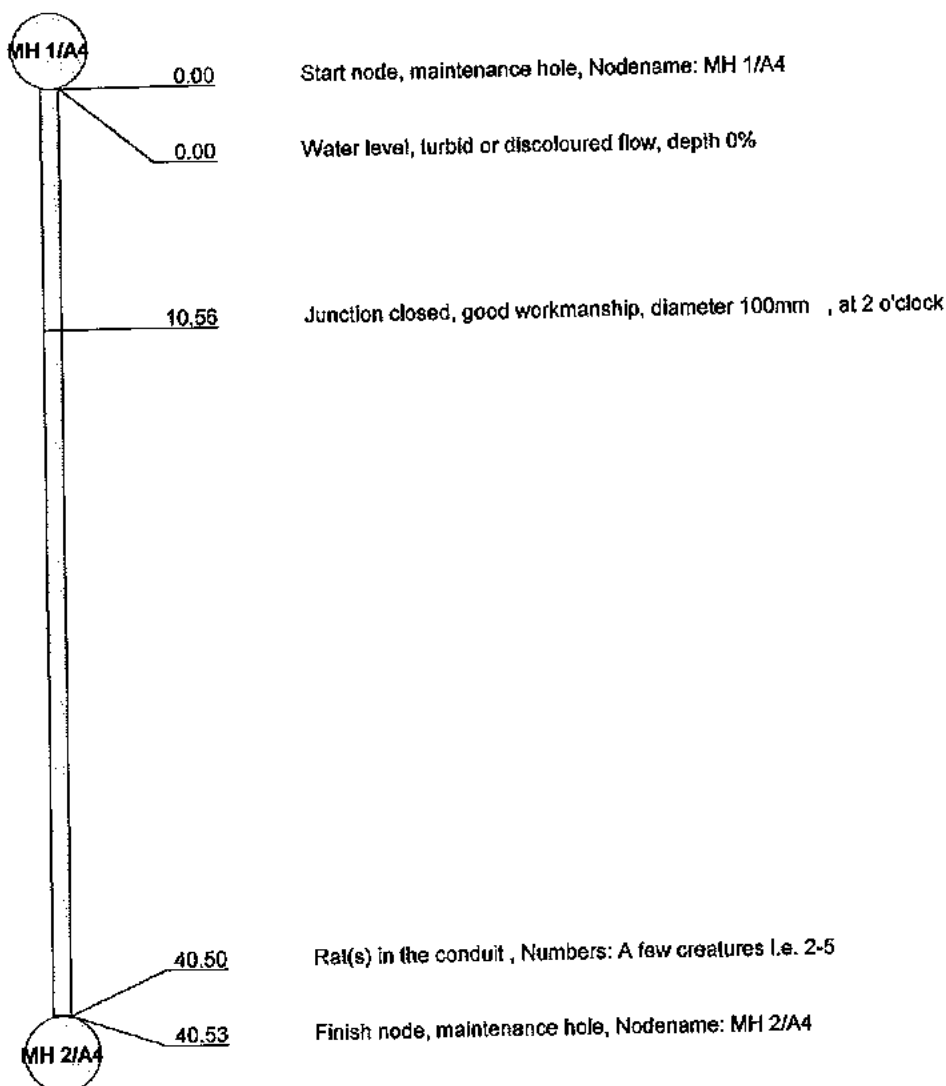
Date: 4/2/2012	Asset owner's job ref.:	Project Name:	Operator: Frank Gralner	Section number: 22	Pipe Asset Id: 1308387
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-5	Retine Material	MH Depth 1.8

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 2/A4
Location: LUND ST	Asset Owner:	DS MH.: MH 1/A4
Location type:	Job No.:	Section length : 40.63 m
	Flow control	Survey Dir : upstream

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	 150 mm PVC-Plasticised
---	--	--	-----------------------------------

Remarks :

1:330 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	1	20	0.49	20	3

Inspection report / Inspection: 1

Date: 4/2/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 21	Pipe Asset id: 1308385
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-5	Reline Material	MH Depth 1.9

Town/suburb: MOSSMAN	Catchment:	US MH: MH 2/A1
Location: LUND ST	Asset Owner:	DS MH: MH 1/A1
Location type:	Job No.:	Section length : 27.02 m
	Flow control	Survey Dir: downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:225 Position

Observation

MH 2/A1

0.00

Start node, maintenance hole, Nodename: MH 2/A1

0.00

Water level, turbid or discoloured flow, depth 5%

27.02

Finish node, maintenance hole, Nodename: MH 1/A1

MH 1/A1

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

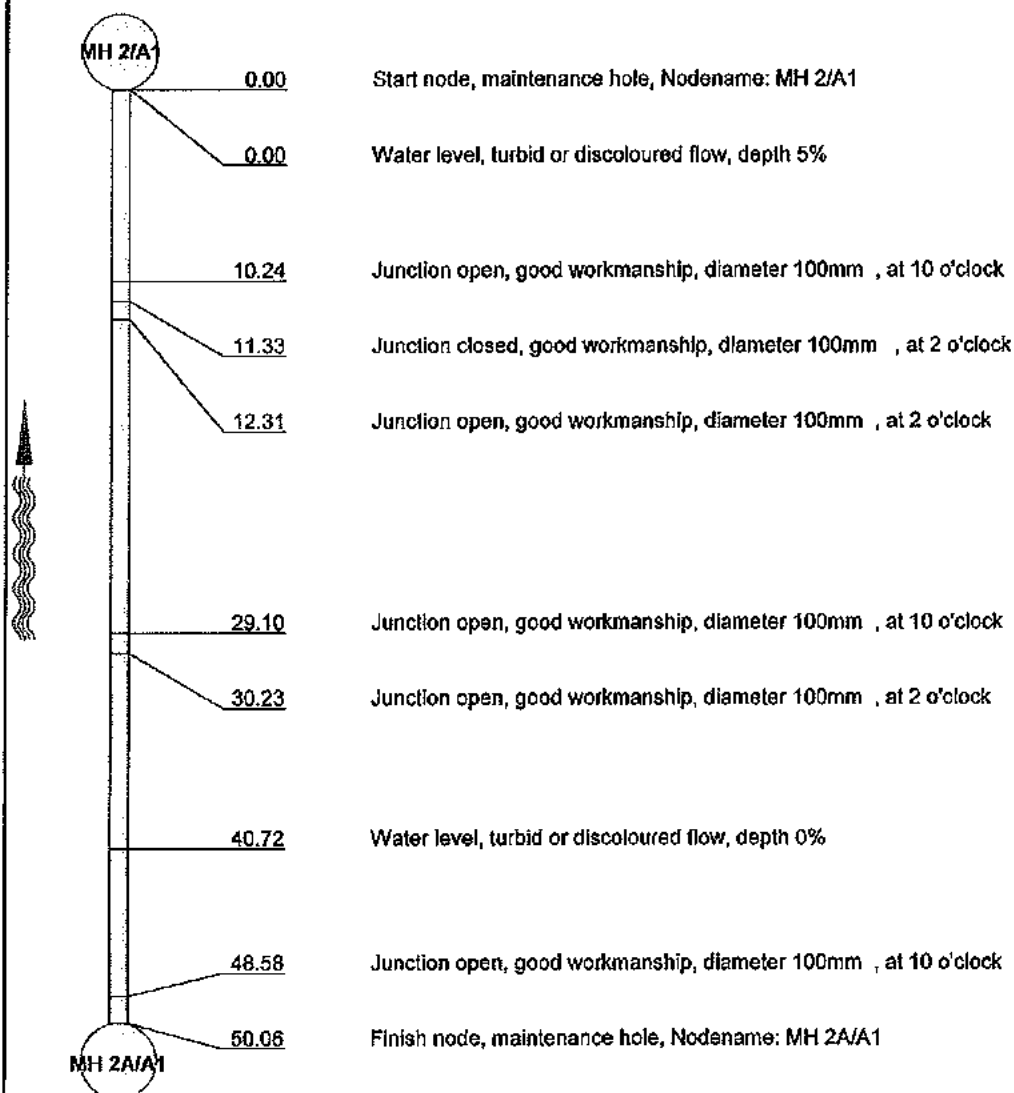
Date: 4/2/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 20	Pipe Asset Id: 1308386
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-5	Refine Material	MH Depth 1.9

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 2/A1
Location: LUND ST	Asset Owner:	DS MH.: MH 2/A1
Location type:	Job No.:	Section length : 50.06 m
	Flow control	Survey Dir : upstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 160 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:405 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

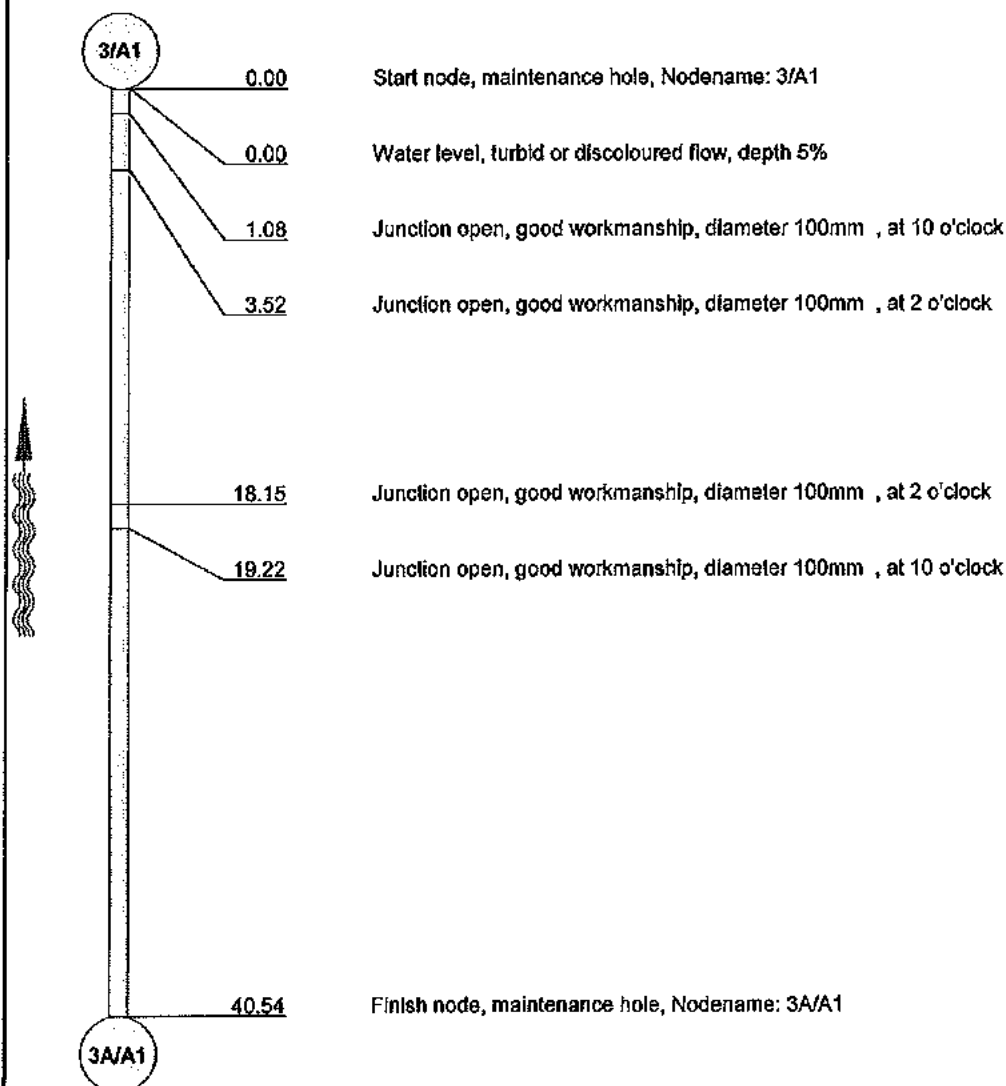
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Shane Overlack	Section number: 19	Pipe Asset Id: ?
Method of inspection:	Cleaning: not cleaned	Criticality:	Drawing Number 6053-5	Reline Material	MH Depth 1.8

Town/suburb: MOSSMAN	Catchment:	US MH.: 3/A1
Location: LUND ST.	Asset Owner:	DS MH.: 3/A1
Location type:	Job No.:	Section length : 40.64 m
	Flow control	Survey Dir : upstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 160 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:330 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Shane Overlack	Section number: 18	Pipe Asset Id: 1308369
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.8

Town/suburb: Location: Location type:	MOSSMAN LUND ST.	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	4A/A1 4/1A 38.57 m downstream
Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	150 mm PVC-Plasticised	

Remarks :

1:225 Position Observation

4A/A1

0.00

Start node, maintenance hole, Nodename: 4A/A1

0.00

Water level, clear flow (the invert is visible), depth 5%



27.64 m

19.16

Junction closed, good workmanship, diameter 100mm , at 10 o'clock

20.47

Junction closed, good workmanship, diameter 100mm , at 2 o'clock

27.64

Vertical deformation , change in diameter 16-20%, length of deformation 400mm , at 12 o'clock

27.64

Inspection (survey) abandoned, VERTICAL DEFORMATION

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	125	4.62	125	6	0	0	0	0	1

Inspection report / Inspection: 1

Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Gralnar	Section number: 17	Pipe Asset Id: 1308389
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 8053-4	Refine Material	MH Depth 1.7

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 4/A1
Location: LUND ST	Asset Owner:	DS MH.: MH 4/A1
Location type:	Job No.:	Section length : 38.57 m
	Flow control	Survey Dir : upstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 160 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:75 Position Observation

MH 4/A1

0.00

Start node, maintenance hole, Nodename: MH 4/A1

0.00

Water level, turbid or discoloured flow, depth 5%

1.00

Junction open, good workmanship, diameter 100mm , at 10 o'clock

1.75

Water level, turbid or discoloured flow, depth 10%

4.65

Junction open, good workmanship, diameter 100mm , at 2 o'clock

4.65

Water level, turbid or discoloured flow, depth 5%

8.09

Vertical deformation , change in diameter 16-20%, length of deformation 400mm , at 1 o'clock

8.09

Inspection (survey) abandoned, obstruction , VERTICAL DEFORMATION



8.09 m

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	126	15.45	126	5	0	0	0	0	1

Inspection report / Inspection: 1

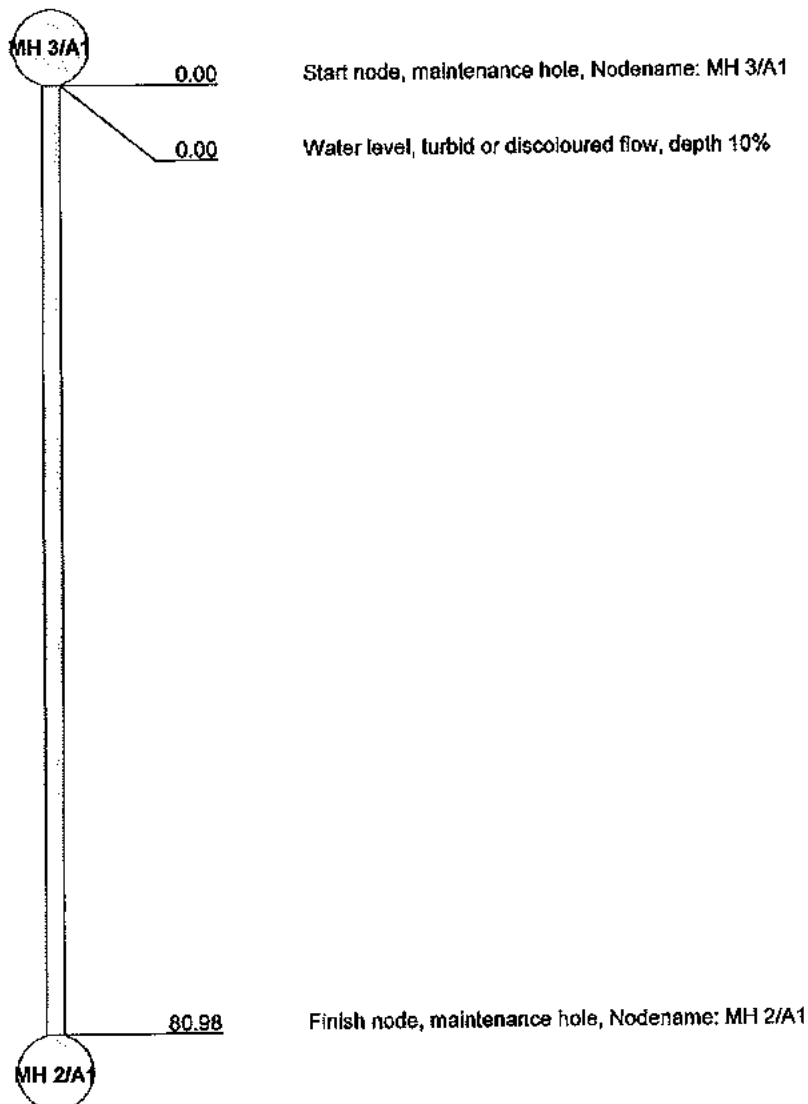
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 16	Pipe Asset Id: 1308388
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.7

Town/suburb: MOSSMAN	Catchment:	US MH: MH 3/A1
Location: LUND ST	Asset Owner:	DS MH: MH 2/A1
Location type:	Job No.:	Section length : 80.98 m
	Flow control:	Survey Dir : downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:645 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

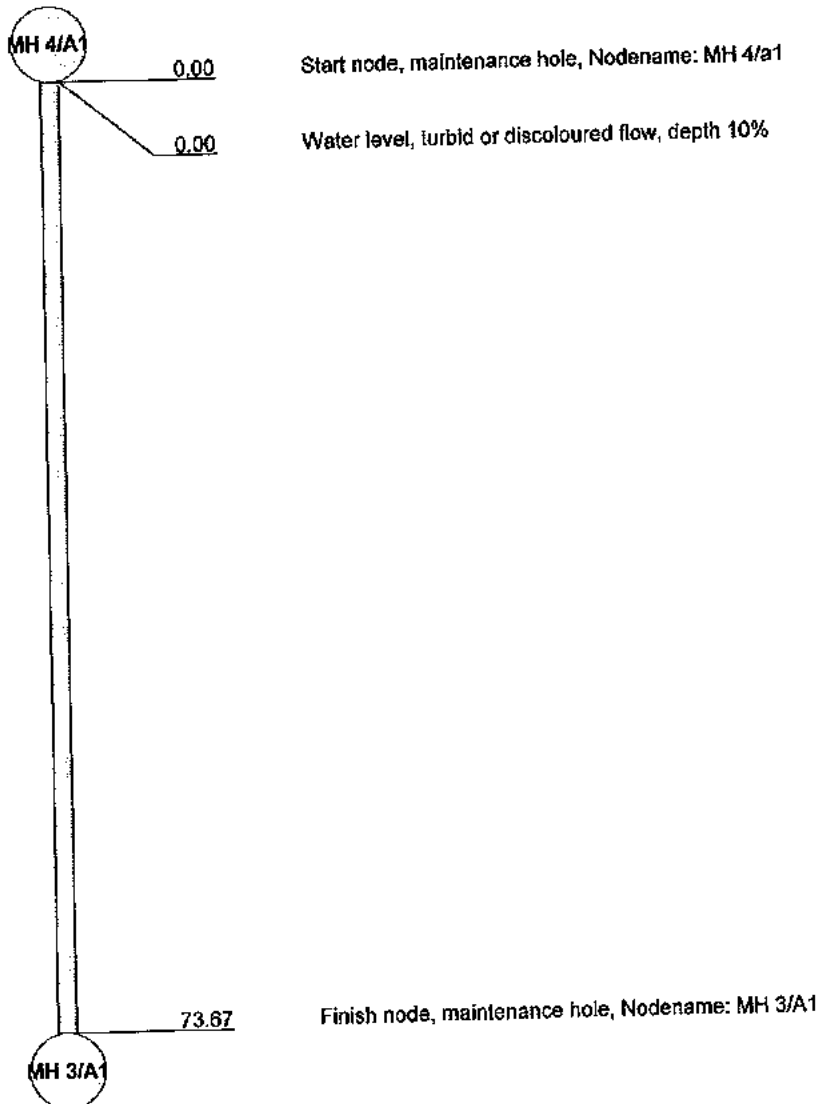
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 16	Pipe Asset Id: 1308390
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.7

Town/suburb: Location: Location type:	MOSSMAN LUND ST	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	MH 4/A1 MH 3/A1 73.67 m downstream
---	--------------------	--	--	---

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	150 mm PVC-Plasticised
---	--	--	---------------------------

Remarks :

1:585 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 14	Pipe Asset Id: 1308391
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.7

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 6/A1
Location: LUND ST	Asset Owner:	DS MH.: MH 4/A1
Location type:	Job No.:	Section length : 78.85 m
	Flow control	Survey Dir : upstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:165 Position Observation

MH 4/A1

0.00

Start node, maintenance hole, Nodename: MH 4/A1

0.00

Water level, turbid or discoloured flow, depth 5%

6.12

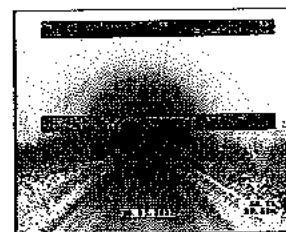
Vertical deformation, at joint, change in diameter 5-10%, length of deformation >1000mm , at 12 o'clock

19.10

Inspection (survey) abandoned, VERTICAL DEFORMATION 15%



6.12 m



19.1 m

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	30	1.57	30	3	0	0	0	0	1

Inspection report / Inspection: 1

Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Shane Overlack	Section number: 13	Pipe Asset Id: 1308391
Method of Inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6063-4	Reline Material	MH Depth 2.1

Town/suburb: Location: Location type:	MOSSMAN LUND ST.	Catchment: Asset Owner: Job No.: Flow control	US MH: DS MH: Section length : Survey Dir :	5/A1 4/A1 78.86 m downstream
Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	160 mm PVC-Plasticised	

Remarks :

1:465 Position Observation

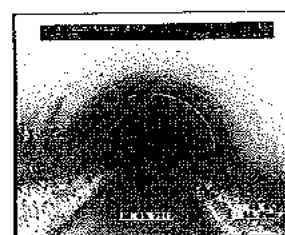
5/A1

0.00

Start node, maintenance hole, Nodename: 5/A1

0.00

Water level, clear flow (the invert is visible), depth 5%



58.35 m

58.35

Vertical deformation , change in diameter 11-15%, length of deformation 800mm , at 12 o'clock

58.35

Inspection (survey) abandoned, VERTICAL DEFORMATION

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	90	1.64	90	6	0	0	0	0	1

Inspection report / Inspection: 1

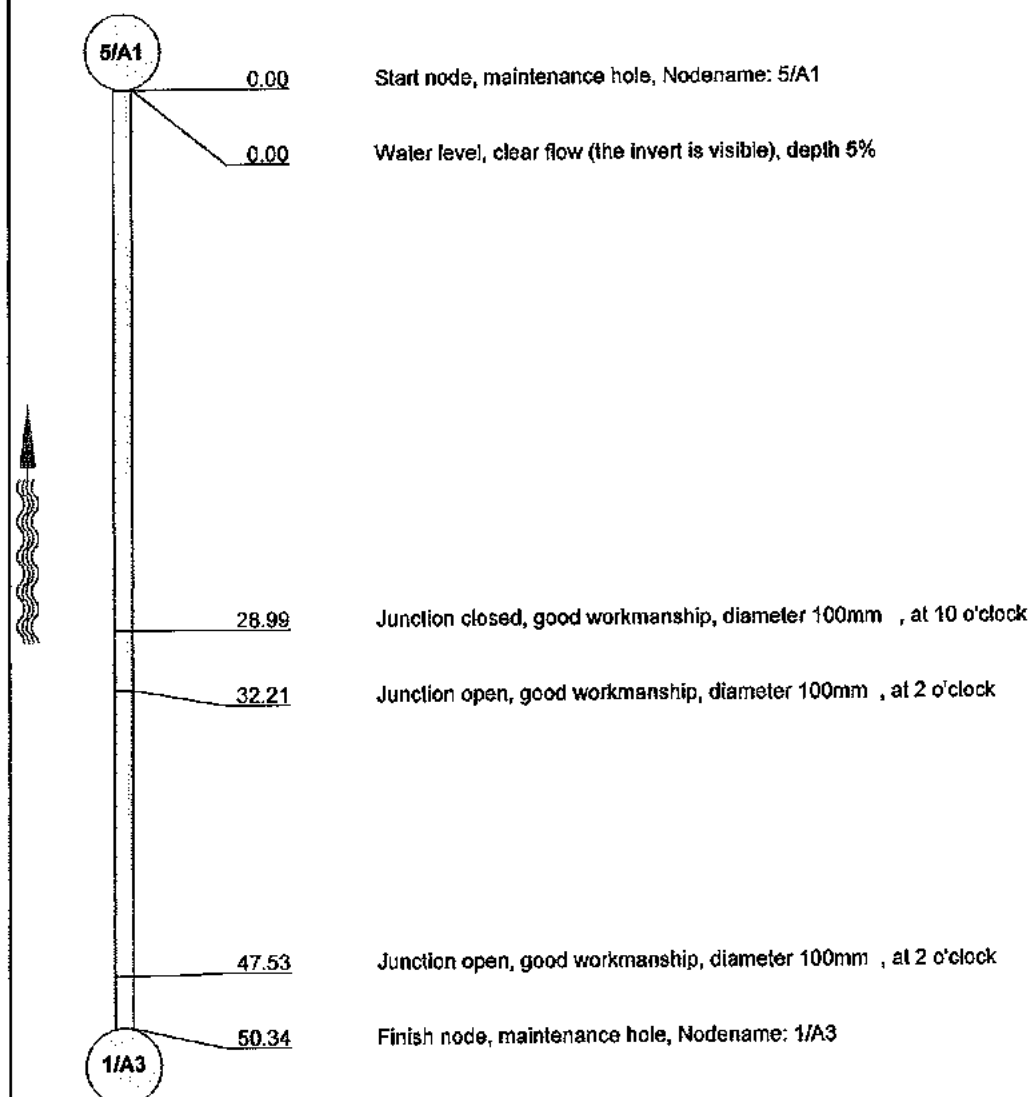
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Shane Overlack	Section number: 12	Pipe Asset Id: 1308395
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 2.1

Town/suburb: Location: Location type:	MOSSMAN LUND ST.	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	1/A3 5/A1 50.34 m upstream
---	---------------------	--	--	-------------------------------------

Purpose of inspection :	Structural exam	Shape :	
Use of sewer:	Sewage	Dia/Height:	150 mm
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticised

Remarks :

1:405 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

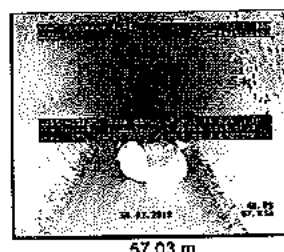
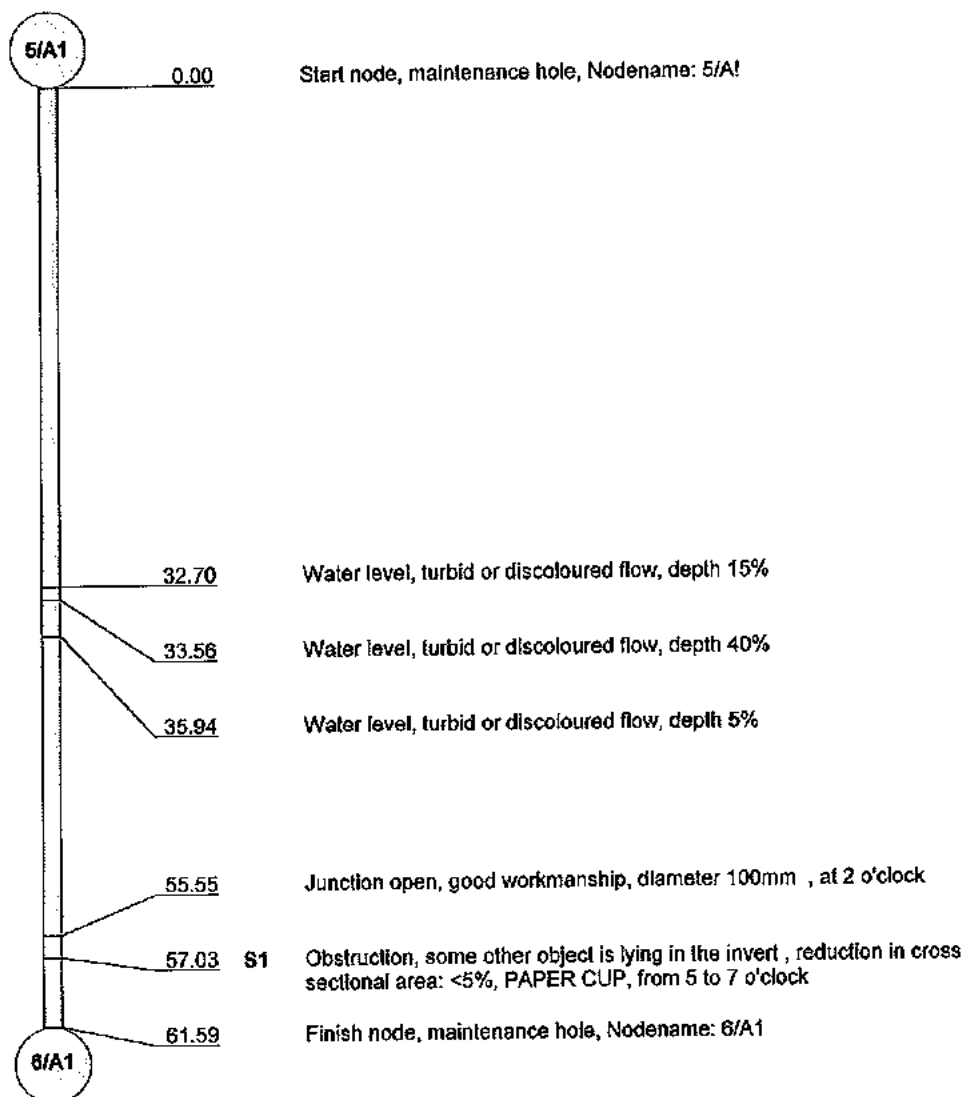
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator: Shane Overlack	Section number: 11	Pipe Asset Id: 1308396
Method of Inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 2.1

Town/suburb: Location: Location type:	MOSSMAN LUND ST. Location type:	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	6/A1 6/A1 61.59 m upstream
---	---------------------------------------	--	--	-------------------------------------

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	 150 mm PVC-Plasticised
---	--	--	-----------------------------------

Remarks :

1:495 Position Observation



57.03 m

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

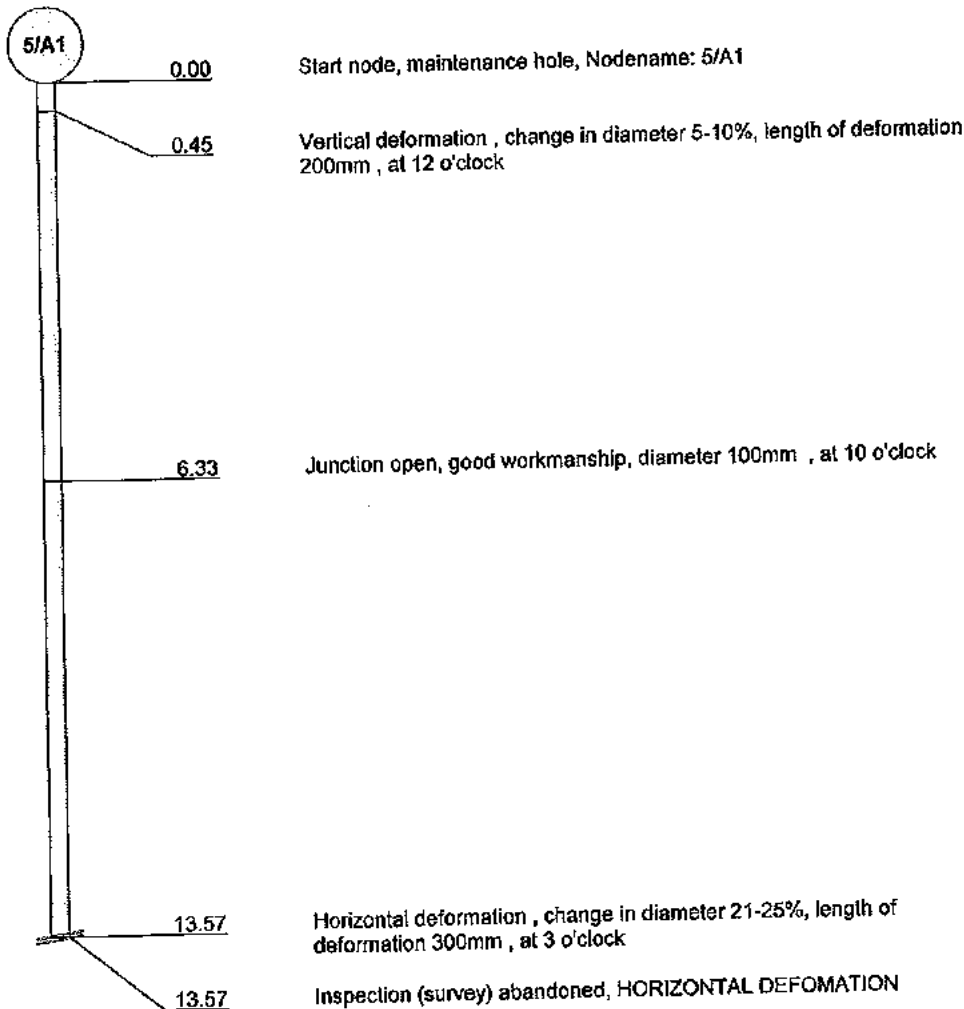
Date: 3/30/2012	Asset owner's job ref.:	Project Name:	Operator : Shane Overlack	Section number: 10	Pipe Asset Id: 1308383
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 8053-4	Reline Material	MH Depth 2.1

Town/suburb: Location: Location type:	mossman LUND ST. Flow control	Catchment: Asset Owner: Job No.:	US MH.: DS MH.: Section length : Survey Dir :	1/A2 5/A1 72.99 m upstream
---	-------------------------------------	--	--	-------------------------------------

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	160 mm PVC-Plasticised
---	--	--	---------------------------

Remarks :

1:120 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
2	165	14.36	195	5	0	0	0	0	1

Inspection report / Inspection: 1

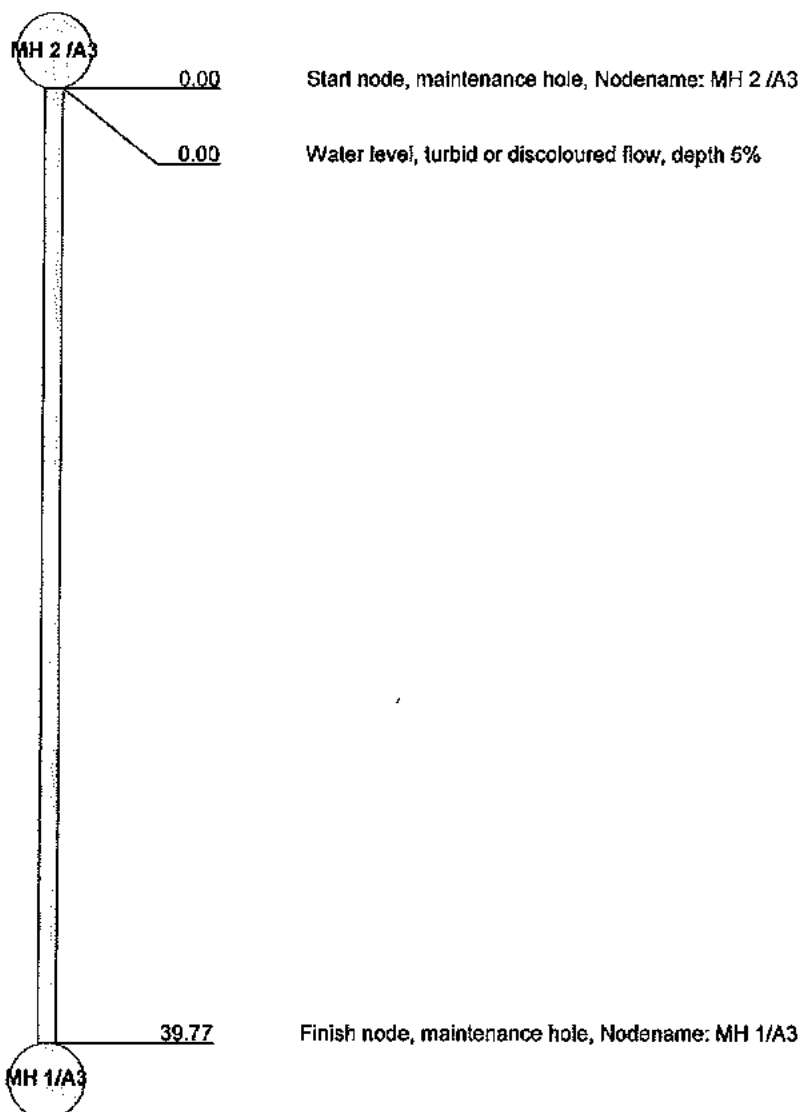
Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 7	Pipe Asset Id: 1308394
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 8053-4	Reline Material	MH Depth 1.3

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 2 /A3
Location: LUND ST	Asset Owner:	DS MH.: MH 1/A3
Location type:	Job No.:	Section length : 39.77 m
	Flow control	Survey Dir : downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:315 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

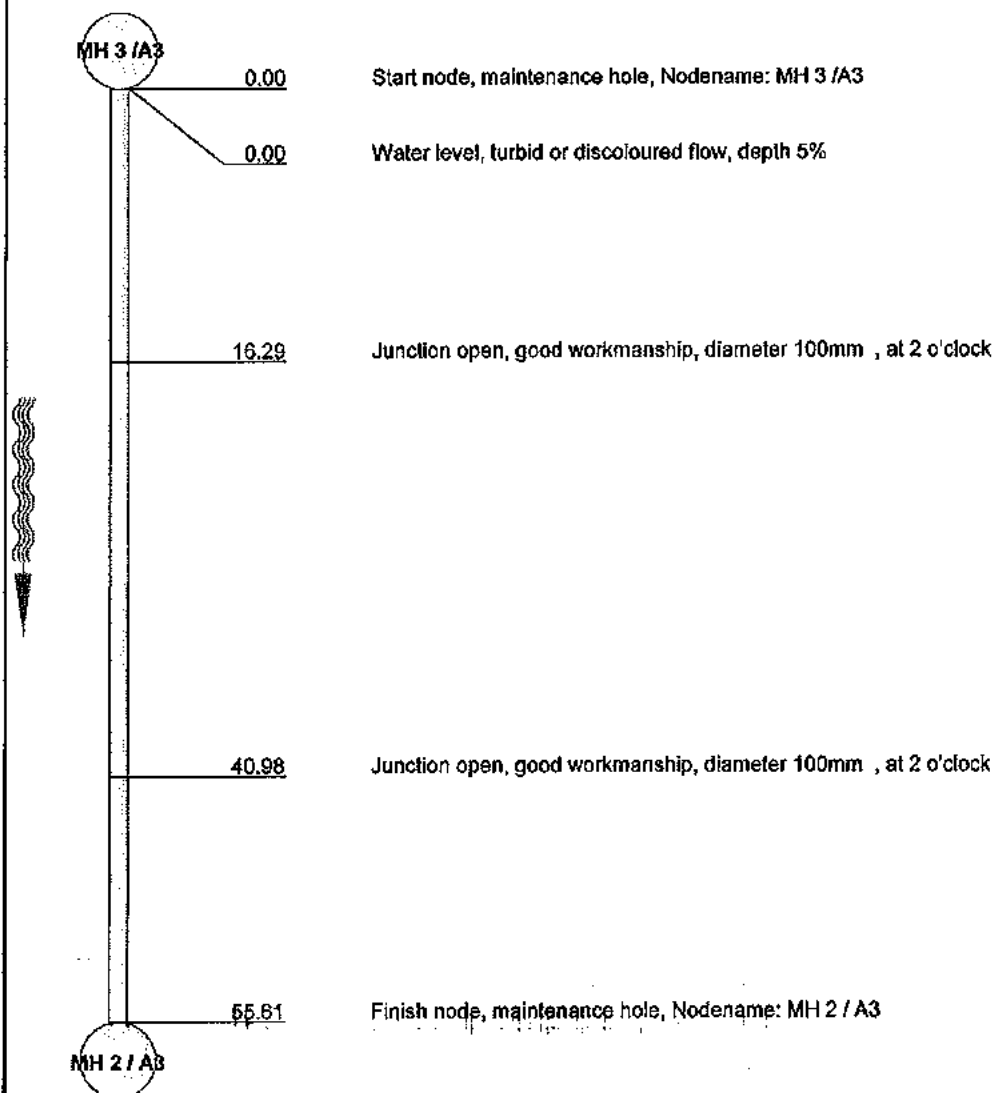
Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 6	Pipe Asset Id: 1308393
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 8053-4	Refine Material	MH Depth 1.3

Town/suburb: Location: Location type:	MOSSMAN LUND ST	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	MH 3 /A3 MH 2 / A3 55.61 m downstream
---	--------------------	--	--	--

Purpose of inspection :	Structural exam	Shape :	
Use of sewer:	Sewage	Dia/Height:	160 mm
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticised

Remarks :

1:450 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 6	Pipe Asset Id: 1308393
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.3

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 3 /A3
Location: LUND ST	Asset Owner:	DS MH.: MH 2 / A3
Location type:	Job No.:	Section length : 55.61 m
	Flow control	Survey Dir : downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:450 Position

Observation

MH 3 /A3

0.00

Start node, maintenance hole, Nodename: MH 3 /A3

0.00

Water level, turbid or discoloured flow, depth 5%

16.29

Junction open, good workmanship, diameter 100mm , at 2 o'clock

40.98

Junction open, good workmanship, diameter 100mm , at 2 o'clock

55.61

Finish node, maintenance hole, Nodename: MH 2 / A3

MH 2 / A3

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

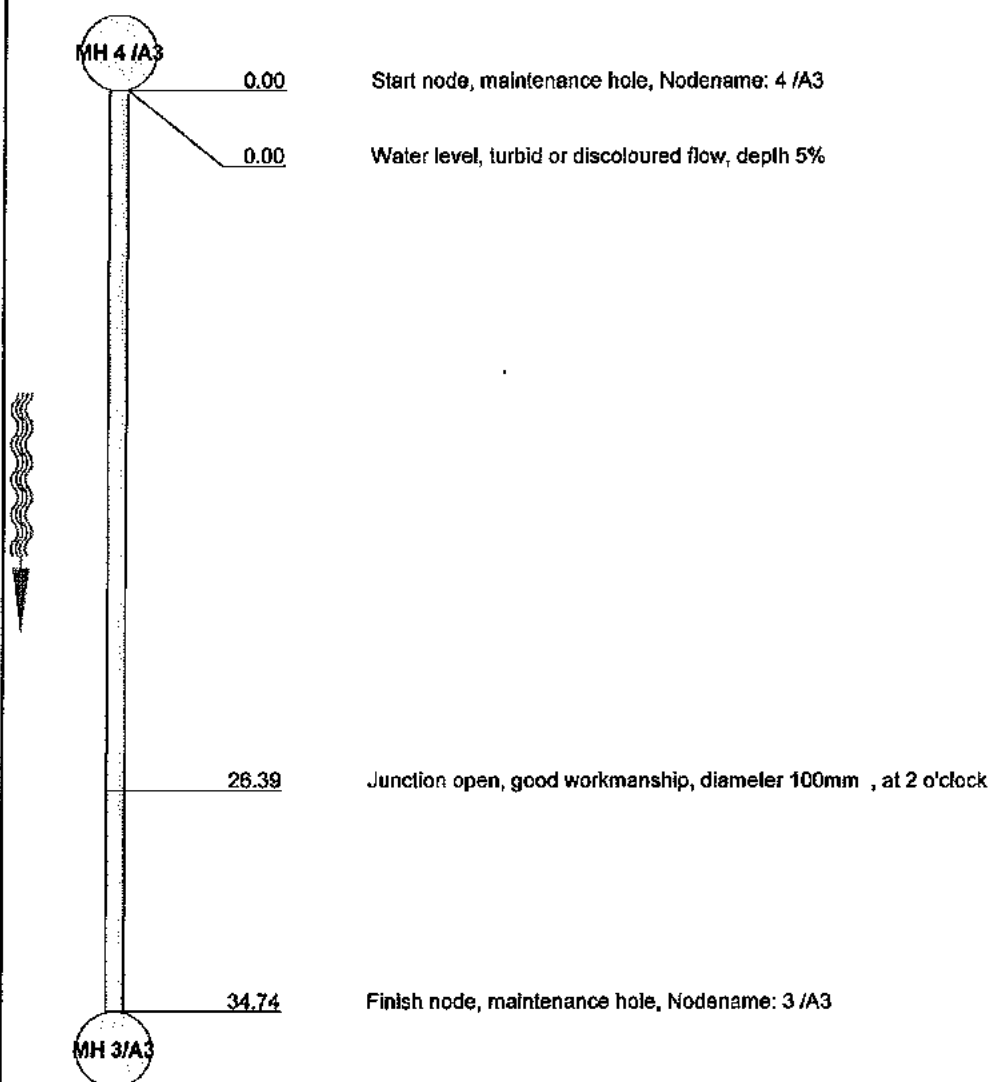
Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Gralner	Section number: 5	Pipe Asset Id: 1308392
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 1.3

Town/suburb: Location: Location type:	MOSSMAN LUND ST	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	MH 4 /A3 MH 3/A3 34.74 m downstream
---	--------------------	--	--	--

Purpose of inspection :	Structural exam	Shape :	
Use of sewer:	Sewage	Dia/Height:	150 mm
Land ownership:	Private Land	Width:	
Type of sewer:	Gravity sewer	Pipe Material:	PVC-Plasticised

Remarks :

1:285 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Grainer	Section number: 4	Pipe Asset Id: 1308387
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 2.1

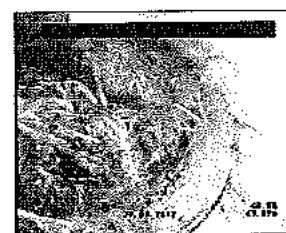
Town/suburb: MOSSMAN	Catchment:	US MH.: MH 7/A1
Location: JUNKURRI ST	Asset Owner:	DS MH.: MH 6/A1
Location type:	Job No.:	Section length : 73.11 m
	Flow control	Survey Dir : downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:585 Position

Observation



43.09 m

MH 7/A1

0.00

Start node, maintenance hole, Nodename: MH 7/A1

0.00

Water level, turbid or discoloured flow, depth 5%

43.09

Defective junction, roots are growing into and/or down the connecting conduit, magnitude of obstruction >75% , at 10 o'clock

73.11

Finish node, maintenance hole, Nodename: MH 6/A1

MH 6/A1

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	1	60	0.82	60	8

Inspection report / Inspection: 1

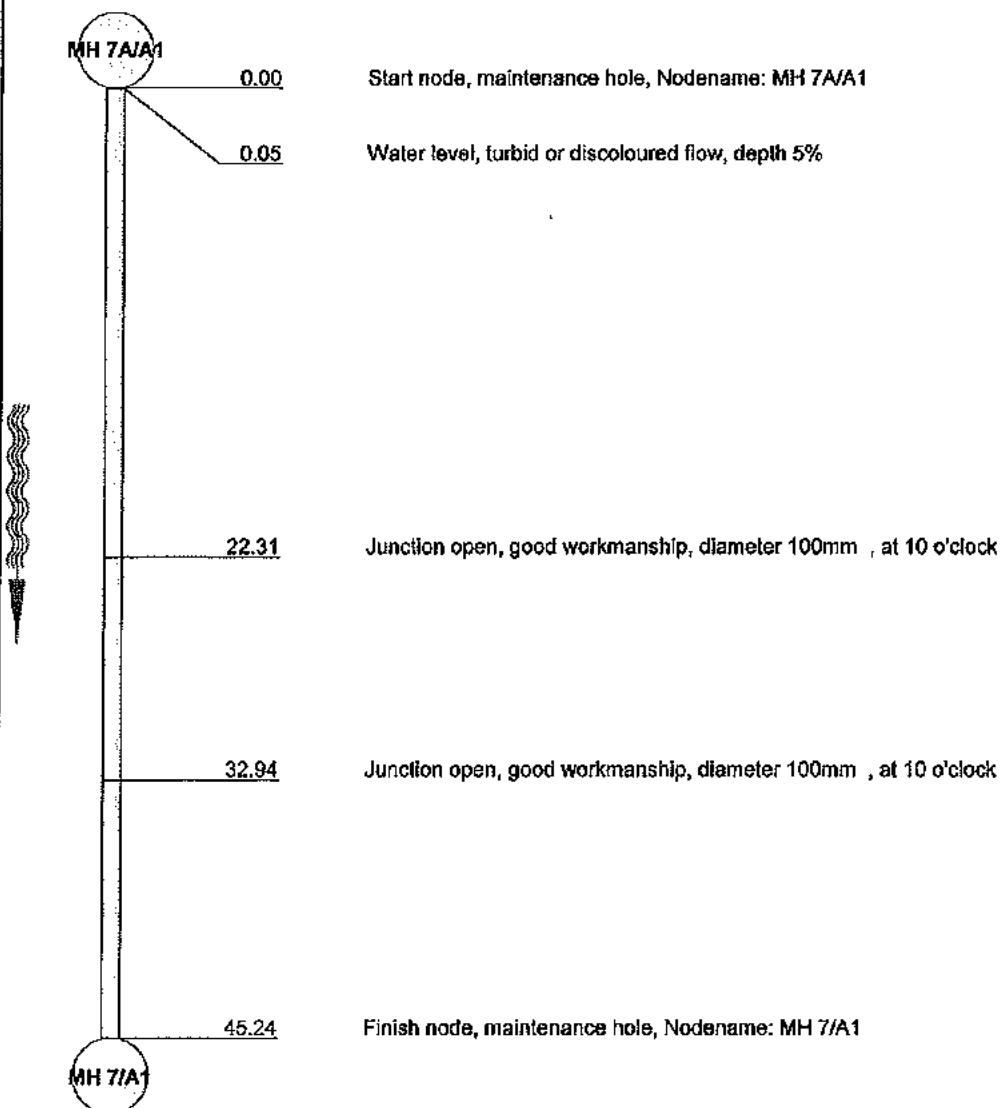
Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Gräner	Section number: 3	Pipe Asset Id: 1308398
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 2.1

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 7A/A1
Location: JUNKURRI ST	Asset Owner:	DS MH.: MH 7/A1
Location type:	Job No.:	Section length : 46.24 m
	Flow control	Survey Dir : downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticised

Remarks :

1:360 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

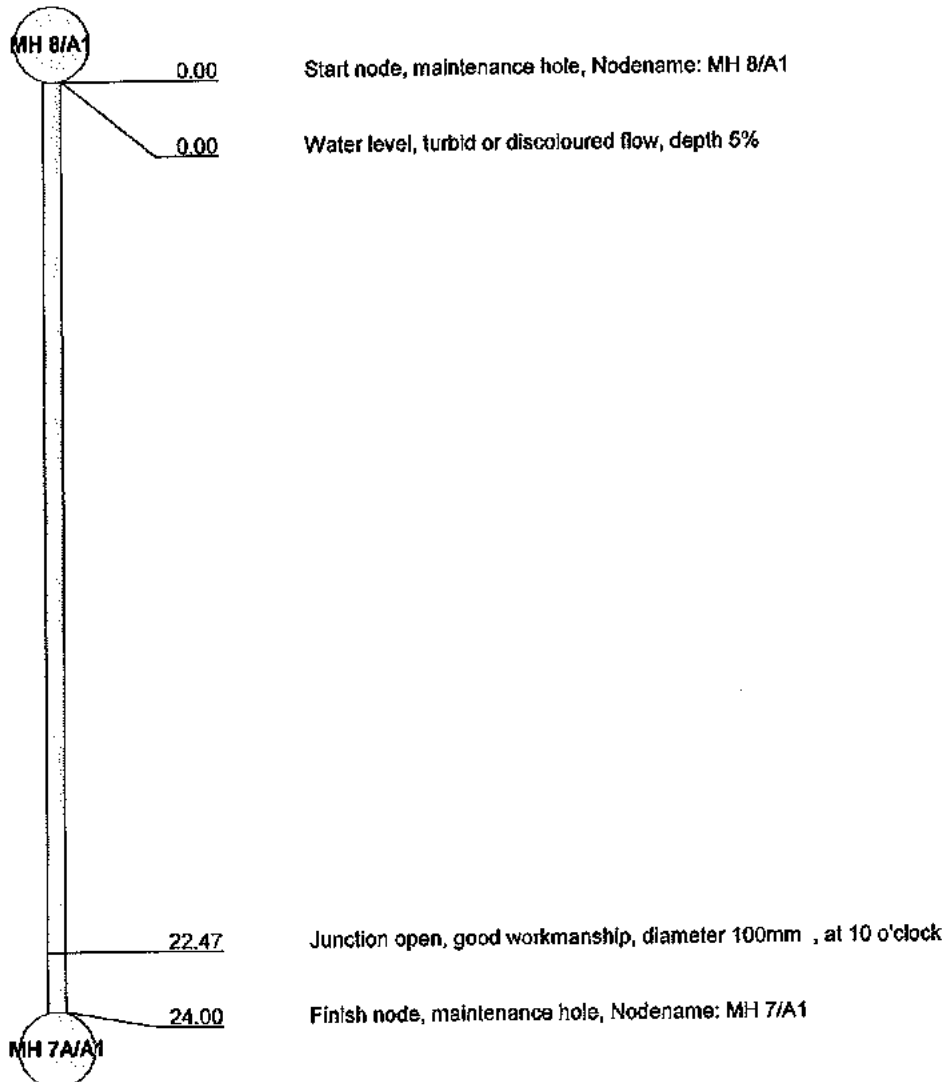
Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Gralner	Section number: 2	Pipe Asset Id: 1308399
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 2.1

Town/suburb: MOSSMAN	Catchment:	US MH.: MH 8/A1
Location: MOSSMAN GORGE ROAD	Asset Owner:	DS MH.: MH 7A/A1
Location type:	Job No.:	Section length : 24.00 m
	Flow control	Survey Dir : downstream

Purpose of inspection : Structural exam	Shape :
Use of sewer: Sewage	Dia/Height: 150 mm
Land ownership: Private Land	Width:
Type of sewer: Gravity sewer	Pipe Material: PVC-Plasticlead

Remarks :

1:195 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Inspection report / Inspection: 1

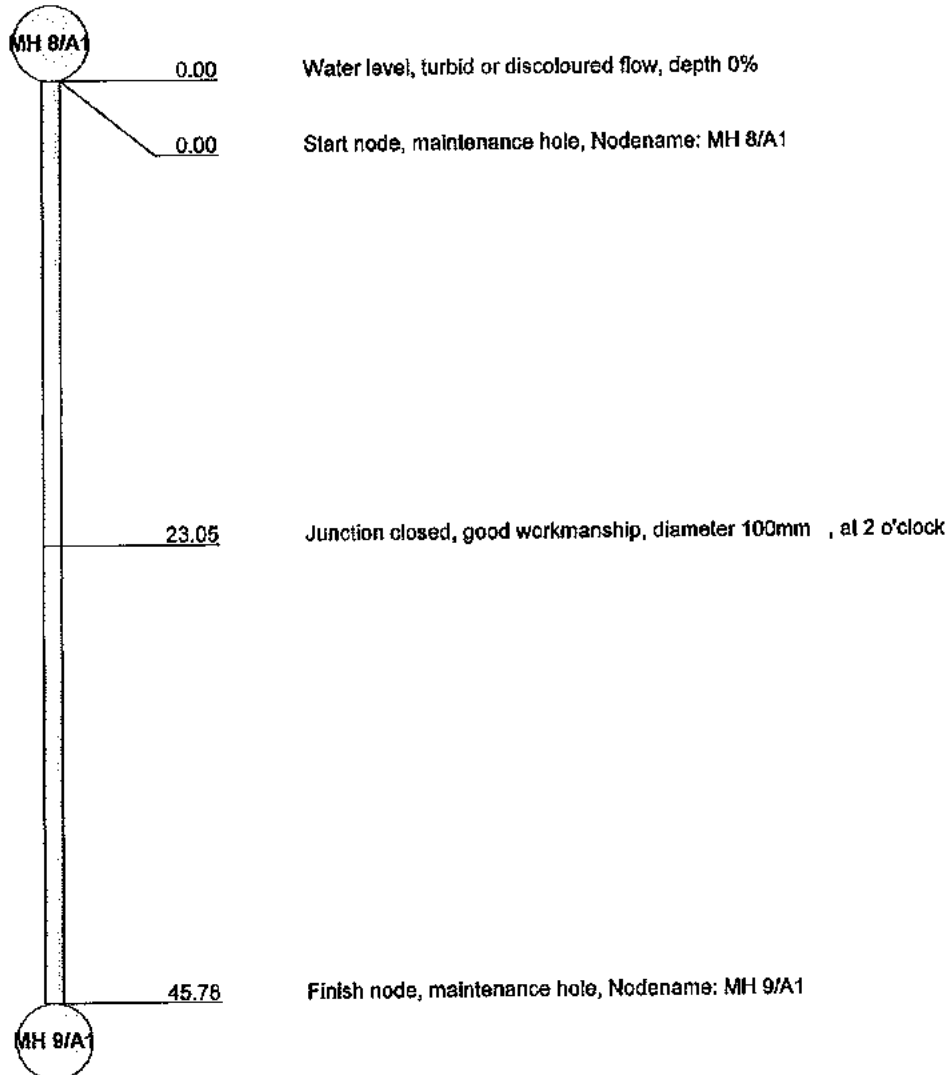
Date: 3/29/2012	Asset owner's job ref.:	Project Name:	Operator : Frank Gralner	Section number: 1	Pipe Asset Id: 1308400
Method of inspection:	Cleaning: cleaned	Criticality:	Drawing Number 6053-4	Reline Material	MH Depth 2.1

Town/suburb: Location: Location type:	MOSSMAN MOSSMAN GORGE ROAD	Catchment: Asset Owner: Job No.: Flow control	US MH.: DS MH.: Section length : Survey Dir :	MH 9/A1 MH 8/A1 45.78 m upstream
---	-------------------------------	--	--	---

Purpose of inspection : Use of sewer: Land ownership: Type of sewer:	Structural exam Sewage Private Land Gravity sewer	Shape : Dia/Height: Width: Pipe Material:	 150 mm PVC-Plasticised
---	--	--	-----------------------------------

Remarks :

1:375 Position Observation



STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1

Item 3

Water Reticulation Audit

2015 Water Reticulation Audit

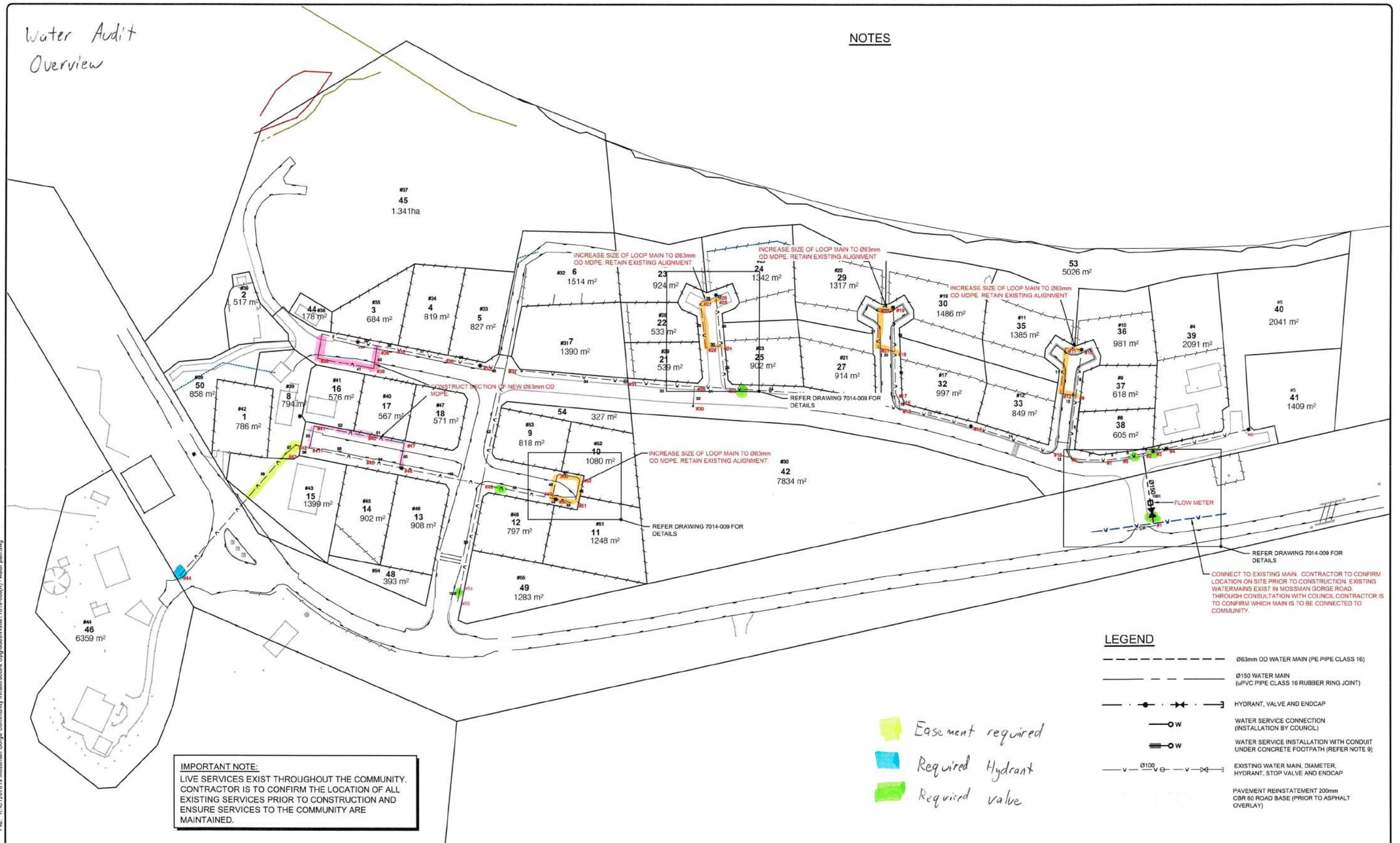
Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual
	Y - Valve/Hydrant located on pipe N/A - No valve/hydrant required

Pipe Number	Diameter (mm)	Materials	Depth ⁽¹⁾	Alignment from lot (m)	Alignment from verge (m)	Length (m)	Valve Location	Hydrant Location	Spacing to next hydrant (m)	Access Rights (Land Tenure)	Recommendation
1001 (Connection)	150 (Install)	PVC	TBC	N/A	2.2	30.7	Required	N/A		Road Reserve	Additional valve to be installed
2	100	PVC	TBC	2 (<2.8m)	0.98	4.5	Required	Y (between 2/3)	5.8	Road Reserve	Additional valve to be installed, Recommend council accept alignment
3	100	PVC	TBC	2 (<2.8m)	0.92	5.9	N/A	Y (between 3/4)	36.5	Road Reserve	Recommend council accept alignment
4	100	PVC	800	1.98 (<2.8m)	1	36.6	Y	Y (end)	36.5	Road Reserve	Recommend council accept alignment
5	100	PVC	TBC	2.1 (<2.8m)	0.7	10.4	N/A	N/A		Road Reserve	Additional valve to be installed, Recommend council accept alignment
6	100	PVC	TBC	2.6 (<2.8m)	0.7	7	N/A	N/A		Road Reserve	Recommend council accept alignment
7	100	PVC	TBC	2.6 (<2.8m)	0.7	15.5	N/A	N/A		Road Reserve	Recommend council accept alignment
8	100	PVC	900	2.2 (<2.8m)	0.68	27	Y	N/A		Road Reserve	Recommend council accept alignment
9	40 (<50)	Unknown	TBC	2.05 (<2.8m)	0.7	19.9	N/A	N/A		Road Reserve	Pipe diameter increase, Recommend council accept alignment
10	40 (<50)	Unknown	TBC	1.3 (<2.8m)	0.78	7.1	N/A	Y (between 9/10) Cul-de-sac	54	Road Reserve	Pipe diameter increase, Recommend council accept alignment
11	40 (<50)	Unknown	TBC	1.42 (<2.8m)	0.67	19.8	N/A	N/A		Road Reserve	Pipe diameter increase, Recommend council accept alignment
12	40 (<50)	Unknown	TBC	Road crossing	Road crossing	6.8	N/A	N/A		Road Reserve	Pipe diameter increase
13	100	PVC	TBC	Road crossing	Road crossing	7.9	N/A	N/A		Road Reserve	Recommend council accept alignment
14	100	PVC	TBC	2.1 (<2.8m)	0.7	36.7	N/A	Y (between 14/15)	58	Road Reserve	Recommend council accept alignment
15	100	PVC	TBC	2 (<2.8m)	0.7	31.8	Required	N/A		Road Reserve	Additional valve to be installed, Recommend council accept alignment
16	100	PVC	TBC	1.96 (<2.8m)	1.5	3.8	Y	N/A		Road Reserve	Recommend council accept alignment
17	100	PVC	TBC	2.2 (<2.8m)	1.5	3.3	N/A	N/A		Road Reserve	Recommend council accept alignment
18	100	PVC	TBC	2.4 (<2.8m)	1	18	N/A	N/A		Road Reserve	Recommend council accept alignment
19	100	Unknown	900	2.37 (<2.8m)	1.2	19.1	N/A	Y (between 19/20) Cul-de-sac	53	Road Reserve	Recommend council accept alignment
20	40 (<50)	Unknown	TBC	2.1 (<2.8m)	0.94	6.7	N/A	N/A		Road Reserve	Additional valve to be installed, Recommend council accept alignment
21	40 (<50)	Unknown	TBC	2.1 (<2.8m)	0.5	17.1	N/A	N/A		Road Reserve	Additional valve to be installed, Recommend council accept alignment
22	40 (<50)	Unknown	TBC	Road crossing	Road crossing	7.5	N/A	N/A		Road Reserve	Pipe diameter increase
23	100	PVC	TBC	1.76 (<2.8m)	0.68	42.2	N/A	Y (between 23/24)	53	Road Reserve	Recommend council accept alignment
24	100	PVC	TBC	1.9 (<2.8m)	1	34	Required	N/A		Road Reserve	Additional valve to be installed, Recommend council accept alignment
25	100	PVC	700	1.45 (<2.8m)	1.4	18.5	Y	N/A		Road Reserve	Recommend council accept alignment
26	100	PVC	TBC	1.6 (<2.8m)	1.1	20	N/A	N/A		Road Reserve	Recommend council accept alignment
27	100	PVC	TBC	Road crossing	Road crossing	2	N/A	Y (dead end) Cul-de-sac	49	Road Reserve	Nil
28	50 (Upgraded) ⁽²⁾	PE	TBC	Road crossing	Road crossing	6.9	N/A	N/A		Road Reserve	Nil
29	50 (Upgraded) ⁽²⁾	PE	TBC	2.4 (<2.8m)	0.8	20	N/A	N/A		Road Reserve	Recommend council accept alignment
30	50 (Upgraded) ⁽²⁾	PE	TBC	Road crossing	Road crossing	6.9	N/A	N/A		Road Reserve	Nil
31	100	PVC	TBC	Road crossing	Road crossing	13.5	N/A	N/A		Road Reserve	Nil
32	100	550	TBC	Road crossing	Road crossing	8.5	Y	Y (dead end)	31	Road Reserve	Nil
33	150	PVC	700	1.56 (<2.8m)	1.4	30	N/A	Y (between 33/34)	63.1	Road Reserve	Recommend council accept alignment
34	150	PVC	500-700	0.5 (<2.8m)	1.7	52.2	Y	N/A		Road Reserve	Recommend council accept alignment
35	150	PVC	500 (<600)	1.62 (<2.8m)	1.61	11	N/A	Y (between 35/36)	54	Road Reserve	Recommend council accept alignment
36	150	PVC	TBC	1.8 (<2.8m)	1.4	16.6	Y	N/A		Road Reserve	Recommend council accept alignment
37	150	PVC	TBC	1.8 (<2.8m)	1.27	21.4	N/A	N/A		Road Reserve	Recommend council accept alignment
38	150	PVC	550 (<600)	1.87 (<2.8m)	1.35	7.4	Y	N/A		Road Reserve	Recommend council accept alignment
39	150	PVC	550 (<600)	1.86 (<2.8m)	1.5	8.6	Y (dead end)	Y (dead end)	54	Road Reserve	Recommend council accept alignment
40	50 (new Install) ⁽²⁾	PE	550 (<600)	Road crossing	Road crossing	9.9	N/A	N/A		Road Reserve	Nil
41	50 (new Install) ⁽²⁾	PE	TBC	3.1	2.8	24.7	N/A	N/A		Road Reserve	Nil
42	100	PVC	500 (<600)	1.57 (<2.8m)	2.1	51	Y	N/A		Road Reserve	Recommend council accept alignment
43	100	PVC	550 (<600)	2.84	1.6	31.1	Required	N/A		Road Reserve	Additional valve to be installed
44	100	PVC	550 (<600)	2.6 (<2.8m)	2.7	1.5	N/A	Y (between 44/45)	68	Road Reserve	Recommend council accept alignment
45	50 (Upgraded) ⁽²⁾	PE	TBC	2.6 (<2.8m)	1.5	8.6	Y	N/A		Road Reserve	Recommend council accept alignment
46	50 (Upgraded) ⁽²⁾	PE	TBC	1.43 (<2.8m)	0	11.1	N/A	N/A		Road Reserve	Accept Boundary alignment
47	50 (Upgraded) ⁽²⁾	PE	TBC	1.26 (<2.8m)	3.5	10.1	N/A	N/A		Road Reserve	Accept Boundary alignment
48	50 (Upgraded) ⁽²⁾	PE	550 (<600)	Road crossing	Road crossing	11	N/A	N/A		Road Reserve	Nil
49	100	PVC	450 (<600)	3.1	1.5	35.6	Y	Y (between 49/54)	68	Road Reserve	Nil
50	50	PVC	450 (<600)	Road crossing	Road crossing	10.9	N/A	N/A		Road Reserve	Nil
51	50 (new Install) ⁽²⁾	PE	TBC	0.98 (<2.8m)	3.2	17.2	N/A	N/A		Road Reserve	Recommend council accept alignment
52	50 (new Install) ⁽²⁾	PE	550 (<600)	1.1 (<2.8m)	3	22.4	N/A	N/A		Road Reserve	Recommend council accept alignment
53	50 (new Install) ⁽²⁾	PE	550 (<600)	Road crossing	Road crossing	9.8	N/A	N/A		Road Reserve	Nil
54	100	PVC	450 (<600)	3.2	1.2	16.8	Y	N/A		Road Reserve	Nil
55	100	PVC	TBC	3.57	1.1	24	N/A	N/A		Road Reserve	Recommend council accept alignment
56	100	PVC	TBC	4	0.56	6	Y	N/A		Freehold Land	3m Easement required
57	100	PVC	TBC	In lot	In lot	5.8	Y	N/A		Freehold Land	3m Easement required
58	100	PVC	TBC	In lot	In lot	69.7	N/A	Required (dead end)		Freehold Land	3m Easement and hydrant required
59	150	PVC	TBC	1.59 (<2.8m)	1.56	45.4	N/A	N/A		Road Reserve	Recommend council accept alignment
1002 (Connection)	150	PVC	TBC	1.7 (<2.8m)	2.4	6.6	Required	N/A		Road Reserve	Additional valve to be installed, Recommend council accept alignment

(1) Depth to existing mains can be determined during the course of construction
(2) As detailed in previous operational Works Application to Council
(3) Margin surrounds, valve boxes, covers and marking can be inspected and reinstated during construction phase

Water Audit
Overview

NOTES



IMPORTANT NOTE:
LIVE SERVICES EXIST THROUGHOUT THE COMMUNITY. CONTRACTOR IS TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES PRIOR TO CONSTRUCTION AND ENSURE SERVICES TO THE COMMUNITY ARE MAINTAINED.

LEGEND

- Ø63mm OD WATER MAIN (PE PIPE CLASS 16)
- Ø150 WATER MAIN (uPVC PIPE CLASS 16 RUBBER RING JOINT)
- HYDRANT, VALVE AND ENDCAP
- WATER SERVICE CONNECTION (INSTALLATION BY COUNCIL)
- WATER SERVICE INSTALLATION WITH CONDUIT UNDER CONCRETE FOOTPATH (REFER NOTE 9)
- EXISTING WATER MAIN, DIAMETER, HYDRANT, STOP VALVE AND ENDCAP
- PAVEMENT REINSTATEMENT 200mm CBR 60 ROAD BASE (PRIOR TO ASPHALT OVERLAY)

Easement required
Required Hydrant
Required valve

© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.



Black & More
ABN 24 845 447 483
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

Client DEPARTMENT OF ABORIGINAL AND TORRES STRAIT ISLANDER MULTICULTURAL AFFAIRS
Project MOSSMAN GORGE INFRASTRUCTURE UPGRADES
Drawn NDC
Designed GAS
Drawing Check
Design Check
Approved
Date
RPEQ
Drawing is not to be used for construction unless approved

Drawing Title
WATER RETICULATION PLAN
SHEET 1 OF 2
Drawing Size A1
Scale (A1 size) 1:750
Drg No 7019-008
Revision A

No.	Description	Reviewed	Approved	Date
A	ISSUED FOR TENDER	SC		20/06/14

External References: B&M-TITLE-A1_e.dwg; 7019-X-SURVEY.dwg

Matt DiMaggio

Subject: Mossman Gorge Community Condition Assessment
Attachments: 20120420134642221.pdf

From: Meade Wendy [<mailto:w.meade@cairns.qld.gov.au>]
Sent: Friday, 20 April 2012 1:52 PM
To: Paul Steele
Cc: Phillips Denney; Reaston Kelly
Subject: Mossman Gorge Community Condition Assessment

Paul

Findings that will need to be addressed from the assessment:

- All existing services will require renewal to meet CRC standard service assemblies from mains to property connections
- Estimate of costs per connection - 20mm connection is \$1100, 25mm connection \$1500, 40mm connection \$3500, 50mm connection \$4500
- Estimate of costs for locating & painting SV's & Hydrants - \$5000

Please find attached, hydrant test & photos showing hydrants & mains in good condition & services tapped directly to the water main with no ferrule cock for turning service off.

Sent to you on behalf of [Denney Phillips](#) by

Wendy Meade | Administrative Officer
Operations | Cairns Regional Council
Phone: +61740589527 | **Fax:** +61740581178
Email: w.meade@cairns.qld.gov.au | **URL:** cairns.qld.gov.au
Mail: PO Box 359, Cairns Q 4870 | **Office:** 119-145 Spence St, Cairns Q 4870

[Cairns Regional Council Disclaimer](#)

"This message, and any attachments, may contain privileged and confidential information intended only for the use of the intended addressee(s). Any unauthorized use of this material is prohibited. If you receive this message in error, please notify the sender immediately, delete the message and destroy any printed or electronic copies.

Opinions expressed in this e-mail are those of the sender and do not necessarily represent the views of the [Cairns Regional Council](#). Council does not accept any responsibility for the loss or damage that may result from reliance on, or the use of, any information contained in this e-mail or attachments."



Hydrant Test for Pressure & Flow Rate

Requested By	
Company	
Postal Address	
Phone	
Fax	
Email	

Address of Test			
Suburb	Mossman Gorge Community		
Date of Test/Time of Test	18-April-2012	10:00am	
Name of Tester	Chris Clifford	Assisted By	Jeremy Neve

Note: 1page per Hydrant tested

Static Pressure in Main KPA	Hyd 550 KPA		
-----------------------------	----------------	--	--

The following lists the amount of water through the standpipe measured in Litres / Second and the pressure in the water main at the above time.

Location of Test hydrant and Main pressure test points as per attached drawing.

	Flow Rate L/sec	Pressure KPA	Time	
		Hyd	Start	Stop
Slow Rate ↓ ↓ ↓ ↓ ↓ ↓ Fast Rate	5	390	10:00	10:10
	7.5	225	10:10	10:20
	10	75	10:20	10:30
	15			
	20			
	25			
Full Flow →	11.5 L/sec	0	10:30	10:40
ALTITUDE _____ M				

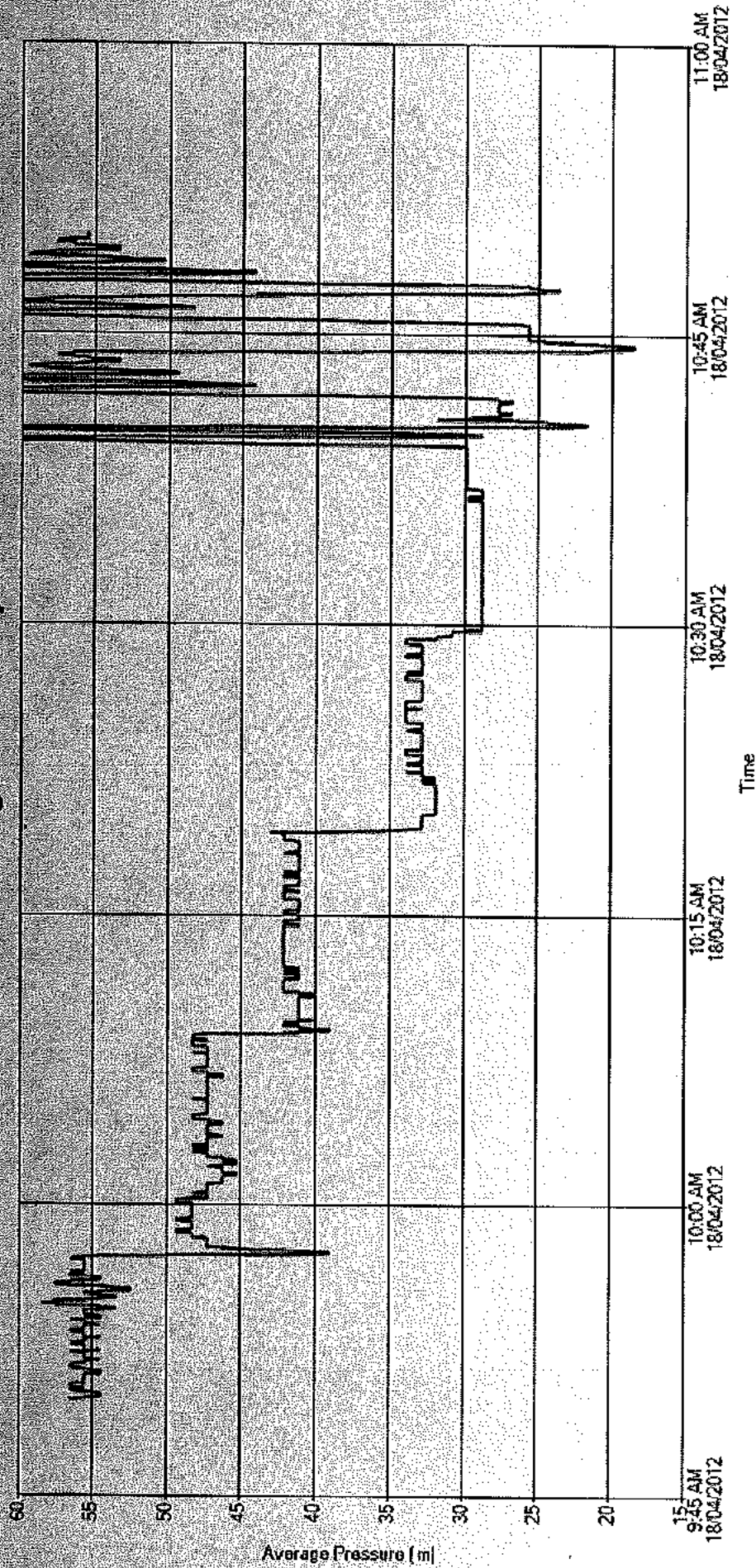
PLEASE FORWARD THE COMPLETED APPLICATION FORM TO WATER OPERATIONS, MAGAZINE ST, STRATFORD

Cairns Regional Council – Information Privacy Statement

Your personal information has been collected for the purpose of processing your application for Hydrant Test for Pressure Flow & Rate. You are providing personal information which will be used for the purpose of delivering services and carrying out Council business. Your personal information is handled in accordance with the *Information Privacy Act 2009* and will be accessed by persons who have been authorised to do so. Your information will not be given to any other person or agency unless you have given Council permission or the disclosure is required by law.

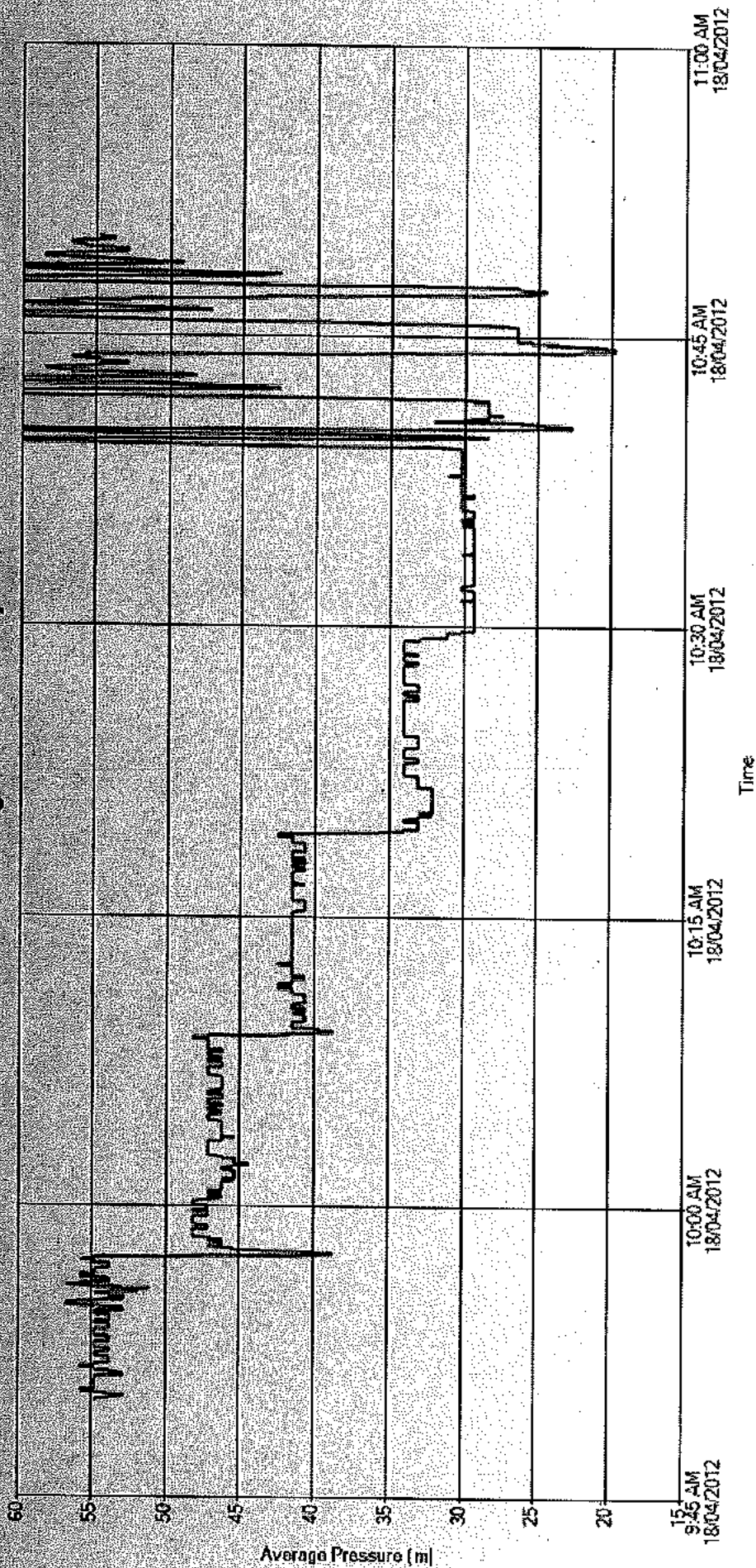
Fee:	\$	Date Paid:		Receipt No.:	
T87 / CAT 5 / A/C #:				CSO Name:	
Approved By:		Date Approved:		Work Order #:	

Mossman Gorge Community site 2



Mossman Gorge Community site 2 - Pressure t (Average): (m) Min: 18.50 Max: 81.11 Average: 41.54

Mossman Gorge Community site 1



Mossman Gorge Community site 1 - Pressure 1 (Average): (m) Min: 19.84 Max: 79.24 Average: 41.37

NOTES

- 1) The site has been surveyed by the services of Kenfro Pty Ltd.
- 2) The site has been surveyed by the services of Kenfro Pty Ltd.
- 3) The site has been surveyed by the services of Kenfro Pty Ltd.
- 4) The site has been surveyed by the services of Kenfro Pty Ltd.
- 5) The site has been surveyed by the services of Kenfro Pty Ltd.
- 6) The site has been surveyed by the services of Kenfro Pty Ltd.
- 7) The site has been surveyed by the services of Kenfro Pty Ltd.
- 8) The site has been surveyed by the services of Kenfro Pty Ltd.
- 9) The site has been surveyed by the services of Kenfro Pty Ltd.
- 10) The site has been surveyed by the services of Kenfro Pty Ltd.
- 11) The site has been surveyed by the services of Kenfro Pty Ltd.
- 12) The site has been surveyed by the services of Kenfro Pty Ltd.
- 13) The site has been surveyed by the services of Kenfro Pty Ltd.
- 14) The site has been surveyed by the services of Kenfro Pty Ltd.
- 15) The site has been surveyed by the services of Kenfro Pty Ltd.
- 16) The site has been surveyed by the services of Kenfro Pty Ltd.
- 17) The site has been surveyed by the services of Kenfro Pty Ltd.
- 18) The site has been surveyed by the services of Kenfro Pty Ltd.
- 19) The site has been surveyed by the services of Kenfro Pty Ltd.
- 20) The site has been surveyed by the services of Kenfro Pty Ltd.

DISCLAIMER

- 1) The site has been surveyed by the services of Kenfro Pty Ltd.
- 2) The site has been surveyed by the services of Kenfro Pty Ltd.
- 3) The site has been surveyed by the services of Kenfro Pty Ltd.
- 4) The site has been surveyed by the services of Kenfro Pty Ltd.
- 5) The site has been surveyed by the services of Kenfro Pty Ltd.
- 6) The site has been surveyed by the services of Kenfro Pty Ltd.
- 7) The site has been surveyed by the services of Kenfro Pty Ltd.
- 8) The site has been surveyed by the services of Kenfro Pty Ltd.
- 9) The site has been surveyed by the services of Kenfro Pty Ltd.
- 10) The site has been surveyed by the services of Kenfro Pty Ltd.
- 11) The site has been surveyed by the services of Kenfro Pty Ltd.
- 12) The site has been surveyed by the services of Kenfro Pty Ltd.
- 13) The site has been surveyed by the services of Kenfro Pty Ltd.
- 14) The site has been surveyed by the services of Kenfro Pty Ltd.
- 15) The site has been surveyed by the services of Kenfro Pty Ltd.
- 16) The site has been surveyed by the services of Kenfro Pty Ltd.
- 17) The site has been surveyed by the services of Kenfro Pty Ltd.
- 18) The site has been surveyed by the services of Kenfro Pty Ltd.
- 19) The site has been surveyed by the services of Kenfro Pty Ltd.
- 20) The site has been surveyed by the services of Kenfro Pty Ltd.

NOTES

Level Datum: AHD-0
 Datum of Levels: GDA 1984
 Datum of Levels: RL 9.332
 Meridian: V02 9805
 Depth of Coordinates: GDA 91187
 Datum: C 1000
 Datum: N 3000

Some stations of services have been
 investigated for dealing daily.
 Therefore it is recommended to use
 dimensions shown for position.
 (do not scale)

All horizontal & vertical control and datum
 information has been taken from engineering
 drawing 8714/1 - Revision A.

As part from the Construction Water Retention
 details, all information shown on this drawing
 (including the location of the water retention
 structure) has been taken from the
 original design data provided by
 Kenfro & Associates Consulting Engineers.

Scale: 1:1000
 10m 20m 30m 40m 50m 60m 70m 80m 90m 100m

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

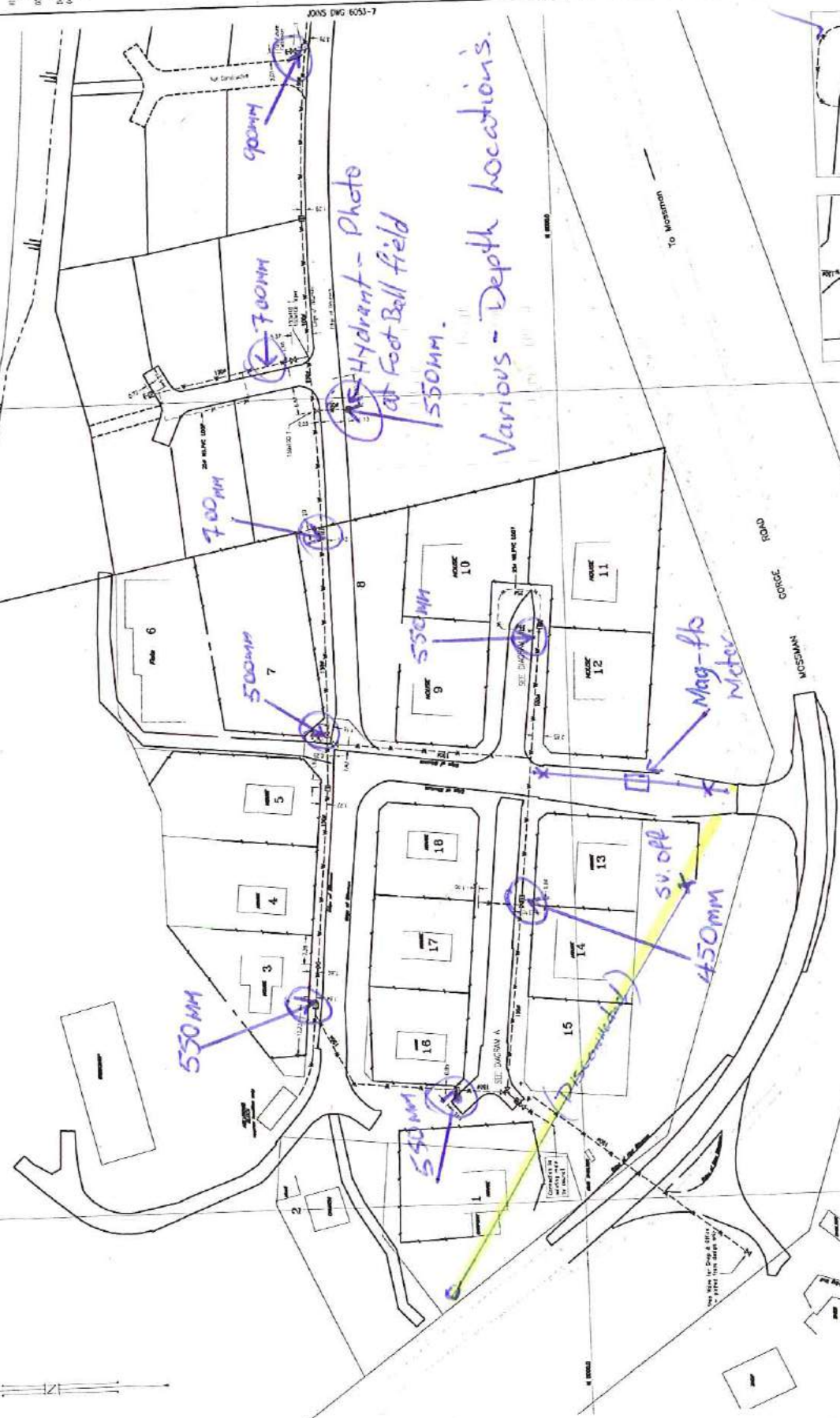
Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

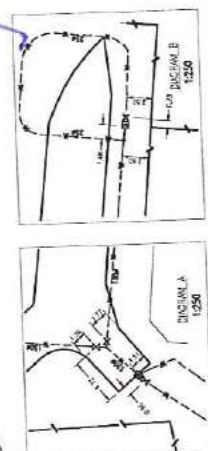
Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

Kenfro Pty Ltd
 100/101 Stirling Highway
 Perth WA 6000
 Tel: 09 437 3234
 Fax: 09 437 3235
 Email: info@kenfro.com.au
 Website: www.kenfro.com.au

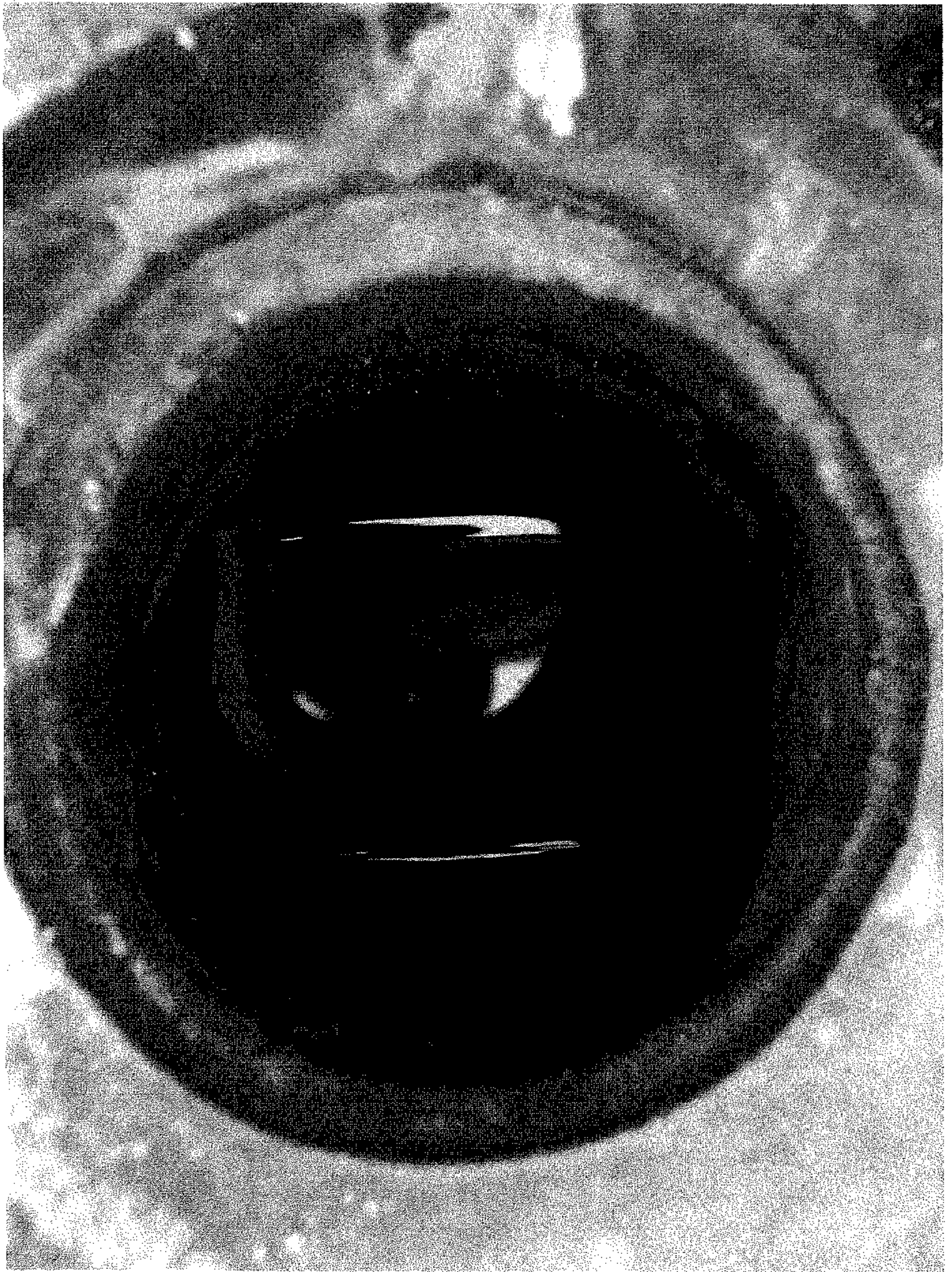
Mossman River

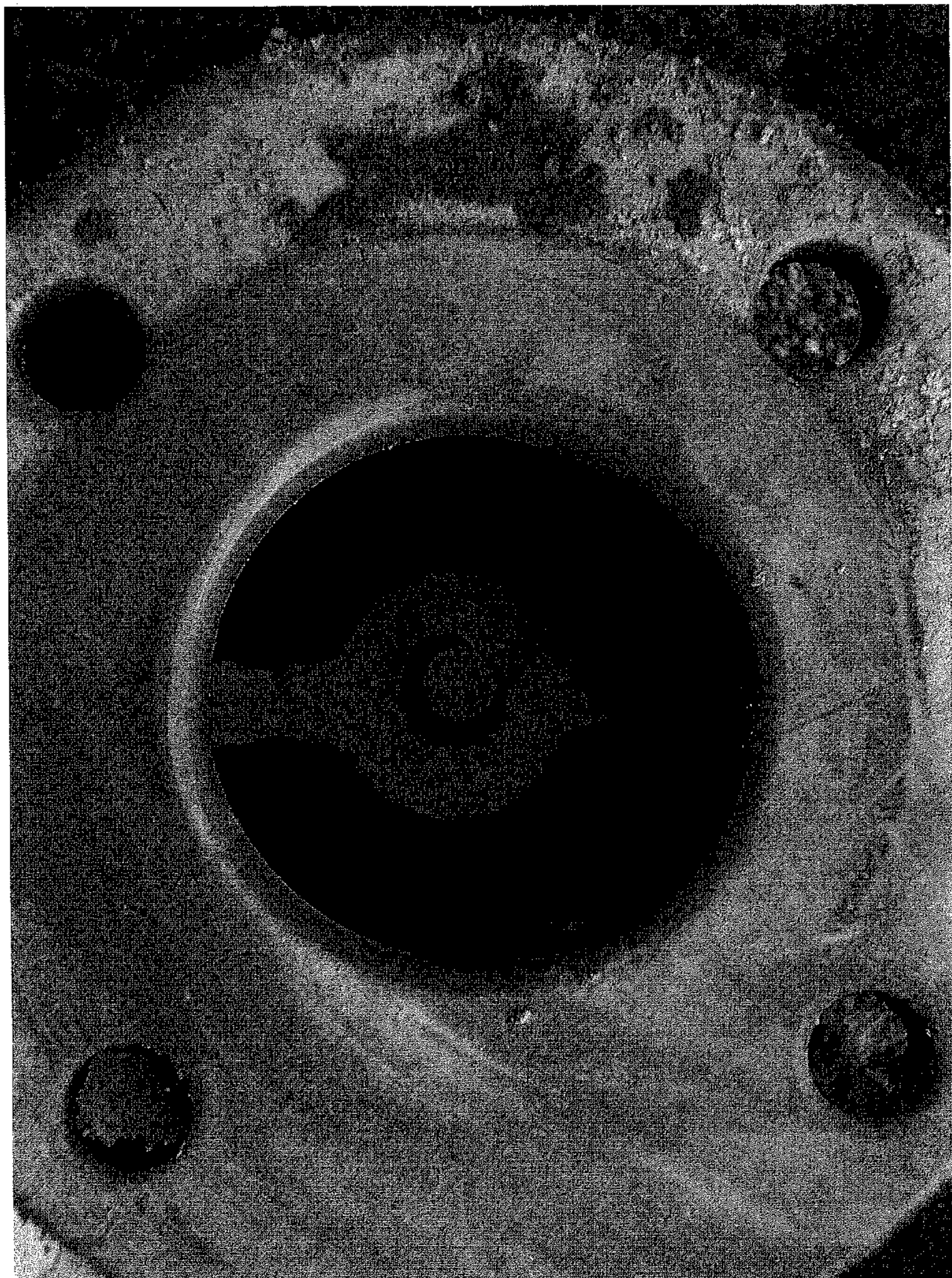


- LEGEND**
- As Constructed
 - Proposed
 - Existing
 - Water Main
 - Fire Hydrant
 - End Cap
 - Water Meter









Item 4

Roads and Intersections Audit

2015 Intersection Infrastructure Audit

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual

Description	Road Classification	Min. Reserve Width (m)	Carriageway Width (m)	Minimum Kerb Returns (m)	T-head Radii/Leg Length (m)	Linemarking / Signage	Sight Distance	Recommendation
Intersection No.1 (Mossman Gorge Road & Junkurrji St)	T Intersection	Major leg - 40 Minor leg - 15 (<15.5)	Major leg - 10 Minor leg - 6.5	7.5 & 7.9	-	No Linemarking; Street signage	Requires 30-36m; intersection non-compliant due to vegetation	Upgrade linemarking and Signage Clear vegetation (wcs) Wdien major intersection/road for bus route
Intersection No.2 (Junkurrji St & Kankarr St)	4-way intersection	Major leg - 15 (<15.5) Minor leg - 15	Major leg - 8.3 Minor leg - 5.6	4.3 & 7.9 (<4.5)	-	Street signage	Acceptable (intersection Clear)	Nil
Intersection No.3 (Junkurrji St & Lund St)	T-intersection	Major leg - 15 (<15.5) Minor Leg - 14.5	Major Leg - 6.2 (<6.5) Minor Leg - 6.0 (<6.5)	9.1	-	Street signage	Acceptable (intersection Clear)	Nil
Intersection No.5 (Lund St West T-Head)	Turning Head (3 point)	Major leg - 15	Major leg - 6.5	7	West Radii - 8.4 North Radii - 28 South Radii - 13.7 Leg Length - 5.7	NA	Acceptable (intersection Clear)	Current plans indicate no t-head, due to carport built in turnaround area
Intersection No.7 (Lund St & Jankaji CI)	T-intersection	Major leg - 14.75 (15.5) Minor Leg - 11 (<15.5)	Major leg - 5.9 (<6.5) Minor leg - 5.0 (<5.5)	4.5	-	Street signage	Acceptable (intersection Clear)	Nil
Intersection No. 8 (Jankaji CI T-Head)	Turning Head (3 point)	Major leg - 11 (<14.5)	Major leg - 4.9 (<5.5)	3.1 (<4.5)	West Radii - 4.3 (<6) East Radii - 3.1 (<6) North Radii - 4.5 Leg Length - 5.8	NA	Cul-de-sac	Nil
Intersection No. 9 (Lund St & Manjal CI)	T-intersection	Major leg - 16.3 Minor Leg - 11.4 (<14.5)	Major leg - 6.5 Minor leg - 4.9 (<5.5)	4.3 (<4.5)	-	Street signage	Acceptable (intersection Clear)	Nil
Intersection No.10 (Manjal CI T-head)	Turning Head (3 point)	Major leg - 11.6 (<14.5)	Major leg - 5.1 (<5.5)	5.5	West Radii - 5.6 (<6) East Radii - 5.7 (<6) North Radii - 6 Leg Length - 5.4	NA	Cul-de-sac	Nil
Intersection No.11 (Lund St & Walkarr CI)	T-intersection	Major leg - 12.2 (<15.5) Minor Leg - 11.5 (<14.5)	Major leg - 5.6 (<6.5) Minor leg - 4.9 (<5.5)	4.9	-	Street signage	Acceptable (intersection Clear)	Nil
Intersection T-Head No.12 (Walkarr CI T-Head)	Turning Head (3 point)	Major leg - 10.3 (<14.5)	Major leg - 4.9 (<5.5)	4.6	West Radii - 5.2 (<6) East Radii - 5 (<6) North Radii - 5.8 Leg Length - 5.5	NA	Cul-de-sac	Nil
Intersection No.13 (Lund St East T-Head)	Turning Head (3 point)	Major leg - 10.6 (<14.5)	Major leg - 5.9	4.1 (<4.5)	Radii - 4.2 (<5) Leg Length - 7.3	NA	Cul-de-sac	Nil
Intersection No.14 (Lund St & Bama Bubu St)	T-intersection	Major leg - not defined Minor Leg - 10.5 (<15.5)	Major leg - 6 (<6.5) Minor leg - 6 (<6.5)	7.2	-	Street signage	Acceptable (intersection Clear)	Nil
Intersection No.15 (Mossman Gorge Rd & Bama Bubu St)	T-Intersection	Major leg - 40	Major leg - 5.6 (<6.5) Minor leg - 5.9 (<6.5)	11	-	No Linemarking; Street signage	Acceptable (intersection Clear)	Upgrade linemarking and Signage (wcs) Wdien major intersection/road for bus route

2015 Road Infrastructure Audit

Legend	Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual
	Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual

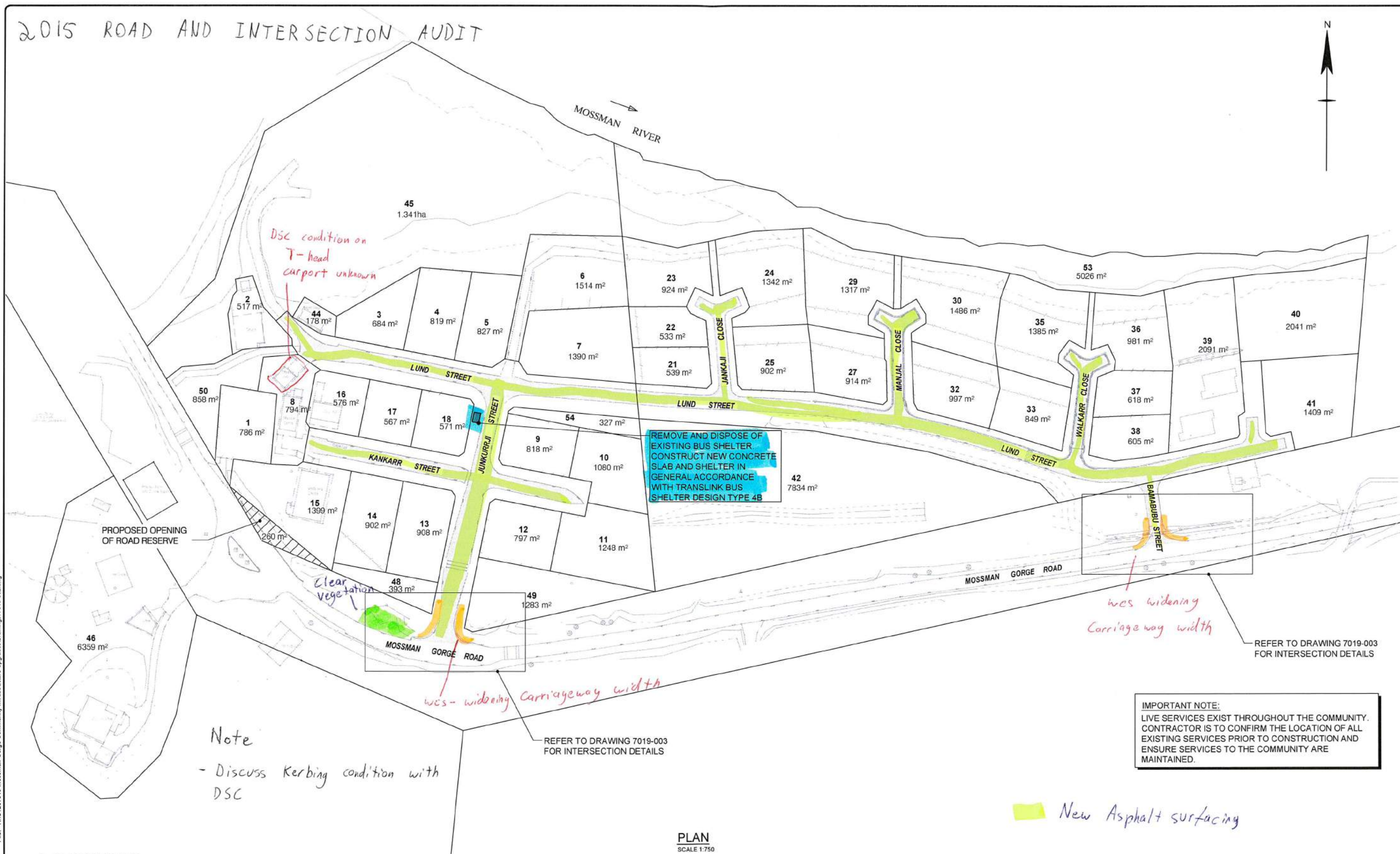
Description	Road Heirachy	Catchment Size (no. of dwellings)	Off street Parking provied	Foothpath Y/N	Pavement Thickness	Surface treatment	Surface Condition
Road Section No. 1 (Junkurrji St)	Access Street	0	0	N (required)	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No. 2 (Kankarr St West)	Access Place	8	0	N	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No.3 (Kankarr St East)	Access Place	4	0	N	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No.4 (Junkurrji St)	Access Street	0	0	N (required)	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No.5 (Lund St West)	Access Place	9	2 (Cul-de-sac)	N	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No.8 (Lund St)	Access Street	0	0	N (required)	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No. 9 (Lund St)	Access Street	0	0	N (required)	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No. 10 (Jankaji Cl)	Access Place	5	2 (Cul-de-sac)	N	150 (200)	Asphalt	Re-surface required (AC)
Road Section No.11 & Road Section No.12 (Lund St)	Access Street	0	0	N (required)	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No.13 (Lund St)	Access Place	3	1 (Cul-de-sac)	N (required)	150 (200)	2 coat seal	Re-surface required (AC)
Road Section No.14 (Manjal Cl)	Access Place	4	1 (Cul-de-sac)	N	150 (200)	Asphalt	Re-surface required (AC)
Road Section No.15 (Walkarr Cl)	Access Place	5	2 (Cul-de-sac)	N	150 (200)	Asphalt	Re-surface required (AC)
Road Section No.16 (Bama Bubu St)	Access Street	0	0	N (required)	150 (200)	2 coat seal	Re-surface required (AC)

2015 Road Infrastructure Audit

Legend		Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual					
		Not Compliant with FNQROC Development Manual and Queensland Urban Drainage Manual					
Description	Longitudinal Gradient (%)	Reserve Width (m)	Verge Width (m)	Carriageway Width (m)	Road Edge Type	Kerbing Condition	Recommendation
Road Section No. 1 (Junkurrji St)	0.5	15 (<15.5)	1.3-3.5 (<4.5)	7-10	Spoon Drain (Layback Kerb and Channel)	Discuss with DSC	Nil
Road Section No. 2 (Kankarr St West)	3.2	15	4.2-4.5 (<4.5)	5.5-6	Concrete Spoon Drains (Layback Kerb and Channel)	Discuss with DSC	Nil
Road Section No.3 (Kankarr St East)	1.56	15	4.2-4.5 (<4.5)	6	Concrete Spoon Drains (Layback Kerb and Channel)	Discuss with DSC	Nil
Road Section No.4 (Junkurrji St)	0.5	15 (<15.5)	4.3-4.5 (<4.5)	6	Concrete spoon drain (Layback Kerb and Channel)	Discuss with DSC	Nil
Road Section No.5 (Lund St West)	1.44	15	West side - 4.6 East side - 3.0 (<4.5)	5.8	Concrete spoon drain (Layback Kerb and Channel)	Discuss with DSC	Nil
Road Section No.8 (Lund St)	1.24	18-23	North side - 3 (<4.5) South side - 9.3- 14	5.9 (<6.5)	Layback Kerb and Channel	Discuss with DSC	Nil
Road Section No. 9 (Lund St)	1.24	15 (<15.5)	North side - 2.8-3 (<4.5) South side - 6	5.8 (<6.5)	Layback Kerb and Channel	Discuss with DSC	Nil
Road Section No. 10 (Jankaji Cl)	2.34	11 (<14.5)	3 (<4.5)	5 (<5.5)	West - Layback Kerb and Channel East - Layback Kerb	Discuss with DSC	Nil
Road Section No.11 & Road Section No.12 (Lund St)	1.21	16	North side - 2.7 (<4.5) South side - 6-8	5.7 (<6.5)	North - Layback Kerb and Channel South - Edge Restraint	Discuss with DSC	Nil
Road Section No.13 (Lund St)	1	10 (<14.5)	North side - 3 (<4.5) South side - 1.7 (<4.5)	5.9	Layback Kerb and Channel	Discuss with DSC	Nil
Road Section No.14 (Manjal Cl)	1.11	11 (<14.5)	West side - 2.3 (<4.5) East side - 3.7 (<4.5)	5.5	Layback Kerb and Channel	Discuss with DSC	Nil
Road Section No.15 (Walkarr Cl)	0.45	10-11 (<14.5)	West side - 2.9 (<4.5) East side - 2.8 (<4.5)	5.5	Layback Kerb and Channel	Discuss with DSC	Nil
Road Section No.16 (Bama Bubu St)	0.55	No Reserve Defined	None defined	6 (<6.5)	Layback Kerb and Channel	Discuss with DSC	Nil

Lighting design to AS. Prepare by SPA (attached)

2015 ROAD AND INTERSECTION AUDIT



REMOVE AND DISPOSE OF EXISTING BUS SHELTER. CONSTRUCT NEW CONCRETE SLAB AND SHELTER IN GENERAL ACCORDANCE WITH TRANSLINK BUS SHELTER DESIGN TYPE 4B

IMPORTANT NOTE:
LIVE SERVICES EXIST THROUGHOUT THE COMMUNITY. CONTRACTOR IS TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES PRIOR TO CONSTRUCTION AND ENSURE SERVICES TO THE COMMUNITY ARE MAINTAINED.

Note
- Discuss Kerbing condition with DSC

was - widening Carriageway width

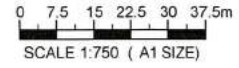
was widening Carriageway width

REFER TO DRAWING 7019-003 FOR INTERSECTION DETAILS

REFER TO DRAWING 7019-003 FOR INTERSECTION DETAILS

New Asphalt surfacing

PLAN
SCALE 1:750

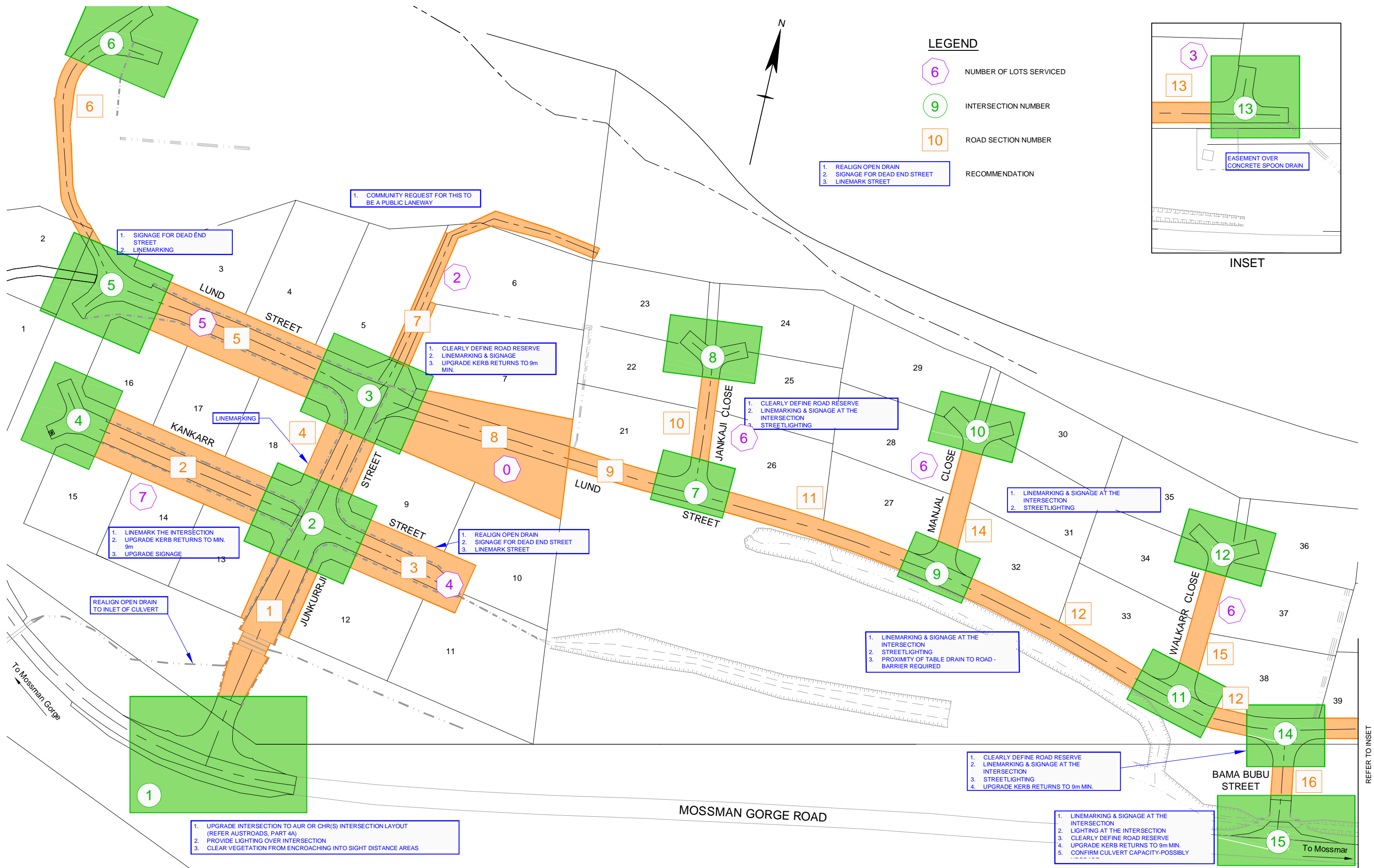


Printed: 25 June 2014, 9:06 AM
File: K:\1207019 Mossman Gorge Community Infrastructure Upgrades\Drawings\7019-002.dwg

Revisions A ISSUED FOR TENDER No. Description Reviewed Approved Date		© Black & More This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.		Black & More ABN 24 845 447 493 93 Digger St Cairns North QLD 4870 PO Box 999N Cairns North QLD 4870 Telephone (07) 4031 9944 Fax (07) 4031 9914 Email black.more@blackm.com Internet www.blackm.com		Client DEPARTMENT OF ABORIGINAL AND TORRES STRAIT ISLANDER MULTICULTURAL AFFAIRS Project MOSSMAN GORGE INFRASTRUCTURE UPGRADES Drawn NDC Drawing Check Approved Date Designed GAS Design Check RPEQ Drawing is not to be used for construction unless approved		Drawing Title ROADWORKS PLAN SHEET 1 OF 2 Drawing Size A1 Scale (A1 size) 1:750 Drg No 7019-002 Revision A	
--	--	--	--	---	--	--	--	--	--

External References: B&M-TITLE-A1_e.dwg ; 7019-X-SURVEY.dwg ; 7019-X-DESIGN.dwg

Printed: 02 April 2012, 10:52 AM File: G:\Synergy\Projects\C12069901 Mossman Gorge Subdivision\Drawings\Sketch 6990-003a.dwg



PRELIMINARY ONLY

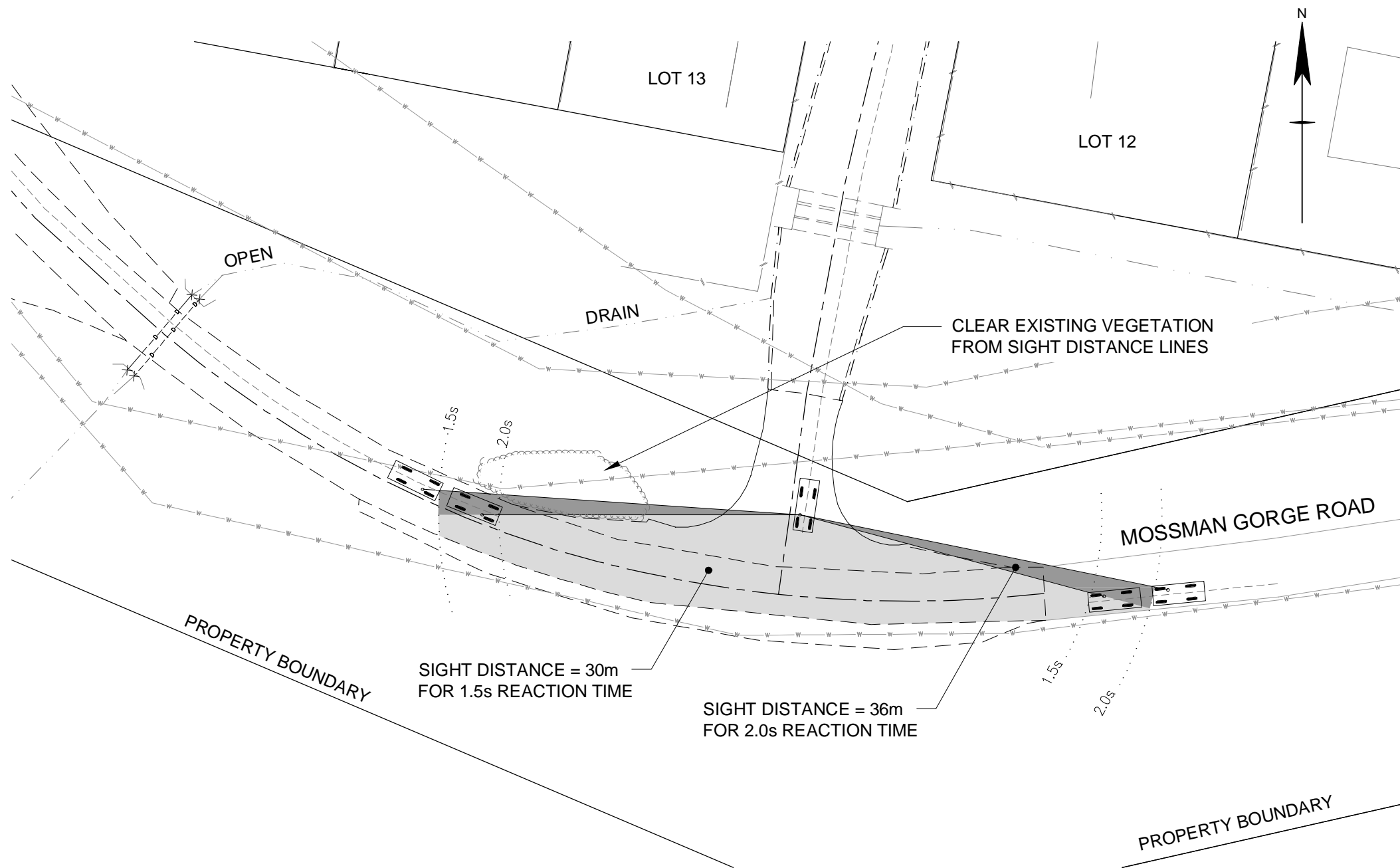
© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

CAIRNS REGIONAL COUNCIL
MOSSMAN GORGE SUBDIVISION
ROADS AND INTERSECTIONS AUDIT

SKETCH 6990-3a
Date MARCH 2012 Project Number 6990
Drawing Size A1 Scale (A1 size) 1:1000 Revision A

External References: B&M-TITLE-SKETCH-A1_e.dwg; X-BASEPLAN.dwg



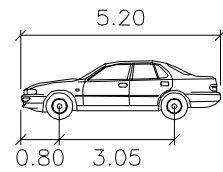
MOSSMAN GORGE ROAD LOOKING EAST



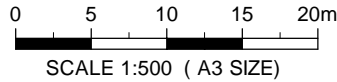
MOSSMAN GORGE ROAD LOOKING WEST



FROM MOSSMAN GORGE ROAD LOOKING ONTO JUNKURRJI STREET



B99 Car	meters
Width	: 1.94
Track	: 1.55
Lock to Lock Time	: 6.0
Steering Angle	: 29.0



© Black & More
This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

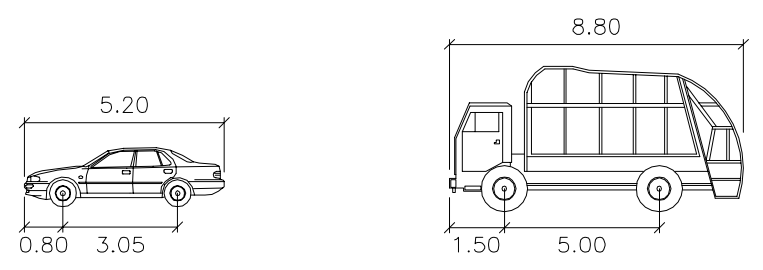
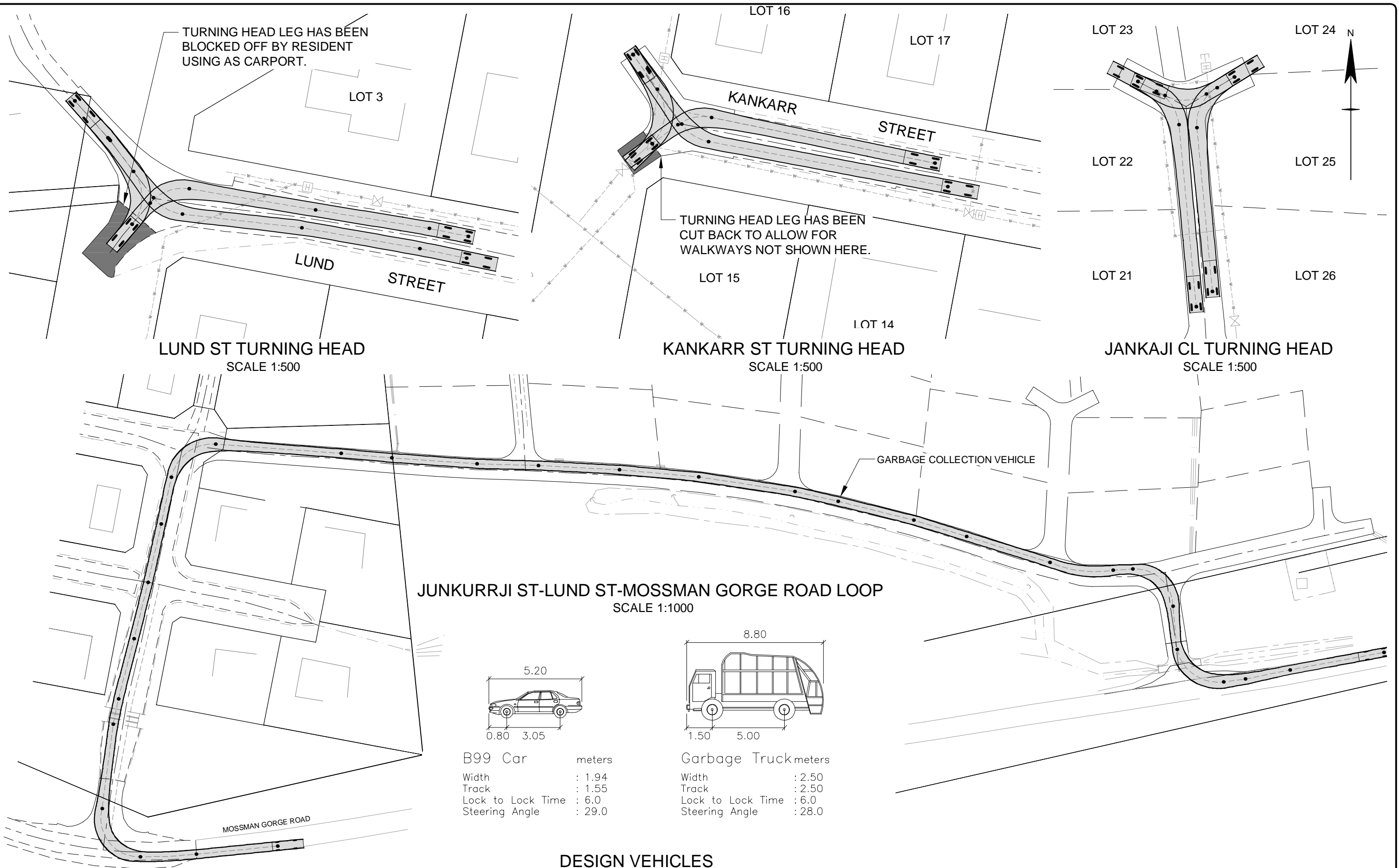


Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

CAIRNS REGIONAL COUNCIL
MOSSMAN GORGE COMMUNITY
INTERSECTION MOSSMAN GORGE ROAD
& JUNKURRJI ST
SIGHT DISTANCE CHECK

SKETCH 6990-3b	
Date MAR 2012	Project Number 6990
Drawing Size A3	Scale (A3 size) 1:500
Revision A	

File: G:\Synergy\Projects\C1206990 Mossman Gorge Subdivision\Drawings\SKETCH 6990-003c.dwg
Printed: 30 March 2012, 10:40 AM

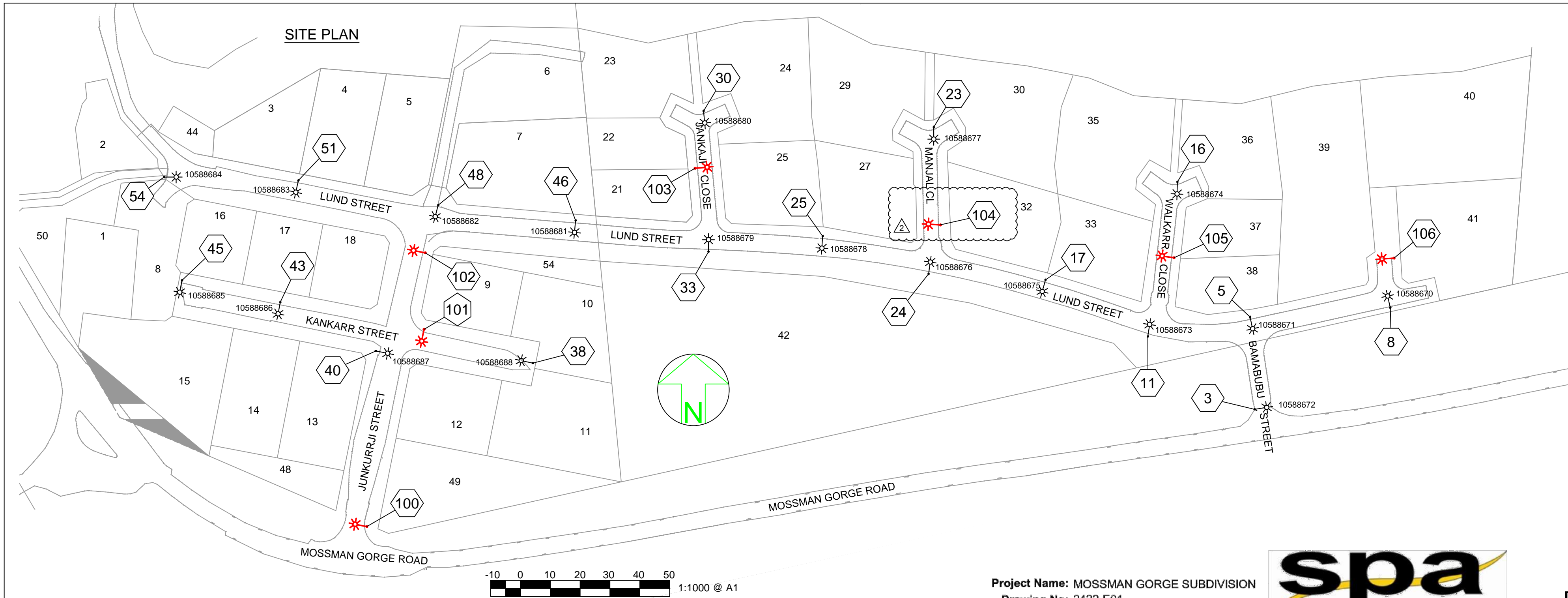


B99 Car	meters	Garbage Truck	meters
Width	: 1.94	Width	: 2.50
Track	: 1.55	Track	: 2.50
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 29.0	Steering Angle	: 28.0

DESIGN VEHICLES



	<p>© Black & More This document is and shall remain the property of Black & More. This document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.</p>	<p>Black & More ABN 24 845 447 493 93 Digger St Cairns North QLD 4870 PO Box 999N Cairns North QLD 4870 Telephone (07) 4031 9944 Fax (07) 4031 9914 Email black.more@blackm.com Internet www.blackm.com</p>	<p>CAIRNS REGIONAL COUNCIL MOSSMAN GORGE COMMUNITY</p> <p>TURNING PATH ANALYSIS</p>	<p>SKETCH 6990-3c</p> <table><tr><td>Date</td><td>Project Number</td></tr><tr><td>MAR 2012</td><td>6990</td></tr><tr><td>Drawing Size</td><td>Scale (A3 size)</td><td>Revision</td></tr><tr><td>A3</td><td>AS NOTED</td><td>A</td></tr></table>	Date	Project Number	MAR 2012	6990	Drawing Size	Scale (A3 size)	Revision	A3	AS NOTED	A
Date	Project Number													
MAR 2012	6990													
Drawing Size	Scale (A3 size)	Revision												
A3	AS NOTED	A												



WORKPLAN NOTES

- STREETLIGHT POLE FOOTINGS SHALL BE LOCATED PERPENDICULAR TO THE KERB AND SQUARE FROM THE FRONT BOUNDARY PEG ENSURING NO CONFLICT WITH FUTURE DRIVEWAYS, UNLESS DETAILED OTHERWISE. WHERE DIMENSIONS ARE SHOWN, THEY TAKE PRECEDENCE OVER GRID COORDINATES.
- THERE ARE 26x32W CFL MAXI URBAN MINOR ROAD STREETLIGHTS ON RATE 2.
- STREETLIGHT DESIGN TO AS1158 CATEGORY P4 FOR ALL ROAD.
- MINOR STREETLIGHTS - THE DEVELOPER SHALL SUPPLY AND INSTALL STREETLIGHT BASES. FOUNDATION DEPTH IS 1200mm FOR MINOR STREETLIGHTS. REFER TO LIGHTING CONSTRUCTION MANUAL DRAWING 1-6-4-1 & 2. FOR ALL FOOTPATHS, CENTRELINE OF STREETLIGHT SHALL BE 0.82m FROM THE INVERT OF KERB AND CHANNEL.
- THE LIGHTING DESIGN INCLUDES AN ALLOWANCE FOR CONSTRUCTION TOLERANCE OF LIGHT POLES SUCH THAT ANY STREETLIGHT CAN BE POSITIONED UP TO A MAXIMUM OF ±350mm LONGITUDINALLY FROM THE POSITION SHOWN AND UP TO 100mm MAXIMUM FURTHER AWAY FROM KERB EDGE, INCLUDING POLES WITH GRID COORDINATES, AND STILL MAINTAIN COMPLIANCE.

Project Name: MOSSMAN GORGE SUBDIVISION
Drawing No: 2422-E01

Council: Douglas Shire Council



I certify this design meets the compliance requirements of AS/NZS 1158.3.1:2005

Jane Errey RPEQ 6863

PUBLIC LIGHTING SCHEDULE							
STN NO	SITE LABEL	ACTION	CONSTRUCTION CODE	RATE	TARIFF OWNER	MOUNTING HEIGHT (m)	REMARKS
3	10588672	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
5	10588671	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
8	10588670	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
11	10588673	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
16	10588674	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
17	10588675	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
23	10588677	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
24	10588676	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
25	10588678	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
30	10588680	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
33	10588679	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
38	10588688	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
40	10588687	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
43	10588686	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
45	10588685	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
46	10588681	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
48	10588682	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
51	10588683	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
54	10588684	INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LIGHT DESIGNED BY ERGON ENERGY REFER TO ERGON DRAWING 769605
100		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
101		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
102		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
103		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
104		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	LOCATE LIGHT AS CLOSE AS PRACTICABLE TO NORTHERN SIDE OF DRIVEWAY LOT 32
105		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	
106		INSTALL	SL CFL 0003	RATE 2	DOUGLAS SHIRE COUNCIL	7.5	

LUMINAIRE / POLE / PHOTOMETRIC INFORMATION TABLE			
Category	P4	Road Surface Luminaire Type	R3 IV
Luminaire Type	Urban - Singl	Luminaire Wattage	CF32
Pole Height (m)	5.5	Luminaire Outreach (m)	0.3
Foundation Depth (mm)	1200	Outreach (m)	Standard 1.5m
Upcast	5	Uplift (m)	2
Mounting Height (m)	7.5	Cleaning / Replacement	36 Months
Lamp	SUB 32CFL PEC LYNX	Pollution Level	Medium
Photometric File	206243.cie	IP Rating	IP6x
Lamp Type	Compact Fluorescent	LLMF	0.82
Lumens	2400	MF	0.71

LIMITING LTPs			
Min Av E _h	0.85	Min E _h Maint	0.14
Lamp Type	4	U _p Maint	10

HAS COMPLIANCE WITH THE FOLLOWING ELEMENTS BEEN MET?	
Is compliance with the maximum permissible spacing achieved on all straights and curves?	YES
For curved sections, does a straight line joining successive luminaires lie within the road reserve or is at least one luminaire located within the hatched area, as shown in figure 3.1?	YES
Has a luminaire associated with one of the intersecting roads been located within the hatched area shown in figure 3.1, and where differing levels of Category P lighting are provided, the luminaire is a type that complies with the higher lighting category?	YES
For Tee-intersections, has the first luminaire in the joining road been located no more than 50% of the maximum spacing detailed in clause 3.2.1 from the limits of the junction defined by the prolongation of the property lines?	YES
Where pedestrian refuges are located on roads requiring category P lighting, is the maintained horizontal illuminance over the surface of the refuge, within the design area shown in figure 3.3, not less than 3.5 Lux?	N/A
Do maximum spacing for luminaires in cul-de-sacs comply with Clause 3.2.1 and are the provisions of Clauses 3.2.5.2, 3.2.5.3 or 3.2.5.4 met?	N/A
Lighting design compliance is conditional on all lights being operational.	
Is the maintained horizontal illuminance over the surface not be less than 3.5 lux for the design areas defined below:	Modelling Software Used:
Roundabouts	N/A
LATMDs	N/A
PlaPcat	

ROAD INFORMATION TABLE				RESULTS TABLE				ELEMENTS FOR THIS ROAD							
Road Name	Road Reserve Width (m)	Distance to Kerb (m)	Offset (m)	Spacing Value from PlePal	Min Av E _h	Min E _h Maint	U _p Maint	Straights Single Sided	Straights Staggered	Curves (Straights or Staggered)	T-Inter sections	Pedestrian Refuges	LATMDs	Cul-de-sacs	Round abouts
LUND STREET (STN 51)	15	3.27	4.27	64.9	0.85	0.14	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 51)	15	3.27	4.27		64.9	0.85	0.14	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
LUND STREET (STN 11)	15	10.13	11.13	53.8	0.85	0.15	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 33)	15	7.55	8.55	61.5	0.85	0.16	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LUND STREET (STN 24)	15	6.76	7.76	63.2	0.85	0.15	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNKURRJI STREET (STN 100)	15	4.58	5.58	65.2	0.85	0.14	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNKURRJI STREET (STN 102)	15	3.42	4.42	65	0.85	0.15	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KINKARR STREET	15	4.28	5.28	63.7	0.87	0.14	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
JANKAJ CLOSE	11	3.17	4.17	65.1	0.98	0.14	4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
MANJAL CLOSE	11.72	3.71	4.71	59.4	0.93	0.14	4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
WALKARR CLOSE	11.14	3.03	4.03	65.3	0.97	0.14	4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

2	22/04/14	LIGHT 104 MOVED PAST DRIVEWAY	JE				
1	16/04/14	FOR APPROVAL	HL				
Code	Date	Description	Revised	Code	Date	Description	Approved

CLIENT: BLACK & MORE (CAIRNS)
PO BOX 999
NORTH CAIRNS QLD 4870
Ph. 07 4031 9944 Fax 07 4031 9914
CIVIL ENGINEER
BLACK & MORE (CAIRNS)
PO BOX 999
NORTH CAIRNS QLD 4870
Ph. 07 4031 9944 Fax 07 4031 9914



Tel: (07) 4032 3311 Fax: (07) 4032 5633
PO Box 664N North Cairns QLD 4870
Email Address - admin@spaconconsulting.com.au
A business unit of SPA Consulting Engineers (QLD) Pty Ltd a.c.n. 016444416

LEGEND
--- CABLE EXISTING
--- CABLE PLANNED
--- CABLE RECOVER
--- EQUIPMENT EXISTING
--- EQUIPMENT RECOVER
--- EQUIPMENT PLANNED
--- HV DUCT
--- LV DUCT
--- LIGHTING DUCT
--- 35mm sq ANNEALED BARE COPPER EARTH

--- CABLE EXISTING
--- CABLE PLANNED
--- CABLE RECOVER
--- EQUIPMENT EXISTING
--- EQUIPMENT RECOVER
--- EQUIPMENT PLANNED
--- HV DUCT
--- LV DUCT
--- LIGHTING DUCT
--- 35mm sq ANNEALED BARE COPPER EARTH

SUBSTATION
HV ISOLATING DEVICE
LV ISOLATING DEVICE
NORMAL PILLAR
CROSS ROAD PILLAR
LINKING PILLAR
COMMERCIAL/ INDUSTRIAL PILLAR
DISTRIBUTION CABINET
STREETLIGHT
EARTH
POLE

Drawing Title	Date	APRIL, 2014
MOSSMAN GORGE SUBDIVISION LIGHTING DESIGN SITE PLAN & SCHEDULE NOTES & CERTIFICATE	Scale	1:1000 @ 1A
	Drawn	HL
	Approved	JE
	Sheet	1 OF 1
Project Description MOSSMAN GORGE COMMUNITY MOSSMAN GORGE ROAD, MOSSMAN	ERGON Project Number 769605	SPA Drawing Number 2422-E01
	Revision	2

Our Reference

David Purkiss
Infrastructure Services
Cairns Regional Council
119 145 Spence St
CAIRNS QLD 4870

FWD AND GPR TESTING MOSSMAN GORGE PAVEMENT TESTING and DATA COLLECTION

Dear David,

Please find attached individual reports for the streets within the Mossman Gorge Community. The following notes are applicable to the reports:

- The sequence of each report is Project Overview, Satellite Overlay, Layer Profile, Relative Strength, and Strength Graph of all drops in Micrometres.
- All streets are very narrow but two FWD/GPR runs were done on each road except the northern extension of Junkurrji Street, which services three townhouses and is at best a single lane.
- Streets were tested as far as physically possible but some of the shorter streets only allowed limited access.
- With respect to deviation under test, the following standard should apply.
 - Less than 400 micrometres = Sound
 - Between 400 and 750 micrometres = Warning
 - Greater than 750 micrometres = Severe
- Tests were done with a fall weight of 40kN at 25 metre intervals.

Overall Assessment

Of all pavements tested, less than 5% could be categorised at Sound with the remaining 95+% falling into the Warning or Severe category. The interesting anomaly is that the structural profiles shown for the GPR returns indicate very consistent and structured layers. It would appear the pavements were not designed and built for normal carrying capacities and current testing criteria. e.g. 40kN drop test weight. However, due to the uniqueness of this community, the roads appear to only have occasional and light vehicular usage. This would account for the profiles maintaining structure whilst being below normal pavement strength

standards. It would be reasonable to conclude that these roads have had very little heavy vehicle (trucks and buses etc) usage.

Any proposed maintenance activities on these pavements should consider all future loading requirements to ensure 'future proofing'. Based on a limited visual inspection of the pavement surfaces there was no significant deterioration. This is consistent with the GPR profiles. There is grass ingress in road surfaces close to curbs and this should be addressed.

Consolidated reports are attached and individual data files in .dat and .xls are also available.

Yours sincerely

Steve Ford

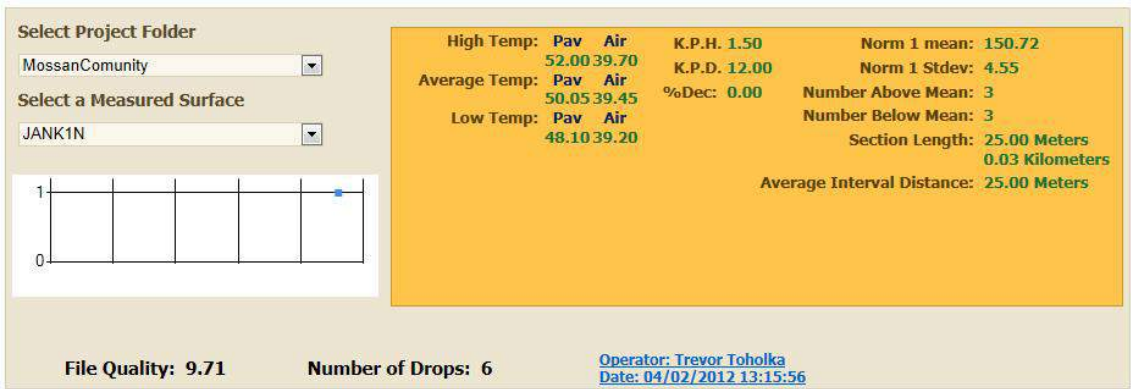
Engineering Geologist
0421569969

Attachments:

Mossman Report – Jankjia
Mossman Report - Junkurrji
Mossman Report - Kankarr
Mossman Report - Lund
Mossman Report - Manjal
Mossman Report – Sth Entrance
Mossman Report - Walkarr

Jankjia St

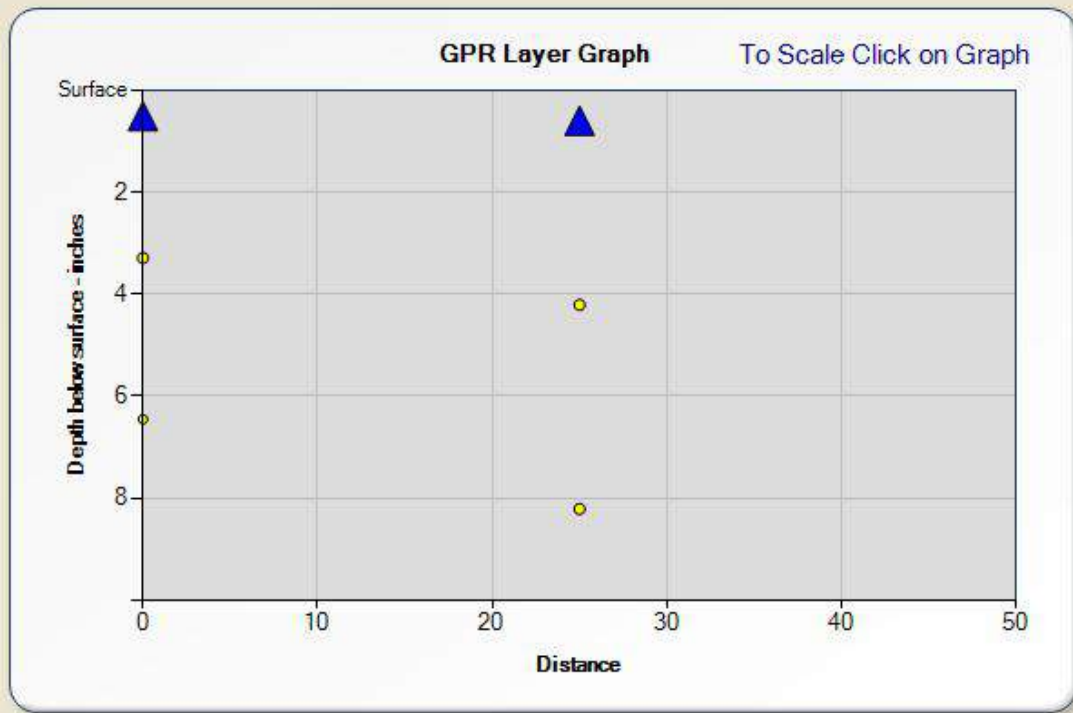
Track 1N



Satellite Overlay

Layer Data Graph

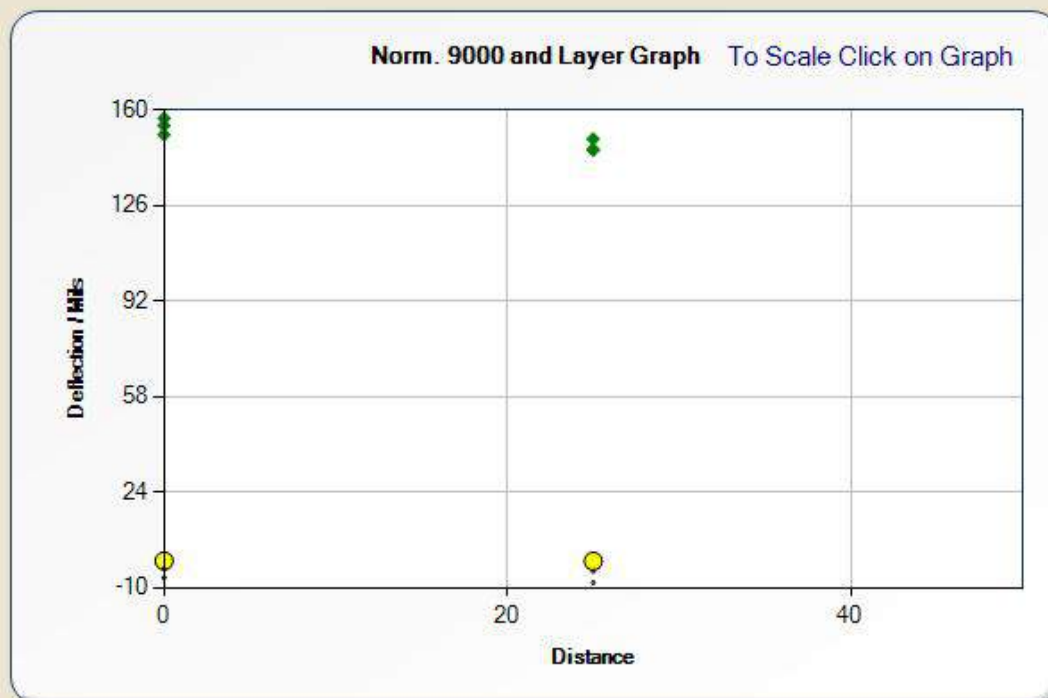
Relative Strength



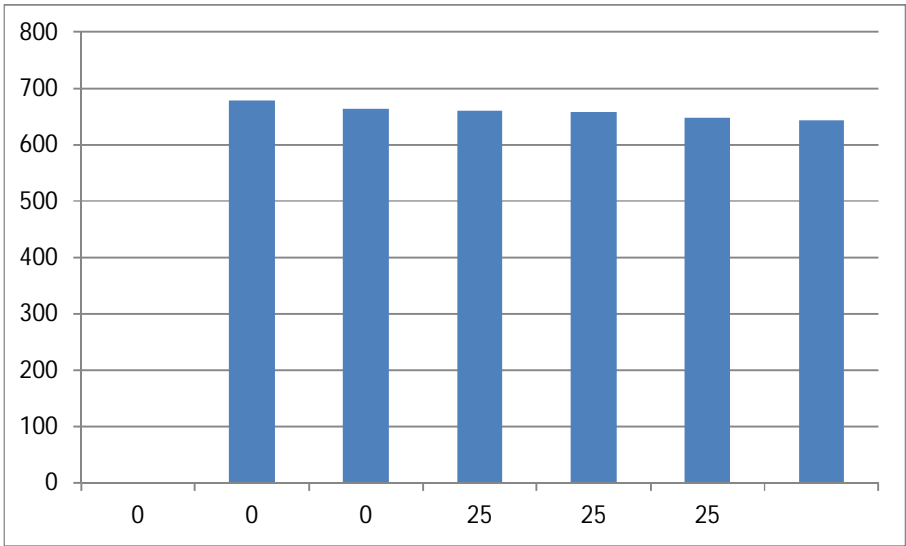
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



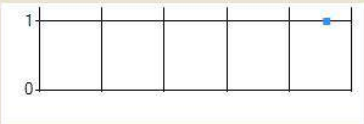
Track 2N

Select Project Folder

MossanCommunity

Select a Measured Surface

JANK2N



High Temp:	Pav	Air	K.P.H.	0.75	Norm 1 mean:	156.32
	52.70	41.00	K.P.D.	6.00	Norm 1 Stdev:	6.46
Average Temp:	Pav	Air	%Dec:	0.00	Number Above Mean:	3
	52.25	40.35			Number Below Mean:	3
Low Temp:	Pav	Air			Section Length:	25.00 Meters
	51.80	39.70			0.03 Kilometers	
					Average Interval Distance:	25.00 Meters

File Quality: 9.57

Number of Drops: 6

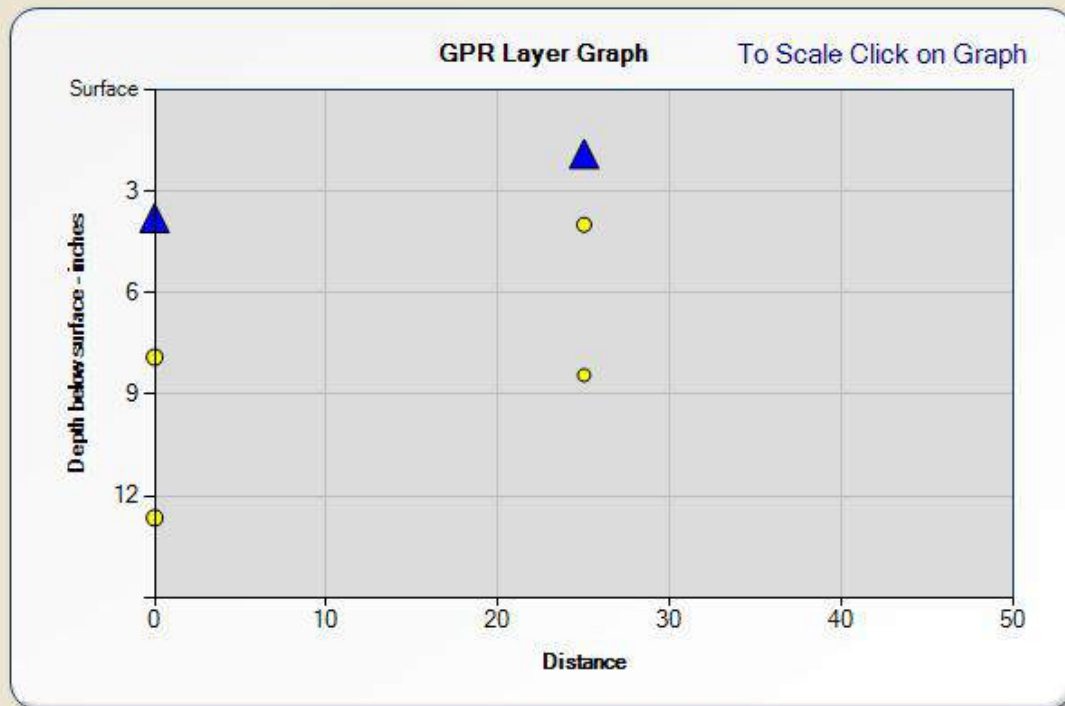
Operator: Trevor Toholka

Date: 04/02/2012 13:21:14

Satellite Overlay Layer Data Graph Relative Strength



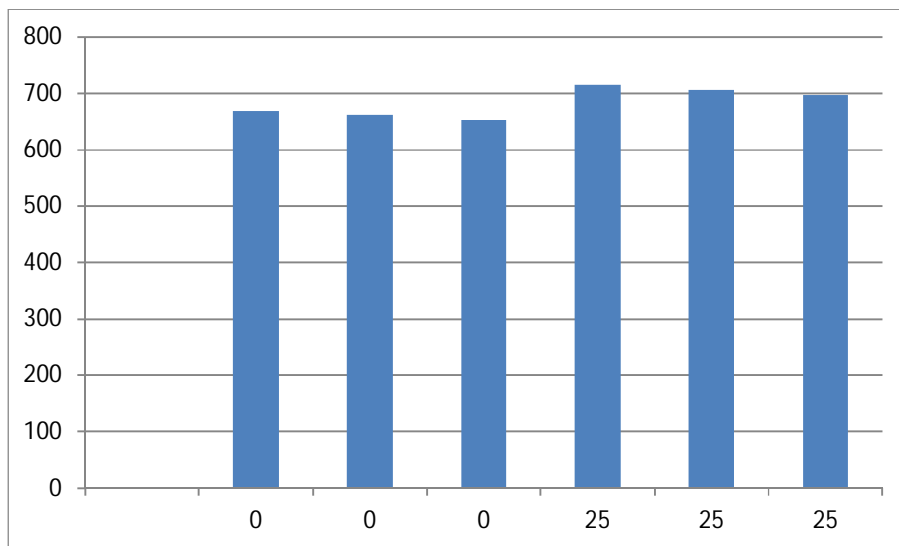
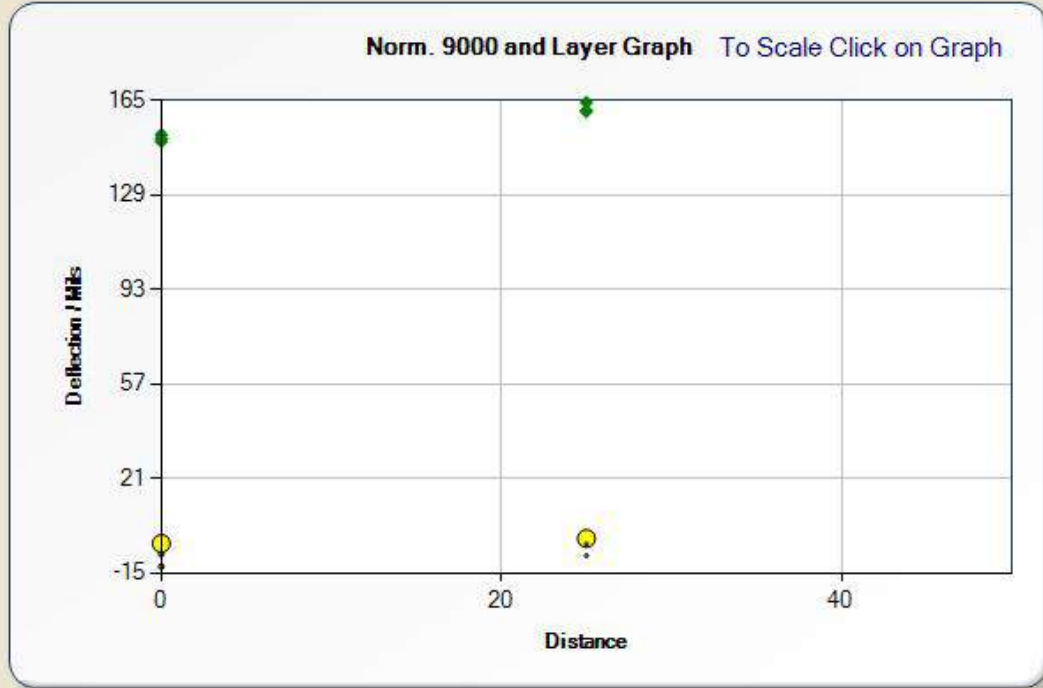
Satellite Overlay Layer Data Graph Relative Strength



Satellite Overlay

Layer Data Graph

Relative Strength



Junkurri – Including northern lane to three townhouses

Track 1N

Select Project Folder

MossanCommunity

Select a Measured Surface

JUNK1N

1

0

High Temp: Pav Air K.P.H. 1.46 Norm 1 mean: 172.20

Average Temp: Pav Air K.P.D. 11.66 Norm 1 Stdev: 40.44

Low Temp: Pav Air %Dec: 0.00 Number Above Mean: 12

Number Below Mean: 12

Section Length: 170.00 Meters

Average Interval Distance: 24.29 Meters

File Quality: 9.46

Number of Drops: 24

Operator: Trevor Toholka

Date: 04/02/2012 12:52:31

Satellite Overlay

Layer Data Graph

Relative Strength

Hybrid

1

2

3

4

5

6

7

8

Lund St

Kankam St

Junkurri St

Google

© 2012 Google

Report a problem

Image

Google

© 2012 Google

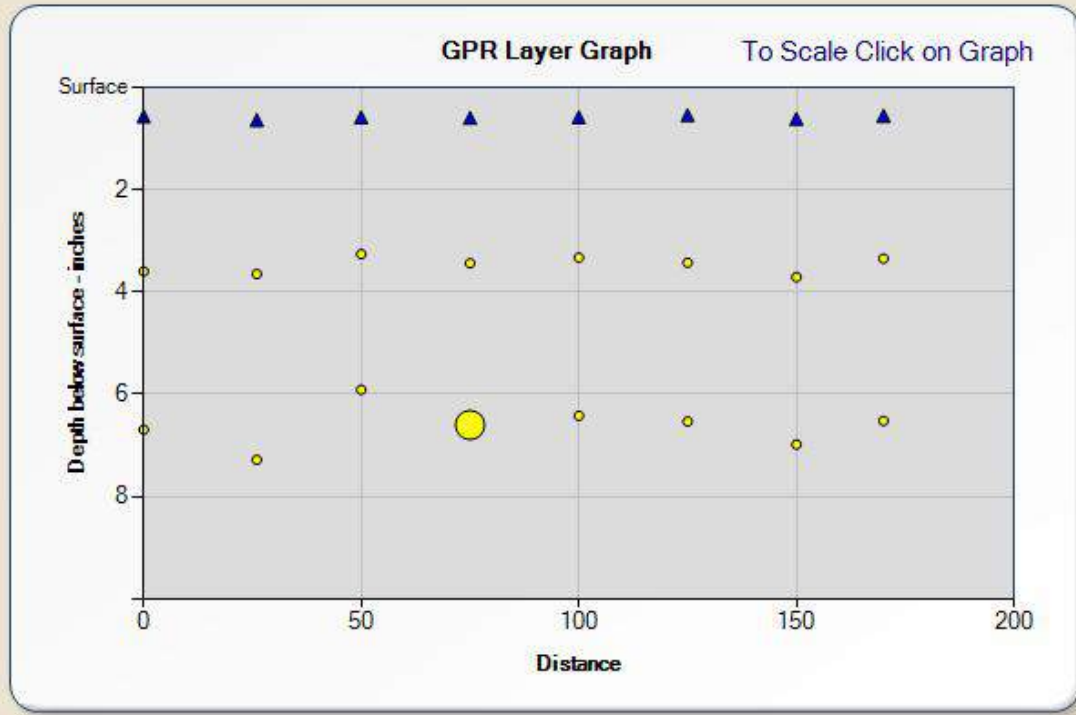
Report a problem

Image

Satellite Overlay

Layer Data Graph

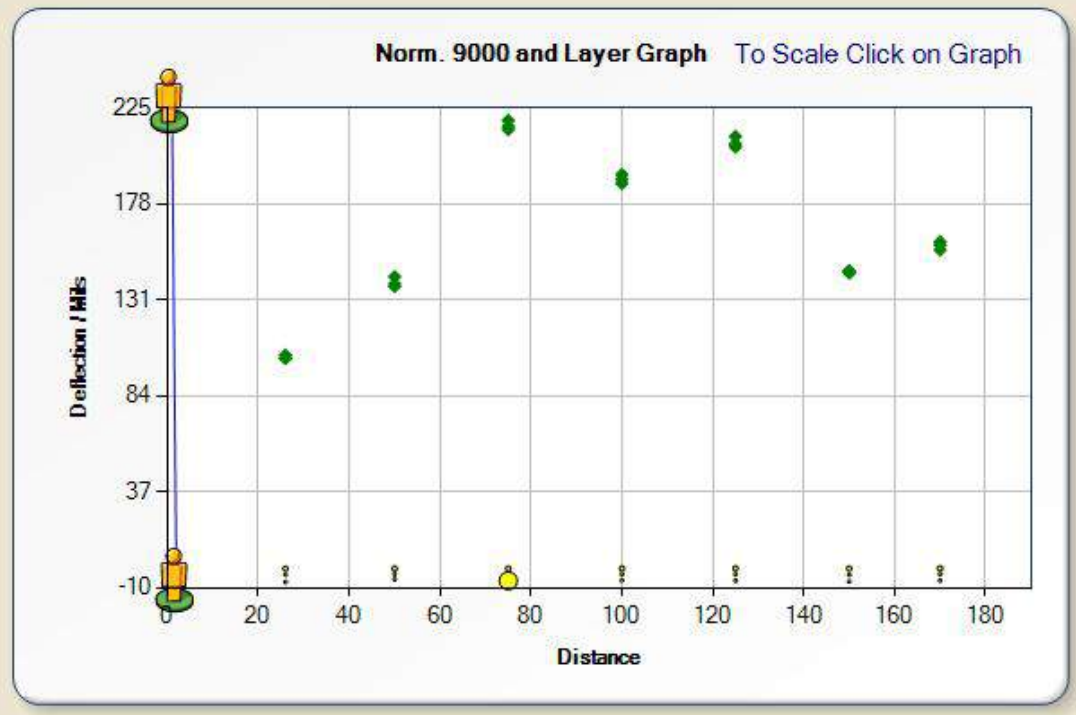
Relative Strength



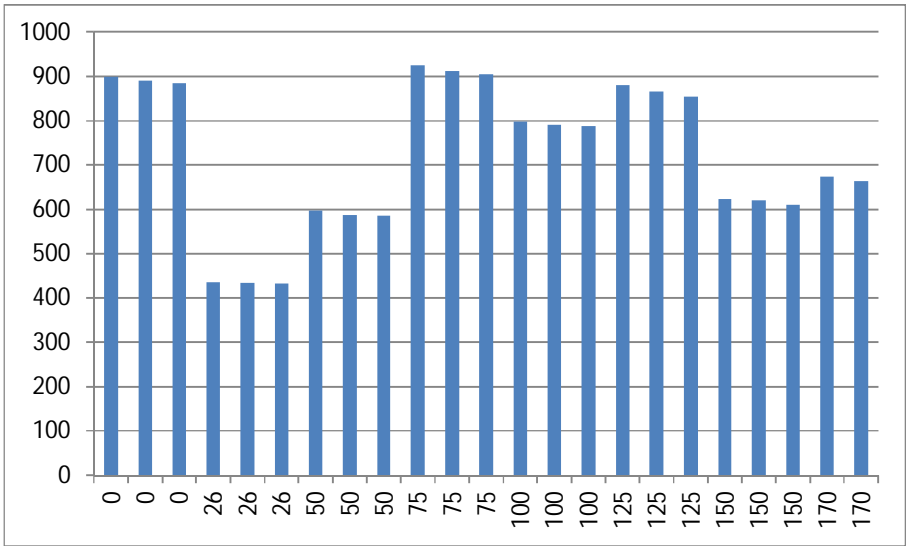
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



2N – No northern lane

Select Project Folder

MossanCommunity

Select a Measured Surface

JUNK2N

1

0

High Temp:	Pav	Air	K.P.H.	1.50	Norm 1 mean:	151.59
	50.30	40.30	K.P.D.	12.00	Norm 1 Stdev:	45.45
Average Temp:	Pav	Air	%Dec:	0.00	Number Above Mean:	9
	44.25	39.65			Number Below Mean:	3
Low Temp:	Pav	Air			Section Length:	75.00 Meters
	31.30	39.20				0.08 Kilometers
					Average Interval Distance:	25.00 Meters

File Quality: 9.73

Number of Drops: 12

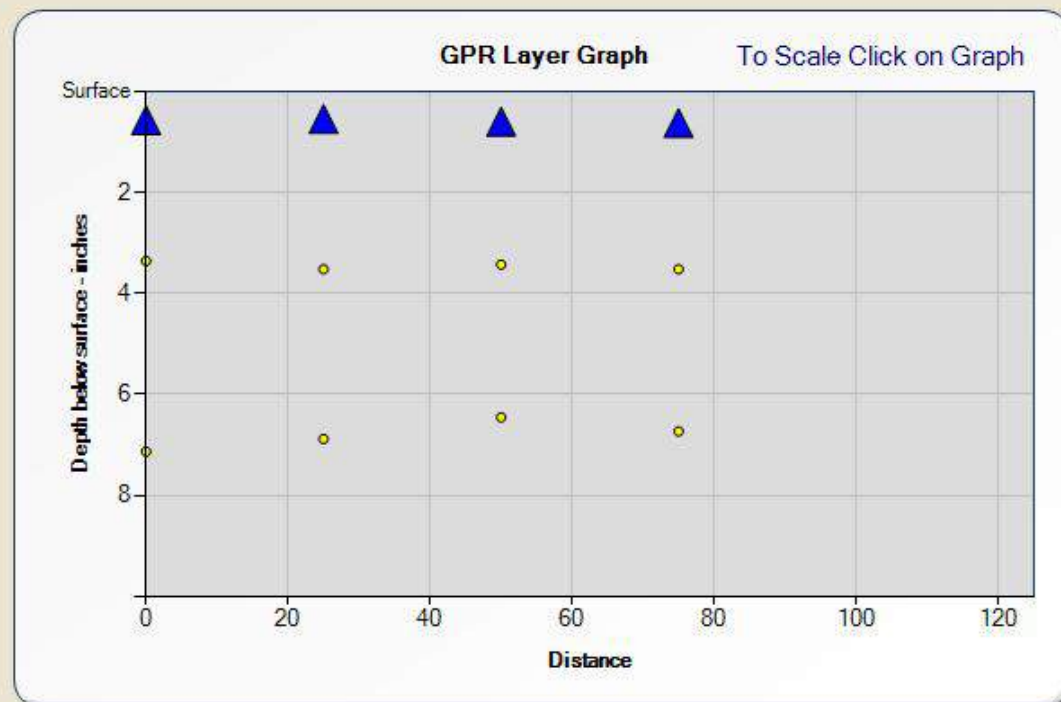
Operator: Trevor Toholka

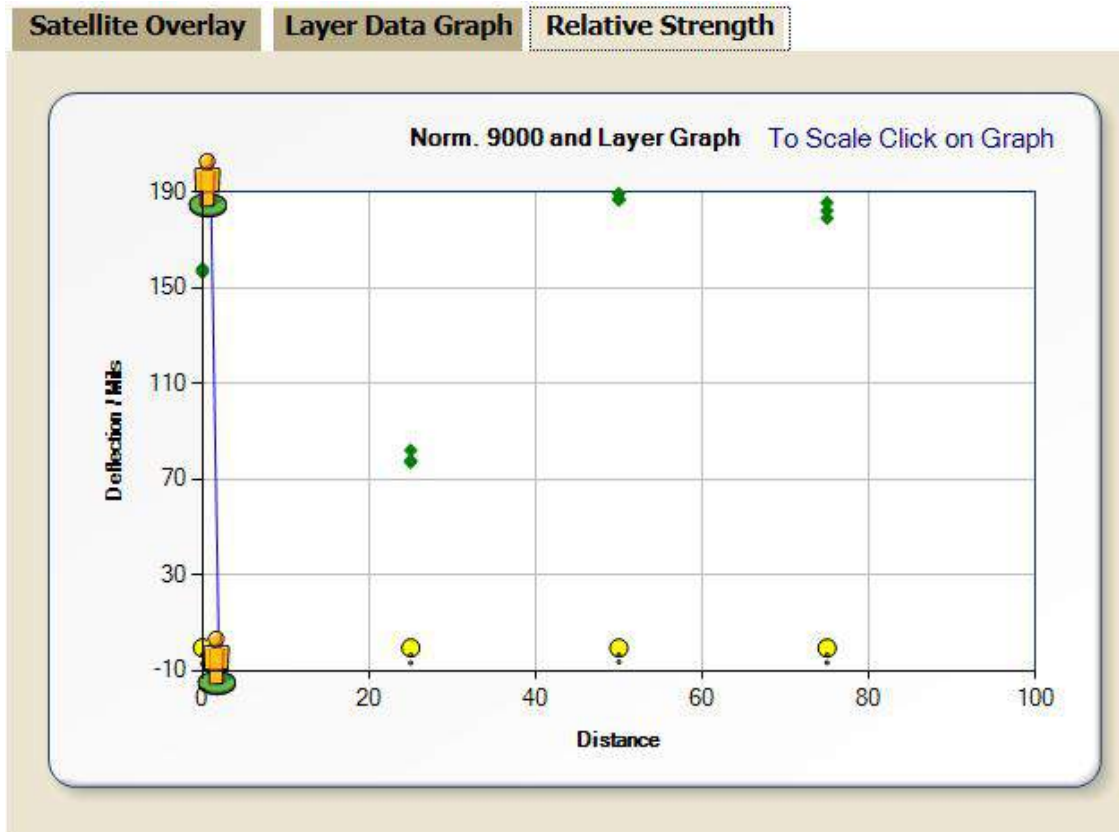
Date: 04/02/2012 13:07:35

Satellite Overlay Layer Data Graph Relative Strength

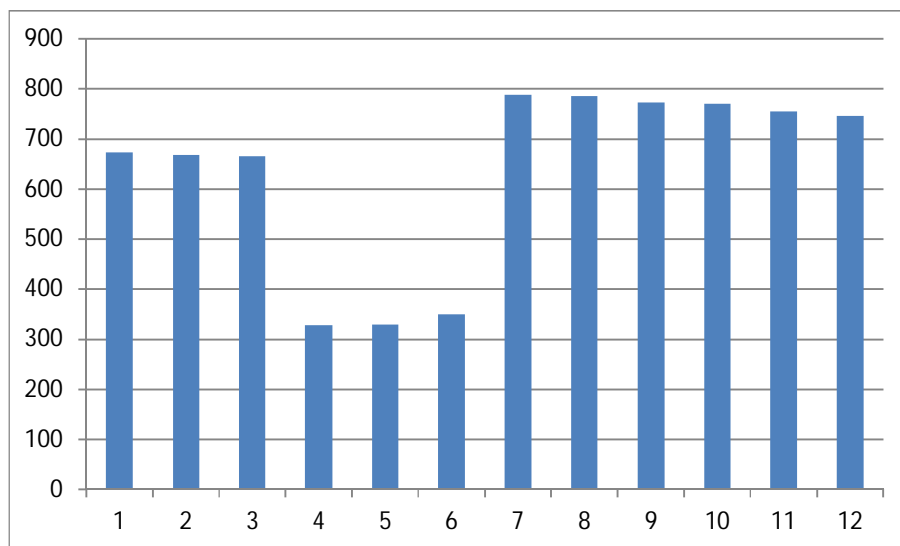


Satellite Overlay Layer Data Graph Relative Strength





Deflection Graph



Kankarr

Track 1W

Select Project Folder

MossanCommunity

Select a Measured Surface

KANK1W

1

0

High Temp: Pav Air K.P.H. 1.50 Norm 1 mean: 234.33

53.10 42.50 K.P.D. 12.00 Norm 1 Stdev: 42.96

Average Temp: Pav Air %Dec: 0.00 Number Above Mean: 6

47.66 41.12 Number Below Mean: 9

Low Temp: Pav Air

33.50 39.70

Section Length: 100.00 Meters

0.10 Kilometers

Average Interval Distance: 25.00 Meters

File Quality: 8.85

Number of Drops: 15

Operator: Trevor Toholka

Date: 04/02/2012 12:30:03

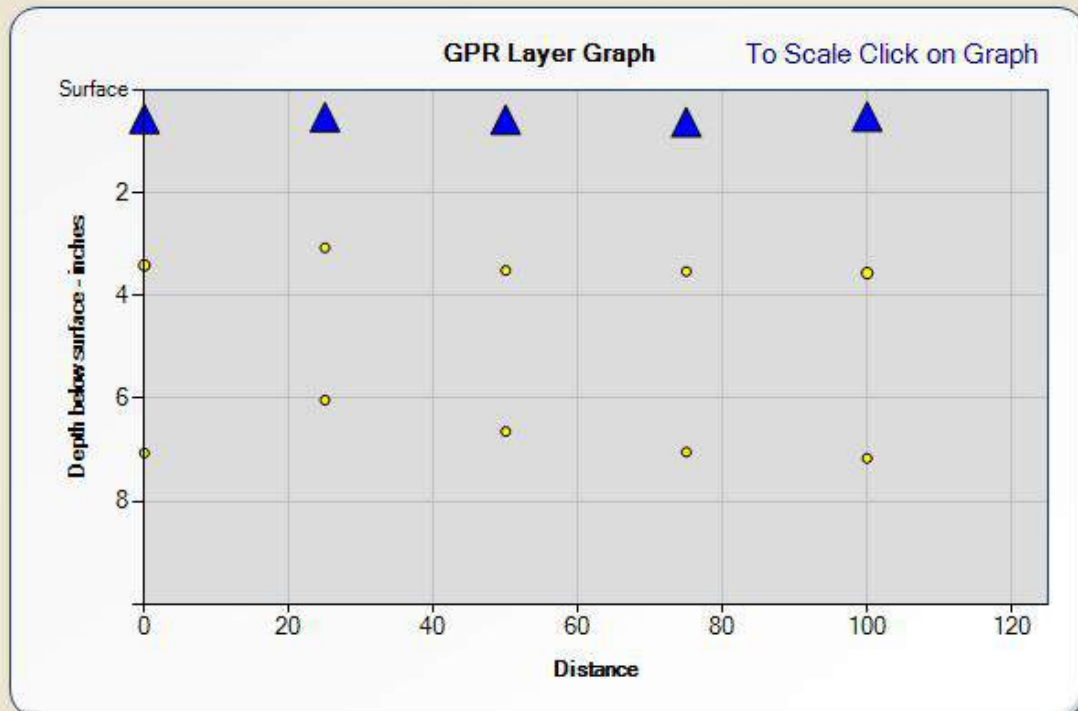
Satellite Overlay Layer Data Graph Relative Strength



Satellite Overlay

Layer Data Graph

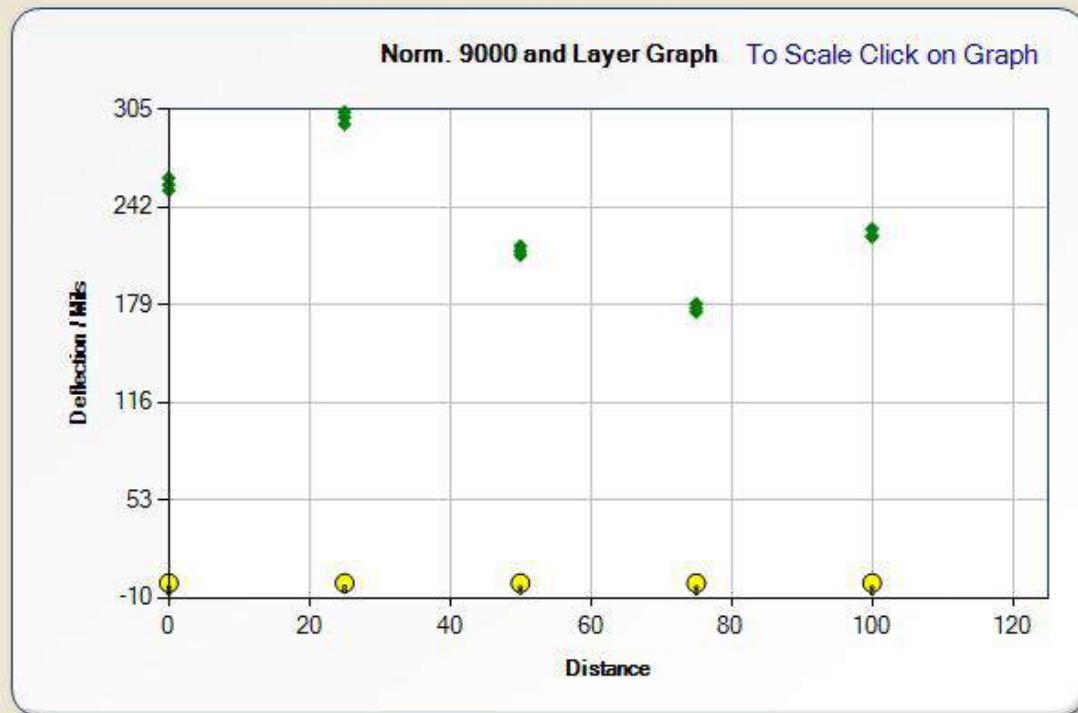
Relative Strength



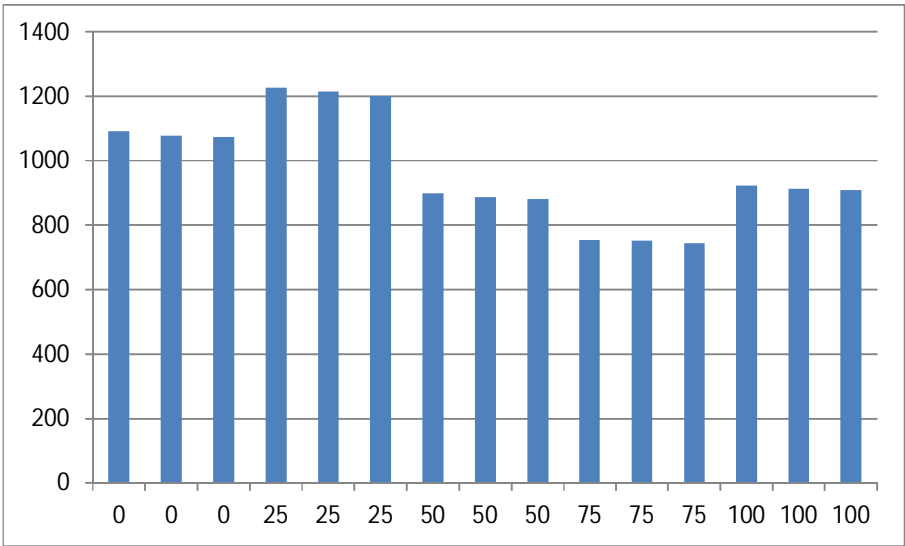
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



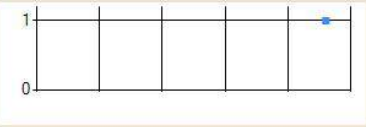
Track 2W

Select Project Folder

MossanCommunity

Select a Measured Surface

KANK2W



High Temp:	Pav	Air	K.P.H.	1.50	Norm 1 mean:	192.15
	49.40	42.00	K.P.D.	12.00	Norm 1 Stdev:	35.33
Average Temp:	Pav	Air	%Dec:	0.00	Number Above Mean:	9
	43.78	41.62			Number Below Mean:	6
Low Temp:	Pav	Air			Section Length:	100.00 Meters
	31.50	40.80				0.10 Kilometers
					Average Interval Distance:	25.00 Meters

File Quality: 9.61

Number of Drops: 15

Operator: Trevor Toholka
Date: 04/02/2012 12:38:59

Satellite Overlay

Layer Data Graph

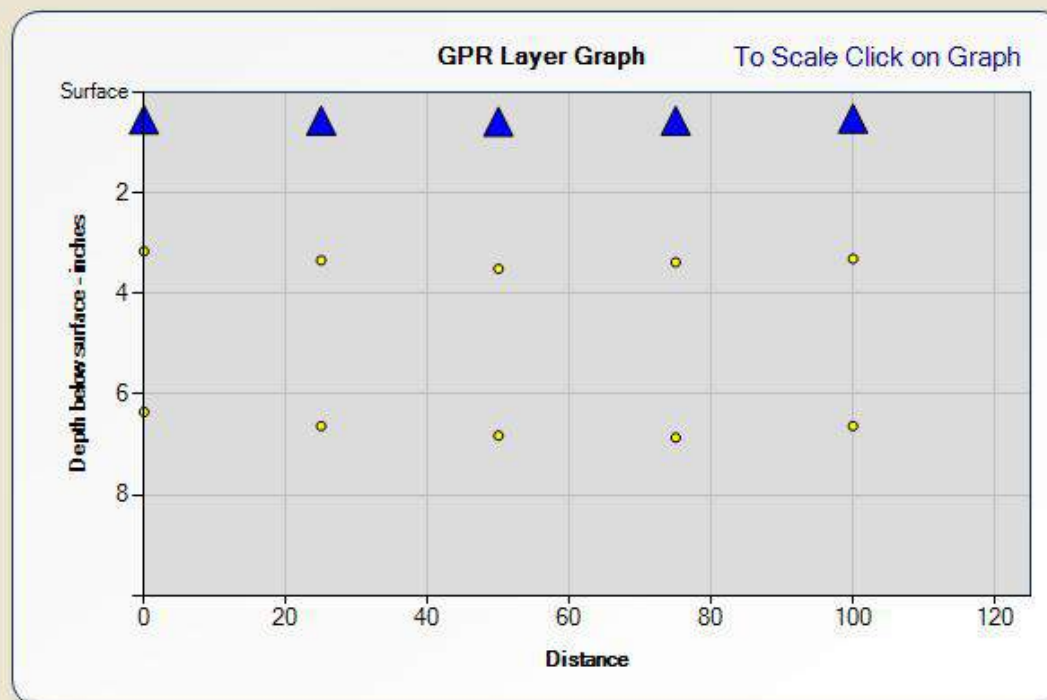
Relative Strength

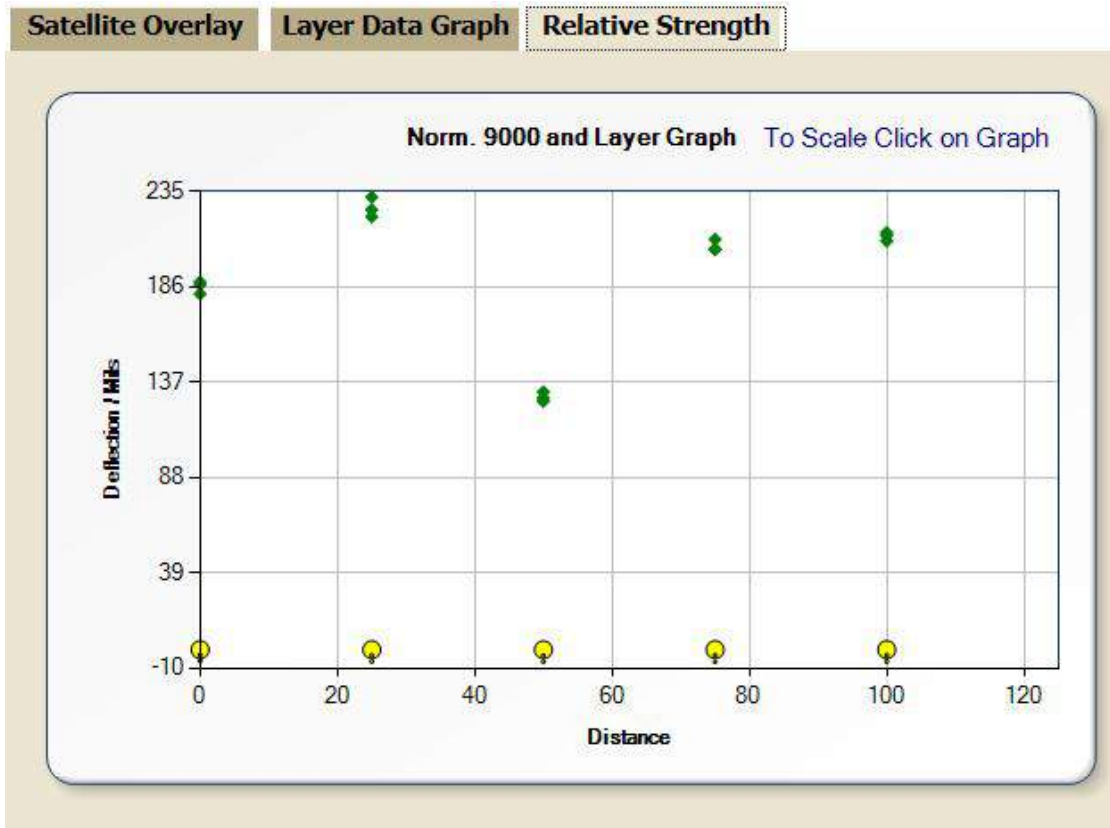


Satellite Overlay

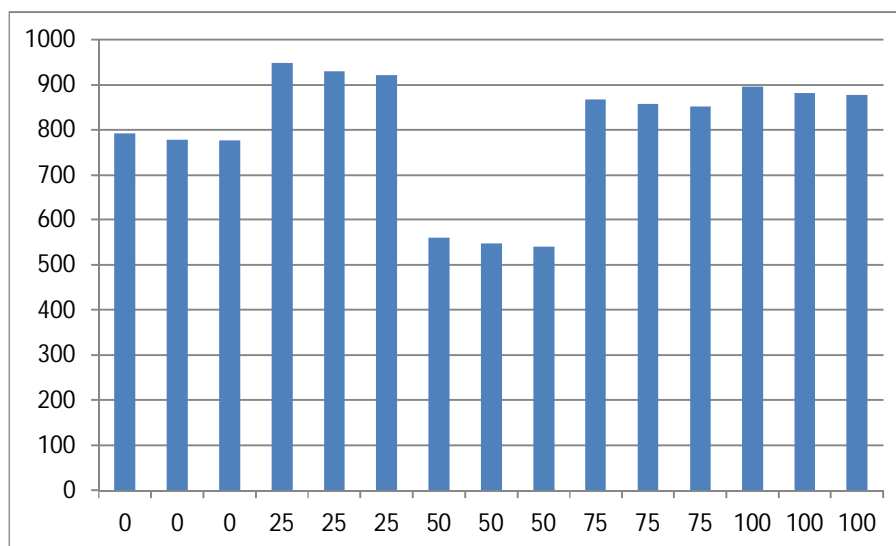
Layer Data Graph

Relative Strength

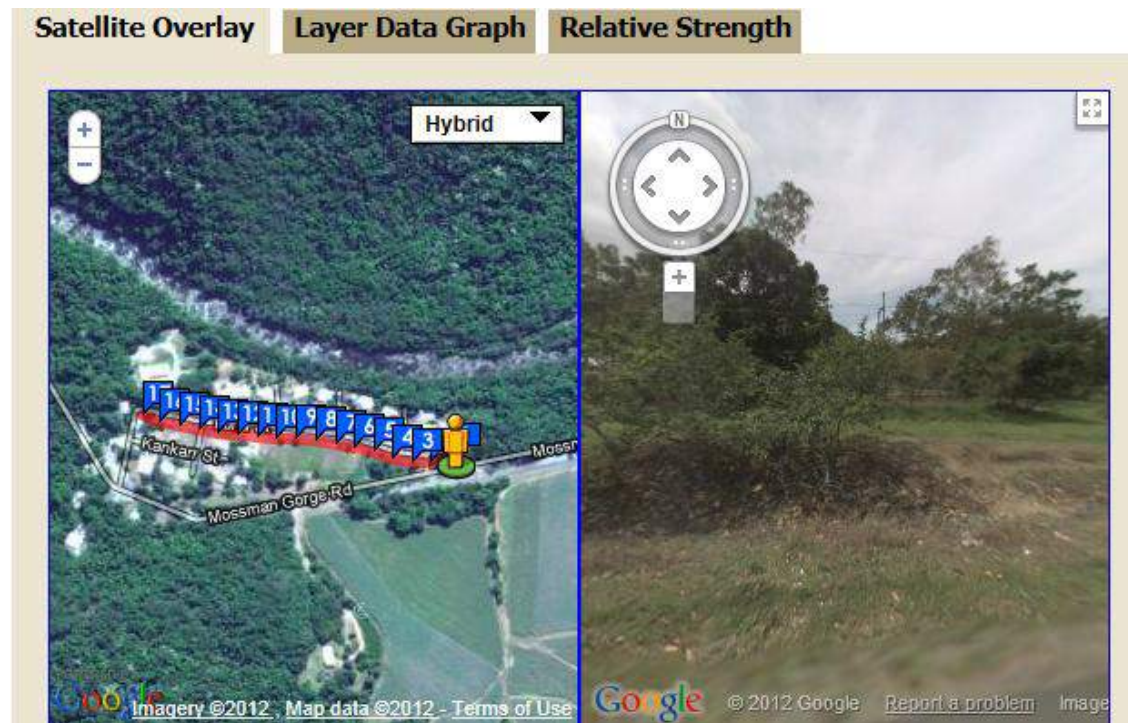
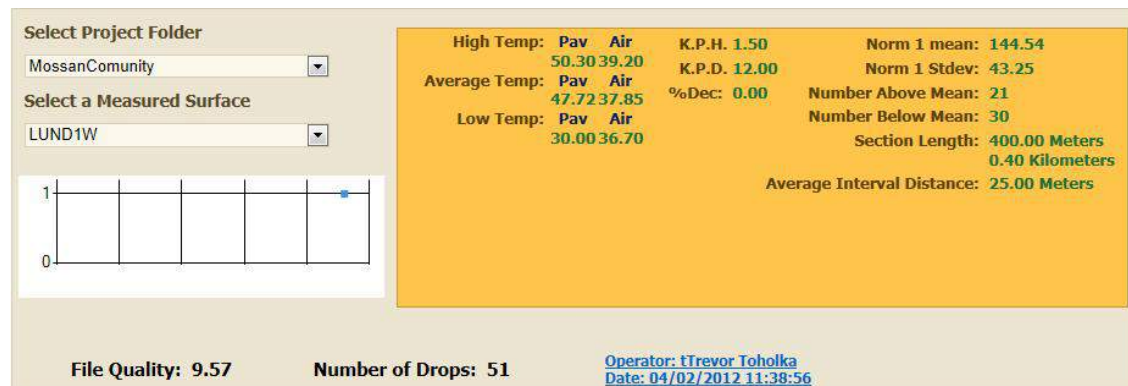




Deflection Graph



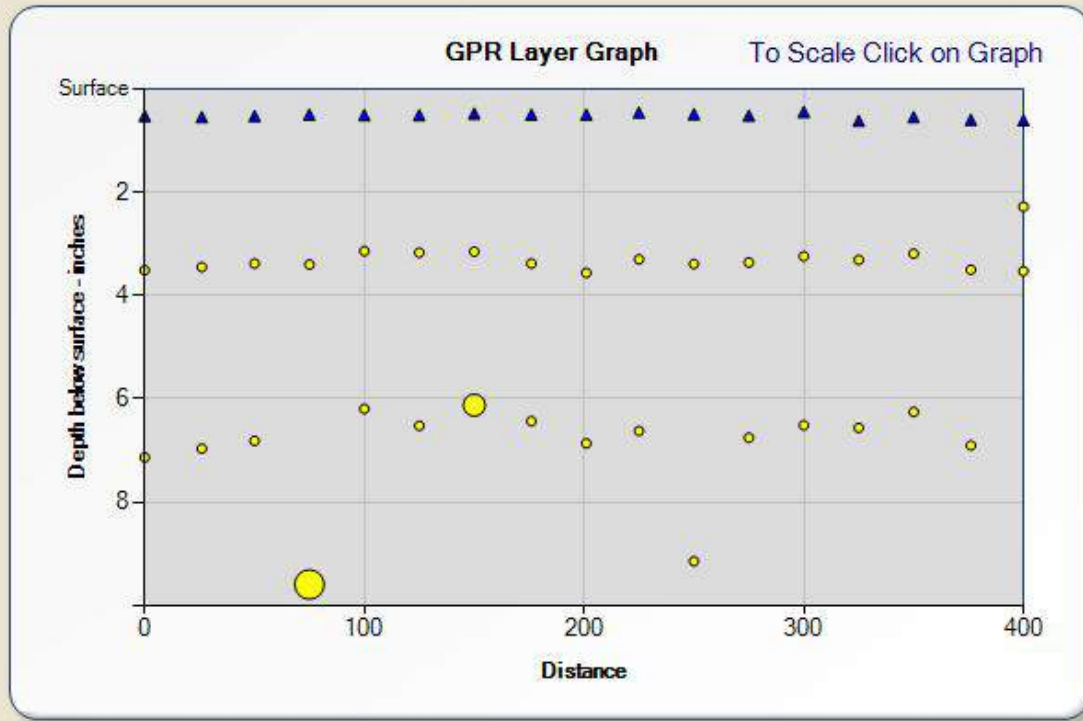
Track 1W



Satellite Overlay

Layer Data Graph

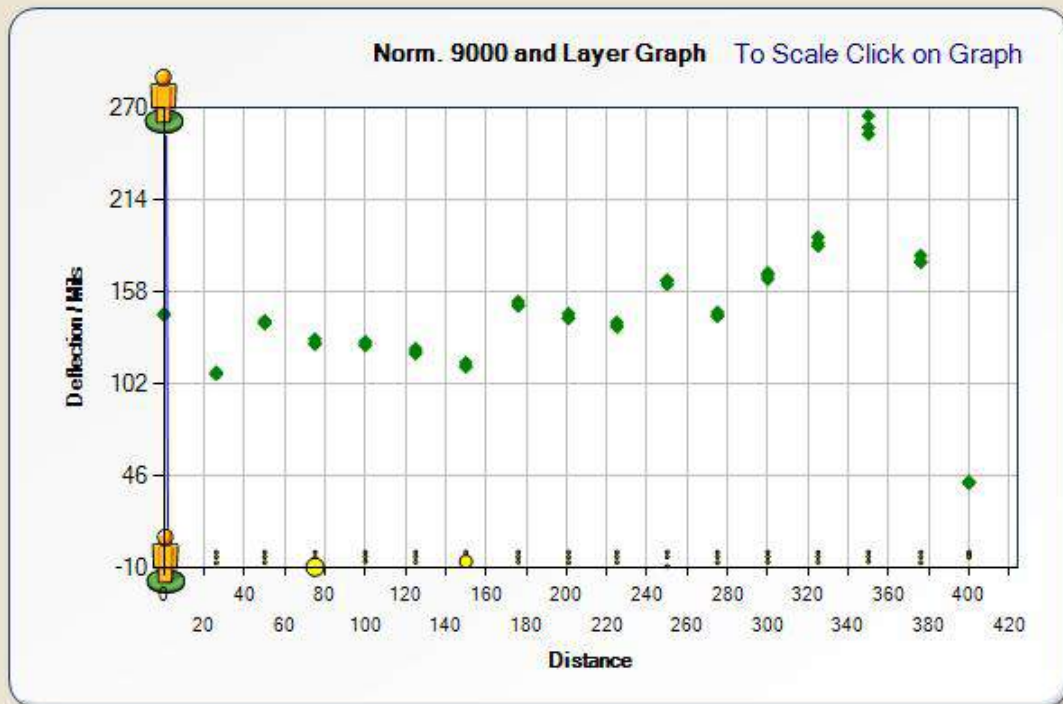
Relative Strength



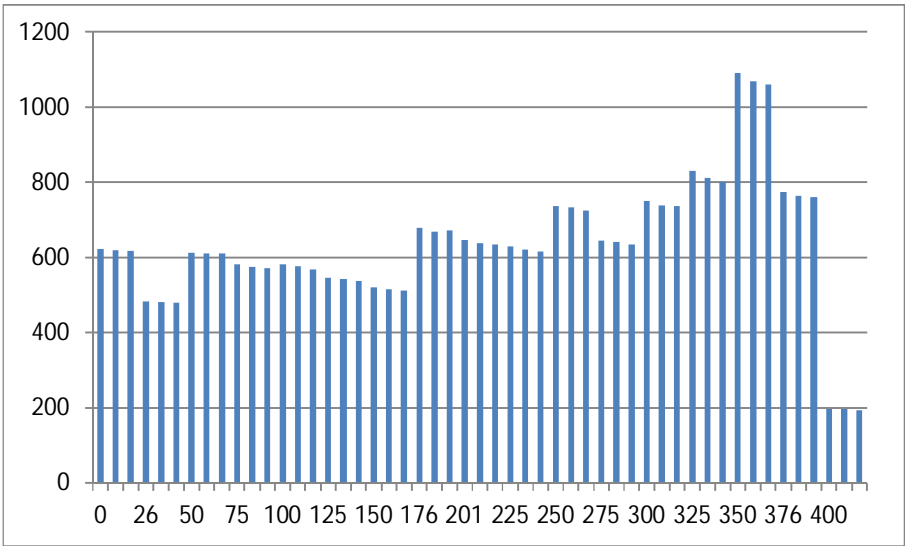
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



Track 2W

Select Project Folder

MossanCommunity

Select a Measured Surface

LUND2W

High Temp: Pav 50.90 Air 42.50

Average Temp: Pav 47.57 Air 40.91

Low Temp: Pav 35.00 Air 39.20

K.P.H. 1.41

K.P.D. 11.29

%Dec: 0.00

Norm 1 mean: 164.12

Norm 1 Stdev: 41.64

Number Above Mean: 24

Number Below Mean: 27

Section Length: 400.00 Meters

0.40 Kilometers

Average Interval Distance: 25.00 Meters

File Quality: 9.82

Number of Drops: 51

Operator: Trevor Toholka

Date: 04/02/2012 12:06:01

Satellite Overlay

Layer Data Graph

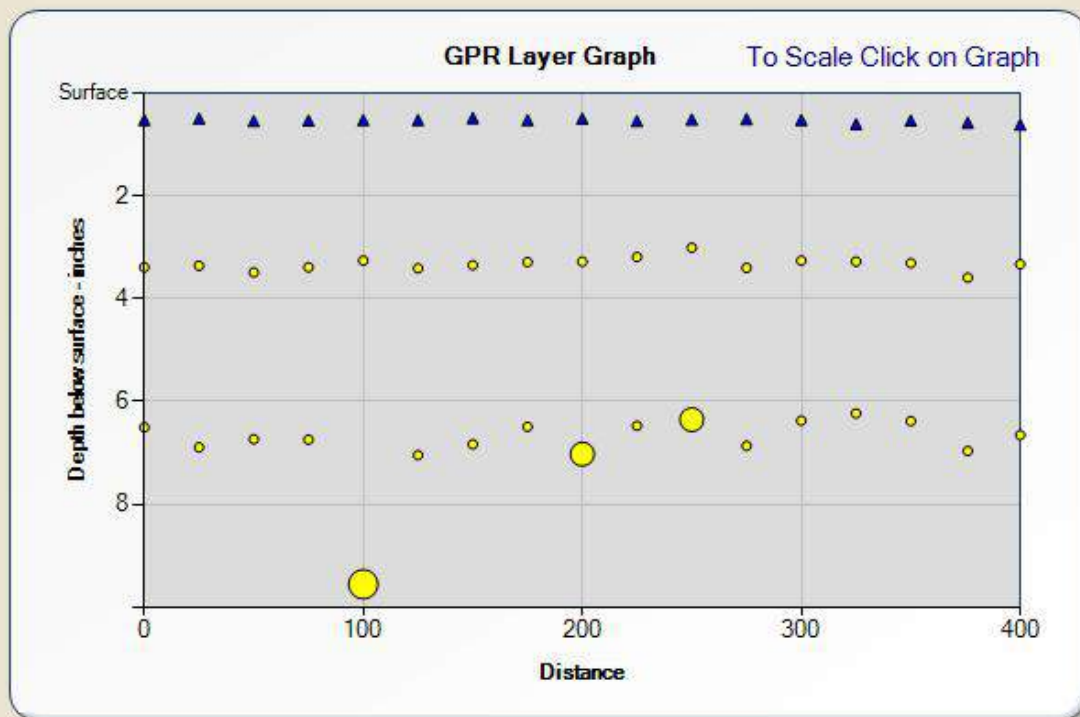
Relative Strength

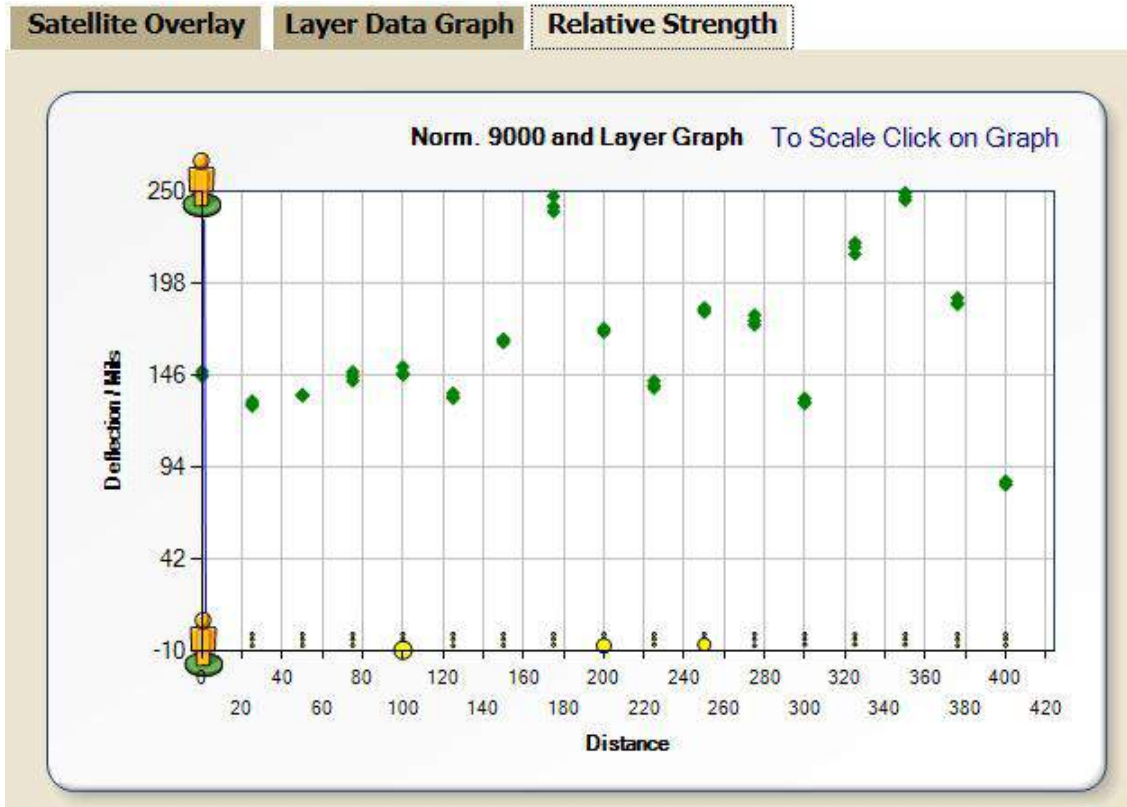


Satellite Overlay

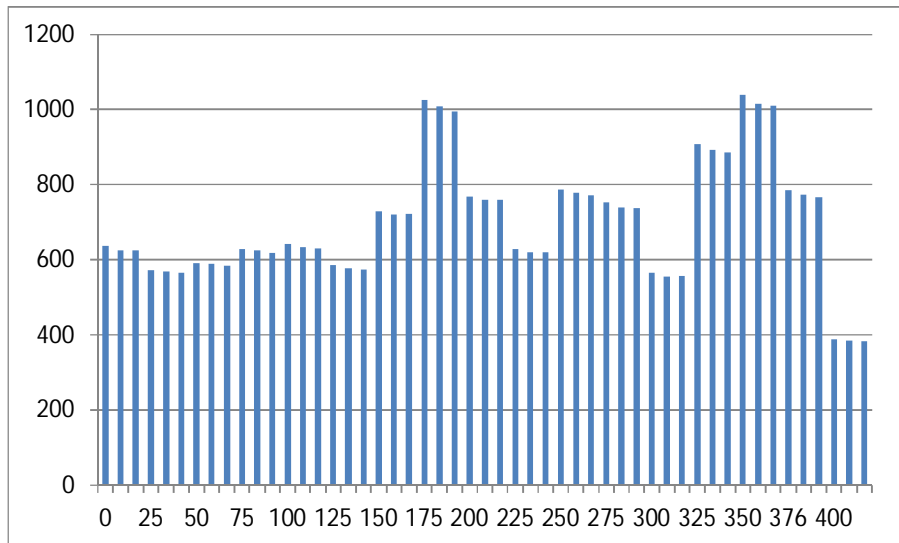
Layer Data Graph

Relative Strength





Deflection Graph



Manjal St

Track 1N

Select Project Folder

MossanCommunity

Select a Measured Surface

MANJ1N

1

0

High Temp: Pav Air

53.10 40.50

K.P.H. 1.50

Norm 1 mean: 107.28

Average Temp: Pav Air

52.55 39.60

K.P.D. 12.00

Norm 1 Stdev: 11.78

Low Temp: Pav Air

52.00 38.70

%Dec: 0.00

Number Above Mean: 3

Number Below Mean: 3

Section Length: 25.00 Meters

0.03 Kilometers

Average Interval Distance: 25.00 Meters

File Quality: 9.69

Number of Drops: 6

Operator: Trevor Toholka

Date: 04/02/2012 13:28:18

Satellite Overlay

Layer Data Graph

Relative Strength

Hybrid

+

-

2

1

Lund St

Lund St

Mossman Gorge Rd

Mossman Gorge Rd

LOT 100

LOT 3

POWERED BY

Google

Imagery ©2012

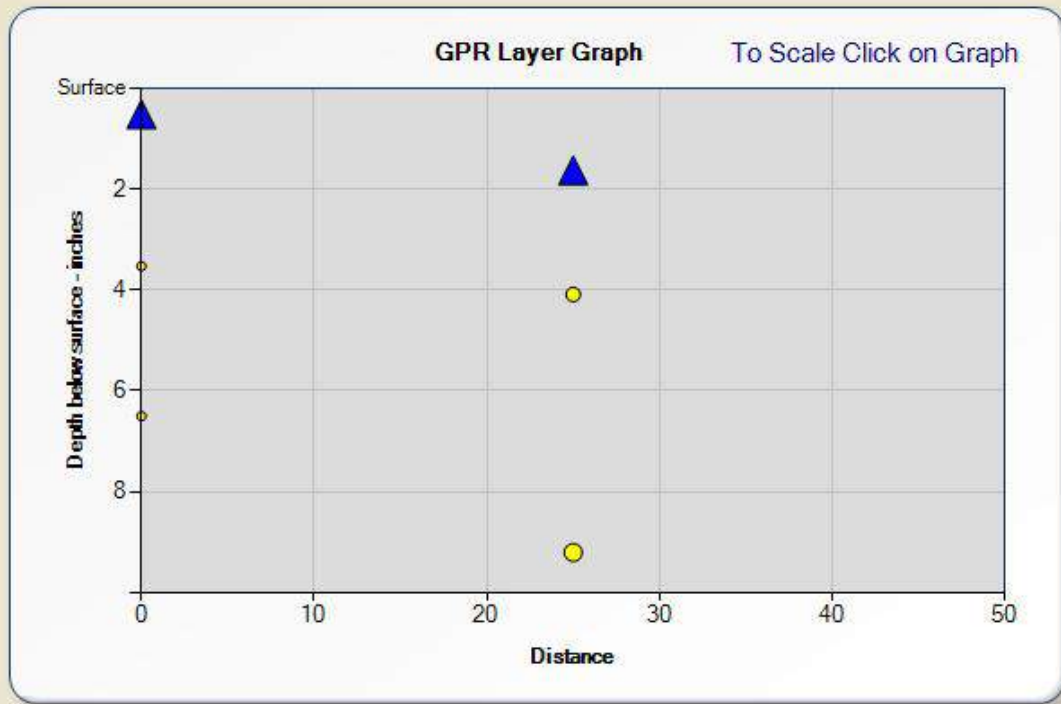
Map data ©2012

Terms of Use

Satellite Overlay

Layer Data Graph

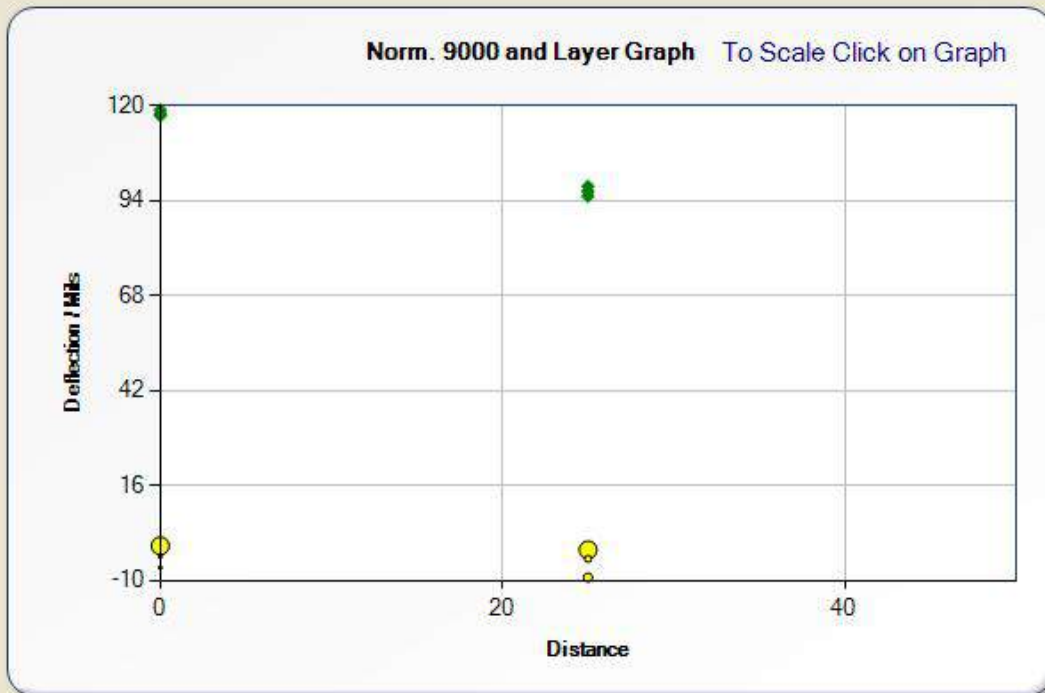
Relative Strength



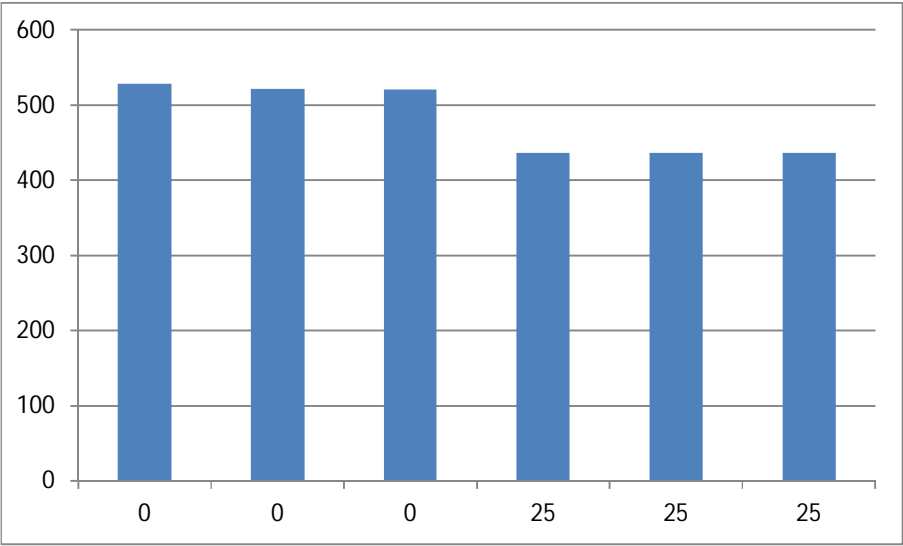
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



Track 2N

Select Project Folder

MossanCommunity

Select a Measured Surface

MANJ2N



High Temp:	Pav	Air	K.P.H.	1.50	Norm 1 mean:	100.41
	52.40	41.50			Norm 1 Stdev:	18.36
Average Temp:	Pav	Air	K.P.D.	12.00	Number Above Mean:	3
	51.85	41.35	%Dec:	0.00	Number Below Mean:	3
Low Temp:	Pav	Air			Section Length:	25.00 Meters
	51.30	41.20				0.03 Kilometers
					Average Interval Distance:	25.00 Meters

File Quality: 9.70

Number of Drops: 6

Operator: Trevor Toholka

Date: 04/02/2012 13:33:50

Satellite Overlay

Layer Data Graph

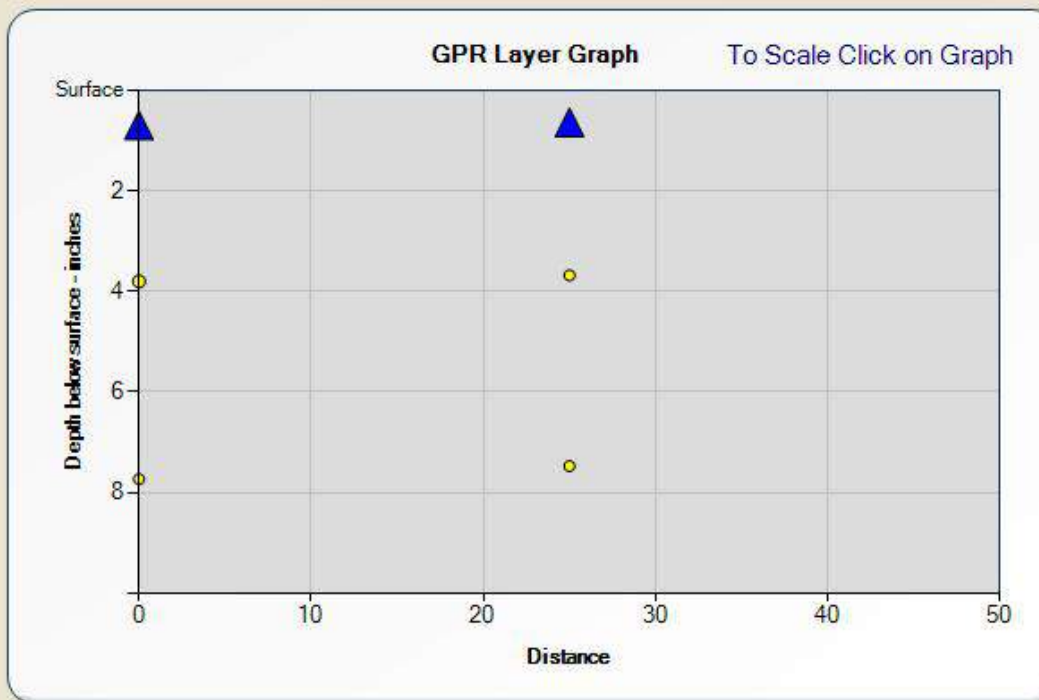
Relative Strength

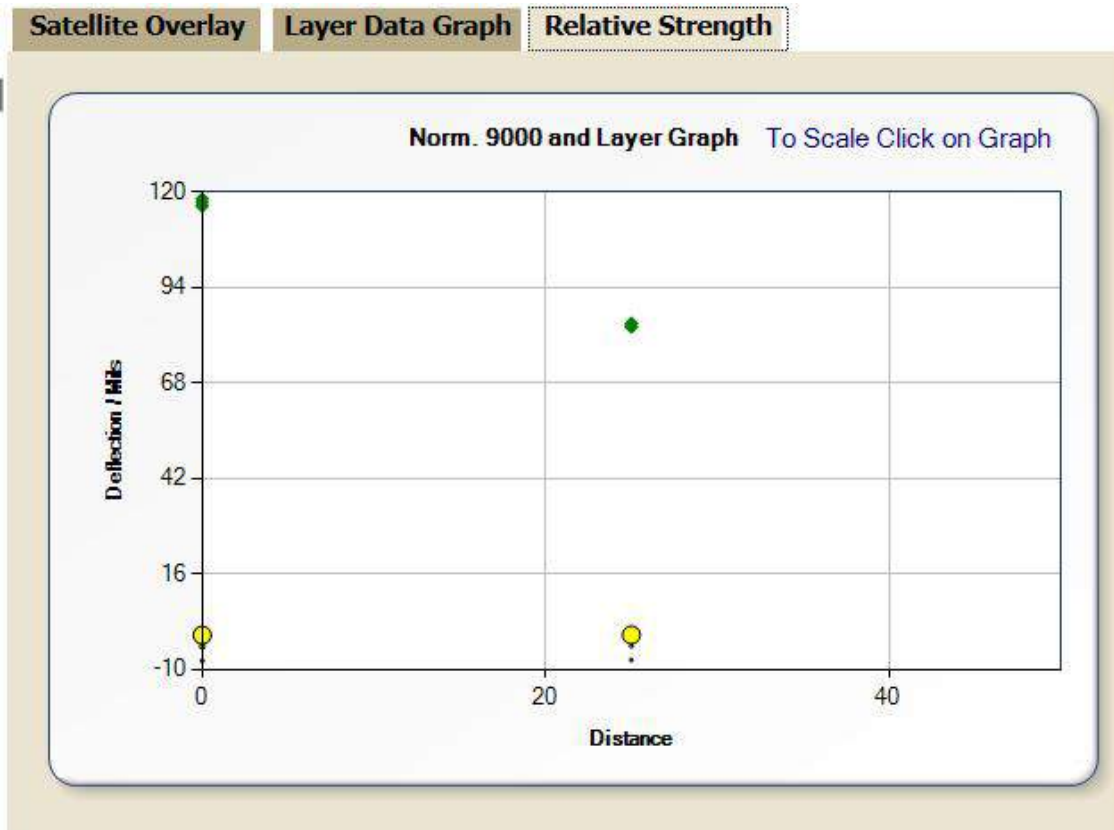


Satellite Overlay

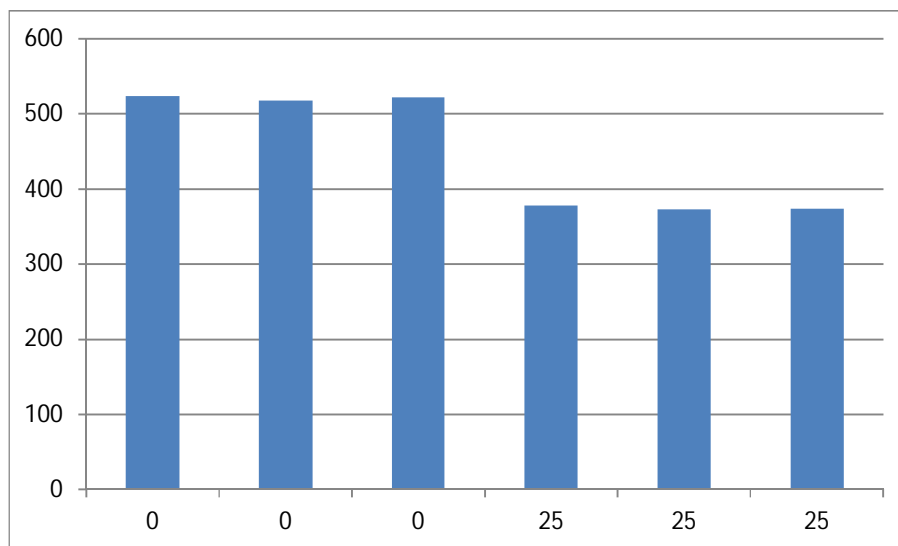
Layer Data Graph

Relative Strength





Deflection Graph



Sth Entrance

Track 1S

Select Project Folder

MossanCommunity

Select a Measured Surface

SENT1S

1

0

High Temp: Pav Air K.P.H. 0.48 Norm 1 mean: 121.75

51.80 42.00 K.P.D. 3.84 Norm 1 Stdev: 15.88

Average Temp: Pav Air

51.07 41.67 %Dec: 0.00 Number Above Mean: 3

Low Temp: Pav Air Number Below Mean: 6

50.70 41.00 Section Length: 24.00 Meters

Average Interval Distance: 12.00 Meters

File Quality: 5.82

Number of Drops: 9

Operator: Trevor Toholka

Date: 04/02/2012 13:51:51

Satellite Overlay

Layer Data Graph

Relative Strength

+

-

Hybrid

LOT 37

Lund St

Mossman

Gorge Rd

1

2

3

Imagery ©2012, Map data ©2012 - Terms of Use

N

+

Google

© 2012 Google

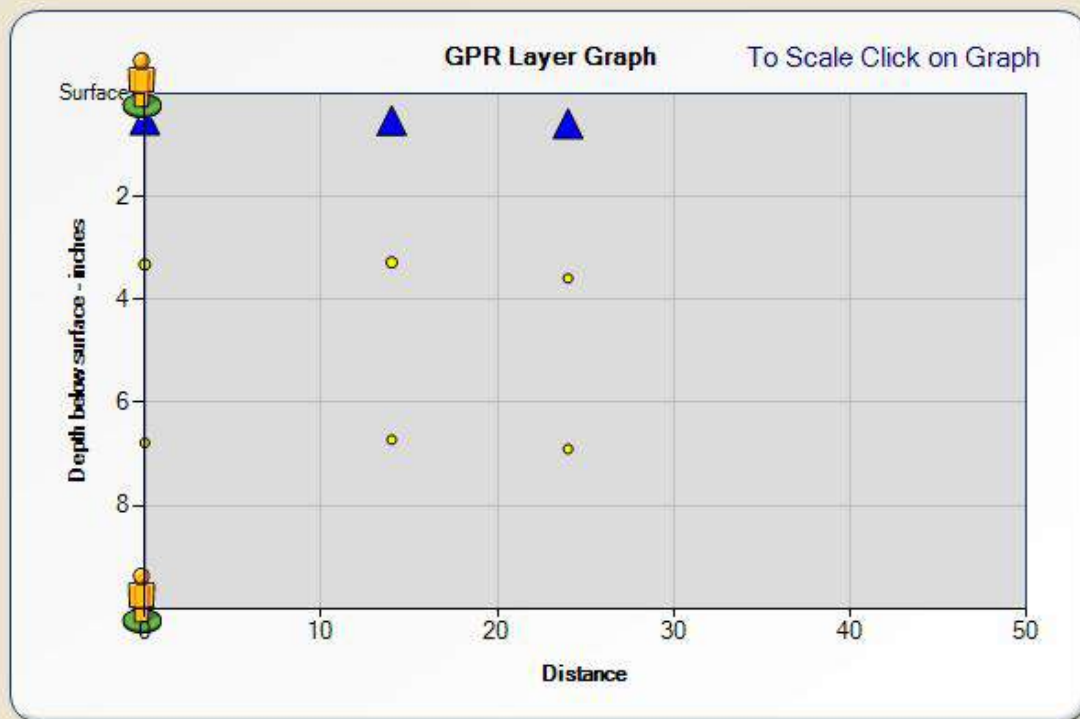
Report a problem

Image

Satellite Overlay

Layer Data Graph

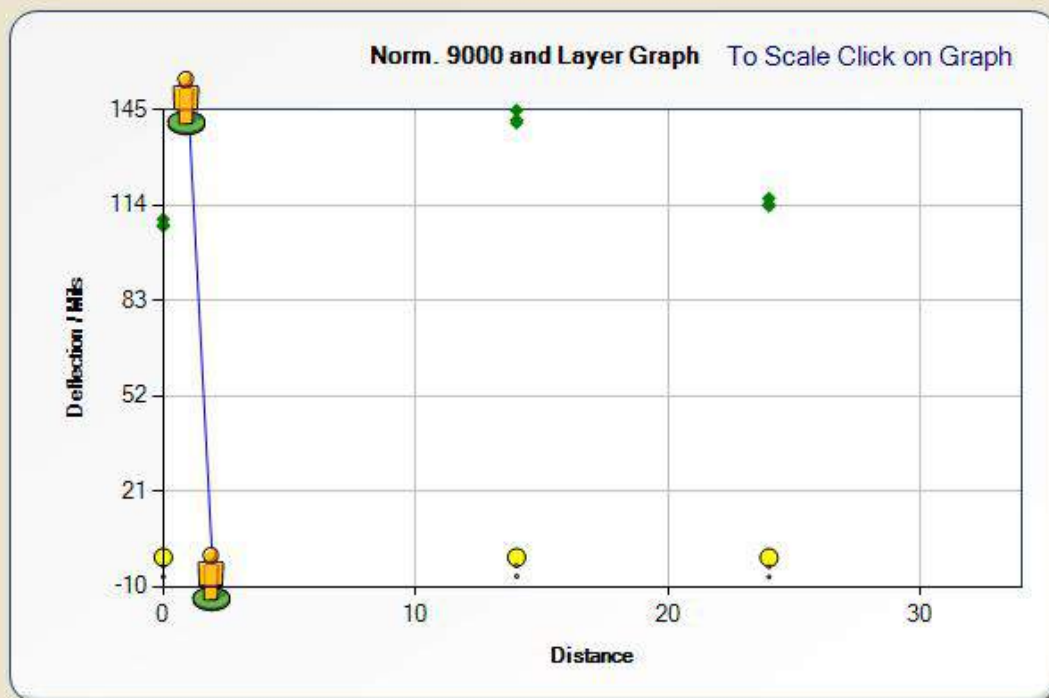
Relative Strength



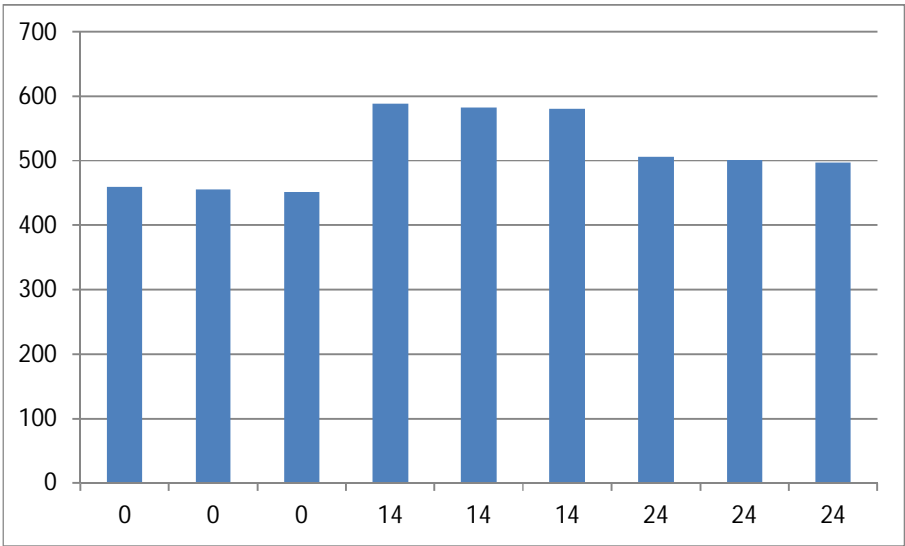
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



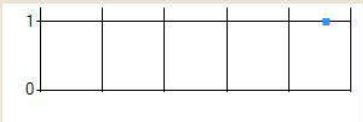
Track 2S

Select Project Folder

MossanCommunity

Select a Measured Surface

SENT2S



High Temp:	Pav	Air	K.P.H.	0.52	Norm 1 mean:	138.29
	52.00	43.60	K.P.D.	4.16	Norm 1 Stdev:	13.39
Average Temp:	Pav	Air	%Dec:	0.00	Number Above Mean:	6
	51.03	43.10			Number Below Mean:	3
Low Temp:	Pav	Air			Section Length:	26.00 Meters
	49.80	42.30				0.03 Kilometers
					Average Interval Distance:	13.00 Meters

File Quality: 9.80

Number of Drops: 9

Operator: Trevor Toholka

Date: 04/02/2012 13:59:45

Satellite Overlay

Layer Data Graph

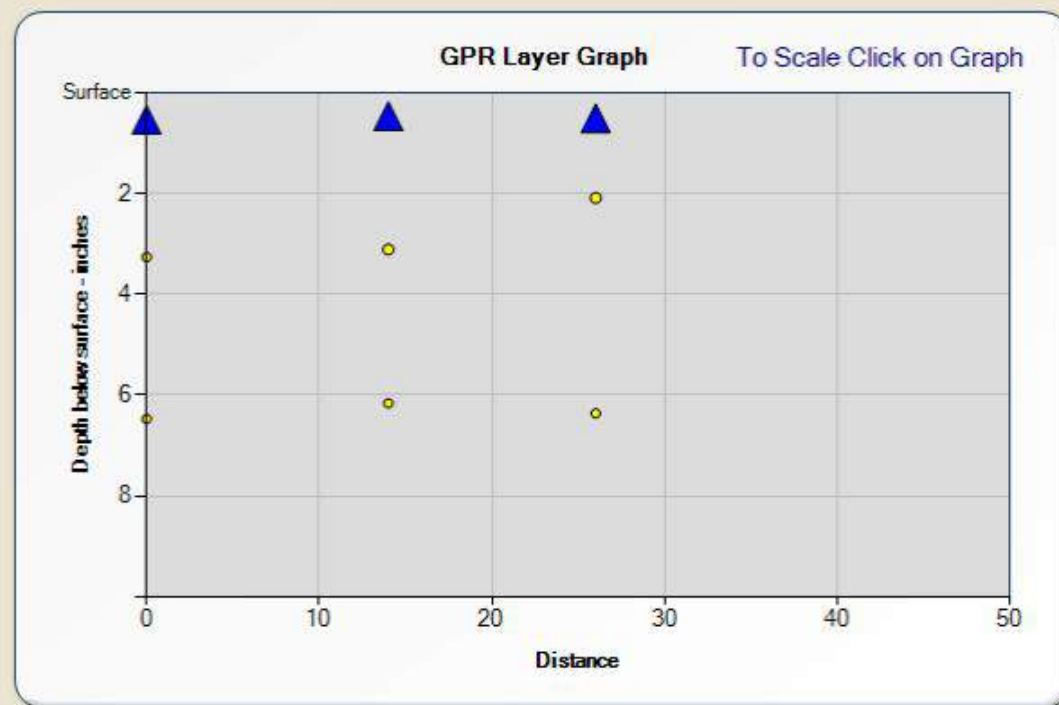
Relative Strength

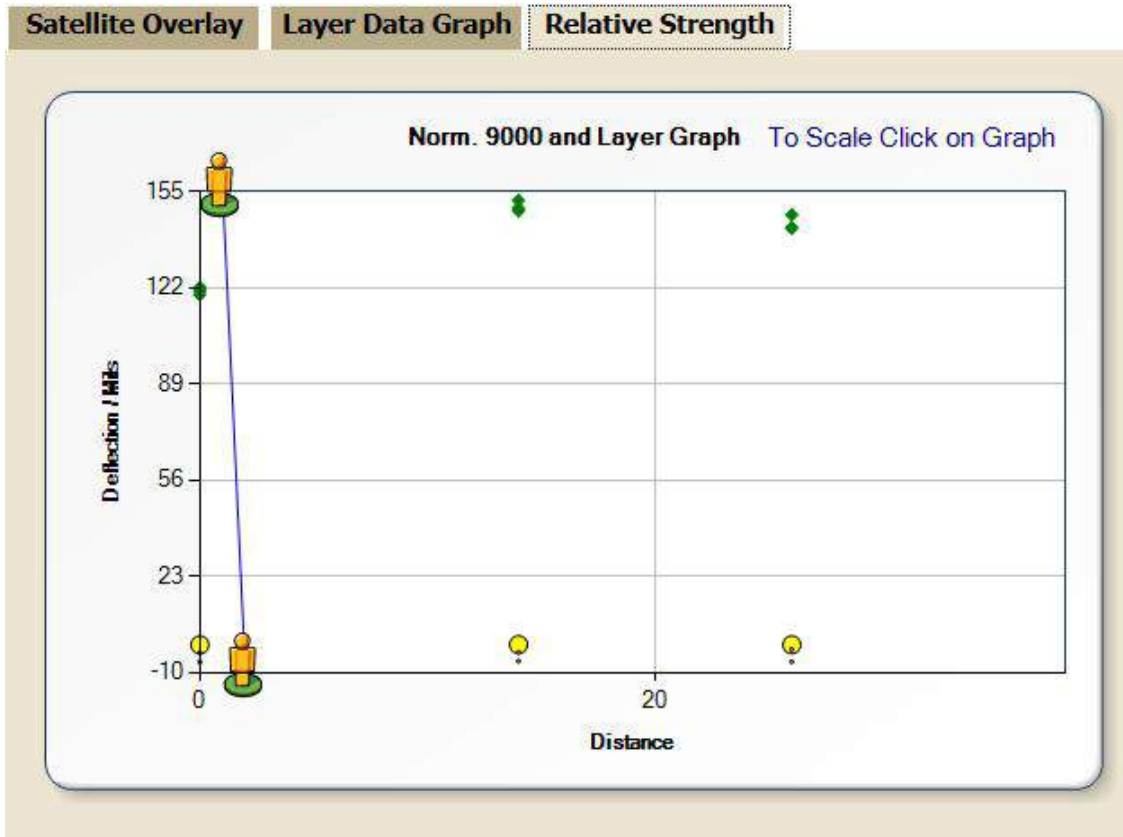


Satellite Overlay

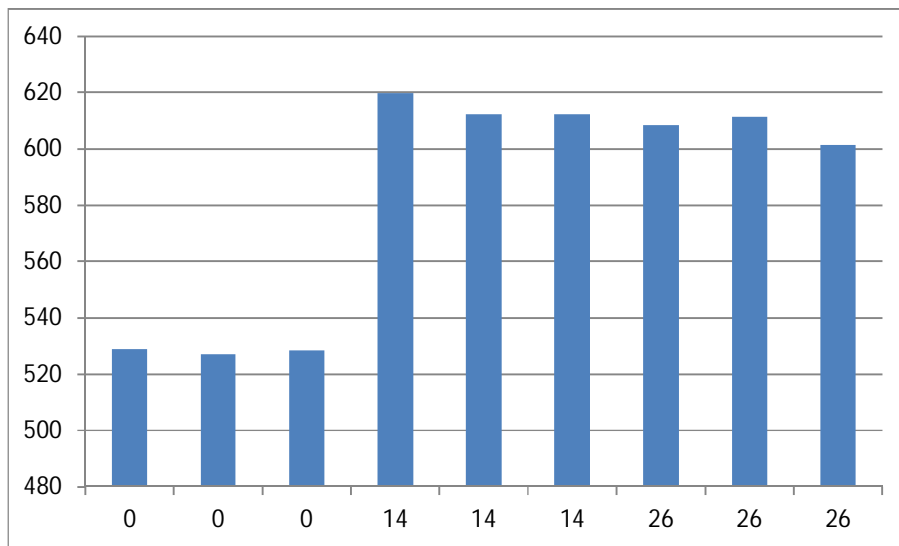
Layer Data Graph

Relative Strength





Deflection Graph



Walkarr St

Track 1N

Select Project Folder

MossanComunity

Select a Measured Surface

WALK1N

1

0

High Temp: Pav Air K.P.H. 1.56 Norm 1 mean: 131.24

Average Temp: Pav Air K.P.D. 12.48 Norm 1 Stdev: 23.99

Low Temp: Pav Air %Dec: 0.00 Number Above Mean: 3

Number Below Mean: 3

Section Length: 26.00 Meters

0.03 Kilometers

Average Interval Distance: 26.00 Meters

File Quality: 9.90

Number of Drops: 6

Operator: Trevor Toholka

Date: 04/02/2012 13:38:53

Satellite Overlay

Layer Data Graph

Relative Strength

Hybrid

+

-

2

OT 37

1

Lund St

Lund St

Mossman Gorge Rd

Google

Imagery ©2012

Map data ©2012

Terms of Use

N

+

Google

© 2012 Google

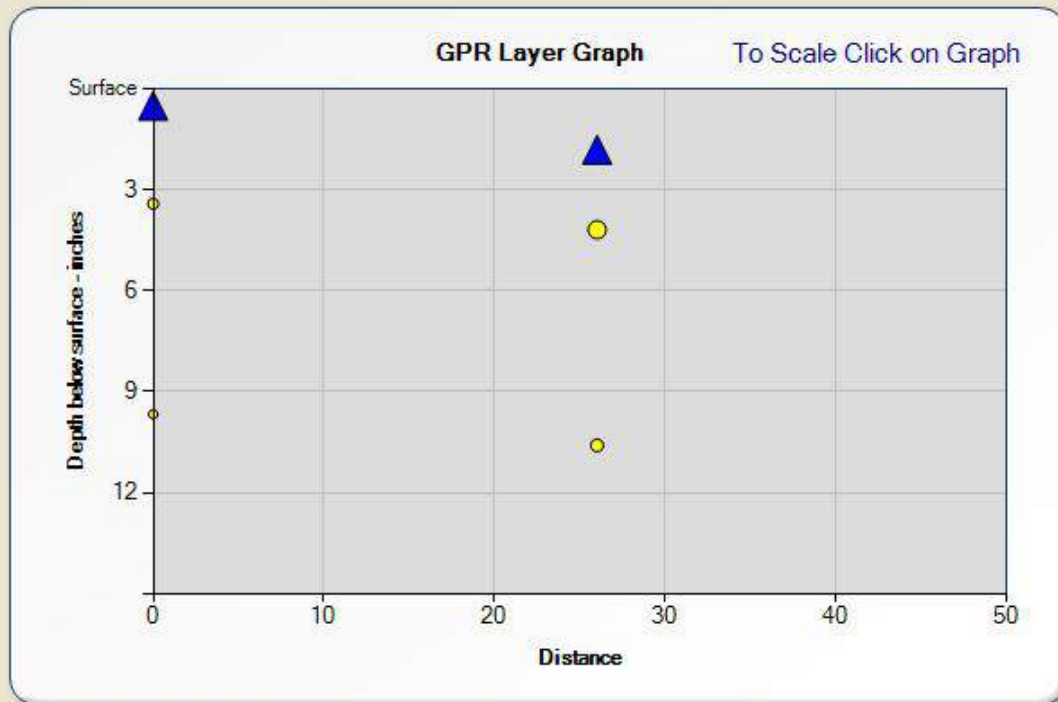
Report a problem

Image

Satellite Overlay

Layer Data Graph

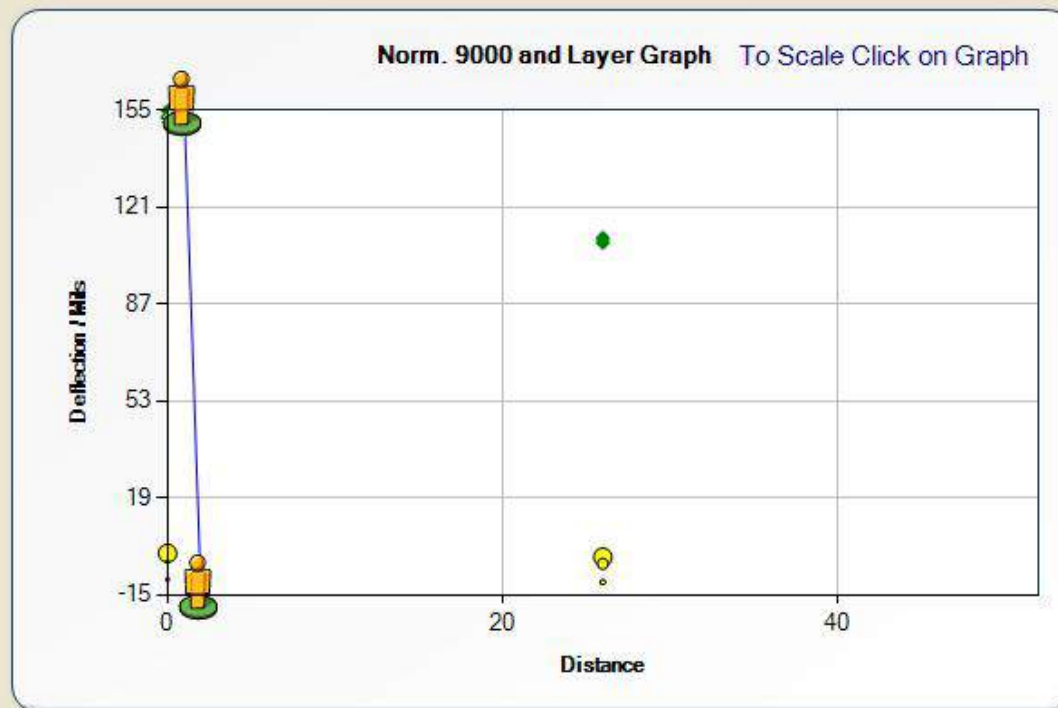
Relative Strength



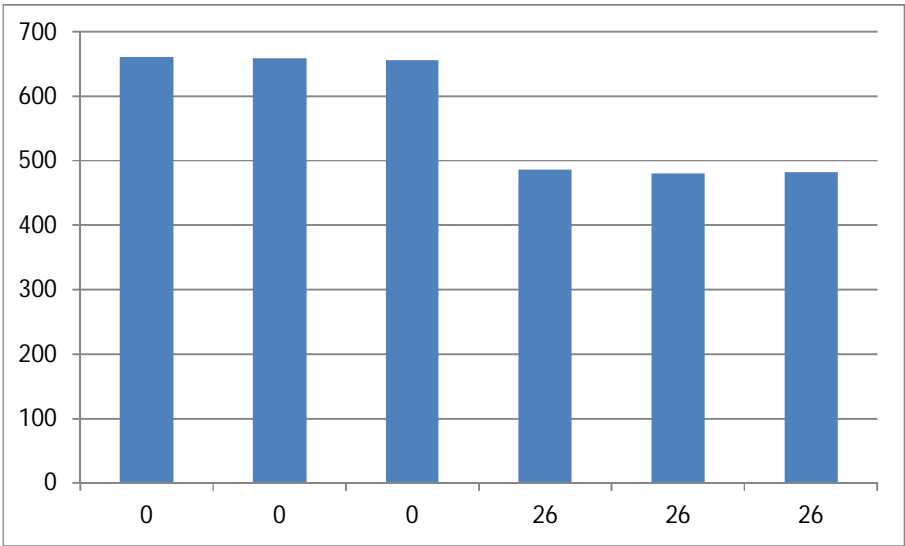
Satellite Overlay

Layer Data Graph

Relative Strength



Deflection Graph



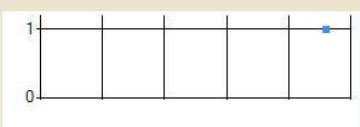
Track 2N

Select Project Folder

MossanCommunity

Select a Measured Surface

WALK2N



High Temp:	Pav	Air	K.P.H.	1.50	Norm 1 mean:	142.20
	52.00	41.80	K.P.D.	12.00	Norm 1 Stdev:	19.23
Average Temp:	Pav	Air	%Dec:	0.00	Number Above Mean:	3
	51.45	41.40			Number Below Mean:	3
Low Temp:	Pav	Air			Section Length:	25.00 Meters
	50.90	41.00				0.03 Kilometers
					Average Interval Distance:	25.00 Meters

File Quality: 9.70

Number of Drops: 6

Operator: Trevor Toholka

Date: 04/02/2012 13:44:26

Satellite Overlay

Layer Data Graph

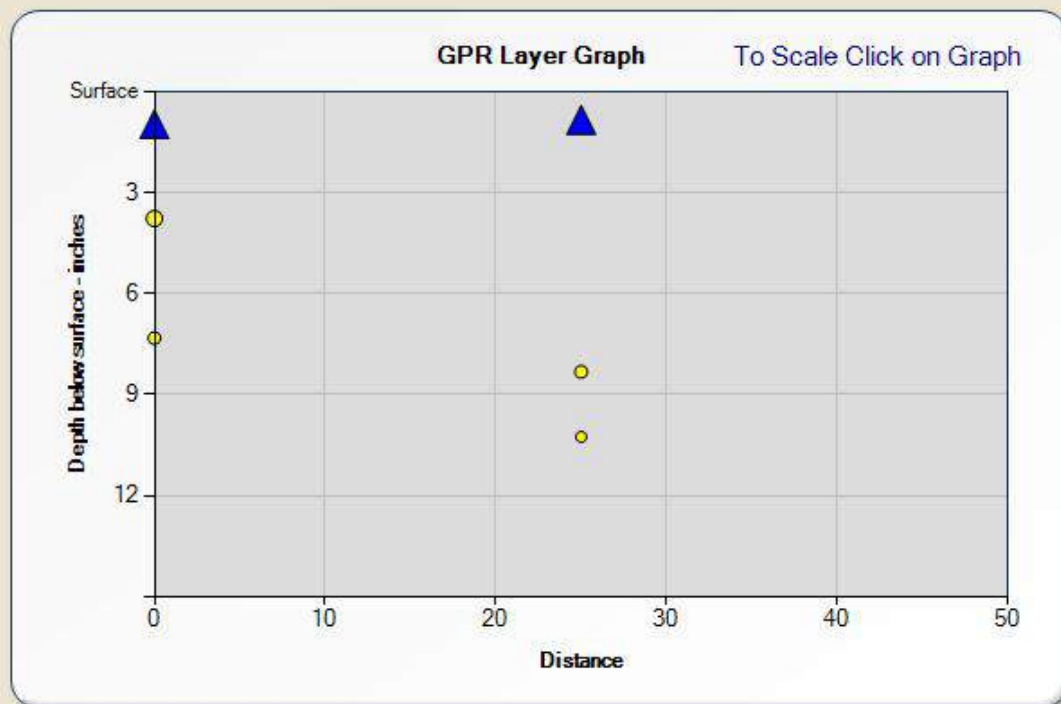
Relative Strength

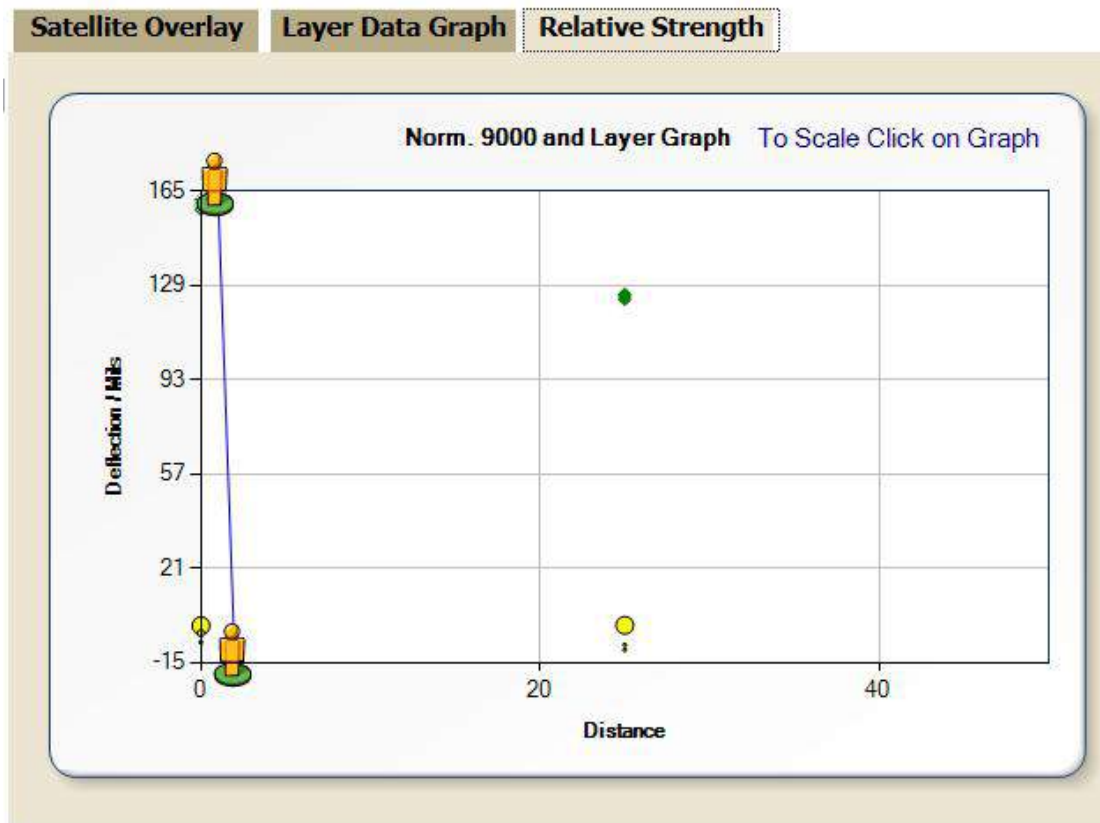


Satellite Overlay

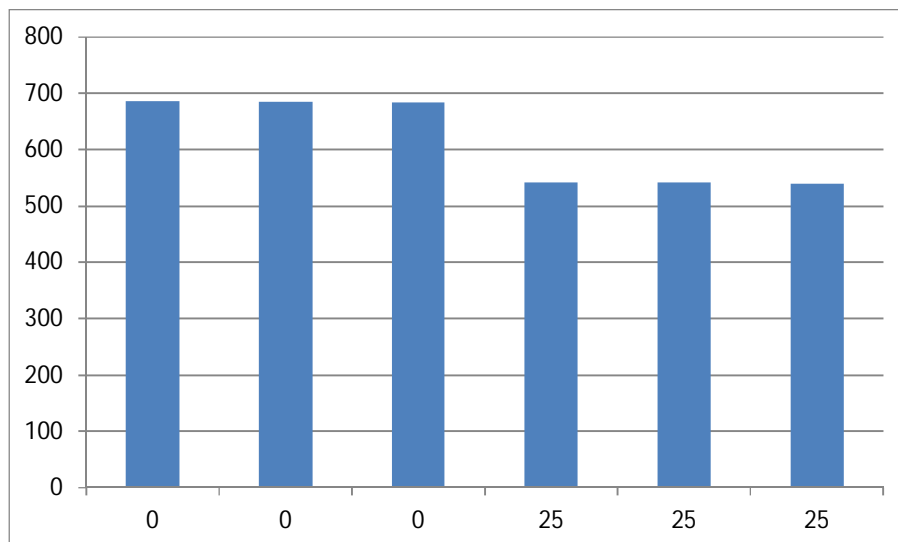
Layer Data Graph

Relative Strength





Deflection Graph





**Trinity Engineering
and Consulting**
design | consult | manage

MOSSMAN GORGE INFRASTRUCTURE UPGRADES

WEED MANAGEMENT PLAN

1. PURPOSE AND SCOPE

The purpose of this Weed Management Plan (**Plan**) is to detail the procedure to be followed to prevent the spread of weeds and pathogens to and from the site by The Contractor's plant (**Plant**).

For the purposes of this Plan, the Mossman Gorge site (**Site**) is defined generally as an area north of Mossman Gorge Road also known as Mossman Gorge Community. This area is generally defined by that shown on Sketches 7019-5 and -6 as enclosed.

The management measures outlined below will be implemented during construction in order to ensure that weeds are managed in areas where works are to be undertaken by The Contractor.

2. MANAGEMENT OF WEEDS DURING CONSTRUCTION

Broadly, The Contractor's scope of works involves the civil works generally, and includes the following:

- Earthworks
- Roadworks
- Concrete works
- Stormwater drainage
- Water reticulation
- Sewer reticulation
- Services conduit
- Street light footings.

The Contractor will typically have Plant that will enter and leave site during the construction phase including the following:

- The Contractor's and locally hired plant including graders, excavators, skid steers, backhoe's, water carts, trucks, rollers, concrete pumps and similar;
- Trucks delivering quarry materials from local quarries and pits;
- Concrete agitator trucks arriving from off site during concrete pour days.

The Contractor will implement on-site management strategies to minimise the spread of weeds to uninfected areas by:

- Controlling access and egress onto the Site;
- Adopting hygiene procedures, including vehicle cleaning.

3. GENERAL WEED MANAGEMENT PROCEDURE

The following methods will be used in order to prevent the spread of weeds and pathogens as a result of The Contractor's construction works.

Weed Management Awareness and Behaviour

- Personnel made aware of risk of spread of weeds (Toolbox Training)
- Provide information to site personnel contractors as to their obligations to prevent the spread of weeds and pathogens.

Control of access

- Restrict movement of vehicles and equipment to the extent possible.
- Set-up a plant inspection and cleaning point.

Plant Inspection & Cleaning Points

- Construct the inspection and cleaning point so as to contain all materials removed as part of any process to clean the Plant: Stabilized Construction Entrance/Exit without the inclusion of the corrugated steel panels.
- Plant is to be inspected and be free of weed and plant material so as to prevent the spread of weeds or pathogens before being taken onto the Site.
- Plant is to be inspected and be free of weeds and plant material so as to prevent the spread of weeds or pathogens prior to it leaving Site:
 - This requirement for inspection applies where plant has come into contact with topsoil materials, and does not apply to plant that has not come in contact with topsoil materials on the Site.

4. PLANT INSPECTION PROCEDURE

For plant that is hired in by The Contractor, the supplier of the plant is to complete a Weed Hygiene Declaration (see attached document) prior to the plant-entering Site. Part of the checklist requires the supplier confirm that the plant is free of weed infestations. This procedure does not apply to itinerate plant or plant that comes and leaves site frequently after the initial inspection to the requirements of the checklist is completed.

The Plant Inspection procedure below is to be followed:

1. Plant to enter inspection area at allocated entry / egress point.
2. A designated inspector is to be positioned at the inspection point. Equally, The Contractor site staff may undertake the inspection.
3. Visual inspections to be conducted to confirm that Plant is free of weedy plant material.
4. Clean Plant as required to ensure Plant is clean of plant and weed material.
5. After inspection of Plant (and if hygiene is not required), complete entry in log sheet (attached) for all The Contractor, or The Contractor subcontractor / supplier plant that enters and leaves site subject to the above-listed provisions.

5. PLANT HYGIENE PROCEDURE

If the Plant Inspection identifies plant or weedy material, the following hygiene procedure will be conducted and implemented at the controlled site entry / egress point:

1. Plant to remain in inspection area.
2. Designated inspector (or other person as directed by The Contractor staff) to determine areas required for treatment.
3. Vehicle operator or inspector to determine method of removal (ie brush off, water wash).
4. Remove any weed or plant materials from the vehicle (to be done by the designated inspector or The Contractor Staff personnel).
5. Complete entry in log sheet (attached) for all The Contractor, or The Contractor subcontractor / supplier Plant that enters and leaves site subject to the above-listed provisions.
6. All Plant exiting the site will be channelled to exit the site through the inspection and cleaning area.

Note:

The inspection and cleaning provisions of this Procedure do not apply to trucks after the initial inspection prior to entering Site, provided the trucks travel only on the internal roads and / or otherwise do not come in contact with topsoil materials.

6. RESPONSIBILITIES

Project Manager;

- Approve this Procedure.
- Update and authorise this Procedure.

Project Foreman;

- Implement this Procedure.
- Monitor performance of the works as measured against this Procedure.
- Supervise all labour and subcontractors in executing the works described.
- Ensure all Log Sheets are completed and signed by the inspector and cleaner of the Plant

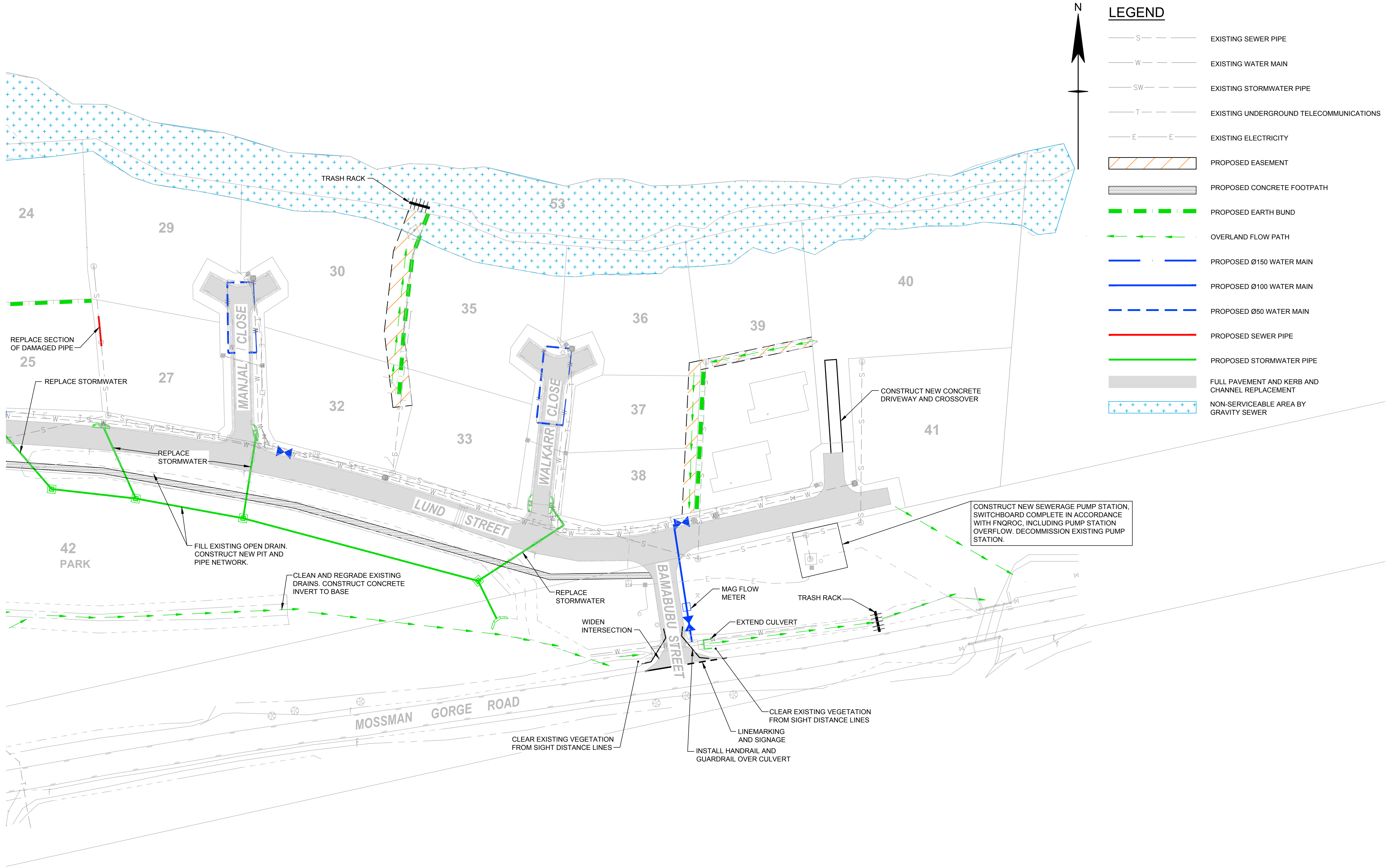
Project Engineer;

- Liaise with The Contractor Project Foreman to ensure all quality control records are maintained and logged.

7. ATTACHMENTS

- Drawing number: 7019-5 and 7019-6





LEGEND

- EXISTING SEWER PIPE
- EXISTING WATER MAIN
- EXISTING STORMWATER PIPE
- EXISTING UNDERGROUND TELECOMMUNICATIONS
- EXISTING ELECTRICITY
- PROPOSED EASEMENT
- PROPOSED CONCRETE FOOTPATH
- PROPOSED EARTH BUND
- OVERLAND FLOW PATH
- PROPOSED Ø150 WATER MAIN
- PROPOSED Ø100 WATER MAIN
- PROPOSED Ø50 WATER MAIN
- PROPOSED SEWER PIPE
- PROPOSED STORMWATER PIPE
- FULL PAVEMENT AND KERB AND CHANNEL REPLACEMENT
- NON-SERVICEABLE AREA BY GRAVITY SEWER

0 5 10 15 20 25m
SCALE 1:500 (A1 SIZE)

PRELIMINARY

External References: 7019-X-SURVEY.dwg ; 7019-X-DESIGN.dwg

Printed: 17 May 2016, 1:35 PM T:\1020 Mossman Gorge\Drawings\7019-SKETCH-006(C).dwg

© Trinity Engineering and Consulting Pty Ltd
This document is and shall remain the property of Trinity Engineering and Consulting Pty Ltd. Unauthorised use of this document in any form whatsoever is prohibited.

Trinity Engineering and Consulting Pty Ltd
Level 1, 10 Grafton Street | PO Box 7963
ABN 78 610 181 130 Cairns QLD 4870
www.trinityengineering.com.au Email admin@trinityengineering.com.au

Client DATSIP				
Project MOSSMAN GORGE INFRASTRUCTURE UPGRADES				
Title INFRASTRUCTURE WORKS REQUIRED BY COUNCIL TO ACHIEVE COMPLIANCE WITH D.A. - SHEET 2 OF 2				
JOB No. 1020	Scale (A3 size) 1:500	Date 17 MAY 2016	Drawing No. SKETCH 7019-6	Revision c



109 Lake Street, Cairns QLD 4870
PO Box 358, Cairns QLD 4870
ergon.com.au

Ergon Energy Work Request: 1251348

26 September 2017

DATSIP
C/- Trinity Engineering
1/10 Grafton Street
CAIRNS QLD 4870

Attn: Scott Christensen

Dear Sir,

OFFER FOR NETWORK CONNECTION SERVICES

SUBDIVISION – MOSSMAN GORGE COMMUNITY – GORGE ROAD, MOSSMAN (Subdivision)

Following your request for an overhead electrical reticulation to the Subdivision, Ergon Energy provides this offer for Network Connection Services to the Subdivision (Offer) for your consideration. Please quote your Ergon Energy Work Request found at the top of this page in all your dealings with Ergon Energy.

The conditions of this Offer are set out in the following documents:

- (i) this Letter;
- (ii) the Summary of Offer Document;
- (iii) the conditions of Offer for Network Connection Services; and
- (iv) Appendix A – Planning, Environment and Cultural Heritage Laws,
- (v) (together referred to as the **Conditions of Connection**).

On acceptance of this Offer, these conditions will constitute our agreement for Network Connection Services (**Our Agreement**).

IMPORTANT: This Offer is made by Ergon Energy using its knowledge of its network in the vicinity of the Subdivision from a desktop perspective (i.e. without a detailed site inspection) and relying on the information provided by you. In addition, a more detailed design prepared after acceptance of this Offer may identify changes to the scope of your Network Connection Works. Please pay particular attention to the condition in the section below entitled '*Rights to Issue a Replacement Offer and Terminate Our Agreement*' which permits Ergon Energy to issue a Replacement Offer (which may include an increased Network Connection Works Price) if new information or circumstances come to light which affect the basis on which this Offer was made.

1.0 Subdivision

Scope of Works

Ergon Energy will undertake the design and construction of the electrical reticulation for your Subdivision utilising the resources at our disposal.

Ergon Energy proposes to erect approximately 910 metres of overhead low voltage three phase conductor and install 26 street lights (**Network Connection Works**).

Ergon Energy will also undertake clearing works on existing road reserve as required to install the new overhead infrastructure within the subdivision.

The costs and supply capacity for each lot are based on an electrical maximum demand of 5kVA at 240/415 Volts; three phase and provides the ability to provide an electricity supply up to these capacities to each lot. The connection of loads greater than this to the lots will require additional costs on a lot by lot, customer by customer basis.

2.0 Financial Considerations

The Project Cost Estimate

As described below under the section entitled 'Rights to Issue a Replacement Offer and Terminate Our Agreement', the electrical reticulation cost for the Subdivision has been estimated from a desktop perspective using information available. The Summary of Offer Document outlines the estimated cost of the electrical reticulation taking into account the known costs and the payment of the Application Fee. The estimated total Developer contribution required from you for provision of the Network Connection Services is the Network Connection Works Price specified in the Summary of Offer Document (**Network Connection Works Price**).

Cost of Network Connection Works	\$176,526.00
Less amount already paid (under WR769605)	\$176,526.00
NETWORK CONNECTION WORKS PRICE	\$0.00

Important note: The Network Connection Works Price is an estimate and Ergon Energy reserves the right to require an increase in the Network Connection Works Price by issuing a Replacement Offer in the circumstances described in the section below entitled 'Rights to issue a Replacement Offer and Terminate Our Agreement'. If you would like more information regarding the Network Connection Works Price, please contact Ergon Energy on the number listed at the bottom of this Offer Letter.

3.0 Offer Expiry

This Offer is valid until 24 October 2017 at which time this Offer will lapse. If the Offer lapses a new application fee will be required to re-instate the project and allow for a revision of costs and conditions. Ergon Energy periodically updates its costs to reflect the current costs of the individual components comprised in the Network Connection Works Price, such as materials and labour. Any subsequent offer made after the lapse of this Offer may, therefore, result in a different Network Connection Works Price.

4.0 How to Proceed

If you wish to proceed with the electrical reticulation for the Subdivision you will need to accept this Offer. To accept this Offer please:

- Sign the attached Summary of Offer Document (in the presence of an adult witness where applicable) retaining the Developer's Copy of the document for your own records; **and**

- Forward, to the postal address shown at the top of this letter, the signed original Summary of Offer Document.

Our Agreement will commence on confirmation that the signed Summary of Offer Document and payment has been received. **The Document must have been received before the Offer expires**, otherwise this Offer will be taken to have lapsed.

On commencement of Our Agreement, the works involved in the electrical reticulation for the Subdivision will be placed in Ergon Energy's programmed works schedule.

Until Our Agreement commences, no arrangements exist for provision of the electrical reticulation, nor should this Offer be taken in any way as an undertaking by Ergon Energy to make an electricity supply available.

5.0 Project Scheduling

On receipt of the second instalment the network connection works will be fixed in Ergon Energy's work schedule.

Assuming Ergon Energy does not encounter any unforeseen circumstances beyond our reasonable control it is anticipated that the network connection works will be completed with supply available to the allotments within 23 weeks of acceptance of this Offer.

Please note that the network connection works will not be fixed in the works schedule until payment of the Network Connection Works Price in full. If the payment is not received within the payments terms of the Tax Invoice your electrical reticulation works will be rescheduled in Ergon Energy's works schedule to the next available time frame. This could add significant delays in the completion of the Subdivision.

6.0 Rights to Issue a Replacement Offer and Terminate Our Agreement

The conditions of this Offer and Our Agreement are based on a concept of the required electrical reticulation which was developed relying on:

- the information you have supplied in the application you lodged with us;
- information available in the public domain in relation to the requirements of local, state and federal governments;
- environmental, cultural heritage and world heritage issues;
- Ergon Energy's knowledge of its network in the vicinity of the Premises from a desktop perspective (i.e. without a detailed site inspection);
- Ergon Energy being granted by property owners, statutory authorities and holders of native title or cultural heritage rights all necessary approvals and easement (**Access Approvals**) by 30 January 2018 (**Consent Obtaining Date**); and
- your Network Connection Works being commenced within 10 months from the date of this Offer and completed within 12 months from the date of this Offer.

If:

- a) the grant of any of the Access Approvals is delayed beyond the Consent Obtaining Date or any of the Access Approvals are refused;

- b) Ergon Energy has not (due to your failure to comply with the conditions of Our Agreement or the required Access Approvals not being granted) either:
 - (i) commenced Your Network Connection Works within 10 months from the date of this Offer; **or**
 - (ii) completed Your Network Connection Works within 12 months from the date of this Offer; **or**
- c) a site inspection or a more detailed design of the required connection works leads Ergon Energy to determine that:
 - (i) the original scope of your Network Connection Works needs to be varied; **or**
 - (ii) the information provided by you to Ergon Energy is found to be incorrect, inaccurate or misleading; **or**
 - (iii) that there are issues beyond the reasonable control of Ergon Energy that require Our Agreement to be replaced, **then,**

Ergon Energy may, at its discretion, issue a Replacement Offer or terminate Our Agreement in accordance with the procedure described in the section below entitled 'Replacement Offer Procedure'.

7.0 Replacement Offer Procedure

Ergon Energy may issue to you a revised Offer (a **Replacement Offer**) if any of the circumstances in paragraphs (a), (b) and (c) of the section entitled 'Rights to Issue a Replacement Offer and Terminate Our Agreement' apply.

Contents of a Replacement Offer

A Replacement Offer must set out the following information in reasonable detail:

- a) the event or circumstance giving rise to the requirement to change;
- b) any proposed change to the Network Connection Works;
- c) the expected delay (if any) in the completion of the Network Connection Works;
- d) any alternative suggestions which may reduce the potential delay in the completion of the Network Connection Works or the cost of the Network Connection Works; **and**
- e) any revision to the Network Connection Works Price.

Your Obligation to notify Ergon Energy

Within ten Business Days of receiving a Replacement Offer, you must notify Ergon Energy whether or not you agree with the matters set out in the Replacement Offer. You may offer alternative suggestions which, if they are acceptable to Ergon Energy (acting reasonably) and are consistent with good electricity industry practice, Ergon Energy may implement by issuing a revised Replacement Offer.

If you accept a Replacement Offer or revised Replacement Offer then Our Agreement will terminate and be replaced by a new agreement formed upon acceptance of the Replacement Offer.

If you reject a Replacement Offer, Our Agreement will terminate automatically and either:

- a) where the event or circumstance which resulted in the issue of a Replacement Offer was beyond reasonable control, Ergon Energy will reimburse or return to you within a reasonable time after rejection of the Replacement Offer all moneys paid or securities provided under Our Agreement, **or**
- b) in all other cases, Ergon Energy may invoice you for:
 - (i) all costs incurred by Ergon Energy in relation to the Network Connection Works up to the date of termination; and
 - (ii) the total of the following estimated or actual costs incurred by Ergon Energy as a result of your failure to proceed with the Network Connection Works.
 - (A) the reasonable costs to recover installed and reusable components of the Network Connection Works that are dedicated to you;
 - (B) the reasonable costs to re-install those reusable components to the Distribution Network, which costs are attributable to the disconnection of the Premises;
 - (C) the reasonable costs to recover and dispose of unusable components of the Network Connection Works that are dedicated to you; **and**
 - (D) the reasonable costs incurred by Ergon Energy to reconfigure the Distribution Network, which costs are attributable to the disconnection of the Premises.
- c) The costs to be reimbursed by you under paragraph (d) include those that are payable by Ergon Energy to third parties, (being those costs payable to third parties arising directly out of the Network Connection Works) after the date of termination, the liability for which was incurred before the date of termination.
- d) Ergon Energy must provide, with the invoice stating the amount payable by you under paragraphs (b) and (c) above, relevant supporting material evidence of the costs incurred by Ergon Energy.
- e) Ergon Energy shall be entitled to deduct from any moneys paid or securities provided by you under our Agreement an amount equivalent to the costs invoiced under paragraph (b).
- f) Any amounts not recovered by Ergon under paragraph (e) shall be payable by You by the date specified in the invoice.

Should you require further assistance or if circumstances require a revision to our Offer, please contact me on telephone (07) 4080 4541 quoting your Ergon Energy Work Request found at the front of this letter.

Yours Sincerely,



NIKITA RITCHIE
CUSTOMER CONNECTION OFFICER

Attachment

1. Acceptance of Offer Document
2. Conditions of Offer – Network Connection Services
3. Schedule Appendix A – Planning and Environmental Laws

ACCEPTANCE OF OFFER DOCUMENT – ORIGINAL COPYIN ACCORDANCE WITH CONDITIONS OUTLINED IN THE LETTER OF OFFER FOR
NETWORK CONNECTION SERVICES**For reticulation of the 45 Lots of the Subdivision described as Mossman Gorge at Gorge Road, Mossman**

Ergon Energy Work Request	1251348
Developer Name	DATSIP
Developer Address	C/- Trinity Engineering 1/10 Grafton Street, Cairns Qld 4870

NETWORK CONNECTION WORKS PRICE \$0.00**Payment on Acceptance \$0.00****Date of Offer - 26 September 2017****Valid until – 30 October 2017**

This Offer must be accepted and all associated documents must be received by Ergon Energy before the validity dates, otherwise the Offer lapses.

Subject to unforeseen circumstances (including the issue of a Replacement Offer as referred to in the Conditions of Connection) and provided that notification of acceptance/securities as outlined/payments due, are received by the validity dates of this Offer Ergon Energy anticipates being able to provide electricity with 23 weeks of acceptance of this Offer.

I/We accept the offer as detailed above and agree to the Conditions of Connection.**SIGNED FOR AND ON BEHALF OF:**

Customer Name/s



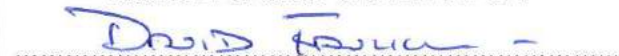
Customer Signature/s

Date: 27/10/17

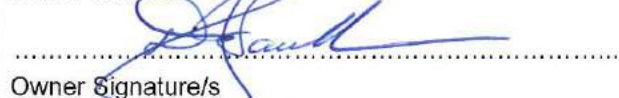


Signature of Witness

Date: 27/10/17

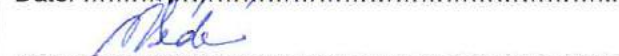
Actual PROPERTY OWNERS CONSENT to provision of this service and agreement to granting of easement/wayleave if required.**SIGNED FOR AND ON BEHALF OF:**

Owner Name/s



Owner Signature/s

Date: 27/10/17



Signature of Witness

Date: 27/10/17

CONDITIONS OF OFFER FOR NETWORK CONNECTION SERVICES

Ergon Energy will facilitate the design, construction, ongoing ownership and maintenance of an electrical reticulation in the Subdivision under the following terms and conditions:

Funds to be Paid

The Developer is required to pay to Ergon Energy the Network Connection Works Price specified in the Summary of Offer Document. This amount includes:

- a) **For Overhead Reticulation**, the actual estimated cost for Ergon Energy to reticulate the Subdivision including streetlighting provisions, using a low voltage overhead reticulation scheme or HV backbone line system;
- b) Inspections, Audits, Testing and Commissioning of the electrical reticulation of the Subdivision;
- c) The additional cost for the erection of Nostalgia streetlighting within the Subdivision, if required and subject to Council approval and indemnity; and
- d) The estimated cost of External/Upstream works outside the Subdivision, i.e. to bring supply to the Subdivision. These costs may include an allowance for planned work to the network by Ergon Energy that has been brought forward to facilitate the connection to the Subdivision.
- e) For Underground URD projects, a calculated amount for transformer equalisation (if applicable). Where the lot will be supplied from a previously installed transformer, the Developer will be required to pay a transformer equalisation payment on a per lot basis for each lot. Where the useable transformer capacity is not utilised in the Subdivision or stage for which this Offer applies, the Developer will be entitled to a transformer equalisation reimbursement on a per lot basis.

Additional Amount

Should the Developer default on any requirement of our Agreement, which causes additional costs to be incurred by Ergon Energy, then Ergon Energy at its discretion may require the Developer to pay the excess amount on demand. Electricity connection to the Subdivision will be withheld until all works have been completed in accordance with Ergon Energy's Civil Works Specifications, the receipt of the Certificate of Completion – Civil Works and all outstanding monies paid.

Ergon Energy's Notification to Local Authority

Upon receipt of written acceptance of this Offer, payment of the Amount Payable on Acceptance and confirmation that the registered owner will provide any required easement(s), Ergon Energy will notify the local government authority by letter that the Developer has satisfied Ergon Energy's requirements for a supply of electricity to the Subdivision.

Works and Undertakings by Developer

The Developer is required to provide and carry out all civil works required to make the Subdivision ready for construction of the electrical reticulation to Ergon Energy's satisfaction. These works and those detailed below will be carried out at the Developer's own costs and in accordance with Ergon Energy's Standard Specifications RSC06, RSC07 and Civil Drawings.

The specifications detail requirements for the supply of materials, trenching, installation of conduits for underground cables, road lighting and padmount transformer foundations in subdivisions. All work covered by the specifications shall be provided by the Developer at no cost to Ergon Energy.

Survey marks required for construction purposes, easements, footpath levels, cable routes etc. and other services relative to the cable route, are the responsibility of the Developer and shall be established and verified by a licensed surveyor.

All work shall be to Ergon Energy's required construction standard and in accordance with the approved construction plans, the specification and the conditions of our Agreement.

The Developer is also responsible for seeking approval for and undertaking the necessary vegetation clearing within the Subdivision and in accepting this Offer, the Developer agrees to indemnify Ergon Energy in respect of all costs, claims, damages and expenses incurred by Ergon Energy as a result of its failure to comply with any law or authorisation relating to the clearing of vegetation at the Subdivision.

Planning, Environmental and Cultural Heritage Laws

The principal planning, environmental and cultural heritage legislation is outlined in Appendix A attached to this letter. In accepting this Offer, the Developer agrees to indemnify Ergon Energy in respect of all costs, claims, damages and expenses incurred by Ergon Energy as a result of its failure to comply with any planning, environmental or cultural heritage law.

Not all clauses within Appendix A may be applicable to the Developer's Subdivision. Owing to the complexity of planning and environmental laws, Ergon Energy strongly recommends that the Developer seeks its own independent legal advice on any planning and environmental laws, which affect the proposed Network Connection Works.

Please be aware that there is a risk that there may be delays in construction of any works because of delays in obtaining the necessary licences, permits and approvals and some licences, permits and approvals may not be able to be obtained at all. Ergon Energy will not be liable for any loss suffered by the Developer as a result of any delays, or any failure to obtain a licence, permit or approval.

Safety Compliance

When carrying out any of the work associated with the electrical installation, contractors must comply with the following:

- *Electrical Safety Act 2002 (Qld)*
- *Electrical Safety Regulation 2002 (Qld)*
- *Workplace Health and Safety Act 1995 (Qld)*
- *Workplace Health and Safety Regulations 1997 (Qld)*

Streetlighting

Streetlighting design and construction is undertaken by Ergon Energy acting as an agent of the local government in fulfilling the local government's obligations to construct, maintain and improve roads.

The design of the lighting for URD subdivision will include public lighting to Australian Standard AS/NZS 1158 – Road Lighting. In addition the following conditions will apply:

- a) A requirement for the local government to take out public liability insurance and professional indemnity insurance as required under section 1123 of the *Local Government Act 1993 (Qld)*; and
- b) And indemnity, on terms satisfactory to Ergon Energy, will be required from the local government, to protect Ergon Energy against third party claims relating to the provision of streetlighting and in particular, to cover any directions by the local government which are inconsistent with AS1158.



Easements

Ergon Energy will require registered easements for any underground cable routes and/or padmount substations installed on land other than road reserve. While a Developer, consultant or engineer etc. may facilitate obtaining easements the **actual registered owner** of the land must consent to or grant the easement to Ergon Energy at no cost to Ergon Energy.

The completed full design of the electrical reticulation will detail the location and size of any required easement. The registered owner or their agent (Developer etc.) is responsible for the easement survey and preparation of the easement survey plan suitable for registration with the Department of Environment and Resource Management. This plan is to be supplied to Ergon Energy to be checked for compliance to requirements.

Ergon Energy's standard conditions for easements across freehold or leasehold land for electricity purposes are registered with the Department of Environment and Resource Management – Dealing numbers 710384571 (Freehold) and 711950329 (Leasehold). It is Ergon Energy's preference to use our standard easement conditions for all required easements. Ergon Energy may, in its absolute discretion, accept or reject any proposed amendments to our standard easement conditions.

Where the land owner seeks to negotiate easement conditions outside Ergon Energy's registered standard easement conditions, a consultation fee will be charged for all time and costs incurred. This fee, if applicable, will be collected in addition to the Network Connection Works Price.

The registered owner or Developer may arrange for the preparation of the easement documents and forward the documents to the Senior Property Administration Officer for execution by Ergon Energy. Alternatively, Ergon Energy's Senior Property Administration Officer will prepare the easement documents for registration and provide them to the registered owner for execution by the registered owner and coordinate lodgement. All costs incurred in effecting registration of such easement(s) (including survey, engrossment, perusal by or on behalf of Ergon Energy, stamp duty, lodgement fees etc.) shall be the responsibility of the registered owner or Developer acting on their behalf. Ergon Energy may levy a fee for this service.

Important note: Final connection and energisation of the electrical reticulation will not occur until all required easement documentation has been received and meets Ergon Energy's requirements.

APPENDIX A

PLANNING ENVIRONMENTAL AND CULTURAL HERITAGE LAWS

Ergon Energy is responsible for obtaining all licences, permits and approvals required under planning and environmental laws, which relate to the construction of any works to be carried out by Ergon Energy. The Developer is responsible for obtaining all licences, permits and approvals required under planning and environmental laws, which relate to the construction of any works to be carried out on behalf of the Developer.

There are a number of different planning and environmental laws which may relate to the proposed connection. The principal legislation is as follows:

1. *Integrated Planning Act 1997* (Qld). The *Integrated Planning Act 1997* (Qld) integrates a great number of approvals and processes under other legislation including, for example, the *Vegetation Management Act 1999*. The 'integrated' Acts may relate to the proposed connection as well.
2. *Environmental Protection Act 1994* (Qld).
3. *Environmental Protection and Biodiversity Conservation Act 1999* (Cth). This Act regulates actions having a significant impact on world heritage, Ramsar wetlands, threatened species and communities, migratory species and many other things.
4. *Aboriginal Cultural Heritage Act 2003* (Qld) and *Torres Strait Islander Cultural Heritage Act 2003* (Qld).

There may be other more specialised pieces of legislation which are issue or geographically specific. They may concern cultural, heritage, marine, water, vegetation, nature conservation, air and occupational health and safety issues.

TECHNICAL SPECIFICATIONS

The following Specifications are included in the Contract:

1. Douglas Shire Council Specific Requirements – FNQROC Development Manual – 03 14
2. FNQROC Development Manual

No	Revision	Title
<i>S1</i>	<i>03/14</i>	<i>Earthworks</i>
<i>S2</i>	<i>01/11</i>	<i>Road Pavements</i>
<i>S4</i>	<i>03/14</i>	<i>Stormwater Drainage</i>
<i>S5</i>	<i>01/09</i>	<i>Water Reticulation</i>
<i>S6</i>	<i>03/14</i>	<i>Sewerage Reticulation</i>
<i>S7</i>	<i>01/11</i>	<i>Concrete Works</i>

3. Water Meter Specification

Specifications are attached in **Appendix D**.

SEWERAGE PUMP STATION SPECIFICATION

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

The Mossman Gorge Sewage Pump Station shall be in accordance with FNQROC requirements and subject to the specific requirements of Douglas Shire Council (DSC). Council should be consulted prior to design to confirm the specific requirements for pumps, electrical requirements, switchboards, telemetry, lighting etc. Council has nominated Welcon Technologies as their current supplier of pump station switchboards and scada telemetry.

The design must be prepared and certified by the Contractor nominated sub-contractor, and submitted to the Superintendent for Council approval prior to the commencement of any pump station related works.

Council's acceptance of the pump station design does not relieve the Contractor of responsibility for the correctness of the design.

The Pump station control panel shall incorporate SCADA equipment for transmission of monitoring data and control to Councils existing master system. Council should be contacted to obtain a copy of their technical specifications for telemetry systems.

1.2 Drawings

Before commencing manufacture, the Contractor shall prepare & submit the following drawings and information:

- Switchboard construction and mounting details, fully dimensioned showing materials of construction and finishes
- Power and control schematics for switchboard
- Telemetry system configuration and wiring diagrams
- Equipment general arrangement and operator interface layout
- Description of operation and details of equipment offered

1.3 OPERATING AND MAINTENANCE MANUAL

On the satisfactory commissioning of the project the contractor shall supply three (3) sets of adequately bound operating and maintenance instructions for the switchboards. A digital copy of this documentation should also be provided on CD or DVD. The instructions shall include periodic, inspections, tests and maintenance procedures required on the equipment. The manual shall also list procedures for untrained staff to determine the possible area of fault should the equipment fail. The manual shall also list the equipment installed with manufacturers catalogue number and supplier's names. A list of recommended spare parts shall be included.

2.0 ELECTRICAL INSTALLATION

2.1 General

All of the electrical equipment associated with the pumping equipment shall be supplied and installed.

The Contractor shall prepare drawings in a CAD format complete with sufficient detail for installation and future maintenance.

The electrical equipment, wiring and connections shall comply with relevant standards and be to the supply authority and DSC's satisfaction.

2.2 Electricity Supply

Power supply cables shall be run from the pillar box supplied by Ergon and into the switchboard. Liaise with the Ergon Energy and DSC for details of electrical supply and cable entries into the switchboard.

Supply and install surge protection on incoming mains cable to the manufacturer's instructions.

2.3 KWH Metering

Make provisions in the switchboard for KWH metering as required by the supply authority.

The KWH meters shall be installed in a separate compartment forming part of the switchboard. The door to the KWH meters shall not allow access to the remainder of the switchboard.

2.4 Control Panel

The control panel for the pumping station shall be designed and constructed to provide a robust and durable unit. The cubicle shall be subjected to extreme and harsh climatic conditions. It shall be required to withstand the effects of heat, humidity, torrential rain and gale force winds. Ignorance of site conditions will not be accepted as justification for subsequent failure of equipment.

The control panel shall comprise three (3) compartments, one to contain the Supply Authority kWh meters, one to contain the Telemetry Equipment and the other to contain the motor switchgear, controls and alarms. It shall be suitably ventilated and fully screened against the entry of insects. It shall be mounted on a concrete switchboard plinth.

The control panel shall be provided with hinged weather-proof blank doors with all doors and escutcheon panels hinged. Doors and hinged escutcheons shall be fitted with fixing bars to provide effective support when opened 90 (minimum). Resilient door gasket shall make continuous contact around door openings. It shall be fitted to doors only and retained by means of metal framing and shall not be installed in a stressed condition. The control panel shall be fitted with a brass tumbler type lock (L and F numbered to suit Council's key system). Two (2) keys shall be provided for this lock. The kWh meters cabinet shall be to the approval of the Supply Authority. The control panel shall be of adequate dimensions to accommodate the equipment. The equipment shall be arranged in a neat and compact layout and shall be surface mounted.

The control panel shall be provided with a drawing holder, screw attached to the internal surface of the cubicle door.

The control panel shall be arranged for bottom entry of cables and shall be completed with gland plates and glands.

The control panel shall be fabricated from 3.0mm minimum thickness "Marine" grade aluminium free from dents, scale and other blemishes and shall be of welded construction with all corners and seams continuously welded and ground. Additional aluminium stiffening and support members shall be provided where necessary to support heavy equipment and to ensure overall rigidity of the cubicle. All external joints shall be fully welded.

The control panel shall be constructed to meet the protection requirements of AS1939.

On completion of fabrication of aluminium cubicles, the outer surfaces only shall be polyester powder coated to Council's requirements.

Ventilation louvres protected by stainless steel gauze shall be fitted to the side panels of the cubicles. Sufficient ventilation openings shall be provided at high and low levels that maintain temperature rises within the operating range of the installed equipment.

Equipment shall be arranged on the control panels to prevent inadvertent personal contact with live parts during normal operation of switches, changing of fuses, resetting of relays or like operations. Fuses, switches etc., shall be mounted clear of all exposed live parts. Resetting of relays shall be by external push button. All exposed live terminals and equipment shall be shielded.

Instruments, controls etc., shall be flush mounted on the front of each control panel. The arrangement shall provide for a complete dead front.

All equipment within the control panel shall be grouped in a logical order and shall have their functions clearly labelled. Labels of engraved traffolyte shall be securely attached to the front of the control panel by means of glue and screws.

2.5 Control Panel Equipment

An isolating main switch of the moulded case construction type shall be installed and mounted such that they may be operated from the front of the control panel once the weatherproof door is opened.

The pump motors shall be protected by a circuit breaker whose tripping current shall be matched to the motor size. This shall also act as a motor isolator.

All final sub-circuits shall be protected by circuit breakers.

All circuit breakers shall be of the moulded type having thermal and instantaneous magnetic trips.

Within the control panel a flush mounted 15-amp combination GPO and switch shall be installed. The GPO shall be protected by a single-phase residual current device (RCD) of 30 milliamp current sensitivity.

Space for Telemetry equipment shall be provided in all cubicles

2.6 MOTOR CONTROLS

All motor controls shall be so arranged that in case of a power failure all units shall be capable of automatic restart once power has been restored.

Contactors shall be rated to suit the full load current of the motor.

Contactors shall be for utilisation category AC-3 intermittent duty Class 0.1 and shall be of moulded block type construction incorporating double break contacts with arcing enclosure. Coils shall be continuously rated.

Each motor shall be provided with a suitably rated circuit breaker isolating switch of the moulded case construction type. The CB shall be flush mounted on the front of the board.

A three (3) position selector switch for each motor with its position labelled:

- 'AUTO - OFF - MANUAL'
- On 'AUTO' the motor shall operate as determined by automatic and remote controls as described below.
- On 'OFF' the entire control circuit shall become inoperative.
- On 'MANUAL' the motor shall run.

Each pump control circuit shall be energised via its own independent CB, rated to suit.

Pumps shall be controlled by a level sensing electrode or floats mounted in the sewage well.

The pumps shall be controlled at these operating levels

- Lowest - Both pumps stop
- Next level Start duty pump
- Next level Start the standby pump
- Next level Bring on the local alarm
- Highest Level Initiate the remote alarm

Supply and install all relays and cabling to operate with the level controls described.

2.7 STANDBY EMERGENCY GENERATOR

The switchboard shall have provision for connection of a standby generator to supply power to the station. Connection shall be by Clipsal inlet socket of adequate rating to suit the motors installed.

The source of supply shall be by a change-over switch accessible from the front of the board when the weatherproof door is open. The switch shall be labelled, "Mains-Off-Generator"

2.8 MOTOR PROTECTION

Over temperature protection shall be fitted to all pump motors.

The control unit shall be suitable for direct connection to supply. Manual resetting of this protection device shall be provided from the front of the control panel.

Motor Visual Indicators and Instruments

Each pump motor starter shall be fitted with the following:

- a) Hour run meter of the cyclometer type reading five (5) digits plus tenths to register cumulative operating hours.
- b) Indicating lights:
 - One (1) 'WHITE' - Motor available
 - One (1) 'GREEN' - Motor operating
 - One (1) 'AMBER' - One for each protection device

Indicating lights for each motor shall be grouped together and located adjacent to the respective motor controls.

Indicating lights shall be suitable for 24 Volts a.c. with a minimum MTBF of 30,000 hours. They shall be of a type where the lamp may be easily replaced from the front of the board. The condition of an indicating light shall be clearly visible under normal lighting conditions. Bezels shall be approx. 25mm across and flush or nearly flush mounted.

Testing of all lights shall be provided via a single push button switch mounted at the front of the board.

2.10 CABLES - WIRING - CONDUIT

All power cables in the switch/control board shall be 660 Volt Grade V75, PVC insulated. All control and protection wiring between motors and the control panel shall be 250 Volt Grade V75 PVC insulated and sheathed cables. Control, protection and indication wiring within the boards shall be minimum 32/0.2. Power wiring minimum 2.5mm² multistrand copper cables.

Wiring within the board shall be rigid and easily traceable and fitted with white number ferrules at each termination.

Where wiring is placed across door hinges, this shall be securely fixed on either side of the hinges and formed into a loop such that no strain is placed on the wiring when the door is opened.

All external control and alarm wiring shall be connected to the equipment via a separate terminal strip within the switch/control board. Wiring on both sides of the terminal strip shall be numbered. LV and ELV terminal strips shall be clearly segregated.

Earthing shall be installed at the control panel in accordance with the appropriate standards.

3.0 TELEMETRY SYSTEM

3.1 HARDWARE

Hardware construction for each site shall comprise of a passive 4 slot backplane with plug-in telemetry modules to meet individual site input/output requirements.

Install a modular processor card on the backplane which supports a minimum of 10 communication ports, high speed I/O scanning up to 80 times/second, self-configuration and PID and ladder logic control. The processor shall include an event and time-based data logging feature.

Communication ports shall be able to support multiple protocols without the need for any software or hardware adjustments.

The radio module shall be suitable for operation in the 450 to 470MHz UHF telemetry band and is to be synthesised type data radio suitable for 12.5 KHz and 25KHz operating bandwidths. The radio module is to be designed for low power consumption while providing an output transmitting power of 1 to 5 watts. Radios are to be PC programmable for frequency and output power.

Input and output modules shall comprise of dedicated I/O type module consisting of analog inputs, analog outputs, digital inputs and digital outputs as well as multi I/O types which will provide for a mix of I/O types on one module. All I/O modules shall comprise of a removable wiring termination unit, LED display and shall offer 3000 volts isolation for all I/O channels.

3.2 CONTROL CAPABILITY

All processor modules shall incorporate full PLC capability including multiple timers. Boolean and sequential logic, PID control, mathematical and analog scaling capability. Communications pooling and reporting is to also be provided from the logic processing and configured in a standard ladder logic style to allow for modification on-site by technical personnel.

Interlock control between remote sites shall be supported from the ladder logic program.

3.3 LOGGING CAPABILITY

All processor modules are required to support event and time-based data logging. To allow for efficient use of the RAM memory, an easy method of partitioning of the memory shall be provided. Partitioning shall allow for the allocation of more or less memory capacity for logging or control capability.

Logged data shall be able to be uploaded over the radio system or remotely using a modem.

3.4 COMMUNICATIONS

All telemetry units offered shall support radio, leased line, PSTN, microwave and truck mobile radio communications media. Multiple media types shall be able to be supported at any site up to a maximum of 10 communications channels.

All communication ports are to have built-in continuous diagnostics capability which will provide the following information:

- Total number of communications XXX
- Total number of successful communications YYY
- Total number of unsuccessful communications ZZZ

The success rate shall be able to be alarmed to provide a system warning of an increase in communication fails.

3.5 PROGRAMMING SOFTWARE

The programming software shall be WINDOWS based and allow for diagnostics and reconfiguration via direct to the RTU or RTU to RTU over the network or from a remote location using a modem to connect to the system.

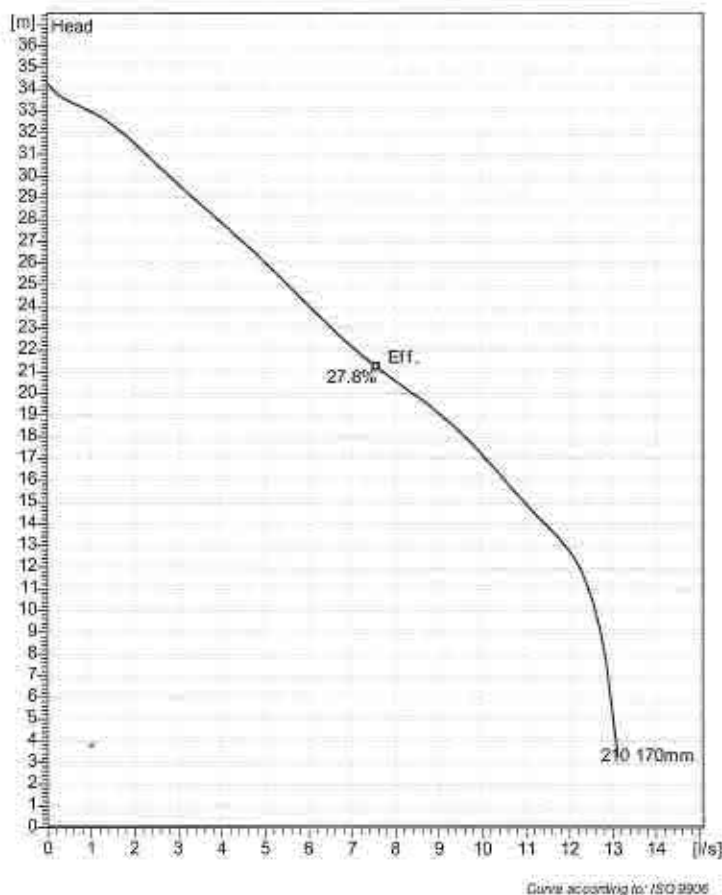
New configurations shall be able to be downloaded using any of the connection modes mentioned above.

The ladder logic control program is required to operate in 'live display' mode to allow debugging during commissioning and testing.

Firmware downloads should also be supported by the programming software package allowing system upgrades to be performed without any hardware modifications.

MP 3127 LT 3~ 210

Technical specification



Note: Picture might not correspond to the current configuration.

General

Semi-open multi-channel impellers with integral grinder cutter in single volute casing for liquids containing solids and fibres.

Impeller

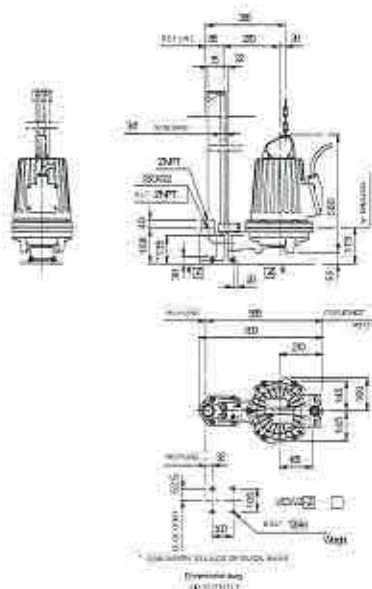
Impeller material	Grey cast iron
Outlet width	50 mm
Inlet diameter	65 mm
Impeller diameter	170 mm
Number of blades	6

Motor

Motor #	M3127.170 21-11-2AL-W 7.4KW
Stator variant	
Frequency	50 Hz
Rated voltage	415 V
Number of poles	2
Phases	3~
Rated power	7.4 kW
Rated current	13 A
Starting current	98 A
Rated speed	2895 rpm
Power factor	
1/1 Load	0.92
3/4 Load	0.90
1/2 Load	0.86
Efficiency	
1/1 Load	83.5 %
3/4 Load	84.5 %
1/2 Load	83.5 %

Configuration

Installation: P - Semi permanent, Wet



Project	Project ID	Created by	Created on	Last update
			2012-10-25	

MP 3127 LT 3~ 210

Performance curve



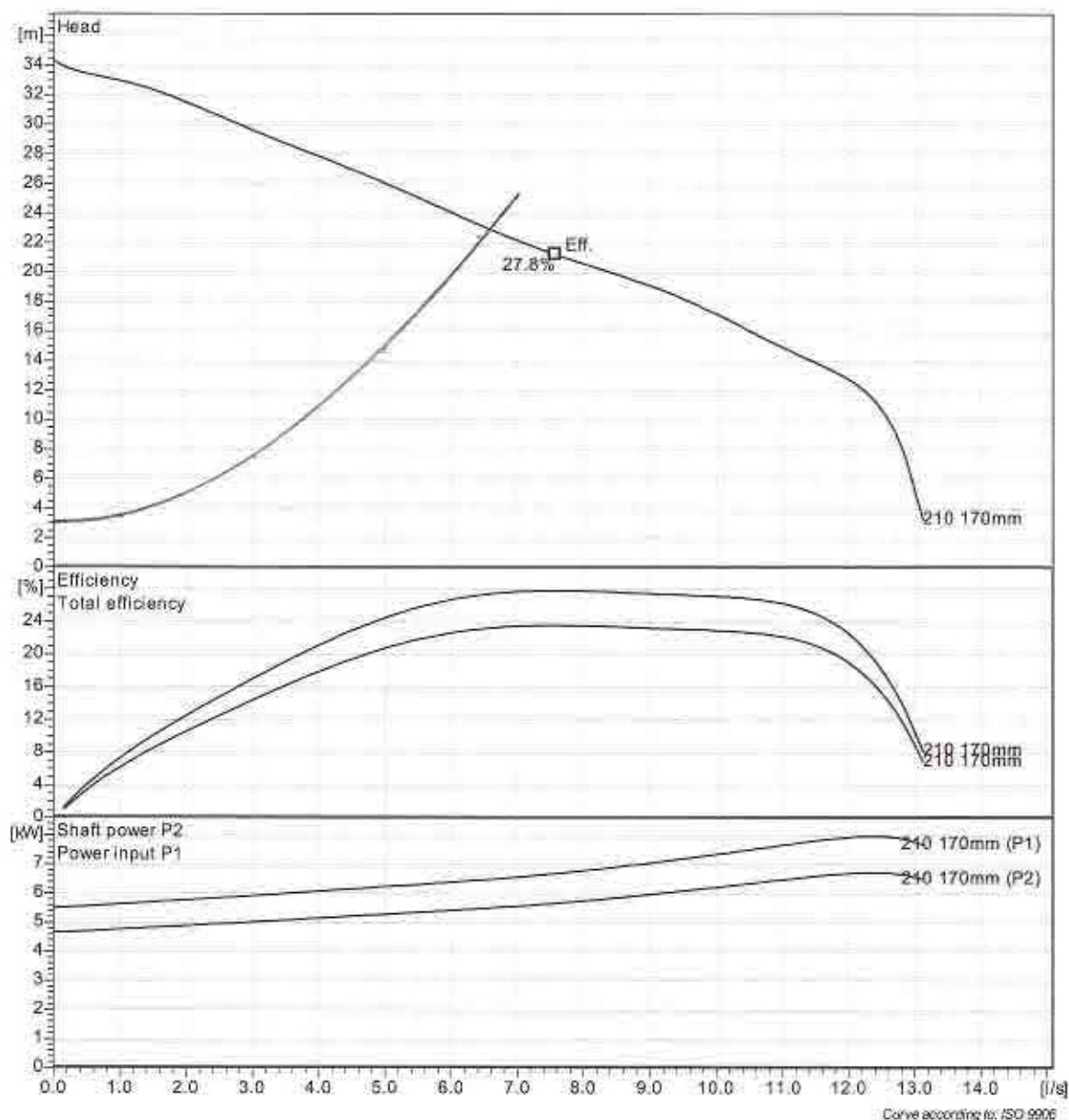
Pump

Outlet width	50 mm
Inlet diameter	85 mm
Impeller diameter	170 mm
Number of blades	6

Motor

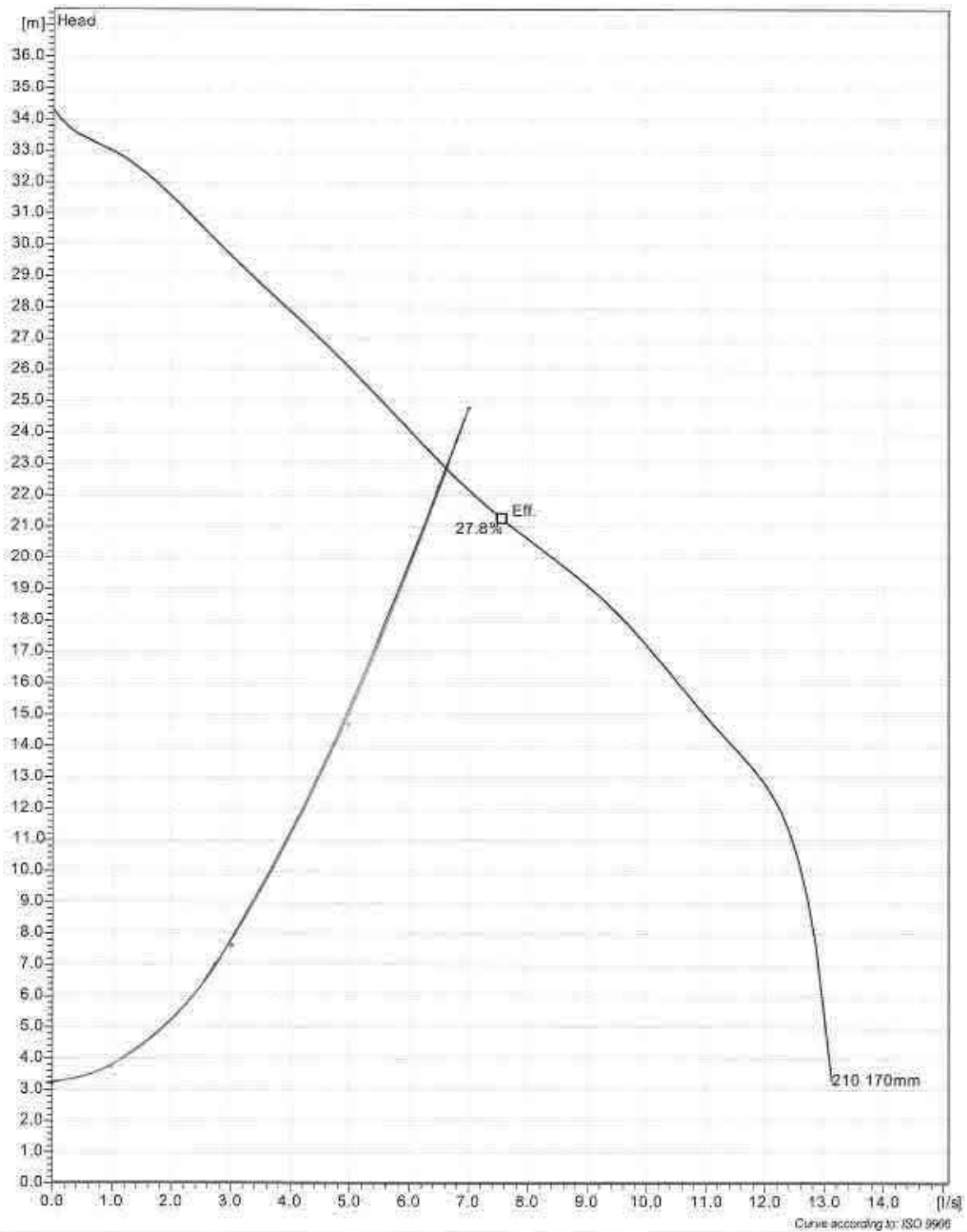
Motor #	M3127.170.21-11-2AL-W 7,4KW
Stator variant	
Frequency	50 Hz
Rated voltage	415 V
Number of poles	2
Phases	3~
Rated power	7.4 kW
Rated current	13 A
Starting current	98 A
Rated speed	2895 rpm

Power factor	
1/1 Load	0.92
3/4 Load	0.90
1/2 Load	0.86
Efficiency	
1/1 Load	83.5 %
3/4 Load	84.5 %
1/2 Load	83.5 %



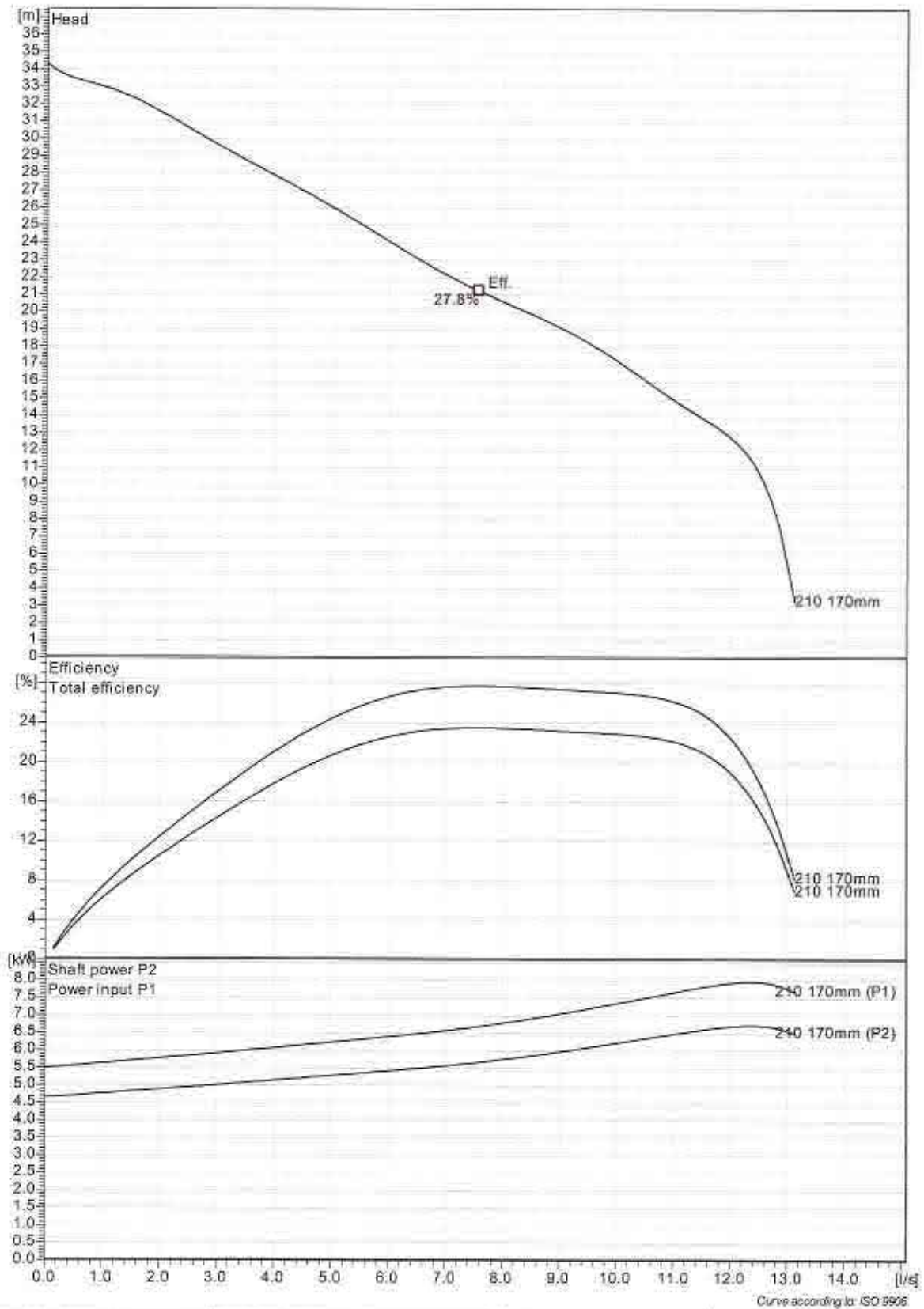
Project	Project ID	Created by	Created on	Last update
			2012-10-25	

MP 3127 LT 3~ 210
Duty Analysis



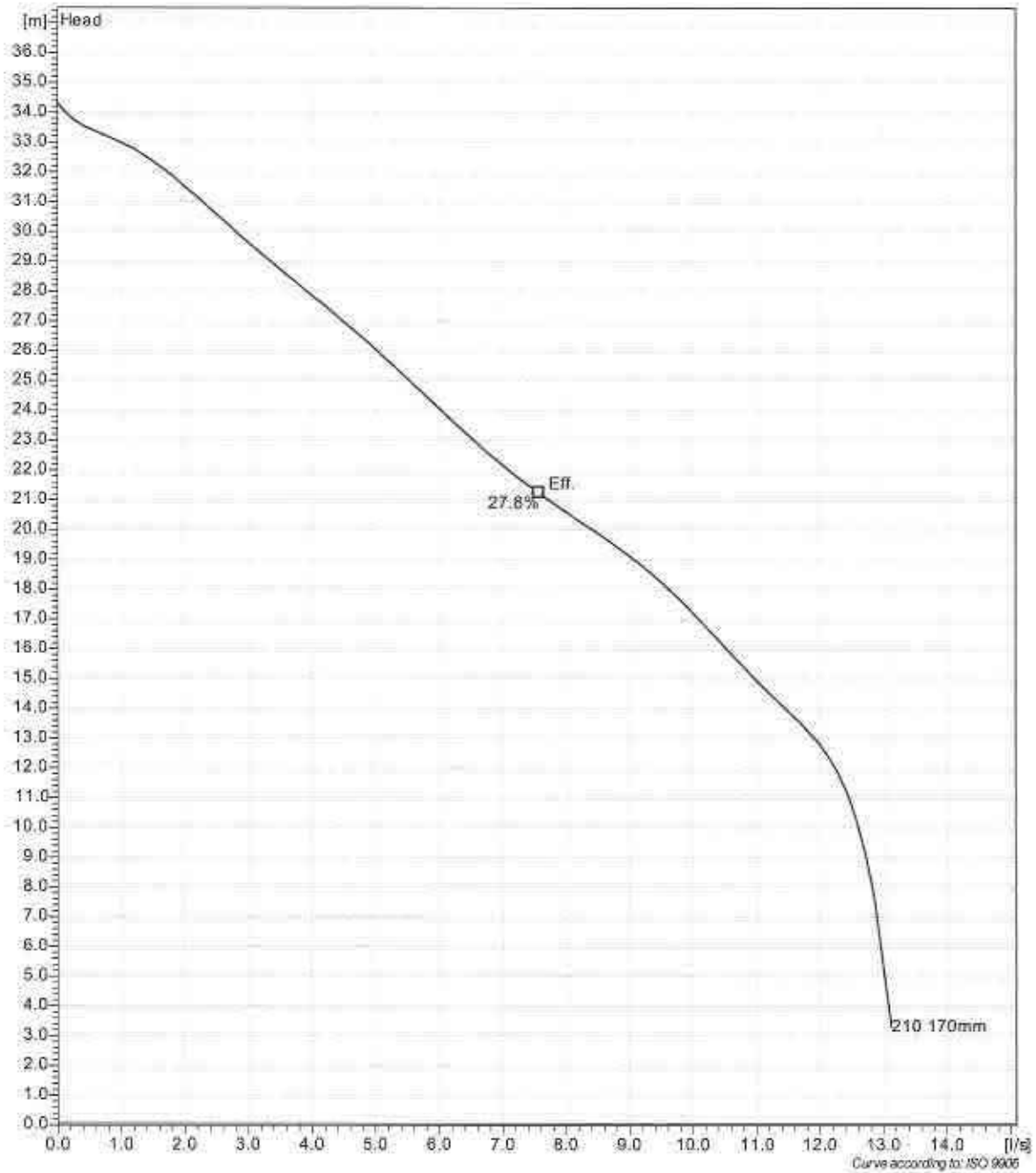
Project	Project ID	Created by	Created on 2012-10-25	Last update
---------	------------	------------	--------------------------	-------------

MP 3127 LT 3~ 210
VFD Curve



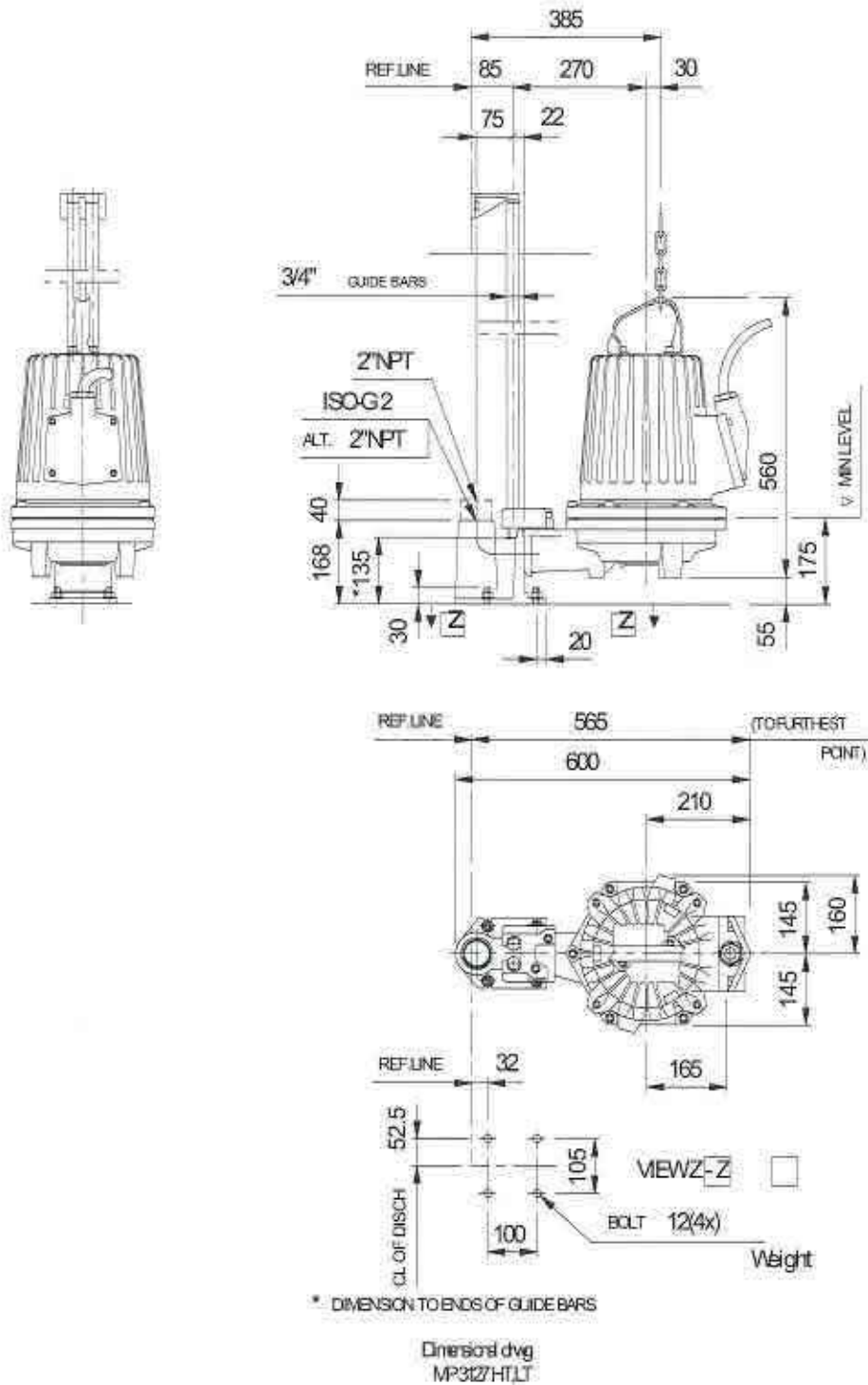
Project	Project ID	Created by	Created on	Last update
			2012-10-25	

MP 3127 LT 3~ 210
VFD Analysis



Project	Project ID	Created by	Created on	Last update
			2012-10-25	

MP 3127 LT 3~ 210
Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2012-10-25	

APPENDIX A

Project Drawings

APPENDIX D

Technical Specifications

LOCAL AUTHORITY SPECIFIC REQUIREMENTS

INTRODUCTION

This Section contains variations and additions to the Operational Works Guidelines, which are considered necessary for the effective application of the Guidelines in Douglas Shire Council and shall be treated as amendments to the Guidelines.

CONTENTS

The following sections have varied or additional clauses

CLAUSE	CONTENTS	PAGE
CONSTRUCTION PROCEDURES.....		1
APPENDIX P – 4. DRAFTING REQUIREMENTS (“AS CONSTRUCTED”).....		1
DESIGN GUIDELINE – D1 ROAD GEOMETRY		2
D1.22 SIGNS AND ROAD MARKINGS		2
DESIGN GUIDELINE - D3 ROAD PAVEMENTS		2
D3.14 ASPHALTIC CONCRETE		2
DESIGN GUIDELINE - D6 WATER RETICULATION		2
D6.17 TELEMETRY SYSTEMS		2
DESIGN GUIDELINE - D7 SEWERAGE		2
D7.13 PROPERTY CONNECTION		2
D7.25 TELEMETRY SYSTEMS		2
SPECIFICATION – S6 – SEWERAGE RETICULATION.....		3
S6.03 PIPES GENERAL		3
S6.21 MANHOLES.....		3
S6.23 PUMP STATIONS		3
DOUGLAS COUNCIL STANDARD DRAWINGS		3

APPENDIX A	DELETED
APPENDIX B	FIELD OUTSTATION RTU REQUIREMENTS
APPENDIX C	ASPHALT SPECIFICATION “CRC 10”

CONSTRUCTION PROCEDURES**APPENDIX P – 4. DRAFTING REQUIREMENTS (“AS CONSTRUCTED”)****SUBSTITUTE CLAUSE**

1. Area Prefix numbers are listed in the Table below: The “Sewer Main Number” and “Manhole Numbers” are to be as designated on the relevant design drawings.

SUBURB NAME	ALPHA CODE	SUBURB NAME	ALPHA CODE	SUBURB NAME	ALPHA CODE
Bloomfield	BI	Forest Creek	FC	Port Douglas	PD
Bonnie Doon	BD	Group Titles	GT	Rocky Point	RP
Cape Tribulation	CT	Killaloe	KL	Rural	RR
Cassowary	CA	Kimberley	KM	Shannonvale	SH
Cooya Beach	CY	Low Isles	LI	Spurgeon	SP
Cow Bay	CO	Lower Daintree	LD	Stewart Ck Valley	SC
Craiglie	CR	Miallo	MI	Syndicate	SY
Daintree	DN	Mossman	MO	Thornton Beach	TH
Dedin	DD	Mossman Gorge	MG	Upper Daintree	UD
Degarra	DG	Mowbray	MY	Wangetti	WA
Diwan	DI	Newell	NE	Wonga	WG
Ellis Beach	EB	Noah	NO	Whyanbeel	WY
Finlay Vale	FV	Oak Beach	OB	Woolanmaroo	WM

DESIGN GUIDELINE – D1 ROAD GEOMETRY

D1.22 SIGNS AND ROAD MARKINGS

SUBSTITUTE CLAUSE

Street signs installed within Douglas Shire Council are to be in accordance with CRC specific standard drawing S1040 – CRC.

DESIGN GUIDELINE - D3 ROAD PAVEMENTS

D3.14 ASPHALTIC CONCRETE

SUBSTITUTE CLAUSE

4. For all asphalt surfacing within Douglas Shire Council Local Authority, up to 30mm thickness, the asphalt grading defined as “CRC 10” shall be used. Refer to Appendix C for details

DESIGN GUIDELINE - D6 WATER RETICULATION

D6.17 TELEMETRY SYSTEMS

ADDITIONAL CLAUSE

2. SCADA telemetry for field outstations shall be in accordance with Council’s Field Outstation RTU Requirements. Refer **Appendix B** at the end of this section.

DESIGN GUIDELINE - D7 SEWERAGE

D7.13 PROPERTY CONNECTION

SUBSTITUTE CLAUSE

1. All House Connection Branches (HCB’s) constructed within Douglas Shire Council shall be constructed in accordance with CRC standard drawing S3005 – CRC.

D7.25 TELEMETRY SYSTEMS

ADDITIONAL CLAUSE

2. SCADA telemetry for field outstations shall be in accordance with Council’s Field Outstation RTU Requirements. Refer **Appendix B** at the end of this section.

SPECIFICATION – S6 – SEWERAGE RETICULATION

S6.03 PIPES GENERAL

1. Alternative pipe material are permitted when registered on the Douglas Shire Councils Approved product list and installed to Manufactures Requirements and by a suitably qualified installer so as not to compromise product warranty.

S6.21 MANHOLES

1. Precast Manholes are not permitted without approval from council.
2. Alternative Manhole configuration to Drawing **S3000** are permitted when registered on the Douglas Shire Councils Approved Product list and installed to Manufactures Requirement and by a suitably qualified installer so as not to compromise product warranty.

S6.23 PUMP STATIONS

1. Alternative Sewerage Pump Station – Cast In Situ configurations to Drawing **S3000** are permitted when registered on the Douglas Shire Councils Approved Product list and installed to Manufactures Requirement and by a suitably qualified installer so as not to compromise product warranty and RPEQ signed design drawings approved by Council.

DOUGLAS COUNCIL STANDARD DRAWINGS

1. The following additional Standard Drawings, shall be deemed to be applicable for those works that shall ultimately become Douglas Shire Council's responsibility for ongoing maintenance:

Nil

APPENDIX A

DELETED

APPENDIX B

FIELD OUTSTATION RTU REQUIREMENTS

Field Outstations

Douglas Shire council require that all the following characteristics are fully supported in tendered field RTU's.

Time stamping. Time stamped logging of all events both for non-critical events and change of state.

Background polling. Background polling requests data logged in the RTU since the last poll, and updates the HMI historical database. For efficient operation the background polls occur at suitably long intervals, ensuring that a suitable "window" exists for any report-by-exception communications from the field RTU to occur. This ensures that the site is still communicating and that any important trends are accumulated by the Supervisory system and are available for viewing on the SCADA system.

Report by exception. In the event of an alarm or other abnormal condition, the RTU is able to notify the SCADA system of the condition, and the Supervisory system is able to immediately request all logged data since the last poll. This allows any trend leading up to the alarm or abnormal condition to be analyzed by the system or operators.

Intelligent device. The RTU must be able to support both internal data logging and complex mathematical and control functionality. This ability allows raw data to be processed in the field. With considered implementation the data retrieval can be maximized while minimizing the use of the communications bandwidth.

Open Standards protocol. Support of Open Standards for both communications protocol and the RTU programming language. The RTU must be able to communicate with the SCADA using the DNP 3 protocol.

Remote programming. The RTU must be able to be configured, programmed and reset remotely via the telemetry radio network.

Field Outstation Inputs & Outputs

Analogue Inputs

All analogue inputs must be calibrated to provide loop fail detection. They are to be 4 to 20mA signals and must be calibrated from 3.5mA to 20.5mA for loop or device failure detection.

Analogue Outputs

All analogue outputs must be able to provide 4 to 20mA signals into an 850 ohm load and must be calibrated from 3.5mA to 20.5mA for loop or device failure detection.

DC power supply

A 24VDC supply must be included in the RTU for use with the inputs and outputs so that any devices providing / receiving the 4 to 20mA signals can be powered from the DC supply via these signals.

Digital Inputs

Input signals must be from voltage-free contacts. The RTU is to supply the switching voltage. The state (on/off) of each input must be displayed on a light emitting diode to allow for on site interrogation without the need for panel lights.

Digital Outputs

Outputs are to be voltage-free contacts rated at 0.5A at 24VDC or 32VAC. The state (on/off) of each output must be displayed on a light emitting diode to allow for on site interrogation without the need for panel lights.

Field Outstation Data

The Field Outstation equipment must be able to provide any combination of water and wastewater control functions and monitoring. The speed with which a new sewerage or water station can be added to the system by an end user will be important selection criteria. RTU's, that require specialized integration, will not be considered. In order to evaluate the likely time required for configuration of a new water or wastewater pumping station into the "SCADA System", details are given below of the minimum Station I/O, Derived Data, Control Function and Statistical Functions.

Wastewater Pump station RTU I/O Requirements

The following station I/O is required where the RTU will perform individual pump control based on well level (all inputs and outputs are active high unless specified otherwise):

Standard Inputs and Outputs for 2 pump Sewage Pumping Station Table 1

Standard Inputs and Outputs for 2 pump Sewage Pumping Station					
I/O	No	Kingfisher Slot/Card/Pin No	Description	System	Input Mechanism
Digital Input	1	15/IO3/T10	Pump 1 is Running	Pump 1	Run Relay
	2	15/IO3/T11	Pump 1 has a Fault	Pump 1	Fault Relay
	3	15/IO3/T12	Pump 1 is in Auto Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Auto position
	4	15/IO3/T13	Pump 1 is in Local Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Local position
	5	16/IO3/T10	Pump 2 is Running	Pump 2	Run Relay
	6	16/IO3/T11	Pump 2 has a Fault	Pump 2	Fault Relay
	7	16/IO3/T12	Pump 2 is in Auto Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Auto position
	8	16/IO3/T13	Pump 2 is in Local Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Local position
	9	14/DI5/T4	Wet Well level is Very High	Common	Float Switch (for alarm redundancy & control redundancy)
	10	14/DI5/T5	Wet well is Overflowing	Common	Float Switch (for EPA requirements)
	11	14/DI5/T2	Flow Pulse	Common	Flow Pulse Relay
	12	14/DI5/T3	Station has Phase Failure	Common	Phase Failure Relay
	13	14/DI5/T1	Rain Gauge	Ancillary	Tipper bucket , 0.2mm tip
	14	14/DI5/T6	Wet well exhaust fan is running	Common	Current Sensing Relay
	15	14/DI5/T14	"Generator Set is in Auto Mode"	Generator Set	Contacts in Gen Set cabinet
	16	14/DI5/T13	Generator Set has Fault	Generator Set	Contacts in Gen Set cabinet
	17	14/DI5/T12	Generator Set is "On Line"	Generator Set	Contacts in Gen Set cabinet
	18	14/DI5/T7	Sump Pump is Running	Dry Well Sump	Run Relay
	19	14/DI5/T8	Sump Pump has a Fault	Dry Well Sump	Fault Relay
	20	14/DI5/T11	Sump Liquid Level is High	Dry Well Sump	Float Switch
	21	14/DI5/T17	Spare		
	22	14/DI5/T18	Station is being Accessed	Common	Door switches
	23	14/DI5/T15	Spare		
	24	14/DI5/T16	Spare		
Digital Output	1	15/IO3/T15	Run Pump 1	Pump 1	Contacts to control relay
	2	15/IO3/T16	Reset Pump 1	Pump 1	Contacts to control relay
	3	16/IO3/T15	Run Pump 2	Pump 2	Contacts to control relay
	4	16/IO3/T16	Reset Pump 2	Pump 2	Contacts to control relay
	5	16/IO3/T17	Well Wash Spray	Wet Well	Contacts to control relay
Analogue Input	1	15/IO3/T1	Pump 1 Motor Current	Pump 1	AC current transducer
	2	16/IO3/T1	Pump 2 Motor Current	Pump 2	AC current transducer
	3	15/IO3/T2	Wet Well Level	Common	Pressure transducer
	4	15/IO3/T3	Sewage Flow Rate	Common	Flow Meter (if available)
	5	15/IO3/T4	Ground Water Level	Ancillary	Water Level transducer (if available)
	6	16/IO3/T2	Discharge/Mains Water Pressure	Ancillary	Water Pressure transducer (if available)
Analogue Output	1	15/IO3/T7	Pump 1 VSD Speed	Pump 1	4-20mA or 0-10 V (if present)
	2	16/IO3/T7	Pump 2 VSD Speed	Pump 2	4-20mA or 0-10 V (if present)

Note: All inputs are active high

A Diesel Pump shall be configured as a generator set, except that it shall run in case of both standard pumps being unavailable or in fault, and reservoir filling is required.

Note: All digital inputs and outputs are active high.

The RTU should include some additional I/O or allow additional I/O cards to be added. Each RTU must have the I/O per pump as listed above with the General Station I/O customised in standard configurations to suit individual station requirements.

Waste water pump station control is generally to be driven using a pressure transducer level signal from the station wetwell. The Generator Fault Input is a combination of Low Battery Voltage, Low Fuel Level, and critical Generator Faults (Low oil pressure, water temperature, no fuel etc)

The RTU should include some additional I/O or allow additional I/O cards to be added. Each RTU must have the I/O per pump as listed above with the General Station I/O customized in standard configurations to suit individual station requirements. The RTU should include some additional I/O and/or allow additional I/O cards to be added. The RTU at every pumping station must calculate an estimate of flow from pump operations, given the well parameters. The current transmitters are used for determining possible pump choke or ragging. If the station current usage is outside a pre-determined band for "XX" seconds then this may indicate a pump ragging. Excessive current may mean a faulty bearing or similar, while a decrease in current may mean impeller damage or ragging of the impeller. Maximum & minimum allowed current set points are to be retained in the RTU for comparison and alarming. The value must be adjustable via the SCADA.

Wastewater Pump Station I/O between RTU and SCADA

The RTU is to perform calculations and station monitoring, based on set points and parameters adjustable via the SCADA. This allows standardization of the RTU programs, it allows flexibility of calculations, flexibility of alarming and of pump control duty and other functions. The modules within the RTU code for monitoring and calculating information based on optional devices such as a rain gauge and flow meter are to be enabled and disabled via the SCADA without the need to reprogram the RTU. Because the calculations are done in the RTU, accurate time stamped events are possible. All RTU data provided to the SCADA is to be time stamped in the RTU. Should the RTU lose connection with the SCADA, the RTU must store the events until they are later transferred to the SCADA database.

NOTES:

All daily totalisation uses a rollover time of Midnight .

A pump becomes unavailable when any of the following occur:

- ◆ ☐ ☐ There is a AC phase failure
- ◆ ☐ ☐ The station is inhibited (by SCADA)
- ◆ ☐ ☐ The pump has a fault
- ◆ ☐ ☐ The pump has failed to start, and this condition has not been reset by the SCADA
- ◆ ☐ ☐ The RTU input pump auto is false

When a pump becomes unavailable, the other available pump(s) must take over the pumping duty automatically. The SCADA operator will use the Control points to override normal automatic operation of the station and individual pumps. The Analogue Set points are used to set station operating and alarm parameters. The RTU control program must be capable of the control functions and calculations indicated by the RTU I/O and RTU/SCADA I/O listed above. The adjustment of the setpoints is to be via SCADA. The adjustments must not require modification of the RTU's control program.

Water Supply Pump station I/O Requirements

The following station I/O is required for sites where the RTU will perform individual pump control based on a controlled reservoir level:

Standard Inputs and Outputs for 2 pump Water Pumping Station Table 2

Standard Inputs and Outputs for 2 pump Water Pumping Station					
I/O	No	Kingfisher Slot/Card/Pin No	Description	System	Input Mechanism
Digital Input	1	15/IO3/T10	Pump 1 is Running	Pump 1	Run Relay
	2	15/IO3/T11	Pump 1 has a Fault	Pump 1	Fault Relay
	3	15/IO3/T12	Pump 1 is in Auto Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Auto position
	4	15/IO3/T13	Pump 1 is in Local Mode	Pump 1	Pump 1 Control Switch: Auto/Off/Local in Local position
	5	16/IO3/T10	Pump 2 is Running	Pump 2	Run Relay
	6	16/IO3/T11	Pump 2 has a Fault	Pump 2	Fault Relay
	7	16/IO3/T12	Pump 2 is in Auto Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Auto position
	8	16/IO3/T13	Pump 2 is in Local Mode	Pump 2	Pump 2 Control Switch: Auto/Off/Local in Local position
	9	14/DI5/T18	Station is being Accessed	Common	Door switches
	10	14/DI5/T3	Station has Phase Failure	Common	Phase Failure Relay
	11	14/DI5/T1	Rain Gauge	Ancillary	Tipper bucket , 0.2mm tip
	12	14/DI5/T2	Flowmeter Pulse	Ancillary	Pulse per kilolitre
	13	14/DI5/T7	"Generator Set is in Auto Mode"	Generator Set	Contacts in Gen Set cabinet
	14	14/DI5/T6	Generator Set has Fault	Generator Set	Contacts in Gen Set cabinet
	15	14/DI5/T5	Generator Set is "On Line"	Generator Set	Contacts in Gen Set cabinet
	16	14/DI5/T8	Generator Set Low Fuel Level	Generator Set	Float Switch
	17	14/DI5/T9	Plant Fault	Ancillary	Fault Relay
Digital Output	1	15/IO3/T15	Run Pump 1	Pump 1	Contacts to control relay
	2	15/IO3/T16	Reset Pump 1	Pump 1	Contacts to control relay
	3	16/IO3/T15	Run Pump 2	Pump 2	Contacts to control relay
	4	16/IO3/T16	Reset Pump 2	Pump 2	Contacts to control relay
Analogue Input	1		Spare		
	2		Spare		
	3		Spare		
	4	16/IO3/T4	Flow Rate	Common	Flow Meter (if available)
	5		Spare		
	6		Spare		
	7		Spare		
	8		Spare		
Analogue Output	1				4-20mA or 0-10 V (if present)
	2				4-20mA or 0-10 V (if present)

A Diesel Pump shall be configured as a generator set, except that it shall run in case of both standard pumps being unavailable or in fault, and reservoir filling is required.

Note: All digital inputs and outputs are active high.

The RTU should include some additional I/O or allow additional I/O cards to be added. Each RTU must have the I/O per pump as listed above with the General Station I/O customised in standard configurations to suit individual station requirements.

The Pump Control is generally to be driven using a DNP3 level signal from a remote reservoir. The Generator Set Fault Input is a combination of Generator Low Battery Voltage, Generator Low Fuel Level, and critical Generator Faults (Low oil pressure, water temperature, no fuel etc)

Water Supply Pump Station I/O between RTU and SCADA

The RTU is to perform calculations and station monitoring, based on setpoints and parameters adjustable via the SCADA. This allows standardisation of the RTU programs, it allows flexibility of calculations, flexibility of alarming and of pump control duty and other functions. The modules within the RTU code for monitoring and calculating information based on optional devices such as a rain gauge and flow meter are to be enabled and disabled via the SCADA without the need to reprogram the RTU. Because the calculations are done in the RTU, accurate time stamped events are possible. All RTU data provided to the SCADA is to be time stamped in the RTU. Should the RTU lose connection with the SCADA, the RTU must store the events until they are later transferred to the SCADA database.

NOTES:

All daily totalisation uses a rollover time of midnight .

A pump becomes unavailable when any of the following occur:

- ◆ ☐ ☐ There is a AC phase failure
- ◆ ☐ ☐ The station is inhibited by SCADA
- ◆ ☐ ☐ The pump has a fault
- ◆ ☐ ☐ The pump has failed to start, and this condition has not been reset by the SCADA
- ◆ ☐ ☐ The RTU input pump auto is false

When a pump becomes unavailable, the other available pump(s) must take over the pumping duty automatically. The SCADA operator will use the control points to override normal automatic operation of the station and individual pumps. The analogue Set points are used to set station operating and alarm parameters. The RTU control program must be capable of the control functions and calculations indicated by the RTU I/O and RTU/SCADA I/O listed above. The adjustment of the set points is to be via SCADA. The adjustments must not require modification of the RTU's control program.

Standard RTU control functions for Wastewater and Water Supply pumping stations.

Well Level Control / Reservoir Level Control using SCADA adjustable set points for Duty Pump Start, Standby Pump Start & Pump Stop, and using the input from an analogue level transmitter or a reservoir level from a remote peer RTU at a reservoir. The RTU will activate a Pump Run Output when the well/reservoir level reaches the Duty Pump Start set point and deactivate the output when the level reaches the Pump Stop setpoint. The pump to be started will be determined by the duty control option selected. See below.

Pump Duty Control with user selectable options for:

CYCLE: where pump duty is swapped at the end of each pump cycle to ensure even run times of both pumps.

DUTY 1-2: where Pump 1 is the duty pump & Pump 2 is standby.

DUTY 2-1: where Pump 1 is the duty pump & Pump 2 is standby.

Duty Level Override must be provided for testing purposes to allow the operator to start the station if it is between normal Start & Stop Levels. The station would start and run until the Stop level is reached and then return to normal operation.

Maximum Permitted Pumps must be provided to allow the operator to specify how many pumps can run at one time. The Hydraulic Design of the station or the capacity of the electricity supply to the station will determine this. If the maximum permitted number of pumps is 1, it is assumed that one pump can cover all pumping requirements. If the duty pump is running and the well/reservoir level reaches the Standby Pump Start level, the Duty pump should stop and the Standby pump will start in its place as it is assumed that there may be a problem with the first pump. If the maximum permitted number of pumps is 2, it is assumed that in times of high flow that two (2) pumps will be required to run. The Standby Duty pump will start if the Standby Pump Start level is reached and both pumps will cut-out when the Pump Stop Level is reached.

Station & Pump Inhibit - this option must be provided to allow the operator to inhibit a pump from running or the entire station for maintenance purposes. This command will generate some form of feedback to notify the operator that the station is inhibited.

Setpoint checks must be performed by the RTU program to confirm the validity of setpoints entered. This is to ensure that there is no logic error in the values entered. Default setpoints must also be provided within the RTU program to ensure that the program will operate when loaded for the first time without the need to enter setpoints.

Pump Current Monitoring (SEWER SITES ONLY) must be implemented utilising a current transducers monitoring current of each pump. The program should compare the pump current against the *Normal Pump Current* setpoint and see whether it is above or below a tolerance setpoint. This must flag an alarm if the pump is running out of its rated range. It may also be an option to take some action within the program such as change pump duty.

Optional Control Functions

Reservoir Fill Control – reservoir should periodically send a refresh command to the pump station while it requests water, the pump station receiving the refresh command must start a watchdog timer that is reset by each refresh. If a refresh is not received within the watchdog period, the pump station RTU will stop pumping.

STANDARD STATISTICAL FUNCTIONS

All statistical functions are to work based on day running from midnight to midnight the next morning. This enables the various personnel to have the latest information available at the commencement of their work each day.

Pump Starts Totalisation must count the *Starts in the last hour* as this relates to the capacity of the motor starter, which generally has a starts/hour rating. This *Starts in the last hour* figure should be compared with a *Normal Starts* setpoint and flag an alarm if exceeded. Values for Pump Starts Today & Yesterday must also be calculated. The value for yesterday will be uploaded to the SCADA for use in calculations to provide Weekly, Monthly & Annual figures.

Pump Hours Run Totalisation must count the hours run since the pump has started. This *Hours Run Since Start* figure should be compared with a *Normal Hours* setpoint and flag an alarm if exceeded. This would come into play if there was a problem with the pump impeller or a faulty level transmitter where the well level failed to reach the Pump Stop setpoint. Values for Pump Hours Run Today & Yesterday must also be calculated. The value for yesterday can be uploaded to the SCADA for use in calculations to provide Weekly, Monthly & Annual figures.

OPTIONAL STATISTICAL FUNCTIONS

Station Flow Totalisation should totalise the station inflow signal to provide total flow figures for Today & Yesterday. The value for yesterday can be uploaded to the SCADA for use in calculations to provide Weekly, Monthly & Annual figures. It is preferred that the RTU totalise the raw count and apply a scaling factor at the SCADA. This is done to keep program generic and suitable for any flow meter scaling.

Water Supply Reservoir I/O Requirements

The reservoir I/O required for sites will depend upon proposal, contact Douglas Shire Council, Water & Waste SCADA Co-ordinator for requirements.

Water Supply Multiple Booster Pressure Pump Station I/O Requirements

The Booster Pressure Pump Station I/O required for sites will depend upon proposal, contact Douglas Shire Council, Water & Waste SCADA Co-ordinator for requirements.

APPENDIX C

ASPHALT SPECIFICATION “CRC 10”

DOUGLAS SHIRE COUNCIL ASPHALT SPECIFICATION “ CRC 10”**MODIFIED GRADING LIMITS**
FOR COMBINED AGGREGATE/FILLER IN 10mm STANDARD ASPHALT

A.S. Sieve Size (mm)	Percent Passing By Mass (%)
13.20	100
9.50	95 - 100
4.75	66 - 80
2.36	38 - 52
0.600	23 - 29
0.300	16 - 22
0.150	7 - 13
0.075	3 - 7
Binder Content	5.40 – 6.00 %



FNQROC DEVELOPMENT MANUAL

OPERATIONAL WORKS

SPECIFICATION

S1

EARTHWORKS

Version No. 03/14

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Far North Queensland Regional Organisation of Councils. Requests and inquiries concerning reproduction and rights should be addressed to the FNQROC Coordinator, PO Box 359, CAIRNS, Qld 4870.

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
GENERAL		1
S1.01	SCOPE	1
S1.02	REFERENCE DOCUMENTS	1
MATERIALS		2
S1.03	TOPSOIL	2
S1.04	UNSUITABLE MATERIAL	2
S1.05	SUITABLE MATERIAL	2
CONSTRUCTION		3
S1.06	GENERAL	3
S1.07	PROTECTION OF EARTHWORKS	3
S1.08	CLEARING AND GRUBBING	3
S1.09	TOPSOIL OPERATIONS	4
S1.10	GENERAL EARTHWORKS	4
S1.11	EXCAVATIONS	5
S1.12	EMBANKMENTS / FILL AREAS	5
S1.13	TRENCHING OPERATIONS	5

GENERAL

S1.01 SCOPE

1. This specification details all requirements pertaining to earthworks operations associated with construction sites. This specification excludes earthworks associated with roadworks construction.
2. Where there is any conflict determined between the requirements specified herein and the requirements of any referenced Australian Standard, Statutory Authority Standards or otherwise, the requirements specified herein shall apply.

S1.02 REFERENCE DOCUMENTS

Note: Where Acts or reference documents are updated, reference should be made to the current version.

Australian Standards

- AS 3798 Guideline on Earthworks for Commercial and Residential Developments.
- AS4373 Pruning of Amenity Trees
- AS4970 Protection of Trees on Development Sites

All documents referenced in this specification shall be the current edition

MATERIALS

S1.03 TOPSOIL

1. Topsoil is defined as surface soils normally high in organic matter and contaminated by residual grass seed and grass roots. Topsoil shall be free from large roots, stones, rocks and unsuitable material as defined below.

S1.04 UNSUITABLE MATERIAL

1. Reference is made to AS 3798 Section 4.2 "Unsuitable Materials" for definitions and guidelines regarding unsuitable materials with regard to earthworks operations.

S1.05 SUITABLE MATERIAL

1. Reference is made to AS 3798 Section 4.3 "Suitable Materials" for the definition and guidelines regarding acceptable materials for earthworks operations.

CONSTRUCTION

S1.06 GENERAL

1. Specific reference is made to AS 3798 in relation all activities pertaining to earthworks operations. Specific construction details are noted in Section 6 of AS 3798 and all appropriate methods of testing, frequency of testing and reporting procedures are to be in accordance with this Australian Standard.
2. Specific reference is made to AS4970 in relation to earthworks near trees selected for retention, i.e. no removal of topsoils should take place within the Tree Protection Zone as this destroys the Michorrhizal root zone the tree needs for nutrient uptake.
3. Specific reference is made to AS4373 in relation to pruning work to be performed on any trees selected for retention.

S1.07 PROTECTION OF EARTHWORKS

1. The Contractor's responsibility for care of the works shall include the protection of earthworks in accordance with the approved Erosion and Sediment Control Strategy.
2. The Contractor shall install effective erosion and sedimentation control measures, prior to commencing earthworks, and shall maintain these control measures as required.
3. Adequate drainage of all working areas shall be maintained throughout the period of construction to ensure run-off of water without ponding, except where ponding forms part of a planned erosion and sedimentation control system.
4. When rain is likely or when work is not proposed to continue in a working area on the following day, precautions shall be taken to minimise ingress of any excess water into earthworks material. Ripped material remaining in cuttings and material placed on embankments shall be sealed off by adequate compaction to provide a smooth tight surface.
5. Should insitu or stockpiled material become over wet as a result of the Contractor not providing adequate protection of earthworks, the Contractor shall be responsible for replacing and/or drying out the material and for any consequent delays to the operations.

S1.08 CLEARING AND GRUBBING

1. Clearing and grubbing operations shall be in accordance with AS 3798 Section 6.1.4.
2. The extent of clearing and grubbing shall be taken to mean the removal and disposal of:
 - a. Trees, Shrubs and overhanging branches, both living and dead;
 - b. Tree stumps and roots to a depth not less than 300mm below ground surface;
 - c. Rocks, rubbish and other artificial obstructions from the ground surface;
 - d. Abandoned services to a depth not less than 300mm below ground surface;
 - e. Old foundations, buildings and structures;
 - f. Minor made structures (such as fences);
 - g. Other materials, which are unsuitable for use in the works.

EARTHWORKS

3. Un-grubbed rocks under embankments may be left undisturbed providing there is a depth of at least 600mm of earth covering over them when the filling operations are completed.
4. Unless otherwise specified or directed, the area to be cleared is the minimum width required to construct the works plus a margin of 2m beyond tops of cuts and toes of embankments.
5. Any trees, shrubs and overhanging branches identified on the Project Drawings to be retained or protected shall be clearly marked by the contractor prior to commencing clearing operations.
6. Beyond the areas to be cleared only those trees, shrubs and over hanging branches which directly interfere with the construction of the works shall be removed or pruned as necessary.
7. Any trees, shrubs and overhanging branches identified in the project drawings to be retained or protected must be clearly fenced off as per AS4970 prior to the commencement of any clearing and grubbing. Any clearing and other works within the Tree Protection Zones must only be done under direction of the project Arborist or suitably qualified person.

S1.09 TOPSOIL OPERATIONS

1. Stripping of topsoil shall be in accordance with AS 3798 Section 6.1.5.
2. For trees selected for retention and protection, no stripping of topsoil is to be done within the Tree Protection Zone as per AS4970, unless under the direction or advice of the project Arborist or suitably qualified person..
3. Removal of topsoil shall only commence after erosion and sedimentation controls have been implemented and when clearing, grubbing and disposal of materials have been completed on that section of the Works.
4. Topsoil throughout the extent of the work shall be removed and stockpiled separately clear of the work with care taken to avoid contamination by other materials.
5. Topsoil material stripped from the site shall be stockpiled for later use in spreading on footpaths, allotments and parkland areas.
6. Topsoil stockpiles shall not contain any timber or other rubbish and shall be trimmed to a regular shape.
7. To minimise erosion, stockpiles are to be protected by effective usage of erosion and sediment control devices, which are to be defined within the Erosion and Sediment Control Management Plan.
8. Where seeding of stockpiles to encourage vegetation cover is specified, such work shall be carried out in accordance with the Specification S8 LANDSCAPING.
9. Nominally 75mm depth of topsoil is to be re-spread over such areas with an absolute minimum of 40mm material to be provided in any one location.

S1.10 GENERAL EARTHWORKS

1. Placement and Compaction of earthworks shall be in accordance with AS 3798 Sections 5 and 6.
2. The methods of testing and frequency of testing shall be in accordance with AS 3798 Sections 7 and 8.
3. Unless a higher level of testing is specified or directed the minimum level of geotechnical testing services to be accorded earthworks activities shall be as determined by Level 2 in Appendix B of AS 3798.

4. All testing is to be carried out by a NATA registered laboratory with appropriate accreditation and suitably qualified personnel

S1.11 EXCAVATIONS

1. Materials encountered in excavation shall be loosened and broken down as required so that they are acceptable for incorporation in the works.
2. All excavations shall be constructed to the shape and slopes shown on the approved Project Documents.
3. Batter shall be trimmed neatly to the shapes specified and shall be free of loose or unstable material.
4. Horizontal tolerances for the excavation of batters, measured at right angles to the batter line, shall be – 50mm +250mm (where the + tolerance is in the direction which increases the width of excavation).
5. Vertical tolerances for all excavation shall be ± 50 mm.
6. When completed all culvert excavations, benches, berms and drains shall be free draining.
7. At all times the requirements of the Workplace Health and Safety Act shall be complied with and all works shall be made safe during the performance of such activities.
8. No excavations may take place within the Tree Protection Zone of trees selected for retention and protection unless under the direction or approval of the project Arborist or suitably qualified person.

S1.12 EMBANKMENTS / FILL AREAS

1. All embankments and fill areas shall be constructed to the shape and slopes shown on the approved Project Documents.
2. When completed, the average planes of the batters of embankments shall conform to those shown on the approved Project Documents.
3. Horizontal tolerances for the embankment batters, measured at right angles to the batter line, shall be – 0mm +250mm (where the + tolerance is in the direction which increases the width of embankment).
4. Vertical tolerances for all embankments / fill areas, shall be ± 50 mm except where such fill defines the subgrade level for a structure, then the vertical tolerances are to be +15mm – 30mm.
5. When completed all embankments / fill areas shall be free draining.
6. At all times the requirements of the Workplace Health and Safety Act shall be complied with and all works shall be made safe during the performance of such activities.

S1.13 TRENCHING OPERATIONS

1. The excavation for trenches shall be taken out to the exact alignment, width and level as shown on the Project Drawings and associated specifications.

EARTHWORKS

2. Trenches shall not be excavated wider than the dimensions shown on these relevant drawings and the Contractor shall take all precautions as necessary to ensure that the excavation is made in a careful manner and that it is rendered secure and safe by all appropriate means.
3. At all times the requirements of the Workplace Health and Safety Act shall be complied with and all works shall be made safe during the performance of such activities.
4. Suitable drainage shall be accorded to all trenching activities and de-watering of trenches shall be undertaken should infiltration of water occur. All materials excavated from trenches shall be separated by material type for latter inclusion into the works or disposal from the site should these materials be deemed unsuitable in accordance with the requirements of AS 3798.
5. Excavation and trenching operations shall proceed with sufficient resources to ensure uninterrupted progress and continuance of the works with subsequent services. Completion and backfilling are to be undertaken as soon as possible so as to minimise the extent of site open to the effects of the environment.
6. No trenching operations may be performed within the Tree Protection Zone of trees selected for retention and protection unless under the direction or approval of the project Arborist or suitably qualified person.



FNQROC DEVELOPMENT MANUAL

OPERATIONAL WORKS

SPECIFICATION

S2

ROAD PAVEMENTS

Version No. 03/14

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Far North Queensland Regional Organisation of Councils. Requests and inquiries concerning reproduction and rights should be addressed to the FNQROC Coordinator, PO Box 359, CAIRNS, Qld 4870.

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
GENERAL		1
S2.01	SCOPE	1
S2.02	REFERENCE DOCUMENTS	1
MATERIALS		2
S2.03	PAVEMENT MATERIAL	2
S2.04	ASPHALTIC CONCRETE SURFACING <small>Commentary available</small>	2
S2.05	SPRAYED BITUMEN SURFACING	3
S2.06	CONCRETE INTERLOCKING PAVERS	3
S2.07	ROAD FURNITURE	3
S2.08	PAVEMENT MARKING	3
CONSTRUCTION.....		4
S2.09	INSPECTION, SAMPLING AND TESTING	4
S2.10	SETOUT	4
S2.11	CLEARING AND GRUBBING	4
S2.12	TOPSOIL OPERATIONS.....	4
S2.13	EARTHWORKS.....	4
S2.14	TRIM AND COMPACT SUBGRADE	4
S2.15	PAVEMENT COURSES.....	5
S2.16	FINAL TRIM.....	6
S2.17	ASPHALTIC CONCRETE SURFACING	6
S2.18	SPRAYED BITUMEN SURFACING	6
S2.19	CONCRETE SEGMENTAL PAVERS.....	7
S2.20	KERBING AND CHANNELLING	7
S2.21	SUBSOIL DRAINAGE.....	7

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
S2.22	TRIM VERGES AND BATTERS	7
S2.23	ROAD FURNITURE AND PAVEMENT MARKING	8

GENERAL

S2.01 SCOPE

1. This specification details all requirements pertaining to the construction of flexible road pavements, including kerbing, subsoil drainage and trimming of verges.
2. Where there is any conflict determined between the requirements specified herein and the requirements of any referenced Australian Standard, Statutory Authority Standards or otherwise, the requirements specified herein shall apply.

S2.02 REFERENCE DOCUMENTS

Note: Where Acts or reference documents are updated, reference should be made to the current version.

Australian Standards

Y	AS 1289	Methods of Testing Soils for Engineering Purposes
Y	AS 2439.1	Perforated Drainage Pipe and Associated Fittings
Y	AS 3706.7	Determination of Pore-size Distribution - Dry Sieving Method

All Standards referenced in this specification shall be the current edition.

Queensland Department of Main Roads Standard Specifications

Y	MRTS03	Drainage, Retaining Structures and Protective Treatments
Y	MRTS04	General Earthworks
Y	MRTS05	Unbound Pavements
Y	MRTS11	Sprayed Bitumen Surfacing (Excluding Emulsions)
Y	MRTS14	Road Furniture
Y	MRTS14A	Road Furniture (Steel Work)
Y	MRTS17	Bitumen
Y	MRTS19	Bitumen Cutter and Flux Oils
Y	MRTS20	Cutback Bitumen
Y	MRTS22	Supply of Cover Aggregate
Y	MRTS30	Dense Graded Asphalt Pavements
Y	MRTS45	Road Surface Delineation

Queensland Department of Main Roads Publication

Y	Manual of Uniform Traffic Control Devices
---	---

Australian Asphalt Pavement Association (Qld. Branch)

Y	Asphalt Specification for Subdivision Pavements -
---	---

MATERIALS

S2.03 PAVEMENT MATERIAL

1. Pavement materials used for pavement construction shall comply with Table S2.1 unless otherwise approved by the relevant authority.

Table S2.1 Pavement Materials

Pavement Material	Type of Material Permissible	Grading	CBR (Minimum)
Subgrade Replacement	Type 2.5	B,C or D	15
Access Places, Access Streets, Residential Streets and Minor Collector			
Sub-base	Type 2.3	B,C or D	45
Base	Type 2.2	B,C or D	60
For all roads of Major Collector or higher in the hierarchy			
Sub-Base	Type 2.2	B, C or D	60
Base	Type 2.1	B or C	80

2. All references to material type in the above table refer to the Main Roads Standard Specification MRTS05 "Unbound Pavements".
3. All materials shall be sourced from a Quality Assured material supplier and the results of the manufacturer's testing to assure the quality of the product shall be incorporated with the Contractor's Quality records.

S2.04 ASPHALTIC CONCRETE SURFACING Commentary available

1. For surfacing on pavements with depth 30mm, the material quality requirements, material quality compliance testing requirements and all other matters pertaining to Asphaltic Concrete road pavement surfacing shall conform to the requirements as specified in the "Asphalt Specification for Subdivision Pavements", published by the Australian Asphalt Pavement Association (Queensland Branch).
2. For surfacing on pavements with depths greater than 30mm, the material quality requirements, material quality compliance testing requirements and all other matters pertaining to Asphaltic Concrete road pavement surfacing shall conform to the appropriate Main Roads Standard Specification.

Y Main Roads Specification MRTS 30 "Dense Graded Asphalt Pavements".

S2.05 SPRAYED BITUMEN SURFACING

1. For surfacing of pavements with sprayed bitumen. the material quality requirements, material quality compliance testing requirements and all other matters pertaining to hot bitumen road pavement surfacing shall conform to the appropriate Queensland Department of Main Roads Specification.
 - Y Main Roads Specification MRTS 11 "Sprayed Bitumen Surfacing (Excluding Emulsions)"
 - Y Main Roads Specification MRTS 17 " Bitumen"
 - Y Main Roads Specification MRTS 19 " Bitumen Cutter and Flux Oils"
 - Y Main Roads Specification MRTS 20 " Cutback Bitumen"
 - Y Main Roads Specification MRTS 22 "Supply of Cover Aggregate" (Only Category A or B as specified, Table 7 – Particle Quality, will be accepted)

S2.06 CONCRETE INTERLOCKING PAVERS

1. Concrete interlocking pavers shall be manufactured and supplied in accordance with the requirements of Specification S3 SEGMENTAL PAVING

S2.07 ROAD FURNITURE

1. The manufacture, supply and material requirements appropriate to the specification for Road Signs and guidepost shall be as per the Main Roads Standard Specification "MRTS 14 Road Furniture".
2. All signs to be Class 1 reflectivity
3. Signs located in concrete islands or medians shall be supplied with the "V Loc" socket system and fitted with anti-theft bolts.

S2.08 PAVEMENT MARKING

1. The manufacture, supply and material requirements appropriate to the specification for Pavement Marking shall be as per the Main Roads Standard Specification "MRTS 45 Road Surface Delineation".

CONSTRUCTION

S2.09 INSPECTION, SAMPLING AND TESTING

1. Inspection, sampling and testing of the pavement shall be in accordance with the requirements of this specification before, during and after the construction of the pavement.
2. All testing shall be carried out by a NATA registered laboratory with appropriate accreditation and suitably qualified personnel.

S2.10 SETOUT

1. The construction setout for roadworks construction shall be by reference to a datum line established by a Registered Surveyor (Consulting). The datum line may be either the road centreline, a pegged chainage offset line or any alternative datum suitable for the purposes of accurately setting out the roadworks in accordance with the drawings for the works.

S2.11 CLEARING AND GRUBBING

1. All clearing and grubbing works shall be in accordance with the Specification for S1 EARTHWORKS.

S2.12 TOPSOIL OPERATIONS

1. All topsoil operations associated with roadworks construction (topsoil stripping, stockpiling and re-spreading), shall be in accordance with the Specification for S1 EARTHWORKS.

S2.13 EARTHWORKS

1. All earthworks operations up to subgrade level shall comply with the requirements detailed in Main Roads Standard Specification MRTS 04 "General Earthworks".

S2.14 TRIM AND COMPACT SUBGRADE

1. The subgrade material is defined as the top 300mm of earthworks profiled and compacted upon which pavement materials are to be placed. The subgrade material shall be compacted in accordance with the requirements detailed in Main Roads Standard Specification MRTS 04 "General Earthworks", with the testing frequency and requirements are detailed herein:
2. The subgrade material shall be compacted to provide a relative compaction determined by AS1289 for a standard compactive effort as follows:
 - a. Minimum Dry Density Ratio (Cohesive soils) - 97%
 - b. Minimum Density Index (Cohesion less soils) - 80%
3. Testing frequency not less than one (1) test per 1000m² with a minimum number of three (3) tests per sample area being tested.
4. At least one (1) sample area shall be tested for type of subgrade material evident on site.

5. The subgrade material shall not include any "Unsuitable Material" as defined in Main Roads Standard Specification MRTS 04 "General Earthworks" and shall be trimmed to the profile required to conform with the Project Drawings and the tolerances specified herein.
6. Where unsuitable material is encountered in the subgrade, a suitable "Subgrade Replacement Material" in accordance with the requirements of this specification shall be incorporated in the works.
7. In this instance, the unsuitable material shall be excavated to a level sufficient to obtain a sound foundation for the pavement. The compaction requirements and testing frequency noted previously shall apply to all operations involving any subgrade replacement material required for the works.
8. The tolerances appropriate to the construction of subgrade and to subgrade replacement material shall comply with the following:
 - a. Design Level Tolerance +15mm, - 30mm
 - b. Shape Tolerance of 25mm maximum deviation from a 3m straight edge laid in any direction.
 - c. Horizontal Tolerances as per MRTS 04,
9. Following completion of subgrade compaction, trimming, and satisfactory density testing, the whole of the subgrade area shall be inspected by proof rolling with a fully loaded single rear axle truck with a minimum axle loading of 8 tonne (or acceptable equivalent). Acceptable proof rolling shall be taken to be no visible signs of deformation or instability in the subgrade.

S2.15 PAVEMENT COURSES

1. The pavement course materials (Base Course and Sub-base Course) shall be transported from the material supplier to the spreading area without segregation and shall be placed at the correct moisture content.
2. The pavement course materials shall be spread in uniform loose layers on the prepared subgrade, subgrade replacement, or sub-base course and compacted to conform with the grades, profiles and cross sections as indicated on the Project Drawings and to the tolerances and compaction standards specified herein.
3. The thickness of any loose layers shall be such that after compaction it shall not be less than 100mm nor more than 200mm thick. Appropriate compaction equipment shall immediately follow the spreading and shaping of the loose materials and under no circumstances shall the materials be allowed to dry out before compaction.
4. After compaction of each pavement course, the whole of the surface shall be watered and rolled with a steel drum roller to give a hard, dense, tightly packed surface free of lenses, compaction planes and caking, in accordance with the tolerances specified herein.
5. No placement of base course material on the sub-base shall commence until the compaction standards and tolerances for construction of the lower layer have been inspected and confirmed satisfactory.
6. The pavement course material shall be compacted to provide a relative compaction determined by AS1289 for a standard compactive effort as follows:
 - a. Base Course - 100%
 - b. Sub-base Courses - 100%
7. Testing frequency not less than one test per 500m² with a minimum of four (4) tests per sample area being tested for sand replacement method and two tests per 500 m² with a minimum of eight (8) tests per sample for nuclear test.

8. The vertical tolerances for the construction of the pavement courses shall comply with Table S2.2.
9. Horizontal tolerances are to comply with MRTS 05

Table S2.2 Construction Tolerances

Course	Design Level Tolerance	Layer Thickness Tolerance	Shape Tolerance
Sub-base	+ 20mm - 20mm	+ 40mm - 20mm	25mm in 3m Maximum
Base	+ 10mm - 10mm	+ 15mm - 15mm	15mm in 3m Maximum
Overall	+20mm -10mm	+20mm -10mm	

S2.16 FINAL TRIM

1. Following placement and compaction of the base course material, the whole of the surface of the base course shall be final graded and trimmed to the specified tolerances so as to leave a hard, dense, tightly packed surface free of lenses, compaction planes and caking.
2. Sprayed bituminous or asphaltic concrete surfacing works shall not be commenced until the profile, surface, compaction, quality and finish of the base course has been inspected and confirmed satisfactory.

S2.17 ASPHALTIC CONCRETE SURFACING

1. For all Asphalt surfacing the construction requirements, method of construction works, and compliance testing requirements for Asphalt surfacing, shall be in accordance with Main Roads Specification MRTS 30 "Dense Graded Asphalt Pavements".
2. All roads greater than 10% gradient shall have a 10mm primer seal applied to the base course prior to the placement of the Asphaltic Concrete. Alternate methods where approved by Council shall be as noted on the approved Project Drawings.

S2.18 SPRAYED BITUMEN SURFACING

1. The construction requirements, method of construction works, and compliance testing requirements for Hot Sprayed Bitumen surfacing, shall be in accordance with the following Queensland Department of Main Roads Specifications.
 - Y Main Roads Specification MRTS 11 "Sprayed Bitumen Surfacing (Excluding Emulsions)"
 - Y Main Roads Specification MRTS 17 "Bitumen"
 - Y Main Roads Specification MRTS 19 "Bitumen Cutter and Flux Oils"
 - Y Main Roads Specification MRTS 20 "Cutback Bitumen"
 - Y Main Roads Specification MRTS 22 "Supply of Cover Aggregate"

S2.19 CONCRETE SEGMENTAL PAVERS

1. Concrete interlocking pavers shall be constructed in accordance with the requirements of Specification S3 SEGMENTAL PAVING

S2.20 KERBING AND CHANNELLING

1. Concrete kerb, kerb and channel shall be constructed by a continuous slip form extrusion machine true to line and grade and to the profile for each kerb type in accordance with the Standard Drawing S1000.
2. Kerbing shall be constructed on sub base material compacted to 100% standard compaction as determined in accordance with the relevant Test Methods contained in AS 1289.
3. The finished kerbing shall be well compacted and shall have exposed surfaces free from voids and honeycombing.
4. Contraction joints shall be made at regular intervals not exceeding 3m. The joints shall be made by forming grooves 40mm deep and not more than 6mm wide in all exposed surfaces of the kerb and kerb and channel. All grooves shall be normal to the top surfaces and square to the alignments of the kerb and kerb and channel.
5. The horizontal and vertical alignments of the kerb and kerb and channel shall not vary from the design level by more than $\pm 10\text{mm}$, provided that:
 - a. The difference between the deviations from correct levels at any two points 30m apart shall not exceed 30mm
 - b. The deviation from a straight edge laid parallel to the centreline shall not exceed 10mm in 3m.
6. The invert of all channels shall be finished true to grade and alignment and no channelling in which water is found to pond will be accepted.
7. Any kerb or kerb and channel not true to line or with noticeable kinks, bends or other faults, or not of the required dimensions (considering the tolerances specified herein), may be condemned and shall be broken out and removed from site.

S2.21 SUBSOIL DRAINAGE

1. Unless otherwise detailed on the Project Drawings subsoil drainage shall be constructed beneath the kerbing on an alignment as shown on Standard Drawing S1095.
2. Subsoil drainage trenches, drainage pipe, backfill material, geotextile shall be constructed in accordance with the requirements of Main Roads Standard Specification MRTS 03 "Drainage, Retaining Structures and Protective Treatments".
3. Subsoil Drainage cleanouts shall be constructed in accordance with the requirements of Standard Drawing S1095 and shall preferably; be located with the upstream flushing point internally within a stormwater gully pit or manhole.

S2.22 TRIM VERGES AND BATTERS

1. Following completion of all earthworks operations associated with roadworks construction, all verges and fill batters shall be graded and trimmed to the line and level indicated on the Project Drawings. Allowance shall be made in the final trimming operations for topsoiling and grassing activities.
2. Cut batters shall be lightly tined to a depth of 25 - 50mm prior to resspreading of topsoil material

S2.23 ROAD FURNITURE AND PAVEMENT MARKING

1. The construction of all Road Signs and associated Road Furniture shall comply with the requirements of the following:
 - a. Main Roads Standard Specification MRTS 14 "Road Furniture"
 - b. Main Roads "Manual of Uniform Traffic Control Devices"
 - c. Standard Drawing S1040 for Street Name Signs.
 - d. Standard Drawing S1041 for Traffic Control Devices.
2. All Pavement Marking shall comply with the requirements of Main Roads Standard Specification MRTS 45 "Road Surface Delineation"



FNQROC DEVELOPMENT MANUAL OPERATIONAL WORKS SPECIFICATION S4 STORMWATER DRAINAGE

Version No. 03/14

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Far North Queensland Regional Organisation of Councils. Requests and inquiries concerning reproduction and rights should be addressed to the FNQROC Coordinator, PO Box 359, CAIRNS, Qld 4870.

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
GENERAL		1
S4.01	SCOPE	1
S4.02	REFERENCE DOCUMENTS	1
MATERIALS		2
S4.03	STEEL REINFORCED CONCRETE PIPES (RCP)	2
S4.04	FIBRE REINFORCED CONCRETE PIPES (FRC)	2
S4.05	REINFORCED CONCRETE BOX CULVERTS (RCBC)	2
S4.06	CORRUGATED ALUMINIUM ALLOY PIPES	2
S4.07	BEDDING MATERIALS	3
S4.08	STEEL WIRE GABION AND MATTRESS PROTECTION WORKS	3
S4.09	CONCRETE.....	3
S4.10	MANHOLE COVERS AND FRAMES	3
S4.11	GRATES AND FRAMES.....	4
S4.12	FLOODGATES	4
S4.13	BACKFILL MATERIAL	4
CONSTRUCTION.....		5
S4.14	SETOUT	5
S4.15	CLEARING AND GRUBBING	5
S4.16	TRENCHING	5
S4.17	DIVERTING WATER AND DEWATERING	5
S4.18	BEDDING	6
S4.19	LAY AND JOINT PIPES.....	6
S4.20	BACKFILL.....	7
S4.21	DRAINAGE STRUCTURES	8

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
S4.22	STEEL WIRE GABIONS AND MATRESS PROTECTION	9
S4.23	HEADWALLS, WINGWALLS AND APRONS.....	9
S4.24	FLOODGATES	9
S4.25	TOLERANCES	10
S4.26	CCTV INSPECTION OF STORMWATER DRAINAGE SYSTEM ^{COMMENTARY AVAILABLE, TRC, MSC} ...	10
	CCTV INSPECTION – UNDERGROUND STORMWATER PIPE DRAINAGE	10
	WHEN IS A CCTV INSPECTION REQUIRED	10
	WHAT IS TO BE INSPECTED	11
	PRE INSPECTION CRITERIA	11
	INSPECTION CRITERIA	11
	ACCEPTANCE CRITERIA.....	12
	SUBMISSION.....	13
	IF REMEDIATION WORKS ARE REQUIRED	14

GENERAL

S4.01 SCOPE

1. The specification details are all the requirements pertaining to the construction of stormwater drainage works.
2. Where there is any conflict determined between the requirements specified herein and the requirements of any referenced Australian Standard, Statutory Authority Standards or otherwise, the requirements specified herein shall apply.

S4.02 REFERENCE DOCUMENTS

Note: Where Acts or reference documents are updated, reference should be made to the current version.

Australian Standards

- AS 1597 Precast Reinforced Concrete Box Culverts
- AS 1650 Hot - Dipped Galvanised Coatings on Ferrous Articles.
- AS 1761 Helical Lock-Seam Corrugated Steel Pipes
- AS 2338 Preferred Dimensions of Wrought Metal Products
- AS 2423 Galvanised Wire Fencing Products
- AS 3725 Loads on Buried Concrete Pipes
- AS 3996 Metal Access Covers, Road Grates and Frames
- AS 4058 Precast Concrete Pipes (pressure and non-pressure)
- AS 4139 Fibre - Reinforced Concrete Pipes and Fittings

All Australian Standards referenced in this specification shall be the current edition.

Department of Main Roads

- MRTS 11.03 Drainage, Retaining Structures and Protective Treatments.

Water Services Association of Australia

- WSA 05-2006 Sewer Inspection Reporting code of Australia

Others

- American Association of State Highway and Transportation Officials (AASHTO) - M197-82 Aluminium Alloy Sheets for Culverts and Underdrains.
- American Association of State Highway and Transportation Officials (AASHTO) - M196-84 Corrugated Aluminium Alloy Culverts and Underdrains.

MATERIALS

S4.03 STEEL REINFORCED CONCRETE PIPES (RCP)

1. Pipes shall conform in all respect to AS 4058.
2. Unless specified otherwise, all pipes used in the works shall be flush (rebated) jointed.
3. In locations where the pipes are to be laid in a subgrade of sand or influenced by saltwater, rubber ringed joints shall be used.
4. Pipes laid in areas influenced by saltwater intrusion or acid sulphate soils, or where any part of the pipe is below the Highest Astronomical Tide (RL 1.80m AHD) the pipe will have cover to reinforcement in accordance with the exposure classification requirements of AS 3600.
5. The class of pipe shall be as specified or shown on the drawings. All pipes under roadways shall be a minimum of Class "2".

S4.04 FIBRE REINFORCED CONCRETE PIPES (FRC)

1. Pipes shall conform to the AS 4139. Pipes of the same diameter and class can be used in lieu of Steel Reinforced Concrete Pipes.
2. In locations where the pipes are to be laid in a subgrade of sand or influenced by saltwater, rubber ringed joints shall be used.
3. Where rubber ring joints are specified the "V" section rubber ring shall be used and are to be jointed using the manufacturer's lubricant.

S4.05 REINFORCED CONCRETE BOX CULVERTS (RCBC)

1. Box culverts shall be of the "Inverted U" type unless specified otherwise and shall conform in all respects to the current edition of AS 1597.
2. Box culverts laid in areas influenced by saltwater intrusion or acid sulphate soils, or where any part of the pipe is below the Highest Astronomical Tide (RL 1.8m AHD) the box culvert will have cover to reinforcement in accordance with the exposure classification requirements of AS 3600.

S4.06 CORRUGATED ALUMINIUM ALLOY PIPES

1. The pipes shall be manufactured in accordance with AASHTO M196-84 and to the tolerances shown in AS 1761 and incorporate a staked, double offset lock-seam joint.
2. The base metal shall conform to AASHTO M197-82 and shall comprise "Alclad 3004-H34" alloy or approved equivalent.

S4.07 BEDDING MATERIALS**Concrete and Fibre Reinforced Concrete Pipes**

1. Bedding shall consist of clean coarse sand with 100% passing the 19mm AS Sieve and not more than 15% passing the 0.075mm AS Sieve.

Reinforced Concrete Box Culverts

2. The bedding material to be used in conjunction with box culverts should conform to the grading specified in the Main Roads Standard Specification MRTS11.03.

Corrugated Aluminium Alloy Pipes

3. Where rock is encountered at the foundation, the bedding material shall consist of a loose granular cushion of maximum 12mm aggregated size to a depth sufficient to allow the corrugations to become filled. This material shall form the top portion of the bedding material.
4. Where soft unstable foundation material is excavated below the invert, backfill material shall consist of gravel, crushed stone or other suitable material.
5. All material directly in contact with the pipe shall be within a pH range 4-9 and have a resistivity greater than 500 ohm cms.

S4.08 STEEL WIRE GABION AND MATTRESS PROTECTION WORKS

1. Steel wire gabions and mattresses shall be proprietary products manufactured from heavily galvanised hexagonally woven steel-wire mesh and filled with rock conforming to the material requirement specified in Main Roads Specification MRTS 11.03.

S4.09 CONCRETE

1. The concrete and reinforcement used in the construction of gully pits, manholes, headwalls and aprons etc shall comply with Specification S7 CONCRETE WORKS.

S4.10 MANHOLE COVERS AND FRAMES

1. Cast iron covers and frames are to be supplied for all stormwater manholes and shall be manufactured and tested in accordance with AS 3996.
2. All openings shall conform to the details on Standard Drawing S1065.
3. All covers shall have a raised stud pattern with the letters SW (65mm high) cast into the centre of the lid and "gatic" type lifting holes.
4. Minimum classes of manhole covers shall be as follows:

a. Within Residential Properties - Parks	-	Class B
b. Residential Road Reserves (Up to collector street status)	-	Class D
c. Residential Road Reserves (Trunk Collector or higher)	-	Class D
d. Industrial, Commercial Road Reserves	-	Class D

S4.11 GRATES AND FRAMES

1. Grates and frames of gully pits are to be fabricated from grade 250 steel and shall comply with the requirements of AS 3996. They shall be constructed to the dimensions and details supplied on the Standard Drawing S1060 and shall be Hot Dipped Galvanised to the requirements of AS 1650.
2. Grates for structures other than gully pits shall be bicycle safe, and of a classification applicable to its location in accordance with AS 3996.

S4.12 FLOODGATES

1. Floodgates shall be a proprietary product manufactured from non-corrosive material of a type specified on the approved Project Drawings.

S4.13 BACKFILL MATERIAL

1. Backfill material shall generally be selected fill material, not markedly different in character from the surrounding soil, free from large stones, lumps of clay, topsoil, tree roots and other rubbish. It shall have an even grading free of lumps retained on a 75mm sieve and free of stones retained on a 25mm sieve.
2. Stabilised Backfill material may need to be required when utilising Corrugated Aluminium Alloy Pipes. Where such materials are required, only approved mixes in accordance with the manufacturers recommendations shall be accepted.

CONSTRUCTION

S4.14 SETOUT

1. The alignment of the stormwater pipes and position of the gully pits, manholes and headwalls shall be as stated in the approved Project Drawings and set out from a datum line established by a Registered Surveyor. The datum line may be either the road centreline, property boundary, a pegged chainage offset line, or any alternative datum suitable for the purposes of accurately setting out the works.
2. The invert levels of the pipes shall be maintained in strict accordance with site bench marks and only approved and tested equipment shall be used to establish and maintain these levels.

S4.15 CLEARING AND GRUBBING

1. All clearing and grubbing works shall be in accordance with Specification S1 EARTHWORKS.
2. Where stormwater lines pass through allotments any trees or obstructions not on the line of the pipes shall be preserved.

S4.16 TRENCHING

1. All trenching and foundation works necessary for the installation of stormwater drainage works, shall be in accordance with Specification S1 EARTHWORKS.
2. Trench or foundation excavation for stormwater drainage works shall be undertaken to the planned level for the bottom of the specified bedding or foundation level. All loose material shall be removed from the bottom of the trench.
3. The width of trenching excavation shall be in accordance with the Standard Drawings S1045 and S1046 at the trench base and comply with all regulations of Workplace Health and Safety Act.
4. In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements.
5. Where public utilities exist in the vicinity of stormwater drainage works the Contractor shall obtain the approval of the relevant authority / corporation to the method of excavation before commencing excavation.

S4.17 DIVERTING WATER AND DEWATERING

1. During construction all care should be taken to ensure any water, which may interfere with the progress of the works, be diverted to keep the trenches and excavations free from water so as to prevent any damage to the works due to flooding or other causes.
2. The necessary pumping items shall be kept on hand to ensure the excavation is constantly dewatered during the progress of the works.
3. Discharge for dewatering pumps shall be directed to location approved by and to the satisfaction of Council.
4. Care shall be taken to ensure that discharge flows do not cause any flooding, erosion or environmental harm, where necessary appropriate measure shall be put in place to trap and dispose of entrained sediments.
5. In areas where acid sulphate soils are present, discharge flows shall be in disposed off and/or treated in accordance with an approved acid sulphates soils management plan.

S4.18 BEDDING

General

1. Pipe support and bedding shall be in accordance with AS 3725 for pipe support types shown on the approved Project Drawings. Where the pipe support type is not shown on the Drawings, the minimum pipe support type shall be HS2 within road reserves and H1 elsewhere.
2. The bedding and haunch zone material shall be placed and compacted in accordance with AS 3725, with care be taken around the Haunch zone area to avoid disturbing the position of the pipe. The surface of every pipe should have full and even contact with the bedding material.
3. In trenches with bad ground water conditions and/or unsuitable material the trench should be over excavated to allow a foundation layer of crushed rock material (min. depth 250mm) to be placed to provide an adequate foundation. A geofabric to engineering design should be placed for the full width of the trench and overlapped 450mm prior to placing the bedding material and laying the pipes in this instance.

Corrugated Aluminium Alloy Pipes

4. Where soft unstable foundation material is encountered below the pipe invert, the minimum width of replacement material under the pipe shall be twice the pipe diameter. The depth of replacement material shall be such as to achieve a good foundation for the constructed works.
5. When rock is encountered in the foundation, the rock shall be excavated and replaced with suitable bedding material to a depth of $D/4$ or 250mm, whichever is lesser (where D is the pipe diameter).

Box Culverts

6. Bedding for precast and cast insitu base slabs shall be selected backfill to a compacted depth of 150mm laid to the line and level of the underside of the base slab. The bedding shall be finished to a smooth surface with a tolerance of $\pm 10\text{mm}$ in level and $\pm 50\text{mm}$ in line.

S4.19 LAY AND JOINT PIPES

Concrete and Fibre Reinforced Concrete Pipes

1. Pipe laying shall begin at the downstream end of the line with the socket or grooved end of the pipe facing upstream. When the pipes are laid, the barrel of each pipe shall be in contact with the bedding material throughout its full length.
2. When elliptical pipes with circular reinforcement or circular pipes with elliptical reinforcement are used, the pipes shall be laid in such a position that the manufacturer's marks, designating the "Top" or "Bottom" of the pipe shall not be more than 5 degrees from a vertical plane through the longitudinal axis of the pipe.
3. External joints shall be taped with the manufacturers supplied tape or rubber external sand bands upon final bedding and alignment.
4. Lifting holes in pipes shall be plugged with mortar, precast tapered concrete / plastic plugs, or other approved means prior to backfill material being placed.
5. Joints shall not be made under water. The trench must be de-watered to facilitate joint making and inspection. Precautions must be taken to prevent erosion of joint material by moving currents of water.

6. Drainage lines shall be constructed with a tolerance of $\pm 15\text{mm}$ in line or level over any section 30m in length (providing each pipe unit has a fall in the direction of flow) from the alignment and levels shown on the approved Project Drawings.

Reinforced Concrete Box Culverts

7. The base of the box culvert shall be laid true to line and grade before the crown units of the box culvert segments are laid.
8. All construction methods, tolerances and requirements for box culverts shall conform to the requirements detailed in Main Roads Standard Specification MRTS 11.03.

Helical Lock Seam - Corrugated Aluminium Alloy Pipes

9. Coupling of one pipe segment to another shall be by means of an external coupling band.
10. Large diameter pipes may be end match marked in the factory in order to simplify installation. Where multiple cell structures are being installed, each difference shall be marked in a unique manner for ease of identification.
11. Bands have corrugations or dimples that correspond to those of the pipe sections. They shall be fitted so as to overlap each pipe section equally. Where the pipes have not been re-corrugated and "dimple" bands are being used, the pipes shall be rotated sufficiently for the helical corrugations to match adjacent pipes.
12. To speed the coupling operation, especially for large diameter structures, a chain or a cable-cinching device may be used to help draw the band tight. On large structures merely tightening the bolts and nuts will not assure a tight joint, due to the friction between the band and the pipe ends. In such installations, the band shall be tapped with a rubber or wooden mallet as the band is tightened to reduce any tendency for the band to bend on the pipe.
13. The coupling bands shall be evenly tightened to provide a firm tough clamp to the jointed pipes.

S4.20 BACKFILL

Concrete and Fibre Reinforced Pipes

1. Compaction standards for backfill material shall conform to Table S4.1.

Table S4.1 Backfill Compaction

Location	Minimum Dry Density Ratio (Cohesive soils)	Minimum Density Index (Cohesionless soils)
Under Road embankments		
> 0.3m below pavement subgrade	95% Standard	65%
< 0.3m below pavement subgrade	98% Standard	80%
Elsewhere	95% Standard	65%

Note: Compaction requirements are with reference to the relevant Test Methods Contained in AS 1289.

2. For trench installations, mechanical compacters shall be used. Where impact tampers are used caution must be exercised not to allow a direct blow on the pipe. The material should be compacted at near optimum moisture content and should be brought up evenly in layers not exceeding 150mm on both sides

of the pipe up to 150mm over the pipe. It should not be bulldozed into the trench nor dropped directly on the pipe.

3. Heavy mechanical equipment must not be used for tamping of backfill or be permitted to run over pipelines at shallow depths except at prepared crossing places and where approved.
4. For trenches not contained within the road reserve the trench shall be refilled to natural surface level with fill material placed evenly in 150mm to 300mm layers, tamped thoroughly.
5. The backfilling should be completed as soon as possible after pipe laying, and before the pipeline is charged with water. This will avoid the risk of pipes floating if the trench becomes flooded.

Helical Lock Seam - Corrugated Aluminium Alloy Pipes

6. Backfill material shall be placed in layers not exceeding 200mm loose thickness both sides of the structure such that the difference in fill height either side of the pipe is minimal.
7. Tamping may be done with hand or mechanical equipment, tamping rollers or vibrating compacters. Each layer shall be compacted to a standard of compaction in accordance with Table S4.1
8. Where very fine granular material is encountered in conjunction with a high ground-water table, special provision may need to be made to prevent infiltration of the surrounding material into the pipe (such as at coupling band joints), which could cause loss of backfill material surrounding the pipe. Geotextile fabrics or gasket material are typically used.

S4.21 DRAINAGE STRUCTURES

1. Gullies, manholes and field inlets shall be constructed to the form and dimensions shown on the plans and in accordance with Standard Drawings S1050, S1055, S1060, S1065, S1066, and S1070. Where the ground is solid, back forms need not be used in the construction of drainage structures, the concrete being poured against the earth. Where this is done, the thickness of the wall of such gully or manhole shall be increased to a minimum of 50mm greater than the dimension shown on the plan.
2. The joints between drainage structures and pipes shall be made watertight using cement mortar. The mortar shall be used within one hour of mixing and shall not be retempered. The joints shall be finished to provide smooth surfaces, uniform with the inner surfaces of the structure.
3. Concrete benching shall be shaped as specified and shall have smooth, even surfaces and neat edges. Step irons shall be installed horizontal, vertically in line, and shall project uniformly from the walls, where the depth of the structure is greater than 1.5m.
4. Where step irons are not cast-in-place, they shall be epoxy mortared into drilled holes. The joints between the step irons and the walls shall be completely filled so that the step irons are held rigid and the joints are watertight.
5. Concrete top slabs in Manholes shall be joined to the walls using cement mortar or epoxy mortar. The opening in the top slab shall be closed with temporary covers, after which excavations shall be backfilled. Cast in situ concrete surrounds shall be constructed on the top slabs to encase the frames. Alternatively, precast concrete surrounds may be employed, using epoxy mortared joints. Only approved covers in accordance with this Specification shall be installed in the frames.
6. Temporary covers to Gullies and Manholes may remain in position and installation of the frames and surrounds deferred until pavement construction has reached a stage where the frames and surrounds can be positioned accurately. Where construction is in a staged format, the joint between each pour shall be suitably roughened to ensure an adequate bind and seal is achieved between the successive concrete pours.

7. Compaction of material surrounding drainage structures shall be in accordance with Table S4.1

S4.22 STEEL WIRE GABIONS AND MATRESS PROTECTION

1. These proprietary products shall be assembled and installed in accordance with the Main Roads Standard Specification MRTS 11.03.

S4.23 HEADWALLS, WINGWALLS AND APRONS

Cast Insitu

1. Where necessary, localised excavations shall be carried out to allow construction of cast insitu end structures.
2. Cast insitu endwalls, wingwalls and aprons, shall be constructed to the dimensions and other requirements shown on the approved Project Drawings and in accordance with Standard Drawings S1075, S1080, S1085, and S1090.
3. Concrete work shall comply with Specification S7 CONCRETE WORKS. Construction of endwalls and wingwalls shall include the construction of integral cut-off walls, where required.

Precast

4. Where necessary, localised excavations shall be carried out to allow installation of precast concrete end structures.
5. End structures shall be laid on foundation bedding, which provides continuous even support to the structures. Foundation bedding material shall be compacted to the relevant standard specified below:
 - a. Cohesive material - to not less than 95% Standard Compaction.
 - b. Non-cohesive material - to a density index of not less than 65.
6. The joints between end structures and culverts shall be filled with cement mortar. The joint areas shall be thoroughly cleaned and wetted just prior to filling. All points shall be finished smooth and uniform with the surfaces of the end structures.
7. Any holes and recesses provided in end structures to assist installation shall be neatly plugged or filled with cement mortar.
8. Mortared joints and filled holes and recesses shall be cured for a period of not less than 48 hours. Backfill operations against end structures shall not be carried out during this curing period.

S4.24 FLOODGATES

1. Floodgates can be sleeved over the end of the pipe, secured with stainless steel bands or fixed to with a flange to headwalls. Installation shall be in accordance with the manufacturers recommendations.

S4.25 TOLERANCES

1. Tolerances for the construction of Stormwater Drainage Works shall comply with Table S4.2.

Table S4.2 Construction Tolerances

Location	Tolerance
Invert Levels	+10mm - 10mm
Surface Levels	+50mm - 50mm in Allotments +10mm - 10mm in Roadways
Structure Locations	Within 100mm of design in Allotments or Park Within 50mm of design longitudinally along roadway Within 10mm of design at right angles to road centreline
Crest and Spillways of Detention Basins	Trimmed to +25mm - 10mm

S4.26 CCTV INSPECTION OF STORMWATER DRAINAGE SYSTEM COMMENTARY AVAILABLE, TRC, MSC**CCTV INSPECTION – UNDERGROUND STORMWATER PIPE DRAINAGE****WHEN IS A CCTV INSPECTION REQUIRED**

1. A minimum of one (1) CCTV inspection will be required to be undertaken for all installed pipe drainage infrastructure, to demonstrate that the standard of the constructed drainage infrastructure is acceptable. **CCTV Inspections**

2. For stormwater infrastructure installed under road pavement, the first CCTV inspection shall be undertaken after the pavement AC seal has been placed and not more than two (2) weeks before Works Acceptance (on Maintenance) inspection. **First CCTV Inspection**

For stormwater infrastructure installed within the road reserve (but not under road pavement), the first CCTV inspection shall be undertaken within two (2) weeks of Works Acceptance (on Maintenance) inspection.

For stormwater infrastructure installed outside the road reserve, the first CCTV inspection shall be undertaken after the final placement of topsoil and not more than two (2) weeks before Works Acceptance (on Maintenance) inspection.

3. A second CCTV inspection of all pipe drainage may be required to be undertaken on or immediately after the expiration of the defects liability period at Final Works Acceptance. Council will determine using a risk management approach, if this additional inspection is required based on the results of the first **Second CCTV Inspection**

inspection at Works Acceptance.

- | | | |
|----|--|---|
| 4. | Additional CCTV inspections are required of any remediation / repair works undertaken to the stormwater infrastructure, as directed by Council to demonstrate that the standard of the drainage system is acceptable. | Other CCTV Inspections (as required) |
| 5. | The CCTV assessment shall also include any existing stormwater infrastructure that is to be utilised within the design. The extent of inspection of the existing infrastructure shall be confined to areas immediately adjoining the new infrastructure. Council will advise if any repair / upgrades to the existing system are required. | Use of existing infrastructure |

WHAT IS TO BE INSPECTED

- | | | |
|----|--|------------------------------|
| 1. | All underground stormwater networks with 375 diameter pipes up to 2000mm in diameter are to be CCTV inspected.

Pipe greater than 2000mm diameter are to be assessed by visual inspection. | CCTV up to 2000mm dia |
| 2. | Pipes shall be inspected and reported on the following:
a. Horizontal alignment
b. Vertical alignment
c. Cracks and defects
d. Pipe joints
e. Joints to manholes/structures and other pipes
f. Ovality | Assessment Criteria |

PRE INSPECTION CRITERIA

- | | | |
|----|--|----------------------------|
| 1. | All pipes are to be inspected and assessed for acceptance for incorporation into the works upon delivery to site. All defects including cracking shall be assessed. The acceptance of pipes upon delivery to the site shall be in accordance with AS4058 for reinforced concrete pipes and the relevant Australian Standards and manufacturers recommendations for other pipe materials. | Acceptance criteria |
| 2. | It is the contractors responsibility to make this assessment. | |

INSPECTION CRITERIA

- | | | |
|----|---|----------------------------------|
| 1. | The CCTV Inspection shall be carried out in accordance with the Water Services Association of Australia (WSAA) "Sewer Inspection Reporting Code of Australia" | CCTV Inspection Procedure |
|----|---|----------------------------------|

2. CCTV surveys are to be undertaken using a camera with the ability to capture footage in colour and pan and tilt 360°.

3. CCTV Field Assessors must be experienced and competent personnel for CCTV inspections.

CCTV Field Assessors

4. All pipes must be free of debris and silt at the time of inspection.

5. The pipeline shall be assessed at the following speeds

Speed

Conduit Diameter	Allowable Camera Speed
Dia. < 200mm	0.1m/s *
200mm ≤ Dia. < 300mm	0.15m/s *
Dia. ≥ 300mm	0.2m/s *
* - Or as agreed by Council	

6. The camera must stop perpendicular to all cracks, defects, joints and manholes and pan 360°. Particular attention should be paid to any infiltration at joints and connections.

Stop and pan 360°

ACCEPTANCE CRITERIA

1. The pipe drainage will be acceptable if Council is satisfied that the CCTV inspection does not reveal any defects that would constitute a departure from this specification or any other relevant Development Specification.

Acceptance of CCTV Inspection

2. The misalignment of the lip at the inside of a joint between two connecting pipes shall be in accordance with AS4058 for reinforced concrete pipe or any other relevant Australian Standard for different pipe materials.

At Joints

3. The following criteria govern whether a crack or impact damage is acceptable without repair being required.

Criteria for crack or impact damage acceptance

- Minor in nature and within the relevant Australian Standards
- No sign of displacement across the crack
- The edges of the crack are not crushed
- No sign of entry of sand or debris to the pipeline
- No rupture of the pipe surface at the site of a dent or bulge

Defects that defer from the above criteria are required to be repaired.

4. Structural Defects beyond the recommendations of the Australian Standards will be deemed to be unacceptable as below;

Types of Defects

- a. Cracks and fractures
- b. Deformed, collapsed and broken pipes
- c. Dropped inverts
- d. Displaced and open joints
- e. Surface damage
- f. Defective connections

Serviceability Defects include;

- a. Debris and silt
- b. Obstructions
- c. Infiltrations, unless there are special design considerations
- d. Roots
- e. Encrustation and scale

5. All cracks are to be assessed by an appropriately experienced RPEQ and pipe surveyor to determine the significance of the crack and thereby the acceptance, rejection or remedial repairs required.

Council will review the RPEQ assessment and determine whether the identified defect is considered significant or not. Council may also seek written advice from the Pipe Surveyor or the Pipe Manufacturer on this matter.

6. All manhole and gully pit pipe connections are to be mortared flush with the walls and that no pipe reinforcement is exposed.

7. The acceptance of pipes during and after installation shall be in accordance with AS4058, manufacturers recommendations and any other relevant Australian Standard particular to the pipe material used.

Acceptance criteria

8. Sections of the pipeline that fail the ovality test are to be excavated and the trench and embedment replaced.

9. Pipes that are crushed or creased are to be replaced.

SUBMISSION

1. The Applicant must submit both a hardcopy report and an electronic report (submitted in CD or DVD medium in a format suitable to Council - as outlined below) of the CCTV inspection. The CCTV Inspection Report is a pre-requisite for issue of a Works Acceptance Certificate or Final Works Acceptance Certificate if required at this final stage.

CD or DVD contents and format:

- a. Individual video files representing each section of pipe from node to node. (e.g. from MH 5A to MH 6A)
- b. Each video file is to be named appropriately to enable easy identification, utilising names as shown on the as-constructed or approved design drawings. (e.g. *MH5A-MH6A*)
- c. Video file format is to be MPG format.

- d. Copy of pipe survey report in PDF format.
2. The reports must
 - a. Specify the date of the inspection
 - b. Specify location (including Street Name and number)
 - c. Specify details of the reach being inspected(including line and structure numbers)
 - d. Provide footage in colour
 - e. Identify all faults, features and connections in the pipeline.
 - f. Clearly show chainage along the pipeline
 - g. Suggest appropriate remediation measures, as required.
3. For all CCTV inspections a written report shall be submitted including;
 - a. Certification by an RPEQ that the pipes have been installed in accordance with the relevant Australian Standards and Manufacturers recommendations. In addition the certification is to include an assessment of any cracks or defects as listed above with regard to compliance with the Australian Standards and Manufacturers recommendations.
 - b. Recommendations on remedial works if compliance is not in accordance with Australian Standards and Manufacturers recommendations.
 - c. Digital photographs of any identified defects,
 - d. Digital photographs of any remediation works undertaken.

**For pipes
greater than
2000mm dia**

IF REMEDIATION WORKS ARE REQUIRED

1. Any defects identified by the inspection must be repaired or replaced in accordance with the provisions of this Specification, or as directed by the RPEQ or Council.
2. All costs associated with the CCTV inspection and rectification works shall be borne by the Applicant. **Costs**
3. Defects identified by the inspection requiring repair may be repaired using one of the following repair techniques;
 - a. Tiger patch liner
 - b. Econoliner
 - c. PL Quick Sleeve System
 - d. Flexi-Bond method
 - e. Other such technique as approved by Council**Acceptable
repair methods**
4. Circumferential cracks are to be repaired by installation of either a bandage for cracks on the outside or by Relining and Grouting for cracks on the inside or alternatively as approved by Council. **Circumferential
cracks**
5. Longitudinal cracks are to be repaired by filling with an approved epoxy resin. The epoxy resin shall not be less than 1mm thick and extended at least 100mm from the crack in all directions. The repair is to be reinspected after curing is complete. **Longitudinal
cracks**
6. A follow-up CCTV assessment is required of any repaired or replaced infrastructure, to demonstrate that the remediation measures undertaken are

satisfactory to Council.



FNQROC DEVELOPMENT MANUAL

OPERATIONAL WORKS

SPECIFICATION

S5

WATER RETICULATION

Version No. 01/11

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Far North Queensland Regional Organisation of Councils. Requests and inquiries concerning reproduction and rights should be addressed to the FNQROC Coordinator, PO Box 359, CAIRNS, Qld 4870.

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
GENERAL		1
S5.01	SCOPE	1
S5.02	REFERENCE DOCUMENTS	1
MATERIALS		3
S5.03	PIPES GENERAL	3
S5.04	POLYVINYLCHLORIDE (PVC)	3
S5.05	POLYETHYLENE PIPE (PE)	3
S5.06	DUCTILE IRON	3
S5.07	COPPER	4
S5.08	BEDDING MATERIAL	4
S5.09	VALVES	4
S5.10	HYDRANTS	4
S5.11	BENDS AND TEES	4
S5.12	PAVEMENT MARKING	4
S5.13	RAISED RETRO REFLECTIVE MARKING	5
CONSTRUCTION		6
S5.14	SETOUT	6
S5.15	CLEARING AND GRUBBING	6
S5.16	TRENCHING	6
S5.17	CROSSINGS	7
S5.18	BEDDING	7
S5.19	LAYING AND JOINTING OF PIPES	7
S5.20	CONNECTION TO EXISTING	8
S5.21	FITTINGS	8

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
S5.22	VALVE / HYDRANT MARKERS.....	8
S5.23	ANCHOR BLOCKS.....	9
S5.24	THRUST BLOCKS.....	9
S5.25	WATER SERVICE CONNECTIONS	9
S5.26	BACKFILLING AND COMPACTION	9
S5.27	RESTORATION OF SURFACES.....	10
S5.28	TESTING OF LINES.....	11
S5.29	FLUSHING & DISINFECTION	11
S5.30	TOLERANCES	12
APPENDIX A – Amendments to Standard Drawings - Water Supply Code of Australia WSA 03-2002		14
APPENDIX B - Dual Water Supply Systems Vers 1.2 – WSA 03-2002 Amendments to Standard Drawings		16

GENERAL

S5.01 SCOPE

1. This specification details all matters pertaining to the minimum requirements for Water Supply Reticulation Construction.
2. Where there is any conflict determined between the requirements specified herein and the requirements of any referenced Australian Standard, Statutory Authority Standards or otherwise, the requirements specified herein shall apply.
3. The planning, design, construction and certification of water reticulation infrastructure is to be carried out in accordance with this Manual and the Water Services Association of Australia latest publication – *WSA 03 – Water Supply Code of Australia*.
4. Aspects of modification or clarification of the Water Supply Code of Australia WSA 03 – 2002 are detailed in Appendix A of Section D6 – Minimum Design Standard of this Manual.
5. Aspects of modification or clarification of the Water Supply Code of Australia WSA 03 – 2002 – Water Supply Code of Australia – Standard Drawings are detailed in Appendix A of this document.

S5.02 REFERENCE DOCUMENTS

Note: Where *Acts* or reference documents are updated, reference should be made to the current version.

Australian Standards

- AS 1289 Methods of Testing Soils for Engineering Purposes
- AS 1432 Copper Tubes for Plumbing, Gasfitting and Drainage Applications
- AS 1646 Elastomeric Seals for Waterworks Purposes
- AS/NZS 1477 PVC Pipes and Fittings for pressure applications
- AS/NZS 1906 Retroreflective Material and Devices for Road Traffic Control Purposes
- AS 2032 Code of Practice for Installation of PVC Pipe Systems
- AS 2033 Installation of Polyethylene Pipe Systems
- AS 2129 Flanges for pipes valves and fittings
- AS/NZS 2280 Ductile Iron Pressure Pipes and Fittings
- AS/NZS 2556 Buried flexible pipelines
- AS 2638 Sluice Valves for Waterworks Purposes
- AS 3952 Water Supply - DN80 Spring Hydrant Valve for General Purposes
- AS/NZS 4129 Fittings for polyethylene (PE) pipes for pressure applications
- AS/NZS 4130 Polyethylene (PE) pipes for pressure applications
- AS/NZS 4765 Modified PVC (PVC-M) pipe for pressure applications

Queensland Department of Main Roads Standard Specifications

- MRTS 11.45 Road Surface Delineation

WATER RETICULATION

Water Services Association of Australia

- WSA 03 – 2002 – Water Supply Code of Australia
- WSA03 – Dual Water Supply Systems – Supplement to the Water Supply Code of Australia
- WSA01 – Polyethylene Pipeline Code

MATERIALS

S5.03 PIPES GENERAL

1. All materials used shall be listed on Council's approved products register.
2. All pipes used for water main reticulation shall be constructed from the following materials:
 - (i) Polyvinylchloride (PVC)
 - (ii) Polyethylene (PE)
 - (iii) Ductile Iron
 - (iv) Copper

S5.04 POLYVINYLCHLORIDE (PVC)

1. Unplasticised PVC (PVC-U) pipes shall be manufactured in accordance with AS/NZS 1477 by an Australian Standards quality endorsed company.
2. Modified PVC (PVC-M) pipes manufactured in accordance with AS/NZS 4765 by an Australian Standards quality endorsed company may be used as an alternative to uPVC.
3. Oriented PVC (PVC-O) pipes manufactured in accordance with AS 4441 by an Australian Standards quality endorsed company may be used as an alternative to PVC-U
4. PVC pipes 100mm diameter and greater to be Class 16 rubber ring jointed (Ductile iron compatible).
5. Rubber Rings shall be manufactured and tested in accordance with AS 1646. Jointing lubricant in accordance with the manufacturers specification should be used to facilitate jointing.

S5.05 POLYETHYLENE PIPE (PE)

1. Polyethylene pipe shall be manufactured in accordance with AS/NZS 4130 by an Australian Standards quality endorsed company.
2. PE pipes to be 50mm inside diameter Class 16.
3. Fittings shall comply with AS/NZS 4129.
4. All pipes and fittings shall have a co-extruded solid colour of blue for potable water supply and lilac for non-potable water.

S5.06 DUCTILE IRON

1. Ductile Iron pipes shall be manufactured and cement lined in accordance with AS/NZS 2280 by an Australian Standards quality endorsed company. The actual lining material shall be approved by Council and be suitable for potable water.

WATER RETICULATION

2. Socketed pipes to be Class PN35 or where cover is less than minimum, suitable for the patented "Tyton" type rubber ring joint. Flanged pipes to be Class PN45.
3. Flanges shall comply with AS 2129 Table C. Bolts and nuts for flanged joints shall be in accordance with AS 2129.
4. All pipes and fittings shall be wrapped in a loose polyethylene sleeving 0.25mm thick and coloured blue for potable water supply and lilac for non-potable. Wrapping and taping shall be carried out in accordance with the pipe manufactures recommendations.

S5.07 COPPER

1. Copper tube shall be a minimum standard of Type B seamless tube manufactured in accordance with AS 1432 by an Australian Standards quality endorsed company.

S5.08 BEDDING MATERIAL

1. Bedding Material shall consist of a clean coarse sand free from organic matter, clay, shells and deleterious material with 100% passing the 6.7mm AS sieve and not more than 5% passing a 0.150mm AS sieve.

S5.09 VALVES

1. All Valves shall be manufactured in accordance with AS 2638 by an Australian Standards quality endorsed company.
2. Valves of 100mm diameter and larger, are to be coated with a thermosetting epoxy powder to AS 2638 and AS 3952.
3. All 50mm diameter valves shall be DR brass construction with appropriate pressure rating or approved equivalent and certified by QAS to Standards Mark or Water Mark. All valves shall be fitted with bronze tee handles.

S5.10 HYDRANTS

1. Hydrants shall be the spring hydrant "Maxi Flow" 2000 type (DN80) manufactured in accordance with AS 3952 by an Australian Standards quality endorsed company. Hydrants are to be coated with a thermosetting epoxy powder to AS 2638 and AS 3952.

S5.11 BENDS AND TEES

1. All bends for mains of 100mm diameter or larger and all other associated fittings shall be constructed in accordance with AS/NZS 2280, and have flanged or spigot and socket type joints as specified on the approved Project Drawings. Where flanges are used, bolts shall be matched sets and conform to the following criteria:
 - i. In above ground uses, bolts shall be Hot Dipped Galvanised
 - ii. In below ground uses, bolts shall be Grade 316 Stainless Steel with nuts and washers Grade 304 stainless steel.
2. All bends, tees and miscellaneous fittings shall be factory nylon powder coated unless otherwise specified.

S5.12 PAVEMENT MARKING

1. The manufacture, supply and material requirements appropriate to the specification of pavement marking shall be in accordance with Main Roads Standard Specification "MRTS11.45 Road Surface Delineation".

S5.13 RAISED RETRO REFLECTIVE MARKING

1. Raised retroreflective pavement markers used to locate hydrants shall be blue bi directional markers.
2. The material requirements of the raised retroreflective pavement markers shall be in accordance with Main Roads Standard Specification "MRTS11.45 Road Surface Delineation".

CONSTRUCTION

S5.14 SETOUT

1. The location and sizes of the mains and position of valves and hydrants shall be as stated on the approved Project Drawings.
2. Bends shall be positioned such that the correct alignment is maintained and remains within the allotted service corridor.
3. Where levels are nominated on the approved Project Drawings the Contractor shall ensure the main is laid within the given tolerances and the equipment used to level the main is approved and tested.
4. The main shall be setout from an approved datum line set by a Registered Surveyor (Consulting). The datum line may be either the road centreline, property boundary, a pegged chainage offset line, or any alternative datum suitable for the purposes of accurately setting out the works.
5. The position of hydrants, fittings, valves and water service connections / conduits shall be located within 1.0m of the side property boundary.

S5.15 CLEARING AND GRUBBING

1. All clearing and grubbing works shall be in accordance with Specification S1 EARTHWORKS.
2. Any trees or obstructions not on the line of the pipes shall be preserved.

S5.16 TRENCHING

1. All trenching and foundation works necessary for the installation of the pipeline or thrust blocks, shall be in accordance with Specification S1 EARTHWORKS.
2. The width of trenching excavation shall be in accordance with the Standard Drawing S2016 at the trench base and comply with all regulations of Workplace Health and Safety Act.
3. In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements.
4. Where public utilities exist in the vicinity of water reticulation works the Contractor shall obtain the approval of the relevant authority / corporation to the method of excavation before commencing excavation.
5. The safety of the public shall be considered at all times. Where necessary, fenced walkways and vehicular crossways shall be provided across trenches to maintain access from carriageway to individual properties or within individual properties. All such installations shall be of adequate size and strength and satisfactorily illuminated.
6. In the event of any trenching being left open for longer than one week, the Contractor shall provide erosion control measures to ensure minimal soil disturbance and material loss off the site. Some or all of these measures shall be provided immediately upon the onset of rain with an open trench.
7. The Contractor shall leave a clear space of 600mm minimum between the edge of any excavation and the inner toe of spoil banks. No excavated materials shall be stacked against the walls of any building or fence without the written permission of the owner of such building or fence. Topsoil from excavations shall be kept separate and utilised to make good the surface after backfilling.

S5.17 CROSSINGS

1. Where a water main crosses a State Controlled Road Railway line or creek, the affected work shall be carried out in accordance with the requirements of the relevant Authority / Corporation. It shall be the Contractor's responsibility to complete written notification to the Authority / Corporation of the intention to carry out the work.
2. Where a water main crosses an existing road, the affected work shall be carried out in accordance with the requirements of Council. It shall be the Contractor's responsibility to notify Council of the intention to carry out the work.

S5.18 BEDDING

1. All pipes shall be uniformly bedded in order to ensure solid and uniform support for the full length of the barrel with bell holes formed to accommodate the sockets to ensure a minimum clearance of 20mm.
2. The depth of bedding shall be as detailed on Standard Drawing S2016 with the bedding material complying with the "Bedding Material" section of this Specification.

S5.19 LAYING AND JOINTING OF PIPES

1. All contractors shall have undertaken a manufacturers pipe laying accreditation course.
2. All pipe lines shall be laid to such lines, curves, gradients and levels as shown on approved Project Drawings.
3. Care shall be taken to preserve uniform gradients and correct alignments. Bends shall be used to effect horizontal and vertical changes of direction.
4. The manufacturers recommendations for maximum deflection at each joint shall be strictly adhered to.
5. Jointing of pipes, valves and fittings is to be carried out to the manufactures recommendations and in accordance with Australian Standards.
6. When the joint is made, the witness mark shall at no point be more than 1mm from the end of the socket.
7. Before being laid, all pipes, fittings, valves, etc shall be cleaned and examined by the Contractor.
8. Approved plugs shall be used to prevent foreign matter entering sections of pipeline, which are left uncompleted overnight.
9. The Contractor shall take all necessary precautions to prevent flotation of pipes during laying, backfilling and initial testing. Any temporary supports shall be removed prior to completion of backfilling.
10. Pipes shall be cut as needed to suit closing lengths, to remove damaged pipe or fittings or to remove sockets if necessary when jointing a socketed fitting.
11. For field cuts, only an approved mechanical pipe cutter shall be used, except that uPVC pipes may be cut using a power saw or a fine toothed hand saw and mitre box.
12. Any pipes cut in the field shall have their ends prepared in accordance with the manufacturer's written instructions.
13. Where pipes are cut in the field, a witness mark shall be made on the pipe at the length specified by the manufacturer from the end of the pipe. Scoring of uPVC pipes shall not be permitted.

WATER RETICULATION

S5.20 CONNECTION TO EXISTING

1. Connections to existing pipes carrying water shall be made at such times as will cause the least interference with the supply. The Contractor shall arrange with the Council or other Authority / Corporation concerned for the timing of the work. All works shall be carried out by the relevant Local Authority at the applicants cost.

S5.21 FITTINGS

1. The laying and jointing of mains shall include the fixing in position of all valves of any description, fire hydrants and all other fittings, which are necessary for the completion of the mains.
2. Joints to secure fittings to pipes shall be approved under Australian Standard AS1646.
3. All sluice valves, gate valves, air valves and hydrants shall be carefully placed in the final position so as to be the correct distance from the surface and installed in accordance with Standard Drawings S2000, S2001 and S2005. With air valves and hydrants, risers shall be installed where necessary and if required, trenches shall be deepened and graded in the vicinity of all valves and hydrants in order to secure the correct depth below the surface.
4. Valves, hydrants and specials shall be thoroughly cleaned out prior to installation in main.
5. The spring hydrants shall be bolted to the flange of the hydrant junction so that the bolts of the hydrants are in line with the main, and the hydrant cover box fitted with its long axis along the centre line of the main. Hydrants must be protected during backfilling in such a manner as will prevent earth or grit from damaging the seating.
6. Hydrants and valves shall be fully protected during laying and backfilling, on completion all glands shall be well screwed down, and all valves shall operate freely.

S5.22 VALVE / HYDRANT MARKERS

1. The position of all stop valve, scour valve, air valve and hydrants shall be indicated by a kerb marker plate, painted kerb marker or marker post. The type of marker to be installed shall be as stated on the approved Project Drawings.
2. Where painted "H" symbol are required to indicated hydrants they shall be in accordance with Standard Drawing S2010.
3. Where a kerb marker plate are required to indicate valve and hydrant locations they shall be fixed to the kerb face it shall be in accordance with Standard Drawing S2010.
4. Where a timber marker posts are required to indicate valve and hydrant locations they shall be in accordance with Standard Drawing S2012.
5. Where a steel marker posts are required to indicate main, valve and hydrant locations they shall be in accordance with Standard Drawing S2011.
6. In addition to painted kerb markers / marker posts, all hydrants shall have a road pavement marker to indicate the location of the hydrant. The road pavement marker shall be either a painted teardrop or blue bi directional raised retro reflective pavement marker as stated on the approved Project Drawings.
7. Where a painted teardrop is specified the teardrop shall be painted with a solid yellow enamel paint and be 630mm overall length with 200mm radius base and a 25mm radius tip. The teardrop shall be painted across the centreline of a two-lane road or in the middle of the near side lane of a multi laned road. The tapered end of the teardrop shall point towards the relevant hydrant

8. Where a blue bi-directional raised retro reflective pavement marker is specified it shall be fixed securely to the road pavement 100mm offset from the centreline of the road on the side of hydrant. On two lane roads, the marker is to be positioned on the road centreline. For multi-lane roads, it is to be positioned on the lane line between the first and second lane.
9. The installation requirements of and pavement makings and raised retroreflective pavement markers shall be in accordance with Main Roads Standard Specification "MRTS11.45 Road Surface Delineation".

S5.23 ANCHOR BLOCKS

1. Where a main is installed at a grade of 1 in 6 or steeper, concrete anchor blocks shall be provided in accordance with Standard Drawing S2016.
2. Concrete works shall comply with Specification S7 CONCRETE WORKS.

S5.24 THRUST BLOCKS

1. Thrust blocks shall be constructed where shown on the approved Project Drawings. The blocks shall be provided at valves, bends, tees, enlargers and reducers or any other point where unbalanced forces resulting from internal pressures will occur.
2. Thrust blocks, sized in accordance with the requirements detailed on Standard Drawing S2015.
3. Concrete works shall comply with Specification S7 CONCRETE WORKS.
4. Chains will not be accepted as an alternative to straps.

S5.25 WATER SERVICE CONNECTIONS

1. Water service connections shall be constructed where shown on the approved Project Drawings in accordance with and to the satisfaction of the relevant Local Authority.
2. All services shall be left turned off at the ferrule following testing.
3. Install brass kerb markers in the kerb, stamped with a "W" at locations where water services cross roads.

S5.26 BACKFILLING AND COMPACTION

1. Material for the side support and overlay of the pipe shall comply with the pipe bedding material specification. The material shall be compacted in layers of not more than 150mm to 95 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289. Flooding of non-cohesive material shall be considered as an acceptable method of compacting bedding material.
2. The remainder of the excavation shall be backfilled with excavated material. The backfill shall be compacted in layers of not more than 150mm thick to 95 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289. Flooding of cohesive material shall not be permitted as a means of compacting backfill.
3. Backfilling and compaction shall be carried out without damaging the pipe or its external coating or wrapping or producing any movement of the pipe.
4. Where trenches are under constructed pavements or in other situations where required, the material used for backfilling shall be approved excavated material with linear shrinkage of the fines passing a 2.36mm sieve of not greater than 6 per cent. The Contractor may elect to use imported, select fill or sand for this

WATER RETICULATION

purpose. The backfill shall be spread in layers not exceeding 300mm in loose depth at or near optimum moisture content and compacted using mechanical vibration equipment.

5. Backfill material down to a depth of 300mm below the underside of the pavement material shall be compacted to 98 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289, and backfill material below such depth shall be compacted to not less than 95 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289.
6. In cases other than those covered by the above clause backfilling above the level of 300mm above the top of the pipes in open trenches may be carried out by dumping from mechanical plant into the trench providing that no rock is placed in the trench until the pipes are covered by at least 300mm of soil backfill.
7. Compaction testing shall be carried out at a rate of 1 test for each 150 metres of trench backfilled or in the case where trenches are constructed under road pavements and road shoulders, 1 test for each 25 metres of trench backfilled.

S5.27 RESTORATION OF SURFACES

1. Pavements, lawns and other improved areas shall be cleaned and left in the same order as they were at the commencement of the works. Lawns shall be restored with turf cut and set aside from the original surface and / or with imported turf.
2. All restored surfaces shall be maintained in the condition to which they are restored until the expiry of the Defects Liability Period applicable to those surfaces. Pavements shall be maintained with crushed metal, gravel or other suitable material allowing for consolidation and shall then be restored to a condition equivalent to that of the original pavement.
3. Immediately the backfilling of a trench excavated through a pavement has been completed, the pavement shall be temporarily restored. Where the trench crosses bitumen or concrete pavement, a pre-mixed asphaltic material shall be used for such temporary restoration. Temporary restoration works shall be maintained by the Contractor until final restoration is carried out.
4. Final restoration of the pavement shall be carried out to restore the pavement and its sub-base to no less than the original condition. Unless noted otherwise on the approved Project Drawings all trenches excavated through bitumen or concrete pavement shall be sawcut each side to facilitate a neat finish to the final restoration. Final restoration may include, if required, the removal of temporary restoration.
5. Backfill shall be placed sufficiently high to compensate for expected settlement and further backfilling shall be carried out or the original backfill trimmed at the end of the Defects Liability Period in order that the surface of the completed trench may then conform to the adjacent surface. Surplus material shall be removed and disposed of to areas arranged by the Contractor.
6. In locations where surplus material left in the vicinity of the trench would not be objectionable, the surplus material may be disposed by spreading neatly in the vicinity of the trench in such a way as to minimise future erosion of the backfill and adjacent ground surfaces. The Contractor shall maintain the backfill and adjacent ground until the end of the Defects Liability Period.
7. Where, within public or private property, the reasonable convenience of persons will require such, trenches to be levelled off at the time of backfilling. Any subsequent settlement shall be made good by the Contractor, as required by placing additional fill.
8. Where shown on the approved Project Drawings or where the Contractor elects to tunnel under paving, kerb and gutter or other improved surfaces in lieu of trenching, backfilling shall be so carried out as to restore full support to those surfaces. The Contractor shall remain responsible for the repair of the improved surfaces, if subsequently damaged due to subsidence of the backfill, until the end of the Defects Liability Period.

S5.28 TESTING OF LINES

1. Hydrostatic pressure testing of all water mains shall be carried out prior to the acceptance of the works.
2. The contractor shall have carried out a successful test prior to arranging a Council witness test.
3. Pressure testing shall not be carried out during wet weather unless otherwise approved by Council.
4. Before testing a pipeline section, it shall be cleaned and filled slowly with water, taking care that all air is expelled.
5. The minimum test pressure acceptable shall be 1200 kPa unless advised otherwise by the relevant Local Authority and shall be considered to be satisfactory if:
 - (a) There is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component;
 - (b) There is no visible leakage; and
 - (c) There is no loss of pressure in the 15 minute test period
6. The specified test pressure shall be maintained as long as required, while the whole section is examined, and in any case not less than 15 minutes.
7. Any failure, defect, and / or visible leakage, which is detected during the pressure testing of the pipeline or during the Defects Liability Period shall be made good by the contractor and re-tested.

S5.29 FLUSHING & DISINFECTION**1. Preliminary Flushing**

The entire new main is to be flushed until it is clean and clear

2. Disinfection

Disinfection of the entire new main is to be carried out using a sodium hypochlorite solution or other chlorine bearing agent. The dosing rate is to be 20mg/L with a contact time of 24 hours. During such time all fittings, valve and hydrants should be operated to ensure all parts are being disinfected.

3. Flushing of Disinfection Water

After disinfection, the treated water is to be flushed from either end until the chlorine content does not exceed 1.0mg/L. Disinfection water is not permitted to enter the reticulation system or be discharged to the stormwater drains or waterways.

4. Testing

Upon completion of the flushing and disinfection process, water samples are to be taken for testing by a Council approved testing authority. The samples are to be tested for E-coli, Total coliform and Heterotrophic Plate Count.

5. Testing

Upon completion of the flushing and disinfection process, water samples are to be taken for testing by a Council approved testing authority. The samples are to be tested for E-coli, Total coliform and Heterotrophic Plate Count.

1. Tolerances for the construction of water reticulation works shall comply with Table S5.1.

Table S5.1 Construction Tolerances

Alignment	On the allocated alignment +/- 100 mm
Hydrants, Fittings	Within 0.3m of design relative to side property boundary
Water service connections / conduits	Within 0.3m of design relative to side property boundary
Valves	Within 0.3m of design relative to first point of truncation of the property boundary

APPENDIX A

WATER SUPPLY CODE OF AUSTRALIA

WSA 03-2002

Amendments to Standard Drawings

APPENDIX A – Amendments to Standard Drawings - Water Supply Code of Australia WSA 03-2002

Amendments to Standard Drawings

Drawing	Amendments
WAT-1100 WAT-1101 WAT-1102 WAT-1103 WAT-1104 WAT-1105 WAT-1106 WAT-1107 WAT-1108 WAT-1109	Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use
WAT-1200 WAT-1201 WAT-1202 WAT-1203 WAT-1204 WAT-1205 WAT-1206 WAT-1207 WAT-1208 WAT-1209 WAT-1210 WAT-1211 WAT-1212 WAT-1213 WAT-1214	<div> Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use </div> <div> } Replace with S2016 } Replace with S2015 Adopt Adopt Adopt Adopt Add Note 7(a) Ensure grouting pressures do not exceed buckling capability of empty pipe. Add Note 5(a) Ensure grouting pressures do not exceed buckling capability of empty pipe. Add Note 5 Ensure grouting pressures to not exceed buckling capability of empty pipe. </div>
WAT-1300 WAT-1301 WAT-1302 WAT-1303 WAT-1304 WAT-1305 WAT-1306 WAT-1307 WAT-1308 WAT-1309 WAT-1310 WAT-1311 WAT-1312 WAT-1313	Do not use – Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Adopt Do not use Adopt Adopt
WAT-1400 WAT-1401 WAT-1402 WAT-1403 WAT-1404 WAT-1405 WAT-1406 WAT-1407 WAT-1408 WAT-1409	Adopt Adopt Adopt Adopt Do not use Do not use Do not use Do not use Do not use Do not use

APPENDIX B

WATER SUPPLY CODE OF AUSTRALIA

WSA 03-2002

Amendments to Standard Drawings

APPENDIX B - Dual Water Supply Systems Vers 1.2 – WSA 03-2002 Amendments to Standard Drawings**STANDARD DRAWINGS**

Drawing	Amendments
WAT-1800	Adopt
WAT-1801	Adopt
WAT-1802	Adopt
WAT-1803	Adopt
WAT-1804	Adopt
WAT-1805	Adopt
WAT-1806	Adopt
WAT-1807	Do not Use
WAT-1808	Adopt
WAT-1810	Adopt
WAT-1811	Adopt
WAT-1820	Do not Use
WAT-1821	Do not use
WAT-1822	Adopt
WAT-1823	Adopt
WAT-1824	Do not use
WAT-1825	Adopt



FNQROC DEVELOPMENT MANUAL

OPERATIONAL WORKS

SPECIFICATION

S6

SEWERAGE RETICULATION

Issue Date – 03/14

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Far North Queensland Regional Organisation of Councils. Requests and inquiries concerning reproduction and rights should be addressed to the FNQROC Coordinator, PO Box 359, CAIRNS, Qld 4870.

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
GENERAL		1
S6.01	SCOPE	1
S6.02	REFERENCE DOCUMENTS	1
MATERIALS		3
S6.03	PIPES GENERAL ^{CRC, DSC}	3
S6.04	UNPLASTICISED PVC (PVC-U)	3
S6.05	DUCTILE IRON	3
S6.06	BEDDING MATERIALS	4
S6.07	CONCRETE	4
S6.08	PRECAST MANHOLES	4
S6.09	MANHOLE COVERS ^{TRC}	4
CONSTRUCTION		6
S6.10	SETOUT	6
S6.11	CLEARING AND GRUBBING	6
S6.12	TRENCHING	6
S6.13	CROSSINGS	7
S6.14	BEDDING	7
S6.15	LAYING AND JOINTING OF PIPES	8
S6.16	CONNECTIONS TO MANHOLES	9
S6.17	CONNECTION TO EXISTING	9
S6.18	ANCHOR BLOCKS	9
S6.19	PROPERTY CONNECTION BRANCHES	9
S6.20	PRESSURE (RISING) MAINS	10

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
S6.21	MANHOLES ^{TRC, CRC, DSC}	10
S6.22	COVERS AND SURROUNDS.....	11
S6.23	PUMP STATIONS ^{CRC, DSC}	11
S6.24	BACKFILL AND COMPACTION.....	11
S6.25	CLEANING SEWERS	12
S6.26	TEST OF MANHOLES.....	12
S6.27	TESTING OF LINES	13
S6.28	TESTING OF PRESSURE (RISING) MAINS	14
S6.29	CCTV INSPECTION OF SEWERS	15
S6.30	RESTORATION OF SURFACES	16
S6.31	TOLERANCES	17

APPENDIX A – Sewerage Code of Australia – WSA 02-2002 - Amendments to

Standard Drawings	2
-------------------------	---

APPENDIX B – Sewerage Pumping Station – WSA 04-2005 - Amendments to Standard

Drawings	5
----------------	---

GENERAL

S6.01 SCOPE

1. This specification details all matters pertaining to the minimum requirements for Sewerage Reticulation Construction.
2. Where there is any conflict determined between the requirements specified herein and the requirements of any referenced Australian Standard, Statutory Authority Standards or otherwise, the requirements specified herein shall apply.
3. The planning, design and construction of infrastructure is to be carried out in accordance with this Manual and the following Water Services Association of Australia publications:
 - a. WSA 02-2002 Sewerage Code of Australia
 - b. WSA 04-2005 Sewerage Pumping Station Code of Australia
4. Aspects of modification or clarification of the codes are detailed in Appendix A of Design Manual – D7
5. The requirements of this Manual will take precedence over the Water Services Association of Australia Codes
6. Aspects of modification or clarification of the codes Standard Drawings are detailed in Appendix A and B of this document.
7. Smart Sewers are to be designed and constructed in accordance with SEQ Water Supply and Sewerage Design and Construction Code.

S6.02 REFERENCE DOCUMENTS

Note: Where *Acts* or reference documents are updated, reference should be made to the current version.

Australian Standards

- | | |
|---------------|---|
| • AS/NZS 1260 | Unplasticised PVC (UPVC) Pipes and Fittings for Sewerage applications |
| • AS 1289 | Methods of Testing Soils for Engineering Purposes |
| • AS 1463 | Polyethylene Pipe Extrusion Compounds |
| • AS/NZS 1477 | Unplasticised PVC (uPVC) pipes and fittings for pressure applications |
| • AS 1646 | Elastomeric Seals for Waterworks Purposes |
| • AS 2032 | Code of practice for installation of uPVC pipe systems. |
| • AS 2129 | Flanges for pipes, valves and fittings |
| • AS 2280 | Ductile Iron Pressure Pipes and Fittings |
| • AS 3996 | Metal Access Covers, Road Grates and Frames |
| • AS 4198 | Precast concrete access chambers for sewerage applications |
| • AS/NZS 4765 | Modified PVC (PVC-M) pipe for pressure applications |

QLD Government Legislation

- Water Act 2000
- Water Supply (Safety and Reliability) Act 2008
- Queensland Plumbing and Wastewater Code

Water Services Association of Australia

- WSA 02-2002 Sewerage Code of Australia
 - WSA 04-2005 Sewerage Pumping Station Code of Australia
 - WSA 05-2006 Conduit Reporting Code of Australia
 - WSA 06-2008 Vacuum Sewerage Code of Australia
 - WSA 07-2007 Pressure Sewerage Code of Australia
 - WSA 05-2006 Sewer Inspection Reporting code of Australia
-
- SEQ Water Supply and Sewerage Design and Construction Code.

MATERIALS

S6.03 PIPES GENERAL CRC, DSC

1. All pipes used for sewer reticulation shall be constructed from the following materials:

- (i) Polyvinylchloride (PVC)
- (ii) Ductile Iron
- (iii) Polyethylene
- (iv) Polypropylene

S6.04 UNPLASTICISED PVC (PVC-U)

1. Unplasticised PVC (PVC-U) pipes and fittings for gravity systems shall be manufactured in accordance with AS1260 suitable for rubber ring joints. Pipe classes shall be in accordance with the manufacturers recommendation and shall be as shown on the approved Project Drawings. The minimum pipe class shall be SN8.
2. Unplasticised PVC (PVC-U) pipes and fittings for pressure (rising) mains and suction pipes shall be manufactured in accordance with AS/NZS 1477 minimum Class 12 suitable for rubber ring joints with a cream coloured pigment.
3. Modified PVC (PVC-M) pipes manufactured in accordance with AS/NZS 4765 minimum Class 12 by an Australian Standards quality endorsed company may be used as an alternative to uPVC with a cream coloured pigment.
4. Oriented PVC (PVC-O) pipes manufactured in accordance with AS 4441 minimum Class 12 by an Australian Standards quality endorsed company may be used as an alternative to PVC-U with a cream coloured pigment.
5. Rubber Rings shall be manufactured and tested in accordance with AS 1646. They shall be of natural rubber and only those impregnated with a Root Inhibitor shall be used.

S6.05 DUCTILE IRON

1. Ductile Iron pipes shall be manufactured and cement lined in accordance with AS 2280 by an Australian Standards quality endorsed company. DI pipes with normal cement lining shall not be used for gravity sewers, which should be Calcium Aluminate lined. For sections of pressure sewers that are permanently wet, DI pipes with normal cement lining may be used subject to Council approval. Sections of pressure (rising) main subject to alternate wetting and drying shall have Calcium Aluminate lining.
2. Socketed Pipes to be Class PN35 suitable for the patented "Tyton" type rubber ring joint. Flanged Pipes to be Class PN45.
3. Flanges shall comply with AS 2129 Table C. Bolts and nuts for flanged joints shall be in accordance with AS 2129.
4. All pipes and fittings shall be wrapped in a cream coloured loose polyethylene sleeving 0.25mm thick. Wrapping and taping shall be carried out in accordance with the pipe manufactures recommendations.
5. All bends for mains of 100mm diameter or larger and all other associated fittings shall be constructed in accordance with AS2280, and have flange or spigot and socket type joints as specified on the approved Project Drawings. Where flanges are used, bolts shall be matched sets and conform to the following criteria:

- a. In above ground uses, bolts shall be Hot Dipped Galvanised
- b. In below ground uses, bolts shall be Grade 316 Stainless Steel with nuts and washers Grade 304 stainless steel.

S6.06 BEDDING MATERIALS

General

1. The bedding material shall be selected commensurate with the trench conditions prevailing and in accordance with Standard Drawing S3015.

Type 1 Bedding

2. Type 1 Bedding shall consist of a clean coarse sand free from organic matter, clay, shells and deleterious material with 100% passing the 6.7mm AS sieve and not more than 5% passing a 0.150 mm AS sieve.
3. In wet conditions and where the trench bottom is firm, a 12 -16mm Aggregate may be used for the bedding material.

Type 2 Bedding

4. Type 2 Bedding shall be used in wet conditions particularly where the trench bottom requires stabilising and consist of a "Crushed Rock Foundation" with a geotextile surround.
5. The crushed rock is to have a maximum size of 37.5mm and there shall be not more than 20% passing the 19mm sieve and not more than 5% passing the 4.76mm sieve.
6. The geotextile surround shall be as stated on the approved Project Drawings or as specified by a registered Geotechnical Engineer.
7. The bedding of the pipes shall then be as specified for Type 1 above.

Type 3 Bedding

8. Type 3 Bedding construction is adopted where there is wet ground with insufficient supporting capabilities for other methods of bedding.
9. Piles shall be in accordance with the approved Project Drawings with 150 x 50 hardwood sleepers and planks placed prior to pouring the concrete cradle as depicted in Standard Drawing S3015. Concrete shall be N15 grade.

S6.07 CONCRETE

1. The concrete and reinforcement used in the construction of cast insitu manholes shall comply with Specification S7 CONCRETE WORKS.

S6.08 PRECAST MANHOLES

1. Precast manhole components shall comply with AS 4198.

S6.09 MANHOLE COVERS ^{TRC}

1. Manhole covers and frames shall be supplied for all sewer manholes and shall be Cast Iron sealed (gastight) covers manufactured in accordance with AS 3996.

2. All openings shall conform to the details on Standard Drawing S3000.
3. All covers shall have a raised stud pattern with the letters SEWER (65mm high) cast into the centre of the lid and “gatic” type lifting holes.
4. Unless noted otherwise on the approved Project Drawings the minimum class of manhole covers shall be as follows:
 - Within Private Properties - Class B
 - All Other Areas (Parks, Road Reserves, etc) - Class C

CONSTRUCTION

S6.10 SETOUT

1. The alignment and grade of sewer lines and position of manholes shall be stated on the approved Project Drawings.
2. The position of the centre of each manhole shall be pegged on the ground by a Registered Surveyor prior to the commencement of work.
3. Offset pegs shall be established prior to commencing construction of any line, at a convenient distance to remain clear of all works and remain intact for the duration of the work.
4. The levels of the sewers shall be maintained in strict accordance with bench marks and only approved and tested equipment shall be used to establish and maintain these levels in accordance with the design documents.

S6.11 CLEARING AND GRUBBING

1. All clearing and grubbing works shall be in accordance with Specification S1 EARTHWORKS.
2. Where sewer lines pass through allotments any trees or obstructions not on the line of the pipes shall be preserved.

S6.12 TRENCHING

1. All trenching and foundation works necessary for the installation of the pipeline or thrust blocks, shall be in accordance with Specification S1 EARTHWORKS.
2. The width of trenching excavation shall be in accordance with the Standard Drawing S3015 at the trench base and comply with all regulations of Workplace Health and Safety Act.
3. In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements.
4. Where public utilities exist in the vicinity of sewer reticulation works the Contractor shall obtain the approval of the relevant authority / corporation to the method of excavation before commencing excavation.
5. In the event of any trenching being left open for longer than one week, the Contractor shall provide erosion control measures to ensure minimal soil disturbance and material loss off the site. Some or all of these measures shall be provided immediately upon the onset of rain with an open trench.
6. The Contractor shall leave a clear space of 600mm minimum between the edge of any excavation and the inner toe of spoil banks. No excavated materials shall be stacked against the walls of any building or fence without the written permission of the owner of such building or fence. Topsoil from excavations shall be kept separate and utilised to make good the surface after backfilling.

S6.13 CROSSINGS

1. Where a sewer main crosses a State Controlled Road, Railway line or creek, the affected work shall be carried out in accordance with the requirements of the relevant Authority / Corporation. It shall be the Contractor's responsibility to complete written notification to the Authority / Corporation of the intention to carry out the work.
2. Where a sewer main crosses an existing road, the affected work shall be carried out in accordance with the requirements of Council. It shall be the Contractor's responsibility to notify Council of the intention to carry out the work.

S6.14 BEDDING

1. Bedding types shall be as detailed on Standard Drawing S3015 with the bedding materials complying with the "Bedding Material" section of this Specification.

Type 1 Bedding

2. The bedding material shall be as specified and shall be placed and compacted for the full width of the trench to the level of the underside of the pipe.
3. An area of bedding adjacent to the position of the pipe collar should be removed to provide a minimum 20mm clearance to the collar while the remainder of the pipe is bedded evenly on the bedding material.
4. The remainder of the bedding material is then placed and carefully tamped to avoid disturbing the position of the pipe thus ensuring that the surface of every pipe is in full and even contact with the bedding material.
5. All bell holes shall be rammed prior to completion of the bedding operation. The bedding material shall be uniformly compacted so as to achieve the following standards:
 - a. Minimum dry density ratio 95% Standard (cohesive soils).
 - b. Minimum density index 65% (cohesionless soils)

Compaction requirements are with reference to the relevant Test Methods contained in AS1289.

6. In wet conditions, where the ground below the invert of the pipe is firm and stable, the pipe surround, for 100mm below the pipe and 300mm above shall be crushed rock (20mm size).

Type 2 Bedding

7. Used in wet conditions particularly where the trench bottom requires stabilising the trench invert shall be over excavated to accommodate a "Crushed Rock Foundation" with a geotextile surround.
8. Water is to be removed from the excavation as work proceeds to allow for placement of the geotextile and crushed rock layer. The crushed rock layer shall be laid in 100mm layers and compacted as required.
9. The crushed rock is to be placed, compacted and tested until it supports a load of 3 tonnes on a 300mm square steel plate with less than 12mm settlement in 12 hours.
10. The geotextile shall surround the crushed rock layer and be overlapped minimum of 450mm.
11. The pipe bedding material shall be placed and compacted over the crushed rock foundation as specified for Bedding Type 1.

Type 3 Bedding

12. Type 3 bedding incorporating designed piles that are driven by air or electric hammer on a heavy dolly.
13. Piles shall be driven to give a set in accordance with the design requirements and spaced accordingly as stated on the approved Project Drawings.
14. A 200 x 400 hardwood sleeper is placed on top of the pile with 150 x 50 hardwood planks spanning the sleepers.
15. A concrete cradle as detailed on the approved Project Drawings shall then be poured on the planks to support the pipes.

S6.15 LAYING AND JOINTING OF PIPES

1. All contractors shall have undertaken a manufacturers pipe laying accreditation course.
2. All pipelines shall be constructed of pipes of such sizes and laid true to such levels and grades as shown on the approved Project Drawings.
3. The lines, levels and grades of all lines shall be checked and all pipes found incorrect shall be removed and re-laid.
4. Trenches shall be kept free of water during pipe laying, and until completion of backfill.
5. Jointing of pipes, valves and fittings is to be carried out to the manufactures recommendations and in accordance with Australian Standards where applicable.
6. When the joint is made, the witness mark shall at no point be more than 1mm from the end of the socket.
7. Before being laid, all pipes, fittings, valves, etc shall be cleaned and examined by the Contractor.
8. Approved plugs shall be used to prevent foreign matter entering sections of pipeline, which are left uncompleted overnight.
9. The Contractor shall take all necessary precautions to prevent flotation of pipes during laying, backfilling and initial testing. Any temporary supports shall be removed prior to completion of backfilling.
10. Pipes may be cut as needed to suit closing lengths, to remove damaged pipe or fittings or to remove sockets if necessary when jointing a socketed fitting.
11. For field cuts, only an approved mechanical pipe cutter shall be used, except that uPVC pipes may be cut using a power saw or a fine toothed hand saw and mitre box.
12. Any pipes cut in the field shall have their ends prepared in accordance with the manufacturer's written instructions.
13. Where pipes are cut in the field, a witness mark shall be made on the pipe at the length specified by the manufacturer from the end of the pipe. Scoring of uPVC pipes shall not be permitted.
14. Gravity lines shall be constructed to the tolerances specified hereafter:
 - a. The maximum horizontal deviations to either side from the design axis of a pipeline shall be 100mm for all sizes of pipes.

- b. The maximum vertical deviations from the design grade of pipelines of any diameter and grade, shall be $\pm 10\text{mm}$.

S6.16 CONNECTIONS TO MANHOLES

1. Pipelines shall be connected to manholes, structures or embedded concrete by means of 600mm long pipes such that two flexible joints are provided, the first joint being at or within 150mm of the face of the structure.
2. The position of the access chamber shall be as shown on the approved Project Drawings. The Contractor shall check the alignment prior to commencing construction and advise the design engineer of any obstructions (Structure, Flora, Services etc)
3. Allowable lateral deviations from the final design position of access chambers shall be in accordance with the tolerances for horizontal deviations of pipelines as specified. Longitudinal deviations from that position shall not exceed 300mm.

S6.17 CONNECTION TO EXISTING

1. Connection to existing live sewer mains and manholes shall be carried out in accordance with the requirements of Council. It shall be the Contractor's responsibility to notify Council of the intention to carry out and arrange for the timing of such works.
2. The upstream side of the existing manhole is to be plugged until all new sewer mains have been approved, tested and cleaned.

S6.18 ANCHOR BLOCKS

1. Concrete anchor blocks shall be provided in accordance with Standard Drawing S3015 for 150 dia. lines laid at a grade of 1 in 6 or steeper and 225 dia. lines laid at 1 in 10 or steeper.
2. Concrete works shall comply with Specification S7 CONCRETE WORKS.

S6.19 PROPERTY CONNECTION BRANCHES

1. Property Connection Branches (PCB) to all properties shall be constructed in accordance with Standard Drawing S3005 and to the types, locations, levels and dimensions stated on the approved Project Drawings.
2. Concrete surrounds shall be provided to all PCB's. All concrete works shall comply with Specification S7 CONCRETE WORKS.
3. Backfill around risers shall be sand compacted to the top of the socket or coupling, for the full width of trench and for a minimum distance of 500mm upstream and downstream of the riser.
4. The position of each riser, junction or end of a sideline shall be clearly marked by the Contractor on completion of backfilling, with an approved metallic marker tape tied to the end of PCB and held in a vertical position during backfilling. The top end of the tape shall be left flush with ground level.

S6.20 PRESSURE (RISING) MAINS

1. All works necessary for the installation of the pressure (rising) mains including installation of thrust block and anchor blocks, shall be in accordance with Specification S5 WATER RETICULATION.
2. Line valves, air release valves and scour valves shall be installed where shown on the approved Project Drawings.
3. Unless otherwise noted on the approved Project Drawings, pipes for pressure (rising) mains shall be laid on continuously rising grades from scour valve to air release valve, notwithstanding any minor irregularities in the ground surface.
4. Marking plates bearing the letters "AV" for air valves, "SV" for scour valves and "RM" at changes of direction and at such chainages that the location of the main is marked at least once each 200 metres, shall be provided as shown on Standard Drawing S2011.
5. Sewer pressure (rising) main connection to discharge manholes are to be constructed in accordance with standard Drawing S3000 CRC Pressure Main Receiving Manhole.

S6.21 MANHOLES^{TRC, CRC, DSC}

1. All concrete work associated with the construction of manholes shall comply with Specification S7 CONCRETE WORKS.
2. Manholes shall be constructed in accordance with Standard Drawing S3000 and to the types, locations, levels and dimensions stated on the approved Project Drawings.
3. Rendering of this invert and benching shall be in accordance with the Standard Drawing S3000.
4. In areas not subject to water charged ground, precast manholes are an acceptable alternative with precast base units for Inlet Type A manholes in accordance with Standard Drawing S3000 and their use has been certified by an RPEQ.
5. In areas not subject to water charged ground, precast manhole risers are acceptable for use with cast insitu manhole bases and their use has been certified by an RPEQ.
6. Precast riser units shall be jointed in accordance with the manufacturers specifications utilising the recommended method and materials. Inlets into precast units shall be constructed in accordance with the details illustrated on Standard Drawing S3000.
7. The installation of all precast manhole components shall be in accordance with the manufacturers' recommended procedures and requirements.

S6.22 COVERS AND SURROUNDS

1. Manhole covers shall be finished flush with the surface in roadways, footpaths and paved surfaces. Elsewhere, unless noted otherwise on the approved Project Drawings, covers shall be finished 50mm above the surface of the ground, in a manner designed to avoid as far as possible, the entry of surface water.
2. Manhole covers are to be gas tight.
3. Manhole covers are to be located such that the position of the access opening is directly over the outlet pipe.
4. The installation of all precast manhole covers shall be in accordance with the manufacturers' recommended procedures and requirements.

S6.23 PUMP STATIONS ^{CRC, DSC}

1. All concrete work associated with the construction of pump stations shall comply with Specification S7 CONCRETE WORKS.
2. Pump Stations shall be constructed in accordance with Standard Drawings S3020, S3025, S3030 and S3035 and to the types, locations, levels and dimensions stated on the approved Project Drawings.
3. Concrete pump stations are to have an council approved hydrogen sulphide resistant. high build, water proof coating applied to the internal walls in accordance with the manufactures specifications.
4. Use of the pump station is not permitted until Works Acceptance, unless otherwise approved by Council.

S6.24 BACKFILL AND COMPACTION

1. Material for the side support and overlay of the pipe shall comply with the pipe bedding material specification. The material shall be compacted in layers of not more than 150mm thick to 95 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289. Flooding of non-cohesive material shall be considered as an acceptable method of compacting bedding material.
2. The remainder of the excavation shall be backfilled with excavated material. The backfill shall be compacted in layers of not more than 150mm thick to 95 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289. Flooding of cohesive material shall not be permitted as a means of compacting backfill.
3. Backfilling and compaction shall be carried out without damaging the pipe or its external coating or wrapping or producing any movement of the pipe.
4. Where trenches are under constructed pavements or in other situations where required, the material used for backfilling shall be approved excavated material with linear shrinkage of the fines passing a 2.36mm sieve of not greater than 6 per cent. The Contractor may elect to use imported, select fill or sand for this purpose. The backfill shall be spread in layers not exceeding 300mm in loose depth at or near optimum moisture content and compacted using mechanical vibration equipment.
5. Backfill material down to a depth of 300mm below the underside of the pavement material shall be compacted to 98 per cent of the standard maximum dry density of the material used when determined in accordance with AS1289, and backfill material below such depth shall be compacted to not less than 95

per cent of the standard maximum dry density of the material used when determined in accordance with AS1289.

6. In cases other than those covered by the above clause backfilling above the level of 300mm above the top of the pipes in open trenches may be carried out by dumping from mechanical plant into the trench providing that no rock is placed in the trench until the pipes are covered by at least 300mm of soil backfill.
7. Compaction testing shall be carried out at a rate of 1 test for each 150 metres of trench backfilled or in the cast where trenches are constructed under road pavements and road shoulders, 1 test for each 25 metres of trench backfilled.

S6.25 CLEANING SEWERS

1. Before the sewers, manholes and house drains are accepted they shall be cleaned to remove all clay, sand and other materials.
2. All water plus materials used in the flushing of the reticulation system shall under no circumstances be discharged into existing sewers downstream of construction. All lines shall be inspected after flushing and will not be accepted until they present a clear barrel, free from any obstruction.
3. The contractor/owner accepts all responsibility for costs associated with pumping out from a manhole.
4. Prior to commencement of use, the manholes and sewers upstream must be flushed to the satisfaction of Council.
5. The Contractor must submit a work method statement for approval by Council for pumping out from a manhole and flushing the sewers.

S6.26 TEST OF MANHOLES

1. All manholes shall be subjected to hydrostatic or vacuum tests to prove their water tightness unless directed otherwise by the Local Authority.
2. For vacuum test, the maximum allowable loss of vacuum is 3.5 KPa after achieving a vacuum of 33.5 KPa in the time shown in Table S6.1.

Table S6.1 Acceptance times for 3.5Kpa Vacuum Drop

Manhole Depth	Manhole Diameter	
	1050 mm	1200 mm
<2400	17 sec	20 sec
3000	21 sec	25 sec
4000	28 sec	33 sec
5000	35 sec	41 sec
6000	42 sec	49 sec
7000	49 sec	57 sec

3. For hydrostatic tests, all pipe openings out of the manhole shall be plugged and the manhole filled with water to the lowest point on the top of the manhole cover surround. The plugs shall be positioned in the pipes as near as practicable to the internal face of the access chamber. After allowing an interval for absorption, the manhole shall be refilled.
4. The test on the manhole will be considered satisfactory provided the level does not drop more than 25mm in twenty four (24) hours. The plug of the outlet shall be fitted with a suitable release for emptying the manhole on satisfactory completion of the test.
5. Manholes failing the test shall be repaired and the test repeated. The process of testing, repair of defects and retesting shall continue until a satisfactory test is obtained.
6. Where the ground water level is high, an infiltration test may also be required. This shall not take place until ten (10) days after the placing of concrete.

S6.27 TESTING OF LINES

1. All gravity lines shall be subject to air testing to prove their water tightness unless directed otherwise by the Local Authority.
2. Testing may be done progressively, a minimum of 24 hours notice shall be provided to Council before commencement of testing. Ensure that pipes are clean before any test is performed.
3. If any of the tests proved to be unsatisfactory, the contractor shall be required to detect and repair the fault and then re-test. The contractor shall continue to repair and re-test until a satisfactory test is obtained. Even if testing produces satisfactory test results, the contractor shall repair any pipeline or conduit in which there is a visible or detectable leak or blockage.
4. The contractor shall carry out a visual inspection to ensure that all sewer lines present a full clean bore.

Air Testing General

5. Air testing shall be either pressure testing or vacuum testing, as directed by the Local Authority. The tests shall include the Property connection branches and inspection tee.
6. Air Testing (Pressure) - The sewer line to be tested shall be pressurised to the "Initial Pressure" shown in the Table S6.2 for a minimum of 3 minutes to stabilise the temperature.

Table S6.2 Pressure Air Testing – Initial Pressures

	Sewer Depth Range (metres)				
	0 - 1.5	1.5 - 3.0	3.0 - 4.5	4.5 - 6.0	Over 6.0
Initial Pressure (kPa)	30	35	40	45	50
Test Start Pressure (kPa)	25	30	35	40	45

7. After the 3 minute stabilisation period the pressure shall be dropped to the "Test Start Pressure" shown in the above table and the pressure gauge monitored for 5 minutes.

8. The sewer line under test shall be considered to have passed the test when the pressure does not fall by more than 5 kPa during the 5 minute period.
9. Air testing (Vacuum) - The sewer to be tested shall be drawn to a vacuum of 28 KPa and the vacuum gauge monitored for 5 minutes. The sewer under test shall be considered to have passed the test when the vacuum does not fall by more than 5 KPa during the 5 minute period.

Ovality Testing

10. All gravity sewer pipes shall be tested to determine any excessive pipe deflection (Ovality) by using a proving tool.
11. Testing for ovality shall be carried out no sooner than 14 days after all backfilling operations have been completed. Testing shall be by pulling a proving tool, for the nominal size pipe in the table below through each section of pipe by hand winching to demonstrate that the maximum allowable deflection is not exceeded.
12. The proving tool shall be:
 - (a) Fabricated from steel or aluminium alloy with pulling rings at each end and marked to indicate the nominal pipe size and the provers' outside diameter.
 - (b) Rigid, non-adjustable, have an odd-number of legs (min 9) and an effective length of not less than its nominal diameter + 75mm. The minimum diameter at any point along the length shall be as shown in Table S6.3.
 - (c) The shape of the proving tool must be approved. An alternate tool to that described in (a) and (b) may be approved by Council.

Table S6.3 Minimum Prover Diameter (mm)

Nominal Pipe Size (DN)	uPVC Pipes (SN 8)*
150	141.9
225	221.1
300	280.8
375	357.2

(Note: Where SN 10 is required as a result of the trench condition (equivalent to PVC pressure pipe PN12) or there is an unusual delay in the ovality testing (>3 months after backfilling of trench) alternate Prover Diameter may be considered by Council provided it is supported by calculations done under AS/NZS 2566.2.)

13. Sewer pipes that fail the maximum allowable deflection as shown above, shall be replaced and the re-laid section retested for ovality.

S6.28 TESTING OF PRESSURE (RISING) MAINS

1. Hydrostatic pressure testing of all sewer pressure (rising) mains shall be carried out prior to the acceptance of the works.
2. The contractor shall have carried out a successful test prior to arranging a Council witness test.

3. Pressure testing shall not be carried out during wet weather unless otherwise approved by Council.
4. Before testing a pipeline section, it shall be cleaned and filled slowly with water, taking care that all air is expelled. Purging of air from pressure (rising) mains shall be promoted by opening air valves.
5. The hydrostatic test pressure which shall be applied to each section of the pipeline shall be such that at each point of the section the test head shall be equal to or greater than the design head specified or shown on the approved Project Drawings, but shall not exceed same by more than 20 per cent.
6. The pressure testing of a section shall be considered to be satisfactory if:
 - (a) There is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component;
 - (b) There is no visible leakage; and
 - (c) There is no loss of pressure in the 15 minute test period
7. The specified test pressure shall be maintained as long as required, while the whole section is examined, and in any case not less than 15 minutes.
8. Any failure, defect, and / or visible leakage, which is detected during the pressure testing of the pipeline or during the Defects Liability Period shall be made good by the contractor.

S6.29 CCTV INSPECTION OF SEWERS

1. All reticulation sewers including private sewers that discharge into the Council reticulation system are to be inspected by closed circuit television (CCTV) at a maximum 14 days before Works Acceptance Inspection but after all backfilling operations have been satisfactorily completed and all junctions are installed. This inspection is required to ensure that the pipe is without any construction defects, the pipe has no internal flow obstructions and all approved junctions are in the correct location. Further the inspection will verify the information provided with the 'As Constructed' drawings
2. Inspection surveys are to be carried out by qualified and experienced CCTV operators with appropriate equipment being able to give accurate chainage and pipe grade and allowing site locations and condition comments to be recorded. All CCTV work is to be carried out under the supervision of the Consulting Engineer.
3. CCTV inspections shall comply with the following requirements:
 - a. Appendix F of the latest version of the WSAA Conduit Inspection Reporting Code of Australia WSA 05-. This includes all requirements outlined in Section 2 of the Code in relation to CCTV operator qualification, CCTV camera equipment and accuracy, camera operation, data display on recorded images and the inspection report.
 - b. The sewer shall be cleaned prior to the CCTV inspection
 - c. Two sets of digital video files (MPEG 1 or MPEG 2 format), digital photographs (JPEG format) or certain defects as state in Appendix F of WSA 05- and a digital file with the coding information (WinCan format or other digital formats stated in future editions of the WSA 05 standard) on CD or DVD medium shall be provided.
4. Viewing and assessing of the DVD recording is to be undertaken by the Consulting Engineer and a report is to be prepared and submitted to Council confirming the inspection verifies the following:
 - a. Chainage of Property connection branches to be checked against the as constructed survey information and drawings.
 - b. Pipe grades to be checked against the as constructed survey information and drawings

- c. Absolutely no ponding
 - d. All joints have been pushed fully home and no ring protrusions to be evident
 - e. No discernible diversion from a straight line in both the vertical and horizontal
 - f. No infiltration
5. One copy of the DVD recording is to be retained by the Consulting Engineer as part of the project records and a copy is to be submitted to Council with the 'As Constructed' submission.

S6.30 RESTORATION OF SURFACES

1. Pavements, lawns and other improved areas shall be cleaned and left in the same order as they were at the commencement of the works. Lawns shall be restored with turf cut and set aside from the original surface and / or with imported turf.
2. All restored surfaces shall be maintained in the condition to which they are restored until the expiry of the Defects Liability Period applicable to those surfaces. Pavements shall be maintained with crushed metal, gravel or other suitable material allowing for consolidation and shall then be restored to a condition equivalent to that of the original pavement.
3. Immediately the backfilling of a trench excavated through a pavement has been completed, the pavement shall be temporarily restored. Where the trench crosses bitumen or concrete pavement, a pre-mixed asphaltic material shall be used for such temporary restoration. Temporary restoration works shall be maintained by the Contractor until final restoration is carried out.
4. Final restoration of the pavement shall be carried out to restore the pavement and its sub-base to no less than the original condition. Unless noted otherwise on the approved Project Drawings all trenches excavated through bitumen or concrete pavement shall be sawcut each side to facilitate a neat finish to the final restoration. Final restoration may include, if required, the removal of temporary restoration.
5. Backfill shall be placed sufficiently high to compensate for expected settlement and further backfilling shall be carried out or the original backfill trimmed at the end of the Defects Liability Period in order that the surface of the completed trench may then conform to the adjacent surface. Surplus material shall be removed and disposed of to areas arranged by the Contractor.
6. In locations where surplus material left in the vicinity of the trench would not be objectionable, the surplus material may be disposed by spreading neatly in the vicinity of the trench in such a way as to minimise future erosion of the backfill and adjacent ground surfaces. The Contractor shall maintain the backfill and adjacent ground until the end of the Defects Liability Period.
7. Where, within public or private property, the reasonable convenience of persons will require such, trenches are to be levelled off at the time of backfilling. Any subsequent settlement shall be made good by the Contractor, as required on a regular basis by placing additional fill.
8. Where shown on the approved Project Drawings or where the Contractor elects to tunnel under paving, kerb and channel or other improved surfaces in lieu of trenching, backfilling shall be so carried out as to restore full support to those surfaces. The Contractor shall remain responsible for the repair of the improved surfaces, if subsequently damaged due to subsidence of the backfill, until the end of the Defects Liability Period.

S6.31 TOLERANCES

1. Tolerances for the construction of sewer reticulation works shall comply with Table S6.4.

Table S6.4 Construction Tolerances

Location	Tolerance
Invert levels	$\pm 10\text{mm}$
Location of alignment and structures	Lateral deviation from line $\pm 100\text{mm}$ Longitudinally along line $\pm 300\text{mm}$
Grade on pipe	The grade should not be less than minimum grade and not more than the maximum grade.

APPENDIX A

SEWERAGE CODE OF AUSTRALIA

WSA 02-2002

Amendments to Standard Drawings

Sewerage Code of Australia WSA 02-2002

APPENDIX A – Sewerage Code of Australia – WSA 02-2002 - Amendments to Standard Drawings

Drawing	Amendments
SEW-1002	Do not use
SEW-1101	Do not use
SEW-1102	Do not use
SEW-1103	Do not use
SEW-1104	Do not use
SEW-1105	Do not use
SEW-1106	Do not use
SEW-1107	Do not use
SEW-1108	Do not use
SEW-1109	Do not use
SEW-1200	Do not use
SEW-1201	Do not use
SEW-1202	Do not use
SEW-1203	Do not use
SEW-1204	Do not use
SEW-1205	Do not use
SEW-1206	Do not use
SEW-1207	Do not use
SEW-1208	Use permitted with prior approval of Council
SEW-1300	Do not use
SEW-1301	Do not use
SEW-1302	Do not use
SEW-1303	Do not use
SEW-1304	Do not use
SEW-1305	Do not use
SEW-1306	Do not use
SEW-1307	Do not use
SEW-1308	Do not use
SEW-1309	Do not use
SEW-1310	Do not use
SEW-1311	Do not use
SEW-1312	Do not use
SEW-1313	Do not use
SEW-1314	Adopt
SEW-1315	Do not use
SEW-1316	Adopt
SEW-1317	Adopt

SEW-1400	Do not use – syphons not permitted
SEW-1401	Adopt
SEW-1402	Adopt
SEW-1403	Adopt
SEW-1404	Adopt
SEW-1405	Do not use
SEW-1406	Adopt
SEW-1407	Adopt
SEW-1408	Adopt
SEW-1409	Do not use – water seals not required
SEW-1410	Do not use – water seals not required
SEW-1411	Do not use – water seals not required
SEW-1412	Do not use – replace with S3035
SEW-1500	Do not use
SEW-1501	Do not use – replace with S3010
SEW-1502	Adopt

APPENDIX B

SEWERAGE PUMPING STATION CODE OF AUSTRALIA

WSA 04-2005

Amendments to Standard Drawings

APPENDIX B – Sewerage Pumping Station – WSA 04-2005 - Amendments to Standard Drawings

Drawing	Amendments
SPS - 1100 SPS - 1101 SPS - 1102 SPS - 1103 SPS - 1104	Do not use Do not use Do not use Do not use Do not use
SPS - 1200 SPS - 1201 SPS - 1202 SPS - 1203 SPS - 1204 SPS - 1205	Do not use Do not use Do not use Do not use Do not use Do not use
SPS - 1300 SPS - 1301 SPS - 1302 SPS - 1303 SPS - 1304 SPS - 1305 SPS - 1306 SPS - 1307 SPS - 1308 SPS - 1309 SPS - 1310	Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use
SPS - 1400 SPS - 1401 SPS - 1402 SPS - 1403 SPS - 1404 SPS - 1405	Do not use Do not use Do not use Do not use Do not use - Do not use
SPS - 1500 SPS - 1501 SPS - 1502 SPS - 1503 SPS - 1504 SPS - 1505 SPS - 1506 SPS - 1507 SPS - 1508	Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use Do not use
SPS - 1600 SPS - 1601 SPS - 1602 SPS - 1603 SPS - 1604 SPS - 1605 SPS - 1606	Do not use Do not use Do not use Do not use Do not use Do not use Do not use

Replace with
S3020 and S3025

Replace with S3035



FNQROC DEVELOPMENT MANUAL

OPERATIONAL WORKS

SPECIFICATION

S7

CONCRETE WORKS

Version No. 01/11

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Far North Queensland Regional Organisation of Councils. Requests and inquiries concerning reproduction and rights should be addressed to the FNQROC Coordinator, PO Box 359, CAIRNS, Qld 4870.

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
GENERAL		1
S7.01	SCOPE	1
S7.02	REFERENCE DOCUMENTS	1
MATERIALS		2
S7.03	CONCRETE - GENERAL	2
S7.04	NO FINES CONCRETE	4
S7.05	LEAN MIX CONCRETE	4
S7.06	REINFORCING STEEL	4
CONSTRUCTION		5
S7.07	TEMPERATURE LIMITS FOR CONCRETE PLACEMENT	5
S7.08	FOUNDATIONS	5
S7.09	FORMWORK AND FALSEWORK	6
S7.10	REINFORCING STEEL	7
S7.11	CONCRETE PLACEMENT - GENERAL	8
S7.12	CONCRETE PLACEMENT – UNDER WATER	9
S7.13	COMPACTION IN CONCRETE FORMS	9
S7.14	REMOVAL OF FORMS AND FALSEWORK	9
S7.15	FINISHING OF EXPOSED SURFACES	10
S7.16	WEEPHOLES	10
S7.17	JOINTS	11
S7.18	CURING	12
S7.19	BACKFILLING	12
S7.20	SPRAYED CONCRETE	13
S7.21	NO FINES CONCRETE	13

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
S7.22	TOLERANCES	14

GENERAL

S7.01 SCOPE

1. This specification details all matters pertaining to the supply, placement, compaction and finishing of Concrete Works.
2. Where there is any conflict determined between the requirements specified herein and the requirements of any referenced Australian Standard, Statutory Authority Standards or otherwise, the requirements specified herein shall apply.

S7.02 REFERENCE DOCUMENTS

Note: Where Acts or reference documents are updated, reference should be made to the current version.

Australian Standards

- AS 1012 Methods of Test Concrete
- AS/NZS 4671 Steel reinforcing bars for concrete
- AS/NZS 4671 Steel reinforcing wire for concrete
- AS/NZS 4671 Welded wire reinforcing fabric for concrete
- AS 1379 The specification and manufacture of concrete
- AS 1478 Chemical Admixtures for Concrete
- AS 1554.3 Welding of Reinforcing Steel
- AS 1553.1 Low Carbon Steel Electrodes for Manual Welding Arc Welding of Carbon Steels & Carbon – Manganese Steels
- AS 2203 Cored Steel Electrodes for Arc Welding
- AS 2717.1 Ferritic Steel Electrodes
- AS 3600 Concrete structures
- AS 3610 Formwork for concrete
- AS 3735 Concrete Structures for retaining liquids
- AS 3799 Liquid membrane-forming curing compounds for concrete,

All Australian Standards referenced in this specification shall be the current edition.

MATERIALS

S7.03 CONCRETE - GENERAL

1. All concrete to be incorporated in the works shall be sourced from a Quality Assured Concrete supplier.
2. The production and delivery of ready-mixed concrete shall be in accordance with the requirements of AS 1379.
3. The quantity of concrete delivered in any truck shall not exceed the rated capacity of its agitator drum. The timing of deliveries shall be such as to ensure an essentially continuous placing operation.
4. Ready-mixed concrete shall be placed and compacted within 1 hour of charging the mixer for concrete temperatures up to 32°C and within 45 minutes of charging the mixer for concrete temperatures exceeding 32°C but less than 35°C. These times may be varied at the Consulting Engineer's discretion where approved set-retarding admixtures are used. In this instance approved admixtures shall conform with the requirements of AS 1478 and shall be used in accordance with AS 1379. Calcium Chloride shall not be used as an admixture in concrete works.
5. A Manufacturer's Certificate in the form of a delivery docket in accordance with AS 1379 shall be supplied for each batch and shall be retained by the Contractor. Such certificates shall be held and maintained in the Contractors Quality records for the project. Further, the Contractor shall obtain a statement from the manufacturer qualifying the quality standard of the concrete in accordance with the requirements as specified herein.
6. The consistency and workability of concrete shall be such that it can be handled and transported without segregation and can be placed, worked and compacted into all corners, angles and narrow sections of forms, and around all reinforcement.
7. Concrete class shall be classed as N "x" where "x" is the minimum 28-day compressive strength in megapascals.
8. For construction elements involving structural concrete construction activities, (eg. bridge slabs, bridge abutment footings etc.) the concrete class and slump shall be as detailed in the Project Documentation. The material quality compliance testing in this instance shall involve on-site sampling and testing in accordance with Australian Standard AS 1012. The testing of the 200mm x 100mm diameter test cylinders shall be at a frequency not exceeding one sample of 2 cylinders for each 15m³ or part thereof placed in an essentially continuous manner with a minimum of two samples of 2 cylinders for each casting day.
9. All testing shall be undertaken by a NATA registered testing authority.
10. The class of concrete relative to each construction element shall be as shown in Table S7.1.

Table S7.1 Concrete Classes

Construction Element	Concrete Strength ¹
Kerb / Kerb & Channel	N25
Manholes (Sewer & Stormwater) ²	N25 or N32 as shown on Standard Drawings
Gully Pits / Field Inlets ²	N25 or N32 as shown on Standard Drawings
Headwalls/Wingwalls & Apron Slabs ²	N25
Pathways / Bikeways	N25
Access Driveways	N25
Edge Restraints for Segmental Pavers (On Road Pavements)	N25
Edge Restraints for Segmental Pavers (On footpaths, bikeways and medians)	N20
Stamped Concrete (where used in road pavement)	N32
Stamped Concrete (where used as parking bay behind kerb or not subject to regular street traffic loadings)	N25
Thrust Blocks	N20
Concrete Surrounds for Sewerage House Connection Branches	N20
Concrete Cradle for Sewer Bedding Type 3	N15
General Concrete Works (Sign Post Bases, Bases for Post and Rail Fences etc.)	N20

Notes:

1. Tested in accordance with the relevant sections of AS 1012.
2. Where any part of the structure is located below RL 1.800 AHD, concrete to be in accordance with the appropriate exposure condition in AS3600

S7.04 NO FINES CONCRETE

1. No fines concrete shall consist of cement, water and coarse aggregate. The quantity of cement used shall be as specified below. The nominal size of the aggregate for no-fines concrete shall conform with the grading limits specified in Table S7.2.
2. The water / cement ratio shall be within the range 0.5 to 0.6 by mass.

Table S7.2 No Fines Concrete – Grading Limits

AS Metric Sieve (mm)	Percentage Passing by Mass	
	Nom. Size 20 mm	Nom. Size 10 mm
26.5	100	-
19.0	85 - 100	-
13.2	0 - 10	100
9.5	0 - 5	85 - 100
4.75	0	0 - 10
2.36	0	0 - 2
Minimum Cement Content (kg/m ³)	210	250

S7.05 LEAN MIX CONCRETE

1. Lean mix concrete shall consist of a graded sand and gravel aggregate of 40mm maximum size with the addition of 5% by mass of Portland Cement or 1 part Portland Cement to 19 parts of graded aggregate and sufficient water to ensure a slump of less than 12mm.

S7.06 REINFORCING STEEL

1. All reinforcement shall comply with AS/NZS 4671:2001 requirements where applicable:-
2. All reinforcement shall be sourced from and Quality Assured manufacturer of such products and the Contractor shall obtain a statement from the manufacturer qualifying the Quality Standard of the reinforcing steel in accordance with the above noted standards.

CONSTRUCTION

S7.07 TEMPERATURE LIMITS FOR CONCRETE PLACEMENT

1. No concrete shall be placed in the Works if:
 - (a) The temperature of the concrete is less than 10°C or exceeds 35°C;
 - (b) The ambient air temperature is likely to be greater than 45°C during placement or within two (2) hours subsequent to placement.
2. If the ambient air temperature measured at the point of placement is likely to exceed 35°C during placing and finishing operations, the Contractor shall take practical precautions, to ensure that the temperature of the concrete does not exceed the permitted maximum so that the concrete can be placed and finished without defects, otherwise it shall be rejected. Typical precautions include those listed below:

At the Concrete Manufacturing Plant

- a. Shading aggregate stockpiles;
- b. Painting water tanks white;
- c. Insulating or burying delivery lines;
- d. Adding crushed ice to replace mixing water (in part) or chilling the water;
- e. Injection of liquid nitrogen into the mixer.

At the Site

- f. Cooling the formwork and reinforcing by dampening with water sprays;
 - g. Shading the work areas;
 - h. Erecting wind breaks;
 - i. Minimising the time for placing and finishing;
 - j. Use of evaporation retarding curing oil.
3. Special attention shall be paid to providing early curing for hot weather concreting operations.

S7.08 FOUNDATIONS

1. Foundations for concrete structures shall be prepared as specified on the Project Drawings.
2. Rock foundations shall be neatly excavated to form a bed for the concrete, and shall be thoroughly scraped and cleaned.
3. Soil foundation shall, as far as possible, be excavated neatly from the solid material to coincide with the under-surface of the concrete, or of the subbase material (where specified).
4. All soft, yielding or other unsuitable material shall be replaced with sound material and the subgrade shall be compacted to provide a minimum of 95 per cent standard compaction as determined by AS 1289.5.4.1 for standard compactive effort. If the subgrade is dry it shall be sprinkled with as much water as it will readily absorb, before the concrete is placed.
5. The surface shall then be checked for uniformity, line and level, and all irregularities shall be made good.

S7.09 FORMWORK AND FALSEWORK

1. All Formwork and Falsework shall conform to AS 3610 unless otherwise required by the specific Project Documentation.
2. All forms shall be built mortar tight and of sufficient rigidity to prevent distortion by the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained to prevent warping and the opening of joints due to shrinkage of the timber. The forms shall be substantial and unyielding and shall be so designed and set that the finished concrete will conform to the proper dimensions and within the tolerances specified herein. The design of the forms shall take into account the effect of vibration of the concrete as it is placed.
3. When forms are re-used, their original shape, strength, rigidity, mortar tightness and surface smoothness shall be maintained at all times. Material previously used in formwork must be cleaned off and oiled before re-use. Warped timber shall not be used.
4. Forms, which are unsatisfactory in any respect, shall not be re-used.
5. All timber shall be free from knotholes, loose knots, cracks, splits, warps and other defects, which would affect the strength of the structure or the appearance of exposed surfaces.
6. For narrow walls and columns where the bottom of the form is otherwise inaccessible, openings shall be provided so that they may be cleaned before placing the concrete, and for purposes of compaction and inspection.
7. All forms shall be treated with the lightest practical coating of release agent before the reinforcement is placed. Release agent shall not be placed on reinforcement or construction joints.
8. All forms shall be set and maintained to the line and level designated. Forms shall remain in place for periods, which shall be determined as specified herein. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the work shall not proceed until the defects have been corrected.
9. Metal form ties shall be of an approved type, and if cast in, shall be of a type which permits removal of the end fittings to a depth of at least 30mm below the finished surface of the concrete. Ordinary wire ties shall not be used.
10. Form ties shall be located in a uniform symmetrical pattern relative to the finished surface. The cavities left when the end fittings of embedded ties are removed shall be as small as possible and shall be filled with cement mortar at the earliest possible time. The surface of such filled cavities shall be left smooth and uniform in colour.
11. Forms for plain exposed surfaces shall consist of plastic-coated plywood, waterproof plywood, timber lined with tempered hard-board or close-fitting unwarped metal forms. Unless otherwise specified, joints in the form sheeting for plain exposed concrete surfaces shall be either vertical or horizontal and spaced with a regular pattern.
12. Forms for surfaces not exposed to general view may consist of modular timber or metal panels. Timber forms shall be constructed and maintained in such a manner as to prevent warping and opening of joints due to shrinkage of the timber. The timber shall be free of any defects, which will affect the structure.
13. Forms shall be removed with care and without unnecessary hammering or wedging, and so as not to injure the concrete or disturb the remaining supports. Methods of form removal likely to cause overstressing of the concrete shall not be used.

S7.10 REINFORCING STEEL

1. Reinforcement shall be free of kinks or other unwanted deformations, and shall be cut to length, and bent in accordance with the Project Drawings. Fabric reinforcement shipped in rolls shall be straightened into flat sheets before use.
2. The surface condition of reinforcement shall comply with the following requirements:
 - a. At the time concrete is placed reinforcement shall be free from mud, oil, grease and other non-metallic coatings and loose rust which would reduce the bond between the concrete and the reinforcement.
 - b. For the purpose of this Specification, rust shall not be deemed to be loose if on rubbing with the thumb it leaves only a stain thereon.
 - c. Nevertheless, a deformed bar or welded wire fabric complying with AS/NZS 4671:2001, and having mill scale or rust or both shall be deemed to comply with this Specification if, after wire-brushing the cross-sectional dimensions, including height of deformations; and mass, are not less than the dimensions and mass required by the applicable Australian Standard.
 - d. Any reinforcement projecting from a previous concreting operation shall be cleaned free of adhering concrete or loose slurry prior to any further embedment.
 - e. Any reinforcement placed within 1km of the coastline shall be thoroughly washed with a high pressure fresh water jet immediately prior to pouring concrete to remove any salts deposited during storage and placement.
 - f. Reinforcement which has been submerged by tidal or flood waters shall also be cleaned with a high pressure fresh water jet prior to pouring concrete.
3. Reinforcement shall be placed in position as shown on the Project Drawings. In the case of bar reinforcement, the bars shall be tied together by wiring each intersection using annealed wire not less than 1.25mm in diameter or by such other fastening devices as may be approved by the Designer, provided that, where the bar spacing is 300 mm or less, alternate intersections only need to be tied.
4. Clearance from forms shall be maintained by use of approved chairs. The shape of the chair shall be such that minimum obstruction is offered to the formation of the homogeneous concrete both within and around the chair. Tubular or cylindrical types shall not be used. Some bar chairs are suitable for soffit use only and should not be used against side forms. Bar chairs shall be sufficient structural strength to support the weight of reinforcement and workmen at temperatures experienced on site.
5. Metal chairs shall not be approved for any locations.
6. Precast mortar blocks shall not be used unless the blocks are manufactured from vibrated concrete of strength equivalent to that of the main concrete, and to a size and shape so as not to interfere with the structural integrity of the works. Such blocks shall have suitable fixing wires cast-in.
7. Layers of bars shall be separated by means of approved bar spacers. Stirrups and ligatures shall pass around the main reinforcement and shall be securely tied thereto.
8. Reinforcement shall be spliced by lapping or where permitted, by welding or by approved mechanical splices. Fabric reinforcement shall be lap spliced only.
9. The system of fixing shall be such as to form a rigid cage which maintains dimensional tolerances under loads experienced during placement of concrete. Welding of reinforcement to form a rigid cage shall comply with the following requirements:-
 - a. Welding shall be in accordance with AS 1554.3. In particular tack welds shall not substantially reduce the cross-section of the reinforcing steel nor adversely affect its strength and shall have:-
 - b. a throat thickness not less than 4 mm;

- c. a length not less than the diameter of the smaller bar.
 - d. Welding shall not be carried out within 75 mm of any portion of a bar which has been bent or will be bent.
 - e. No more than one-third of the main reinforcement at any cross-section shall be so welded.
 - f. Hard drawn wire and fabric reinforcement shall not be welded or heated unless approved by the Engineer.
 - g. Welding electrodes that are to be used complying with AS 1553.1 or AS 2203 or AS 2717.1.
 - h. Splices shall be made by butt or by fillet welding. Butt welds shall be qualified complete penetration butt joints in accordance with AS 1554.3.
 - i. Suitability experienced and competent welding personnel shall be engaged to complete the works.
10. Splicing of reinforcement shall occur only in the locations shown on the Project Drawings. Where practical, splices in bar reinforcement shall be staggered.
11. The length of lap splices in bar reinforcement shall be as shown on the Project Drawings. All reinforcement shall be spliced in such a manner as to maintain specified clear cover to the surface of the concrete. Splicing of fabric reinforcement shall be achieved so that the two outermost transverse wires of one sheet of fabric overlap the outermost transverse wire of the sheet being lapped.

S7.11 CONCRETE PLACEMENT - GENERAL

1. The Contractor shall be solely responsible for placing and compacting the concrete in the forms to comply with this Specification and for achieving dense, sound concrete without voids and to the lines and levels shown on the Project Drawings.
2. When rain threatens or seepage exists in excavations, the Contractor shall have on site sufficient dewatering equipment and covers as applicable to prevent any additional water entering the concrete.
3. Concrete shall be placed in an essentially continuous manner between approved construction joints so as to avoid being placed against partially set concrete.
4. Any troughs and chutes used as aids in placing concrete shall be metal or metal lined and shall be arranged and used in a manner that does not cause segregation. The use of water to facilitate the movement of concrete along troughs or chutes is expressly prohibited, but all troughs and chutes shall be kept clean and free of coating of hardened concrete by flushing thoroughly with water, which shall be discharged well clear of concrete in place.
5. Troughs and chutes shall discharge into vertical downpipes at least 1 metre in length. Where steep slopes are required, the chutes shall be equipped with baffles or be in short lengths that reverse the direction of movement so that the concrete slides without segregation.
6. Pneumatic placers and concrete pump may be permitted for use subject to such equipment being arranged so that no vibrations will damage freshly placed concrete. The delivery end of the pipe shall terminate in a fitting of approved design, which shall prevent segregation of the concrete. After the completion of any concreting operations the equipment shall be thoroughly cleaned before re-use.
7. Concrete shall not be dropped from a height or in such a manner as will cause segregation or loss of material on the reinforcing steel or forms. When placing operations would involve dropping the concrete more than 2 metres it shall be deposited through a sheet metal or other approved downpipe in such a way that the concrete does not segregate. As far as practicable, the pipes shall be kept full of concrete during placing and their lower ends shall be kept buried in the newly placed concrete. The depositing of a large quantity of concrete at any point with the intention of moving it along the forms, will not be permitted.

8. After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of reinforcing bars which project.

S7.12 CONCRETE PLACEMENT – UNDER WATER

1. Concrete shall not be placed under water unless specifically approved. The slump of the concrete to be placed underwater shall be between 150mm and 200mm.
2. Concrete shall not be placed in running water. Any pumping must cease and the water level must be constant where placement commences. The concrete shall be placed carefully in position by a tremie, a closed bottom-dump bucket or by other approved means. Concrete seals shall be placed in one continuous operation, the concrete shall not be disturbed after being deposited and the placing shall be regulated to continually maintain an approximately horizontal surface.
3. When a tremie is used it shall consist of a watertight tube and at no time shall concrete in the tube come in contact with water when it is being filled. The means of supporting the tremie shall be such as to permit free movement of the discharge end and to permit its being lowered rapidly when necessary to choke off or retard the flow of concrete. No water shall enter the tremie tube. The discharge end shall be completely submerged in concrete at all times and the tremie tube shall always be filled to a height to overcome the head of water.
4. When concrete is placed with a bottom-dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the prepared foundation or upon concrete already placed. It shall then be raised slowly during the discharge travel so as to maintain as far as is practicable still water at the point of discharge and to avoid agitating the mixture. The concrete so placed shall not be disturbed.

S7.13 COMPACTION IN CONCRETE FORMS

1. Concrete during and immediately after depositing shall be thoroughly compacted. Concrete other than no fines concrete shall be compacted with high frequency internal vibrations in the manner described below:-
2. The vibrators shall be of an approved type and shall be capable of transmitting vibrations at a frequency not less than 150 Hz with an intensity which will visibly affect the concrete at a radius of 300mm.
3. The number of vibrators to be used by the Contractor shall be not less than one for each 4m³ of concrete placed per hour, with a minimum of 2 vibrators to be provided at any time.
4. Vibrators shall be inserted vertically at successive positions not more than 450mm apart and in a manner, which ensures compaction of the concrete around the reinforcing steel and any other embedded fixtures, and into all parts of the forms.
5. Vibration shall continue at each position until air bubbles cease to emerge from the concrete. The vibrators shall then be withdrawn slowly so as to avoid leaving a "pocket". The vibration shall be of sufficient duration to thoroughly compact the concrete, but shall not be continued so as to cause segregation.
6. Care shall be taken to ensure that newly deposited concrete is vibrated into any fresh concrete adjacent to it to provide a homogeneous concrete mass.
7. Vibration shall not be applied either directly or through the reinforcement to any concrete, which has taken its initial set.

S7.14 REMOVAL OF FORMS AND FALSEWORK

1. Unless otherwise specified, forms and falsework shall remain in position until the times stated below have elapsed after completion of concreting:

Non Structural Concrete

- a. Until such time as the concrete has reached 50% of the characteristic 28-day strength or a period of 3 days, whichever is the lesser.

Structural concrete

- b. Soffits of slabs, headstock and diaphragms - Until such time as the concrete has reached 70% of the characteristic 28-day strength or 7 days, whichever is the lesser.
 - c. Side forms on structural concrete - 3 days minimum.
2. Where the timing for the removal of forms is based on concrete strength as specified herein, the strength shall be proven by testing in accordance with AS 1012.
 3. Forms shall be removed with care, without hammering and wedging, and in a manner, which will not injure the concrete or disturb the remaining supports. Centre Forms shall be lowered gradually and uniformly in such a manner as to avoid injurious stress in any part of the structure.
 4. Hole formers such as pipes and bars shall be removed as soon as the concrete has hardened sufficiently for this to be done without damage to the concrete.

S7.15 FINISHING OF EXPOSED SURFACES

1. Unless otherwise specified in the Project Documentation, all surfaces of concrete exposed to view in the completed structure shall be finished in accordance with the following:
 - a. Kerb and channel, invert crossings, vehicle crossings and industrial crossings shall be finished with an approved steel finishing tool.
 - b. Footpaths, bikeways and pram ramps shall be finished with a wooden float and broomed.
 - c. Where a sample panel is supplied or specified associated with a particular project. The concrete finish shall be in accordance with the specified requirement.
2. All concrete surfaces shall be true and even, free from stone pockets, depressions or projections beyond the surface. All arrises shall be sharp and true, and mouldings shall be evenly mitred or rounded. Care shall be exercised in removing forms to ensure this result.
3. Immediately after removal of forms from mass or reinforced concrete work, all rough places, holes and porous spots shall be repaired by removing defective work and filling with stiff cement mortar having the same proportions of cement and fine aggregate as used in the concrete, and shall be brought to an even surface with a wooden float.
4. Any tie wires or other fitments extending to outside surfaces, shall be cut back after removal of forms, to a depth of at least 40mm with sharp chisels or cutters. All cavities caused by removal of fitments or tie wires shall be wetted and carefully packed with cement mortar, as above.
5. The surfaces of bolt cavities, tie wire holes, and all defects in concrete shall be coated prior to the placing of mortar, grout, or fresh concrete, with an approved bonding agent, in lieu of wetting with water. The method of application of such agent and the conditions in which it is to be used shall generally be as laid down by the manufacturer.

S7.16 WEEPHOLES

1. Drainage adjacent to weepholes shall be provided by either a layer of broken stone or river gravel consisting of clean, hard, durable particles graded from 50mm to 10mm such that:

- (a) The maximum particle dimension shall not exceed 50mm
 - (b) No more than 5 per cent by mass shall pass the 9.5mm A.S. sieve.
2. The broken stone or river gravel, enclosed in a filter fabric suitable for drainage without scour, shall be continuous in the line of the weepholes, extend at least 300mm horizontally into the fill and extend at least 450mm vertically above the level of the weepholes.
 3. Alternatively the Contractor may provide a synthetic membrane of equivalent drainage characteristics. It shall be stored and installed in accordance with Manufacturer's instructions.

S7.17 JOINTS

1. Where horizontal construction joints are found to be necessary in walls, or cast-in-situ drainage structures the joints may be made at the base of walls and at other locations in the walls where approved by the Consulting Engineer. In order to provide for bond between the new concrete and the concrete which has already set, the surface on which the new concrete is to be placed shall be thoroughly cleaned of loose material, foreign matter and laitance. The surface shall be roughened or keyed and saturated with water. After any excess water has been removed, the surface shall be thinly coated with a neat cement grout.
2. Where vertical expansion joints are shown on the approved Project Drawings in retaining walls or other walls and structures the expansion joints shall consist of jointing material of approved quality, and of thickness stated on the drawings, and a depth sufficient to fill the joint. The jointing material shall be neatly cut to fit the surface of the concrete.
3. Extruded or cast in place kerbing, shall have narrow transverse vertical grooves, 40mm deep and not more than 6mm wide, formed neatly in the surface of the freshly placed concrete to produce contraction joints for the control of cracking. The contraction joints shall be at intervals not exceeding 3 metres.
4. In footpaths, median toppings and driveways, unless otherwise shown on the approved Project Drawings, expansion joints, 10mm in width for the full depth of paving, shall be constructed at intervals not exceeding 16m and where the pavement abuts against gutters, pits and structures. Expansion joints shall have an approved preformed jointing material. In addition, narrow vertical grooves 25mm deep and not more than 4mm wide shall be formed at intervals not exceeding 2m to induce contraction joints for the control of cracking.
5. All unreinforced paving shall be provided with narrow vertical grooves, 20mm deep and not more than 6mm wide to induce contraction joints for the control of cracking. The joints shall be formed in the freshly placed concrete in a neat regular pattern to form "slabs" no bigger than 2m². The ratio of the longest side to the shortest side shall not exceed 1.6.

S7.18 CURING

1. The curing of unformed surfaces of concrete shall commence as soon as finishing operations are complete.
2. If forms are removed in less than 7 days, curing of the formed surface shall commence within two hours of stripping.
3. Curing shall continue for a period after placing the concrete of not less than:-
 - a. Top surface of slabs - 14 days;
 - b. Other surfaces - 7 days.
4. Curing shall be effected by either Water or Membrane Curing.
5. Water curing shall comprise surfaces being kept moist for the period specified by continuous spraying, ponding, wet hessian or wet sand blankets.
6. Membrane curing shall be effected by application of a sprayed curing compound or by covering with polythene sheet.
7. Sprayed curing compounds shall be of a paraffin wax emulsion type formulated and tested by the manufacturer to conform to AS 3799. The compound shall be mixed if necessary and applied at the rate recommended by the manufacturer.
8. Resin and PVA based compounds shall not be used.
9. Polythene sheet shall be of sufficient strength to withstand wind and any imposed foot traffic. Torn or punctured sheeting shall not be used. Laps should be 300mm minimum and edges and laps shall be sealed by tape or held down by boards or reinforcing bars. Water shall be sprayed under the sheeting at edges and at laps on the day after placing concrete and at regular intervals to maintain moist conditions.

S7.19 BACKFILLING

1. Backfilling at barriers, paving, etc, and minor concrete works shall not commence until after the concrete has hardened and not earlier than three days after placing.
2. No filling shall be placed against retaining walls, headwalls or wingwalls within 21 days after placing of the concrete, unless the walls are effectively supported by struts or when the Contractor can demonstrate that 85 per cent of the design strength of the concrete has been achieved.
3. Selected backfill shall be placed against retaining walls and cast-in-place box culverts for a horizontal distance equal to one-third of the height of the wall. It shall consist of granular material, free from clay and stone larger than 50mm gauge. The Plasticity Index of this selected backfill material shall not be less than 2 or more than 12 when tested in accordance with AS 12893.3.1. The material shall be placed in layers not exceeding 150mm and shall be compacted to provide a relative compaction of not less than 98 per cent as determined by AS 1289.5.4.1 for standard compactive effort.

S7.20 SPRAYED CONCRETE

1. The minimum depth of sprayed concrete to be applied shall be 75mm.
2. Sprayed concrete shall have a minimum 28-day compressive strength of 25 MPa.
3. Earth surfaces shall be graded, trimmed and compacted and shall be dampened prior to applying the sprayed concrete. The Contractor shall take any precautions necessary to prevent erosion when the sprayed concrete is applied.
4. Rock surfaces shall be cleaned of loose material, mud and other foreign matter that might prevent bonding of the sprayed concrete onto the rock surface. The rock surface shall be dampened prior to applying the sprayed concrete.
5. The Contractor shall remove free water and prevent the flow of water, which could adversely affect the quality of the sprayed concrete.
6. Application shall begin at the bottom of the area being sprayed and shall be built up making several passes of the nozzle over the working area. The nozzle shall be held so that the stream of material shall impinge as nearly as possible perpendicular to the surface being coated. The velocity of discharge from the nozzle, the distance of the nozzle from the surface and the amount of water in the mix shall be regulated so as to produce a dense coating with minimum rebound of the material and no sagging. Rebound material shall be removed after the initial set by air jet or other suitable means from the surface as work proceeds and disposed of.
7. Spraying shall be discontinued if wind causes separation of the nozzle stream.
8. Concrete shall not be sprayed in air temperatures less than 5°C.
9. Construction joints shall be kept to a minimum. A joint shall be formed by placing or trimming the sprayed concrete to an angle between 30° and 45° to the sprayed concrete surface. The joint edge shall be cleaned and wetted by air-water jet before recommencing concrete spraying.
10. When spraying around reinforcement, concrete is to be sprayed behind the reinforcement before concrete is allowed to accumulate on the face of the reinforcement.
11. Adjoining surfaces not requiring sprayed concrete shall be protected from splash and spray rebound. Splash or rebound material on these adjoining surfaces shall be removed by air-water jet or other suitable means as work proceeds.
12. Curing shall commence within one hour of the application of sprayed concrete and may be by water or by colourless wax emulsion curing compound complying with AS 3799 and applied in accordance with manufacturer's specifications.
13. In water curing, the surface of the sprayed concrete shall be kept continuously wet for at least seven days.

S7.21 NO FINES CONCRETE

1. Where no fines concrete is incorporated in the works it shall be rodded sufficiently only to ensure the form is completely filled. It shall be screeded to the required surface level without tamping or vibrating. No fines concrete shall be moist cured for at least four (4) days by covering with wet hessian, polythene sheet or other similar materials. The use of wet sand or any other material, which can enter the voids, will not be permitted for curing purposes.

S7.22 TOLERANCES

1. Where tolerances for individual components and associated dimensions are not specified on the Project Drawings, deviations from established lines, grades and dimensions in the completed work shall not exceed the values stated herein.
2. The dimensional tolerances as shown in Table S7.3 are to cover strength, durability and fit of prefabricated elements and cast-in-situ elements.

Table S7.3 Dimensional Tolerances

Description	Tolerance (mm)
Cross-sectional dimension of members and thickness of slabs	+ 10, - 3
Length of members, length and width of slabs: - Up to 18m dimension - 18m or over dimension	± 6 1mm for every 3m in length
Clear cover to reinforcement	+ 6, - 3
Fitments for prefabricated elements – girder anchorages (including dimensions between anchorages on adjacent piers), cored holes, handrail anchorages and other embedded items	± 5 max. 1mm for every 1m in length

3. Positional tolerances, as shown in Table S7.4 refer to the departure of any point, plane or component of a structure from its correct position within the layout of the structure as shown on the Project Drawings.

Table S7.4 Positional Tolerances

Description	Tolerance (mm)
Level of footings	± 20
Level other than footings	± 5
Horizontal location, where tolerances on fit is not applicable	+ 25

4. Relative tolerances refer to departures from linearity or planarity in any part of the structure. Tolerances are measured as the departure of any point in a line or surface from the remainder of that line or surface.
5. Departure may be sudden (eg. misfit at joint in formwork) or gradual (eg. a wobble in the surface). Tolerance on gradual departure is the value calculated by multiplying the overall length of the line or surface under consideration by the factor given below in Table S7.5.

Table S7.5 Relative Tolerances

Description		Tolerance (mm)
Exposed edge	- Gradual departure	0.001
Exposed surface	- Gradual departure	0.004 (10mm max.)
	- Sudden departure	3mm max.

V100 (PSM-T)

Volumetric Cold Potable Water Meters

Product Specification

Overload flow rate (Q ₄)	kL/h	5	5	7.875	12.5	20
Size - Nominal diameter (DN)	mm	15	20	25	32	40

The V100 (PSM-T) meter is designed for the measurement of cold potable water and offers accuracy, long maintenance free life and is highly resistant to tampering.

The range includes five different meter sizes to suit overload flow rates from 5 kL/h up to 20 kL/h. The V100 (PSM-T) is suitable for water temperatures up to 50°C and a maximum working pressure of 1600 kPa. Standard counter registration is in kL and litres.

Every V100 (PSM-T) water meter is individually tested for accuracy before despatch.

Compliance with NMI R49-1 and Australian Standards

All meters in the V100 (PSM-T) range meet the Metrological and Technical requirements of NMI R 49-1: **Water Meters Intended for the Metering of Cold Potable Water and Hot Water** and are StandardsMark certified to AS 3565.1 by SAI Global under Licence No: SMKP20052.

Pattern Approval for the 15 and 20mm meters has been granted by the National Measurement Institute (NMI) under Certificate of Approval No: 14/3/1. For the 25, 32 and 40mm meters this is covered under Certificate of Approval No's: 14/3/11, 14/3/12 and 14/3/18 respectively.

Design Features

- Positive displacement volumetric rotary piston principle of measurement ensures registration even at the very lowest rates of flow with maintained accuracy over the flow range.
- Can be installed in horizontal, vertical or inclined pipelines without affecting accuracy.
- Requires no calibration throughout its lifespan.
- "O" ring seal placed between the measuring chamber and the meter body ensures that internal leaks which could by-pass the measuring chamber are eliminated.
- Use of advanced engineered plastics for the measuring chamber minimises wear and maintains reliability under all operating conditions.
- A large surface area fine filter fitted on the measuring chamber inlet prevents damage by gathering solid particles. Due to its design, a partially obstructed filter will not affect the meter's accurate registration.

Counter

The counter is fully sealed, vacuum filled, with an easy to read straight reading presentation.



The number rollers are totally immersed in a non-toxic liquid. A sac attached to the counter casing acts as a balancing membrane and ensures the pressure of the liquid in the counter is the same as that of the water inside the meter. The counter is placed in a window inside the meter body in the direction of flow for easy reading.

Tamper Resistant

The V100 (PSM-T) offers outstanding resistance to illegal tampering. Its unique conical body half design means it cannot be disassembled while in service and the mechanically driven counter is resistant to magnetic interference. An integral non-return valve is fitted as standard to all V100 (PSM-T) meters or a dual check valve assembly option is also available for the 20 and 25mm sizes. This stops the meter being run back illegally. A lead seal will reveal any attempt that is made to dismantle the meter. An individual serial number is engraved on each meter.

Remote / Electronic Reading

The standard V100 (PSM-T) provides the water industry with the flexibility to meet future demands. Today a conventional meter - tomorrow, whilst in use and without any disconnection, risk of component damage, need to re-calibrate and with no affect on meter performance or accuracy, it can be easily converted for electronic / remote readout capability by simply removing a plastic plug and fitting a magnetically operated "T probe".



Optional Features

- Meters can be supplied with the T probe fitted.
- Meters can be supplied with various standard connections (e.g. nut and tail, ball joint, flanged, etc.).
- The 20mm and 25mm V100 (PSM-T) meters can be supplied fitted with two independently acting non-return valves in series at the downstream end of the meter in compliance with AS/NZS 2845.1.

Materials

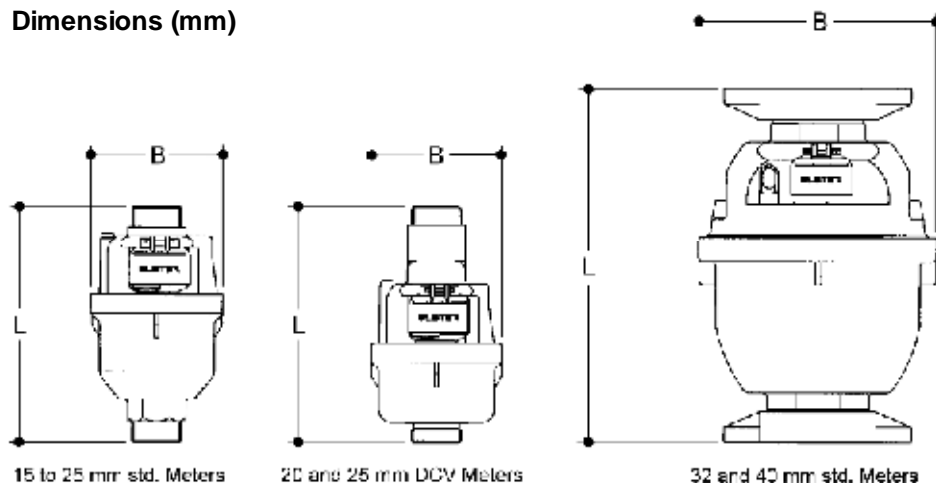
All V100 (PSM-T) meters are manufactured from the highest quality materials ensuring maximum resistance to wear and corrosion. Copper alloys in contact with potable water are de-zincification resistant and comply with the Australian Standard AS 2345. All other materials in contact with potable water comply with the Australian Standard AS/NZS 4020.

V100 (PSM-T) Performance to NMI R49-1 / Class 2

Nominal diameter (DN mm) - (Q ₃ /Q ₁ Ratio)		15 - (200)	20 - (200)	25 - (315)	32 - (250)	40 - (200)
Minimum flow rate - (Q ₁) ± 5%	L/h	20	20	20	40	80
Transitional flow rate - (Q ₂) ± 2%	L/h	32	32	32	64	128
Permanent flow rate - (Q ₃) ± 2%	kL/h	4	4	6.3	10	16
Overload flow rate - (Q ₄) ± 2%	kL/h	5	5	7.875	12.5	20
Minimum registration flow rate	L/h	3	3	13	22	37
Pressure loss – Std. / DCV Meter	kPa	24.9	24.5 / 69	23 / 65	17	23
@ flow rate	kL/h	2.5	2.5	3.5	5	7.5
Maximum working pressure	kPa	1400	1400	1400	1400	1400
Working temperature range	°C	0.3 to 30	0.3 to 30	0.3 to 30	0.3 to 30	0.3 to 30
Operating temperature range	°C	0.3 to 50	0.3 to 50	0.3 to 50	0.3 to 50	0.3 to 50
Minimum counter registration	L	0.1 ❶	0.1 ❶	0.1	0.1	0.1
Maximum counter registration	kL	99999.999 ❶	99999.999 ❶	99999.999	99999.999	99999.999
Pulse Output	Litre/pulse	5 ❶	5 ❶	5	5	5
Overall meter length (L ± 1 mm) ❷	mm	133	153	177	189	231
Maximum meter diameter (B)	mm	87	87	101	121	160
Bare meter weight ❸	kg	1.1	1.25	2.1	3.6	5.7

- Notes:**
- ❶ Technical data shown is for meters fitted with 5 x 3 number wheel counters. For meters fitted with 4 x 4 number wheel counters, the data for minimum and maximum registration plus pulse output would be 0.01, 9999.9999 and 0.5 respectively.
 - ❷ Overall lengths other than those shown are also available.
 - ❸ All weights shown including 20 and 25mm DCV meters are unpacked without connections and are approximate only.

Dimensions (mm)



The Company's policy is one of continuous improvement and the right is reserved to modify the specifications without notice.

Elster Metering Pty Ltd

ABN 98 004 088 680

HEAD OFFICE / VICTORIA:

NEW SOUTH WALES:

TASMANIA:

QUEENSLAND:

WESTERN AUSTRALIA:

Website: www.elstermetering.com

55 Northcorp Blvd, Broadmeadows VIC 3047

14/22 Northumberland Rd, Caringbah NSW 2229

412 Hobart Road, Launceston TAS 7250

12 Holland Street, Northgate QLD 4013

3/19 Action Road, Malaga WA 6090

Tel: (03) 9355 2000

Tel: (02) 8536 7400

Tel: (03) 6344 2466

Tel: (07) 3266 7733

Tel: (08) 9248 7899

Fax: (03) 9355 2001

Fax: (02) 9526 2244

Fax: (03) 6343 0711

Fax: (07) 3266 7695

Fax: (08) 9248 9499

Leaflet No: SML001 11/10