CABONNE COUNCIL

CONTRACT No. 957221

LUMP SUM CONTRACT

for the

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

PREPARED BY:
COUNCIL'S DEPARTMENT OF
ENGINEERING & TECHNICAL SERVICES
DATE: MARCH 2019

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 1 - IMPORTANT MATTERS FOR TENDERERS TO NOTE

Contents

SECTION 1 – IMPORTANT MATTERS FOR TENDERER'S TO NOTE

1. THE PURPOSE

1.1 The Project

The Works under this Contract consists of Supply and Installation of the following pipelines:

- A reticulation main from Yeoval reservoir to Yeoval town;
- New reticulation pipelines at various locations within Cumnock town;
- New reticulation pipelines at various locations within Yeoval town.
- Molong reticulation works

The Contractor shall supply all plant, labour and materials and install all the pipelines specified in this Contract. All accessories required to install the pipelines such as pipes, fittings, valves, reducers/enlargers, thrust blocks, supports/brackets, concrete pits, surface boxes, hydrants etc. shall be provided by the Contractor. Pipe laying includes verification of utilities, setting out, excavation, bedding, supply, laying, jointing, backfilling, compacting, testing, disinfection and restoration.

In addition to the new pipelines, the Contractor shall clean, flush and disinfect all the existing pipelines in order to supply potable water through the system.

In addition to the above works the Contractor shall carry out the following works, which are essential for the proper completion of the Works.

- Site inspections and rectifying defects during the Defects Liability Period;
- Provision of Work-As-Executed documentation;
- Provision of Quality Assurance Documentation;
- Other minor works not stated above but necessary for the proper completion of the Works;
- All temporary works such as environmental management, establishment, disestablishment etc. as necessary.

This Sub Section specifies the general technical requirements for the above works. Details are shown on the contract drawings attached to this Tender Document. Detailed specifications are given in Sub Section 2 – Pipelines.

2. BACKGROUND INFORMATION

Currently, Council is supplying the raw water (non-potable) to Cumnock and Yeoval village using water from Bell River and Buckinbah Creek respectively. Council is planning to connect the newly constructed/installed potable water main to the existing Cumnock and Yeoval water reticulation system (after appropriate disinfection-superchlorination) to supply the potable water transferred from the Molong Gidley Street clear water reservoir.

3. FUNCTIONAL DESCRIPTION

Cabonne Shire Council, located in the Central West of NSW, operates the following water supply networks:

- Molong water supply – provides potable water to the community of Molong;

- Cumnock water supply – provides non-potable water to the community of Cumnock;

- Yeoval water supply – provides non-potable water to the community of Yeoval.

The existing system in Cumnock, including the majority of the current reticulation was installed in 1955. Water is sourced from the Bell River and pumped to a high level "Turkeys Nest" dam before it gravitates to a small reservoir where it is chlorinated and directed into the town reticulation system. There is no potable water system in Cumnock.

A similar situation exists for the Yeoval water scheme which was built in 1964. Water is sourced from the Buckinbah Creek and chlorinated at the intake pump station before being delivered to a high level concrete reservoir through the town reticulation. Two bore water sources are used to supplement the creek supply when either the water demand is high or surface water quality is very poor. There is no potable water system in Yeoval.

Cabonne Council (hereinafter called “Council”) intends to provide potable water to Cumnock and Yeoval from the Molong water treatment plant (WTP) via a new trunk main from Molong to Cumnock & Yeoval. There will be a new pump station at Molong to pump potable water from Molong WTP to a new reservoir at a high point about 4.5 km before Cumnock. Water from this reservoir will gravitate to Cumnock and Yeoval. The trunk main from the new reservoir will feed the existing reticulation network in Cumnock and the existing reservoir in Yeoval from where it will gravitate to the pipe network in Yeoval.

Under the proposed augmentation, the existing reservoir in Cumnock will be abandoned.

The proposed works also include additional reticulation pipes in the two systems to inter-connect dead ends of the existing reticulation pipes.

4. THIS REQUEST FOR TENDER

This Request for Tender is seeking Tenders for the Construction of Cumnock and Yeoval Water Reticulation Pipelines; including associated works as set out in this Section and Section 5 Scope of the Works and Technical Specification and Section 6 Drawings of the tender documents issued to the tenderers.

5. LUMP SUM TENDER

5.1 LUMP SUM REQUIRED

This is a Lump Sum Contract however; Tenderers must submit an accompanying Schedule of Prices justifying the Lump Sum. This schedule will be used to inform progress payments and variations.

The Lump Sum tendered must be sufficient to complete the full extent of the WUC including minor items not specified but necessary to complete the WUC.

5.2 FIXED PRICE

Tendered prices for the Works Under the Contract must be fixed for the duration of the Contract and not subject to rise and fall or any other adjustment.

6. ALTERNATIVE PROPOSALS

6.1 MAY BE LODGED

Tenders may be submitted which contain alternative proposals, which satisfy Council's basic commercial, and performance objectives, technical and legal requirements as set out in this Request for Tender.

Examples of alternative proposals are those, which provide alternatives for the type of pipe, valves and fittings etc. required from those set out in the Specifications and which incorporate innovations of the Tenderer. However, alternative proposals must comply with the functional requirements of the Specifications and the requirement of the contract.

All costs associated with any alternative proposal must be borne by the Tenderer.

6.2 NO NEED TO LODGE CONFORMING TENDER

If a Tenderer wishes to lodge a Tender containing an alternative proposal, it is not mandatory for that Tenderer to lodge a conforming proposal as well; however, it may do so if it wishes.

6.3 COUNCIL NOT OBLIGED TO CONSIDER ALTERNATIVE PROPOSALS

Council, at its absolute discretion, may determine whether an alternative proposal will be considered.

In this regard, Council will have regard to the extent the alternative proposal satisfies the Specifications and functional requirements in this Request for Tender.

7. IMPORTANT MATTERS CONCERNING TENDERS

7.1 TIMING

Council requires that Practical Completion of the Pipeline and associated structures (including Commissioning) is achieved by the following date:

- 31 October 2019

7.2 ALL INCLUSIVE

The Contract requires the successful Tenderer to supply all materials, plant and labour necessary for the completion of the WUC as specified in this Request for Tender. This includes all minor items not specifically specified and other sundry items including approvals and the like.

The Tendered price must include all such costs.

7.3 INSURANCE UNDER THE CONTRACT

Tenderers are to note the insurance policies required to be maintained under the Contract.

7.4 NEGOTIATION OF THE TERMS OF THE CONTRACT

Council notes that clause 178 of the *Local Government (General) Regulation 2005* (**Regulations)** states as follows:

(1) After considering the tenders submitted for a proposed contract, the Council must either:
   a. Accept the tender that, having regard to all the circumstances, appears to it to be the most advantageous, or
   b. Decline to accept any of the tenders.

(2) Council notes in particular:
   a. The provisions of Clause 178(2) of the Regulations referred to above; and
   b. That Council **must** comply with the Regulations with respect to this tender process.

(3) Council is able to vary the terms of the Contract (as part of the Request for Tender) during the Tender process, including at the suggesting of a Tenderer, and if it does so these amendments will be issued as an addendum so that they apply to all Tenderers

7.5 SECURITY UNDER THE CONTRACT

1. Council will only accept bank guarantees from an Australian trading bank as security under the Contract and will not accept any other form of security.

2. Tenderers must submit a copy of the terms of the Bank Guarantee(s) they propose to provide under the Contract to Council as part of their Tender. Such Bank Guarantees must:
   a. Be in the form of an unconditioned promise to pay on demand;
   b. Must not have an expiry date;
   c. Be forwarded to Council directly by the issuer of the guarantee.

8. PRE-CONDITIONS TO POSSESSION OF THE SITE

8.1 INTRODUCTION

There are a number of matters that need to be finalised before the Successful Tenderer can be given possession of the Site for the physical commencement of Works.

8.2 SUMMARY OF THOSE MATTERS

A summary of these pre-conditions is set out below:

1. The provision of security under the Contract;

2. Provision of certificates of currency of all relevant insurances as required under the Contract;

3. Compliance with the relevant Work Health and Safety requirement in accordance with the Contract and relevant legislations;

4. Compliance with the relevant Quality Management System requirements in accordance with the Contract;

5. Provision of a Construction Environmental Management Plan (CEMP);

6. Other matters detailed within the General Conditions of Contract and WUC

9. OTHER RELEVANT MATTERS

9.1 NOTICES UNDER THE CONTRACT

1. Council intends to utilise the 'Aconex' web-based communications system for the purpose of the Contract;
2. Any notices issued under the Contract will only be validly issued if they are issued using this system.

9.2 STATE FUNDING

The Project is funded by the NSW State Government. The Contractor is to record and provide any information required by Council in complying with the funding conditions of the State Government Grant.

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 2 - CONDITIONS OF TENDERING

Contents

1. PREAMBLE

1.1 COMPLIANCE WITH STATUTORY REQUIREMENTS

This request for Tender has been prepared in accordance with:

- The obligations of Council contained in the *Local Government (General) Regulation 2005*; and
- The *Tendering Guidelines for NSW Local Government* as prepared by the NSW Department of Premier and Cabinet, Division of Local Government which sets out the ethics and obligations of Council and the Tenderers in Tendering.

Tenderers must comply with the requirements contained in the *Local Government Regulation 2005* in relation to this Tender process. In particular, attention is drawn to the obligations of Tenderers in the preparation and submission of their Tender.

1.2 PARTICULAR OBLIGATIONS

Without limiting, the obligations referred to above:

- Tenderers must not submit Tenders without a firm intention to proceed;
- Tenderers must not engage in any form of collusive practice; and
- Any Tenderer who directly or indirectly canvasses support from an elected member or servant of the Council will be disqualified.

2. LODGEMENT OF TENDERS

2.1 INVITATION

Tenders are invited by Cabonne Council for the Construction of Water Reticulation System from Tenderers under Central Tablelands Regional Water Security Pipeline Projects.

2.2 LODGEMENT METHOD

All Tenders and Tender enquiries must be lodged electronically through www.tenderlink.com/cabonne

When lodged, Tenders must be endorsed as follows:

"Contract 957221 – Construction of Water Reticulation System"

2.3 CONTENT OF TENDERS

Tenders must contain all material and information required in accordance with Section 3 – Tender Submission Forms.

2.4 PRE-TENDER MEETINGS

Council will hold a mandatory pre-tender meeting for all Tenderers commencing at 11:00am on Friday 29 March 2019 in Cabonne Council's Engineering and Technical Services Office located at Main Street Cudal NSW 2864.

That meeting will be followed by a site visit that includes Molong, Cumnock, Yeoval and Yeoval existing reservoir. Tenderers must provide their own transportation for site visits.

2.5 CLARIFICATION

Tenderers may seek clarification of any aspect of this Request for Tender.

All enquiries relating to the Tender must be directed to the Tender Forum via Cabonne Council's designated website at http://www.tenderlink.com/cabonne

All enquiry responses will be posted on Tenderlink via the forum. The forum shall close on Friday 12:00 noon 12 April 2019.

2.6 AMENDMENTS TO TENDER DOCUMENTS

i. Council may amend this request for Tender at any time prior to the Closing Time.

ii. Any amendments will be made by addenda issued through www.tenderlink.com/cabonne

iii. Should a Tenderer find any discrepancy, error or omission in this Request for Tender, the Tenderer must immediately notify Council in writing.

2.7 VARIATION OF TENDER

i. Council may seek explanation and/or clarification on a Tender from a Tenderer prior to a determination by Council concerning Tenders;

ii. A Tenderer may vary the Tender:
- By providing Council with further information by way of explanation or clarification; or
- By correcting a mistake or anomaly.

iii. Any such variation may be made either:
- At the request of Council any time before Council decides to accept a tender; or
- At the request of the Tenderer and with the consent of Council, but only if:
  I. The request for the variation was received before the Closing Time; and
  II. In the circumstances, it appears to Council reasonable to allow the Tenderer to provide the information or correct the mistake or anomaly.

iv. Council will not accept nor consider any variation to a Tender that substantially alters the original Tender.

2.8 OBLIGATION TO REVIEW TENDER DOCUMENTATION

Prior to submitting a Tender, Tenderers are required to familiarise themselves with:

I. The terms of this Request for Tender (including any attachment to it such as the Contract); and

II. Any other documentation or information to which they will need to have regard when performing their obligations under the Contract if it's Tender is successful.

2.9 TENDERER TO MAKE OWN ASSESSMENT

Tenderers must make an independent assessment of the information contained in this Request for Tender and the Specifications, including obtaining any professional advice they deem necessary when making that assessment.

By lodging a Tender, Tenderers will be deemed to have:

1. Examined this Request for Tender and any other information provided to the Tenderer during the tender process;

2. Examined all information relevant to the risks, contingencies and other circumstances having an effect on their Tender;

3. Inspected and examined the site conditions under the scope of the works

4. Satisfied themselves as to the correctness and sufficiency of their Tenders; and

5. Satisfied themselves they have a complete copy of this Request to Tender.

2.10 CLOSING TIME

Tenders will close at **12 NOON Wednesday 17 April 2019.**

Tenders will be opened in Cabonne Council's Molong office shortly after 12 noon on Wednesday 17 April 2019.

Organisations tendering or their representatives are invited to be present for the opening of tenders.

The anticipated timeline for the Tender Process is:

Tender Invite	Wednesday 20 March 2019
Pre-tender Meeting	Friday 29 March 2019
Tender Close	Wednesday 17 April 2019
Tender Award	by Friday 07 June 2019 (tentative)

2.11 LATE TENDERS

Council will not consider any Tender lodged after the Closing Time.

2.12 NON CONFORMING TENDER

A Tender may be deemed to be non-conforming if any of the Tender requirements are not met.

At the discretion of Council, non-conforming Tenders may or may not be considered.

3. SELECTION CRITERIA

3.1 ASSESSMENT BY COUNCIL

All Tenders considered by Council will be assessed having regard to the Compliance Criteria and the Qualitative Criteria. Council will determine the weight given to each of the Qualitative Criteria in its absolute discretion.

3.2 BASIS OF SELECTION OF SUCCESSFUL TENDER

Subject to Council's right to decline to accept any of the Tenders, Council will accept the Tender, which, having regard to all the circumstances appears to be the most advantageous to Council.

3.3 COMPLIANCE CRITERIA

1. Any Compliance Criteria will not be point scored and instead each Tender will be assessed based on a Yes/No basis as to whether the Compliance Criteria is satisfactorily met.

2. An assessment of "No" against any one (1) or more of the Compliance Criteria may eliminate the Tender from consideration.

3. The Compliance Criteria are:
    a. Conformance with the Tender Submission requirements set out in these Conditions of Tendering and Tender Submission Forms 1-17;
    b. The inclusion of a Project Plan that meets the requirements of the Conditions of Tender including Council's required dates for Practical Completion;
    c. Financial capacity.

3.4 QUALITATIVE CRITERIA

1. It is essential that Tenderers address each Qualitative Criterion.

2. Failure to provide the information required with respect to any Qualitative Criterion may eliminate the Tender from Consideration.

3. The Qualitative Criteria are:

    a. Tendered Lump Sum;
    b. Other Tendered Prices;
    c. Project Program with dates for Practical Completion that exceeds (earlier) than that specified by Council;
    d. Proposed methodology including property rehabilitation and Property Management Plan compliance if any;
    e. Council's perceived quality and suitability of proposed products;
    f. Demonstrated ability to deliver projects to time, budget and quality;

g. Whether the Tenderer is accredited under the Australian Government Building and Construction OHS Accreditation Scheme.
h. Other advantages the proposal offers to Council;
i. Ability to liaise with a variety of stakeholders in the delivery of projects; and
j. Sustainability.

4. CONTACT OFFICER

All enquiries concerning these Tender documents need to be submitted via www.tenderlink.com/cabonne Tenderlink forum to the attention of:

Mr Jeeva San
Project Engineer
Cabonne Council
PO Box 17
MOLONG NSW 2866
Ph: 02 6390 7100

5. VALIDITY PERIOD

5.1 TENDER IS AN OFFER TO COUNCIL

Tenders are an offer to Council, which remain valid for ninety (90) days after the Closing Date.

5.2 WITHDRAWAL OF TENDER

Tenders may be withdrawn by notice in writing to Council to that effect at any time before acceptance by Council.

If a Tender is withdrawn, the Tenderer is liable for all costs, losses or damages suffered by Council by reason of that withdrawal.

6. ACCEPTANCE OF TENDERS

6.1 LOWEST TENDER

Council is not required or obliged to accept the lowest or any Tender.

6.2 ANNOUNCEMENT OF OUTCOME OF TENDER PROCESS

1. The only methods by which Council will accept a Tender, is by notice in writing (i.e. Letter of Acceptance) delivered by:
    a. Hand to the Tenderer;
    b. Sent by Pre-paid post to, or left at, the address nominated by the Tenderer in its Tender;
    c. Sent by facsimile to the facsimile number nominated by the Tenderer in its Tender; or
    d. Sent by Email or some other similar electronic means to the address nominated by the Tenderer in its Tender.

2. No legal or other obligations will arise between a Tenderer and Council in relation to the conduct or outcome of the Tender process, unless and until that, Tenderer is served with

written notification from Council of the acceptance of its Tender in accordance with this clause.

6.3 EFFECT OF NOTIFICATION

Upon service of notification under this clause, the Contract becomes binding on Council and the Successful Tenderer.

If required by Council, the Successful Tenderer must execute a copy of the Contract within fourteen (14) days of being requested to do so by the Council. If the Successful Tenderer fails to comply with any such request from Council, then Council may terminate the Contract by notice in writing to that effect to the Successful Tenderer.

6.4 NO OFFER

Nothing in this Request will be deemed to:

1. Be an offer by Council to enter into an agreement with any Tenderer; or

2. Require Council to accept any Tender.

6.5 WARRANTIES BY TENDERERS

On submission of its Tender, the Tenderer warrants to Council that it has:

1. Read with all due diligence the whole of this Request for Tender and all documents and any other information made available by Council to Tenderers for the purposes of submitting Tenders or in response to any request for documents or information and to have satisfied itself as to all matters relevant to its Tender;

2. Requested clarification from Council's nominated Contact Officer where the Tenderer has any doubts as to the meaning of any portion of this Request for Tender;

3. Notified Council of any error or omission in the Specification contained in this Request for Tender;

4. Considered and satisfied itself about the risks, contingencies and other circumstances (financial and otherwise) having an effect on its Tender;

5. Not relied on any information, letter, document or arrangement, whether oral or in writing, as adding to or amending this Request for Tender other than formal written variations or information issued by Council in writing and signed by the Council's Contact Officer;

6. Not infringed the Intellectual Property of any third party in preparing or submitting its Tender;

7. Taken all internal corporate and other steps necessary for it to participate in this Request for Tender;

8. Is able to discharge its obligations under the Contract in full if its Tender is accepted; and

9. Not been subject to and is not threatened with an Insolvency Event.

6.6 COMPLIANCE WITH LAWS

A Tenderer must comply with all applicable laws in preparing and submitting its Tender.

6.7 INTELLECTUAL PROPERTY

1. Council owns the copyright in this Request for Tender. Tenderers must not copy it or any part of it for any purpose other than the preparation of a Tender.
2. The submission of a Tender does not imply a transfer of any Intellectual Property of Council to the Tenderer or of the Tenderer to Council.
3. The Tenderer licenses Council to use the material contained in the Tender for the purposes of managing this Request for Tender.

6.8 PROBITY

1. Tenderers must not:

    a. Engage in any corrupt practices such as bribery or offer or give other inducements to Council staff or advisors or engage in any conduct whose purpose or effect is to create (or to create the appearance of) an unfair advantage; and

    b. Engage in any collusive or anticompetitive conduct with any other Tenderer or supplier.

2. Without limiting the generality of the preceding sub-clauses, on submission of its Tender, the Tenderer agrees that it must not engage in any forms of conduct listed below, and warrants that it has not done so:
    a. Canvass, coerce or lobby Councillors, Council Employees or advisors about this Request for Tender or its outcome.

    b. Payment of bribes, gifts or loans of money or property, provision of goods or services, offers of employment or contract work or other benefits to Council staff or advisors as an inducement (or that may give the appearance of inducement) to such person to exert influence on the procurement process.

    c. Enter into any agreement or arrangement with any competing Tenderer or supplier as to who would be appointed by Council under this Request for Tender.

    d. Hold any meeting or discussion with any competing Tenderer or supplier about any Tenders, submission or proposal to the Council by the Tenderer or the competing supplier without an authorised representative of the Council being present.

    e. Hold any discussion or other exchange of information with any competing Tenderer or supplier concerning any Tender, its pricing, service or product offers, submissions or proposals given to the Council.

f. Enter into any agreement or arrangement with any competing Tenderer or supplier for the payment of money or other reward for any competing Tenderer or supplier not appointed by Council to supply goods or services to Council.

g. Enter into any agreement or arrangement to receive from, pay or provide any fee, commission or other benefit or reward to any third party, including any agent, advisor, broker, or other person who is in or may be in a position to influence the Council to appoint the Tenderer to provide goods or services to Council, where such agreement or arrangement has not been fully and clearly disclosed to the Council in its Tender.

h. Enter into any agreement or arrangement with any competing Tenderer or supplier to fix prices, margins, discounts, price formulae or other terms or conditions of supply.

i. Give any assistance to any competing Tenderer or supplier to issue a Tender or to make a proposal, submission or response to Council, which has been deliberately priced or framed in order to be unsuccessful.

j. Breach of the provisions of the *Competition and Consumer Act 2010* (Cwth).

3. The Tenderer warrants that:

   a. It has not had corrupt access to information, information technology or other resources of the Council which may have given the Tenderer an advantage over its competitors in bidding for appointment to undertake the Works to Council; and

   b. It has fully and accurately disclosed to Council, in writing, prior to submitting its Tender, the existence of any relationship between the Tenderer (and any party related to the Tenderer) and Council personnel which may cause the Council and the Tenderer to interact on other than an arm's length basis.

4. If the Tenderer breaches any of the provisions of this clause, including any warranty, the Council may, at its option, disqualify the Tenderer from participation in this Request for Tender, terminate any Contract it may have awarded to the Tenderer and ban the Tenderer from participating in future tenders and other procurement projects of Council.

5. The exercise of any one or more of the foregoing rights or remedies will not prevent the exercise, by the Council of any other rights or remedies it may have under this Request for Tender, the Contract or any other Contract, or under the law.

6.9 TENDERER STATUS

It is mandatory that a Tenderer:

1. Is a legal entity; and

2. Has a registered Australian Business Number (ABN) and is registered for the Goods and Services Tax with the Australia Taxation Office.

6.10 COSTS OF TENDER

Council will not be liable for:

1. Any costs incurred by a Tenderer in connection with its Tender whether before or after the submission date, whether incurred directly by it or its advisors and regardless of whether such costs arise as a direct or indirect consequence of any amendments made to this Request for Tender by Council at any time; and

2. Any commission or brokerage fee payable to any broker or agent responsible for introducing the Tenderer to Council, and the Tenderer:

    a. Indemnifies the Council against any such fees; and

    b. Agrees that the broker or agent is the agent of the Tenderer and is not the agent of the Council.

6.11 NO RELIANCE BY TENDERER ON INFORMATION IN THIS REQUEST FOR TENDER

1. The information contained in or in connection with this Request for Tender or otherwise provided in the course of the tender process is provided by Council in good faith. Such information is intended only as an explanation of Council's requirements and is not intended to form the basis of a Tenderer's decision on whether to:

    a. Submit a Tender; and/or

    b. Enter into any contractual relationship with Council,

    And by submitting a Tender, the Tenderer warrants that it has not relied on that information but formed its own judgements as to whether or not to do so.

2. The information provided in this Request for Tender does not purport to be all-inclusive or to contain all information that a Tenderer may require to complete their Tender or discharge their obligations under the Contract.

3. Council will not be liable for any loss or damage arising as a result of reliance on the information it provides during this tender process.

4. Subject to any contrary provisions of the Contract, if any, and to the extent permissible at law, Council is not liable for errors and omissions in this Request for Tender, or in any information supplied by Council to Tenderers during the procurement process, whether Council is negligent or otherwise.

5. Council does not warrant the accuracy or completeness of any information contained in this Request for Tender or which may be provided to Tenderers.

6. Council is not liable for:

a. Any unavailability of the Tenderlink Portal or for any failure of technology inherent in the Tenderlink Portal nor for any failure of the internet;

b. Any errors or omissions in the content accessible by the Tenderlink Portal caused by the act or omission of the third party provider of the portal; and/or

c. Any loss or damage caused to Tenderers by the foregoing.

6.12 PUBLICITY

Tenderers must obtain the written approval of Council before any disclosures relating to the Tender or the Contract are made by the Tenderer to the press or in any other public domain.

Tenderers must not undertake any publicity activities with any part of the media in relation to the Tender or the Contract without the prior consent of Council, including consent on the form and content of any such publicity.

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 3 - TENDER SUBMISSION FORMS

Contents

1. DETAILS CONCERNING THIS SECTION

1.1 STRUCTURE

This Section 3 contains the following parts:

1. A description of the requirements for each Form that must be completed by Tenderers and submitted as part of their Tender.

2. The specific Forms that Tenderers must complete and submit as part of their Tenders.

1.2 TENDERERS MUST COMPLETE FORMS

Tenderers must complete each of the forms contained in this Section 3 and lodge them as part of their Tender.

Each form must be completed in accordance with the instructions set out in this Section 3.

If these instructions are not followed, the relevant Tender may not be considered by Council.

2. FORM 1 – OFFER

2.1 MANDATORY FORM

This form must be completed and submitted as part of a Tender.

2.2 EXECUTION

This form must be executed by persons:

1. That have the authority to execute the Form on behalf of the Tenderer; and

2. Who print their full names where indicated on the Form.

3. FORM 2 – SCHEDULE OF PRICES

3.1 MANDATORY FORM

This form must be completed and submitted as part of a Tender.

3.2 DETAILS REQUIRED

1. The Tenderer must use this Form to show the make-up of the Lump Sum price included in the Tender.
2. The Tenderer must insert lump sums against each element within the Schedule of Prices and the aggregate of these prices must equal the total amount of the Lump Sum price.

3.3 USE IN CONTRACT

1. The Schedule of Prices will form part of, and be used in accordance with, the Contract only to the extent provided in the Contract.

3.4 USE IN ASSESSMENT PROCESS

The information in this Form will be used by Council in the assessment of Tenders.

4. FORM 3 – FINANCIAL INFORMATION

4.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

4.2 DETAILS REQUIRED

Tenderers are required to submit financial information with respect to their company entity. By submitting a Tender, the Tenderer is deemed to have authorised Council to undertake additional financial investigation that is required to ensure that the Tenderer will be financially capable of undertaking this Project. The Tenderer will provide any additional information required by Council for this process.

The Tenderer must submit the last two (2) years audited annual financial statements with this form.

It is noted that Council (either jointly or independently) may undertake an independent financial assessment of the Tenderer.

Assessments may occur during the Tender evaluation process and the Tenderer should be duly prepared for the assessment of its financial capability.

The Financial assessment will include but not be limited to the following criteria:

a. Performance ratio
b. Cash expenditure Cover ratio
c. Current ratio

Failure to submit financial statement in accordance with this form may exclude those Tenders from consideration. The full details of any joint venture are to be provided clearly showing the extent of liability for each entity.

Council may require an external financial assessment to be undertaken. The Tenderer agrees to comply with any request for additional information in a timely manner.

5. FORM 4 – PROPOSED METHODOLOGY

5.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

5.2 DETAILS REQUIRED

The Tenderer is to detail a methodology of how they would undertake the work under the contract. This methodology should identify at a minimum:

a. Construction methodology;

b. Key procedures that will be put in place;

c. Innovations;

d. How product quality will be guaranteed;

e. Assumptions made in developing the methodology;

f. Stakeholder engagement including a list of key stakeholders.

6. FORM 5 – RISK ASSESSMENT

6.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

6.2 DETAILS REQUIRED

The Tenderer is to detail key risks and how those risks to the Principal, Contractor and other stakeholders will be eliminated or minimised. These risks must include at a minimum the following:

a. Geological impacts including shallow rock and naturally occurring asbestos and how risk to the Principal, Contractor and other stakeholders will be minimised;
b. High risk activities in relation to Work Health and Safety;
c. Environmental impacts;
d. Quality compliance;
e. Any other high-level risks associated with the works under the Contract.

7. FORM 6 - PROPERTY MANAGEMENT PLAN

7.1 MANDATORY FORM

This form must be completed and submitted as part of a Tender.

7.2 DETAILS REQUIRED

The Tenderer is to detail methodology of how they would proceed with consultation, rehabilitation and compliance with the requirements of the Tender. This methodology should identify at a minimum:

a. Landowner engagement including dealing with complaints;

b. Biosecurity;

c. Meeting KPI's

8. FORM 7 – SCHEDULE OF CONFLICT OF INTEREST

8.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

8.2 DETAILS REQUIRED

The Tenderer is to complete either: -

Declaration A - declare that no owner, manager or employee or any family members of any owner, manager or employee of the aforementioned business, have any association with the management or employees of Cabonne Council, which could reasonably be regarded as a potential conflict of interest in relation to this Tender. OR

Declaration B - declare that there is an association between an owner, manager or employee or family member of an owner, manager or employee of the aforementioned business and the management or employees of Cabonne Council, which could reasonably be regarded as a potential conflict of interest in relation to this Tender.

9. FORM 8 – SCHEDULE OF SUBCONTRACTOR AND SUB-CONSULTANT

9.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

9.2 DETAILS REQUIRED

Tenderers shall set out in the Schedule provided, full details of those parts of the works it is proposed to subcontract and, if known at the time of tendering, details of the proposed subcontractor.

10. FORM 9 – DETAILS OF KEY PERSONNEL

10.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

10.2 DETAILS REQUIRED

The details of the Project Team (including relevant qualifications and certifications) provided should generally include, but not necessarily be limited to:

a. Experience including details of experience on similar works.

b. Structure of the proposed project team, together with roles and responsibilities of team members.

c. Brief resumes of team members with educational qualifications.

d. Availability and time allocation of team members.

e. Details of proposed substitutes of key personnel.

10.3 PURPOSE

The information in this Form will be used by Council in the assessment of Tenders.

11. FORM 10 – TECHNICAL SCHEDULE

11.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

11.2 DETAILS REQUIRED

The information in this Form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract.

- Pipeline details (open cut, horizontal bore etc.)
- Valves details
- Any other associated items/infrastructures

11.3 PURPOSE

The information in this Form will be used by Council in the assessment of Tenders.

12. FORM 11 – SCHEDULE OF ADDITIONAL INFORMATION/ALTERNATIVE PROPOSALS/INNOVATIONS

12.1 NON-MANDATORY FORM

This Form is not a mandatory form and should only be completed and submitted as part of a Tender where the Tenderer wishes to include an alternative proposal.

12.2 PURPOSE

The information in this Form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract.

13. FORM 12 – STATUTORY DECLARATION ON NON-COLLUSIVE TENDER DECLARATION

13.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

13.2 INSTRUCTIONS

The Statutory Declaration set out in this Form must be made by the Tenderer, or where the Tenderer is a corporation, by a representative of the Tenderer who:

a. Is in a position to know the facts attested to in the Statutory Declaration; and
b. Has delegated authority to complete the Statutory Declaration.

14. FORM 13 – STATEMENT OF CONFORMANCE

14.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

14.2 COMPLETION OF FORM

1. The Tenderer must complete this Form in accordance with the instructions within the form.

2. If the Tenderer does not conform with the requirements set out in this Request for Tender, each non-conformance listed in this form must be valued so that if the non-conformance is unacceptable:
    a. The Tender may be accepted without that non-conformance; and
    b. The Contract sum can be adjusted accordingly.

3. Failure to state non-conformance issues or items for consideration in this Form will indicate that the offered lump sum price meets all Council's specifications.

4. In the event of a successful tender submission, any non-conformance item not listed in this form will be supplied at the expense of the Successful Tenderer.

14.3 PURPOSE

The information in this Form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract.

15. FORM 14 – ACKNOWLEDGEMENT OF ADDENDA

15.1 MANDATORY FORM

This form must be completed and submitted as part of a Tender.

15.2 PURPOSE

The information in this form will be used by Council in the assessment of Tenders to confirm that the Tenderer has received all Addenda.

16. FORM 15 – DETAILS OF MATERIALS TO BE USED AND WARRANTIES PROVIDED

16.1 MANDATORY FORM

This Form must be completed and submitted as part of a Tender.

16.2 DETAILS REQUIRED

The Tenderer must include in this Form details about:

1. The materials and warranties which will be provided for the main items set out in the Specifications, and in particular, pipe materials, and items of mechanical and electrical equipment are to be fully specified if any;

2. Manufacturers details about the asset life for the main items set out in the Specifications, particularly for pipe materials; and

3. Any material proposed for pipe bedding, embedment, overlay and backfill, which is not set out in the Specifications.

16.3 PURPOSE

The information in this Form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract.

17. FORM 16 – PROJECT PROGRAM

17.1 MANDATORY FORM

This form must be completed and submitted as part of a Tender.

17.2 DETAILS REQUIRED

1. This form must include an implementation/construction program in the form of a Gantt chart which:
    a. Is sufficiently detailed to allow an assessment to be made of how the various major activities will be integrated to ensure Practical Completion of the Works by the times set out in the tender documents.
    b. The Programme is to clearly show start and finish dates, predecessors and successors for each task/activity including Practical Completion.
    c. Submission of design documents for each package of works and documentation by the Contractor and allowance for reviews by the Superintendent prior to commencing construction
    d. Critical Paths from Contract Award to Practical Completion.
    e. Identify tasks to be undertaken by subcontractors and suppliers, both on and off site.
    f. Submission of Works as Constructed and Operation and Maintenance information as a prerequisite for Practical Completion.
    g. The estimated value of work completed for each calendar month.
    h. Submission of all management plans

17.3 PURPOSE

The information in this form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract.

17.4 KEY DATES

The table below specifies Council's Key Dates with respect to the Pipeline.

Date	Event
20 March 2019	Invitations to Tender Issued
29 March 2019	Pre Tender Meeting
17 April 2019	Closing Date for Tenders
By 07 June 2019	Letter of Acceptance issued (assuming Council resolves to accept a Tender)
31 October 2019	Practical Completion of the Works Under the Contract (or the date for Practical Completion as per the Tendered Project Programme)

18. FORM 17 – SUSTAINABILITY

18.1 MANDATORY FORM

This form must be completed and submitted as part of a Tender.

18.2 DETAILS REQUIRED

Consistent with the *Local Government Act 1993* (NSW), Council requires that all purchasing decisions incorporate principles of sustainability in its decision making process. The purpose of considering sustainability factors in decision-making is to prefer products or services that have minimal impact on the environment and the community.

The following sustainability principles will therefore be considered by Council when assessing Tenders:

1. Minimise waste – only purchase when a product or service is necessary.
2. Minimise unnecessary purchasing – purchase in accordance with the waste hierarchy of "avoid, reuse, recycle".
3. Recycled content – purchase products that contain recycled content and/or that can be recycled.
4. Non-toxic – avoid purchasing chemicals that may harm human health or ecosystems.
5. Energy and water efficiency – purchase products that improve resource efficiency.
6. Biodiversity protection – consider biodiversity and habitat conservation implications of purchases
7. Greenhouse – purchase products with a lower carbon footprint and that reduce reliance on fossil fuels, such as through reduced transportation.
8. Durability – purchase products with a longer lifespan
9. Minimise soil degradation – purchase products that do not degrade or pollute the soil, or result in erosion in their use.

18.3 PURPOSE

The information in this form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract.

FORM 1 – OFFER FORM

EFFECT OF SUBMITTING THIS OFFER FORM

By executing and submitting this form (together with any material attached to it), the party named in the **Schedule (Tenderer)** makes an irrevocable offer to the Council to enter into the Contract, subject to the Terms of the Request for Tender.

DOCUMENTS COMPRISING THE TENDER

The following documents are required to be submitted to be a conforming Tender:

Description of Document	**COMPLETED**	
	YES	**NO**
Form 1 – Offer		
Form 2 – Schedule Of Prices		
Form 3 – Financial Information		
Form 4 – Proposed Methodology		
Form 5 – Risk Assessment		
Form 6 – Property Management Plan		
Form 7 – Schedule of conflict of interest		
Form 8 – Schedule of subcontractor and sub-consultants		
Form 9 – Details of Key Personnel		
Form 10 – Technical schedule		
Form 11 – Schedule of additional information/ alternative proposals/ innovations		
Form 12 – Statutory Declaration on Non-Collusive Tender Declaration		
Form 13 – Statement of Conformance		
Form 14 – Acknowledgement of Addenda		
Form 15 – Details of Materials used and Warranties provided		
Form 16 – Project Programme		
Form 17 - Sustainability		

FORMATION OF CONTRACT

The Tenderer agrees that, upon service of a Notice of Acceptance by Council on the Tenderer, the Contract is formed between the Tenderer and Council.

EXECUTION OF FORM OF CONTRACT

The Tenderer warrants to Council that it will execute the Contract:

1. If requested to do so by Council; and
2. In accordance with the requirements of the Request for Tender.

DEFINITIONS

Terms defined in the Request for Tender have the same meaning when used in this Offer Form.

SCHEDULE: SEPARABLE PORTION ONE (SP1)

TENDERER'S FULL NAME	
TENDERER'S ABN	
TENDERER'S ADDRESS	
TENDERER'S CONTACT PHONE NUMBER	
TENDERER'S CONTACT PERSON	

LUMP SUM INCLUDING GST AS PER FORM 2 SCHEDULE OF PRICES BUT EXCLUDING PROVISIONAL SUMS (IF ANY)

Construction of Cumnock and Yeoval Water Reticulation Pipelines and Associated Structures	
Works under the contract as per the tender documents	**Lump Sum Amount $ (GST Inclusive)**
Lump Sum Amount for Construction of Cumnock and Yeoval Water Reticulation Pipelines and Associated Structures	

EXECUTION

Executed by the Tenderer

_____	_____
Signature	Signature
_____	_____
Name of Person Signing	Name of Person Signing
_____	_____
Authority of Person Signing	Authority of Person Signing

SCHEDULE: SEPARABLE PORTION TWO (SP2)

TENDERER'S FULL NAME	
TENDERER'S ABN	
TENDERER'S ADDRESS	
TENDERER'S CONTACT PHONE NUMBER	
TENDERER'S CONTACT PERSON	

LUMP SUM INCLUDING GST AS PER FORM 2 SCHEDULE OF PRICES BUT EXCLUDING PROVISIONAL SUMS (IF ANY)

Flushing and Disinfection of all existing reticulation system of Cumnock and Yeoval.	
Works under the contract as per the tender documents	**Lump Sum Amount $ (GST Inclusive)**
Lump Sum Amount for Flushing and Disinfection of all existing pipelines	

EXECUTION

Executed by the Tenderer

_____	_____
Signature	Signature
_____	_____
Name of Person Signing	Name of Person Signing
_____	_____
Authority of Person Signing	Authority of Person Signing

SCHEDULE: SEPARABLE PORTION THREE (SP3)

TENDERER'S FULL NAME	
TENDERER'S ABN	
TENDERER'S ADDRESS	
TENDERER'S CONTACT PHONE NUMBER	
TENDERER'S CONTACT PERSON	

LUMP SUM INCLUDING GST AS PER FORM 2 SCHEDULE OF PRICES BUT EXCLUDING PROVISIONAL SUMS (IF ANY)

Construction of Molong Water Reticulation Pipelines and Associated Structures	
Works under the contract as per the tender documents	**Lump Sum Amount $ (GST Inclusive)**
Lump Sum Amount for Construction of Molong Water Reticulation Pipelines and Associated Structures.	

EXECUTION

Executed by the Tenderer

_____	_____
Signature	Signature
_____	_____
Name of Person Signing	Name of Person Signing
_____	_____
Authority of Person Signing	Authority of Person Signing

FORM 2 – SCHEDULE OF PRICES

This schedule does not form part of the Contract. The Superintendent may, at their sole discretion, use this schedule for the purpose of pricing Works Under Contract or Variations.

The lump sum total price in the Form 1 - The total lump sum offer must be equal to total value of the works including GST shown in the Form 2 – Schedule of Prices. The total lump sum price in the Form 1 shall exclude the provisional sums (if any).

The quantities shown are estimated quantities only and are not to be taken as correct quantities of work to be carried out.

SEPERABLE PORTION ONE (SP1) - Construction of Cumnock and Yeoval Water Reticulation Pipelines and Associated Structures

ITEM	DESCRIPTION	AMOUNT ($)
	Break-up of tendered Lump Sum:	
1.0	**MILESTONE 1: PRE-CONSTRUCTION ACTIVITIES**	
1.1	Preparation and Submission of: - Construction Program - WHS Management Plan, Safe Work Method Statements, etc. - Construction Environmental Management Plan - Quality Plan, ITPs and Checklists - Dilapidation Report	
1.2	Long Service Levy Payment	
1.3	Insurances	
1.4	Other Works under Milestone 1 not included in items 1.1 to 1.3 (provide itemised list)	
2.0	**MILESTONE 2**	
2.1	Site Establishment	
2.2	Site Disestablishment	
2.3	Reticulation Main (800m of DN200 pipes & fittings) as per drawings and specification	
2.3.1	Supply all materials, excavate, install and backfill (Type A pipeline backfill)	
2.3.2	Supply all materials, excavate, install and backfill (Type B pipeline backfill)	
2.3.3	Supply all materials, excavate, install and backfill (Type C pipeline backfill)	
2.3.4	Supply and install DN200 isolation valves and valve pits	

2.3.5	Supply and install DN80 air valves including isolation valves and valve pits	
2.3.6	Supply and install DN80 scour valves including drainage pipework and valve pits	
2.3.7	Supply and install marker posts and other sign posts	
2.3.8	Hydrostatic Testing	
2.3.9	Disinfection	
2.3.10	Site Restoration	
2.4	Reticulation Network – Cumnock (1100m of DN100 pipes & fittings) as per drawings and specification.	
2.4.1	Supply all materials, excavate, install and backfill (Type A pipeline backfill)	
2.4.2	Supply all materials, excavate, install and backfill (Type B pipeline backfill)	
2.4.3	Supply all materials, excavate, install and backfill (Type C pipeline backfill)	
2.4.4	Supply and install fire hydrants and pits	
2.4.5	Connection to Existing Pipe Networks – Supply all materials, excavate, connect and backfill, including isolation valves, tees, reducers, special fittings, etc.	
2.4.6	Hydrostatic Testing	
2.4.7	Disinfection	
2.4.8	Site Restoration	
2.5	Reticulation Network – Yeoval (2500m of DN100 pipes & fittings and 500m of DN150 pipes & fittings) as per drawings and specification.	
2.5.1	Supply all materials, excavate, install and backfill (Type A pipeline backfill)	
2.5.2	Supply all materials, excavate, install and backfill (Type B pipeline backfill)	
2.5.3	Supply all materials, excavate, install and backfill (Type C pipeline backfill)	
2.5.4	Supply and install fire hydrants and pits	
2.5.5	Connection to Existing Pipe Networks – Supply all materials, excavate, connect and backfill, including isolation valves, tees, reducers, special fittings, etc.	

2.5.6	Hydrostatic Testing	
2.5.7	Disinfection	
2.5.8	Site Restoration	
2.6	Video Records of Site Works	
2.7	Work as Built Drawings	
2.8	Other Works under Milestone 2 not included in items 2.1 to 2.8 (provide itemised list)	
Subtotal (Excl. GST)		
GST		
TOTAL LUMP SUM CONTRACT PRICE (Incl. GST)		

SEPERABLE PORTION TWO (SP2) - Flushing and Disinfection of all existing pipelines

ITEM	DESCRIPTION	AMOUNT ($)
	Break-up of tendered Lump Sum:	
1.0	**CUMNOCK**	
1.1	Flushing of all existing pipelines	
1.2	Disinfection of all existing pipelines	
2.0	**YEOVAL**	
2.1	Flushing of all existing pipelines	
2.2	Disinfection of all existing pipelines	
	Subtotal (Excl. GST)	
	GST	
	TOTAL LUMP SUM CONTRACT PRICE (Incl. GST)	

SEPERABLE PORTION THREE (SP3) – Construction of Molong Water Reticulation Pipelines and Associated Structures

The works shall be carried out in accordance with the accompanying specifications and relevant Australian Standards and industry standards and shall include all works indicated therein.

As a guide to assist the Contractor in the preparation of the contract lump sum, the following quantities are provided as a guide only. It is the Contractor's responsibility to ensure the lump sum covers all required works. All prices include GST.

Break-up of tendered Lump Sum:					
Item	**Description**	**Quantity**	**Unit**	**Rate ($ GST Inclusive)**	**Amount ($ GST Inclusive)**
1	**General**				
1.1	**Preliminaries**				
1.1.1	Site office and Facilities	1	Item		
1.1.2	Survey Setout	1	Item		
1.1.3	Location of existing services	1	Item		
1.1.4	Project Insurances (Public Liability, Professional Indemnity, Insurance of the Works, WorkCover Insurances and other insurance mandatory as per the Contract and relevant legislation)	1	Item		
1.1.5	Compliance with all statutory codes	1	Item		
1.1.6	Site Inspection	1	Item		
1.1.7	Preparation of Dilapidation reports, quality management plan, Construction Environmental Management Plan, Inspection and Test Plan, Hazard and Risk Management Plan, Traffic Control Plan, Property Management Plan and Erosion and Sediment Control Plan	1	Item		
1.1.8	Works As Executed Survey and Drawing preparation	1	Item		
1.2	**Traffic Control**	**1**	**Item**		
	SUB TOTAL GENERAL				
2	**Miscellaneous Items**				
2.1	**Erosion & Sedimentation Control**				
2.1.1	Supply and installation of Erosion & Sedimentation Control including general maintenance and repair of silt-fence and erosion control measures	1	Item		
2.2	**Clean-up of all works upon completion**	**1**	**Item**		
2.3	**All other work under this scope of this Molong Bore Pipeline works not included elsewhere**	**1**	**Item**		
	SUB TOTAL MISCELLANEOUS ITEMS				

3	**Pipeline and Associated structures**				
3.1	**Pipeline**				
3.1.1	Supply and Installation of DN150 PVC PN16 pipe (approximate length) including four roads crossings.	1,400	m		
3.1.2	Supply and Installation of all required pipe jointing, bends, all types of valves and fittings.	1	Item		
3.1.3	Hydrostatic pressure testing	1	Item		
	SUB TOTAL PIPELINE AND ASSOCIATED STRUCTURES				
	SUMMARY OF LUMP SUM ITEM				
1	**General**	**Sub Total**			
2	**Miscellaneous Items**	**Sub Total**			
3	**Pipeline and Associated Infrastructure**	**Sub Total**			
	Total Lump Sum Items (Incl. GST)				

FORM 3 – FINANCIAL INFORMATION

PARTICULARS OF TENDERER

NAME OF TENDERER	
NAME OF COUNCIL	Cabonne Council
CONTRACT DESCRIPTION	CONTRACT 957221 – CONSTRUCTION OF WATER RETICULATION SYSTEM
ANTICIPATED PROJECT DURATION (MONTHS)	
TENDER PRICE	
MONTHLY EXPENDITURE ($)	

DETAILS OF CURRENT PROJECTS

List and provide the following details for Contracts currently in Progress.

PRINCIPAL	PROJECT DESCRIPTION	CONTRACT VALUE ($)

SUPPORTING FINANCIAL INSTITUTION

NAME OF INSTITUTION	
ADDRESS	
MANAGER	
PHONE NUMBER	
FACSIMILE NUMBER	
TERM OF ENGAGEMENT	

TENDERER'S ACCOUNTANT

COMPANY	
ADDRESS	
CONTACT PERSON	

PHONE NUMBER	
FACSIMILE NUMBER	
TERM OF ENGAGEMENT	

FINANCIAL INSTITUTION

Financial Institution or Tenderer's Accountant to complete the information below.

NAME OF FINANCIAL INSTITUTION OR ACCOUNTANT	
BRANCH/ADDRESS	
REPRESENTATIVE'S NAME AND TITLE	
PHONE NUMBER	

STATEMENT AS TO FINANCIAL CAPACITY

I, _____,
am *a representative of the Financial Institution/the Accountant referred to above.

Based upon the information given above in addition to that information available to me, I believe the Tenderer is capable of meeting the financial requirements of this project.

SIGNATURE:	
WITNESS:	
DATE:	

ACKNOWLEDGEMENT THAT COUNCIL MAY CONDUCT AN AUDIT

1. By submitting a Tender, the Tenderer is deemed to have authorised Cabonne Council to undertake additional financial investigation that is required to ensure that the Tenderer will be financially capable of undertaking this Contract. The Tenderer will provide any additional information required by Council for this process.

2. The Tenderer must submit the last two (2) years Audited Annual Financial Statement with this form. It is noted that Council may undertake an independent financial audit of the Tenderer during the Tender assessment period and the Tenderer's financial institution should be notified and prepared.

3. The Financial assessment will include but not be limited to the following criteria:

    a. Performance Ratio
    b. Cash expenditure cover ratio
    c. Current ratio

FORM 4 – PROPOSED METHODOLOGIES

As a minimum, the following specific aspects of the work must be addressed:

a. Construction methodology;
b. Key procedures that will be put in place;
c. Innovations;
d. How product quality will be guaranteed;
e. Assumptions made in developing the methodology;
f. Stakeholder engagement including a list of key stakeholders

Attach:

FORM 5 – RISK ASSESSMENT

The Tenderer is to detail key risks and how those risks to the Principal, Contractor and other stakeholders will be eliminated or minimised. These risks should include at a minimum the following:

a. Geological impact including shallow rock and naturally occurring asbestos;
b. High risk activities in relation to Work Health and Safety;
c. Environmental impacts;
d. Quality compliance;
e. Any other high level risks associated with the works under the Contract.

Attach:

FORM 6 – PROPERTY MANAGEMENT PLAN

The Tenderer is to detail methodology of how they would proceed with consultation and rehabilitation in accordance with the requirements of the Tender. This methodology should identify at a minimum:

a. Landowner engagement including dealing with complaints;
b. Biosecurity
c. Rehabilitation including meeting KPI's

Attach:

FORM 7 – SCHEDULE OF CONFLICT OF INTEREST

Complete either "Declaration A" or "Declaration B" as appropriate and submit this Schedule with the Tender

Declaration A

I_____

name - please print

of_____

address

declare that no owner, manager or employee of

_____

business name

nor any family members of any owner, manager or employee of the aforementioned business, have any association with the management or employees of Cabonne Council which could reasonably be regarded as a potential conflict of interest in relation to this Tender.

Signature of Tenderer _____ Date _____

Declaration B

I_____

name - please print

of_____

address

declare that there is an association between an owner, manager or employee of

_____

business name

or a family member of an owner, manager or employee of the aforementioned business and the management or employees of Cabonne Council, which could reasonably be regarded as a potential conflict of interest in relation to this Tender. Details of the association are as under:

Name of Person	Position	Nature of Association

FORM 8 – SCHEDULE OF SUBCONTRACTORS AND SUB-CONSULTANTS

Complete this Schedule and submit with the Tender. If requested by the Principal, submit details of relevant experience of proposed subcontractors.

Tenderers shall set out in the Schedule provided, full details of those parts of the works it is proposed to subcontract and, if known at the time of tendering, details of the proposed subcontractor.

Scope of Work	Name and Address of Proposed Sub-consultant and Sub-contractor

FORM 9 – DETAILS OF KEY PERSONNEL AND HOURLY RATES FOR PERSONNEL

KEY PERSONNEL

NAME	COMPANY ROLE	TIME COMMITMENT (%)	YEARS EXPERIENCE	
			IN CURRENT FIRM	PRIOR

Work Responsibilities for this Project:

NAME	COMPANY ROLE	TIME COMMITMENT (%)	YEARS EXPERIENCE	
			IN CURRENT FIRM	PRIOR

Work Responsibilities for this Project:

FORM 9 CONTINUED

NAME	COMPANY ROLE	TIME COMMITMENT (%)	YEARS EXPERIENCE	
			IN CURRENT FIRM	PRIOR

Work Responsibilities for this Project:

NAME	COMPANY ROLE	TIME COMMITMENT (%)	YEARS EXPERIENCE	
			IN CURRENT FIRM	PRIOR

Work Responsibilities for this Project:

FORM 10 – TECHNICAL SCHEDULE

Provide a list of Pipes, Valves, Plant and equipment etc. to be used for the works.

PIPELINES - PIPE AND FITTING DETAILS	
Pipe Material	
Pipe Manufacturer	
Pipe Pressure Rating	
Pipe Nominal Bore (mm)	
Pipe Joints	
Fitting Material	
Fitting Pressure Rating	
Fitting Nominal Bore (mm)	
Pipeline Service Life	
Pipeline Embedment material	
Others	

VALVE AND HYDRANTS DETAILS	
Air Valves	
Scour Valves	
Sections Valves	
Check Valves	
Actuated Valves if any	
Isolation Values	
Other valves	
Hydrants	

ANY OTHER ASSOCIATED ITEMS/INFRASTRUCTURES	

FORM 11 – SCHEDULE OF ADDITIONAL INFORMATION/ALTERNATIVE PROPOSALS/INNOVATIONS

Details of the additional information, alternative proposals or innovations should be set out in, and/or attached, to this Form.

The information in this Form will be used by Council in the assessment of Tenders and under the Contract to the extent (if any) set out in the Contract

Attach:

FORM 12 – STATUTORY DECLARATION ON NON-COLLUSIVE TENDER DECLARATION

I, _____(Print Name)

Of _____(Tenderer),

Do hereby solemnly declare and affirm the following:

1. I hold the position of _____, and am duly authorised by the Tenderer to lawfully proclaim the following and, after having made due inquiry believe the following to be completely accurate to the best of my knowledge.
2. Neither the Tenderer nor the Tenderer's Agents or Servants have entered into any contract or agreement to offer payment of any kind to a trade association, representative of the Superintendent or representative of Council in the event of a winning Tender by the Tenderer.
3. Neither the Tenderer nor the Tenderer's Agents or Servants have had any knowledge of the price of Tenders submitted by its competitors nor did the Tenderer furnish the price of the enclosed Tender to any source external to the Tenderer prior to the close of the Tender date as specified in this Contract.
4. Neither the Tenderer nor the Tenderer's Agents or Servants have entered into any contract or agreement to offer payment of any kind to an unsuccessful Tenderer in the event of a winning Tender.
5. The Tenderer is not aware of any facts, which would affect the decision of Council in accepting the Tender not has the Tenderer attempted to acquire information relevant to the Tender award process by soliciting Council, the Superintendent or their Representative's Agents or Servants.
6. Neither the Tenderer nor the Tenderer's Agents or Servants have entered into any agreement with other Tenderers or third party which results in a payment of unsuccessful Tenderers fees.
7. The contents of this document are true and correct to the best of my knowledge and in no way have been written under duress of any form.

I make this solemn declaration as to the matter aforesaid, according to the law in this behalf made, and subject to the punishment by law for any wilfully false statement in any such declaration.

Signature of Tenderer _____

Subscribed and declared at: _____

This:_____ Day of _____ Year_____

Before me: (Print Name) _____

Witness: (Signature) _____

(Justice of the Peace or authorised Person)

FORM 13 – STATEMENT OF CONFORMANCE

1. The Tenderer must indicate below whether or not the submitted Tender conforms with the requirements of the Request for Tender by striking out below that which is not applicable:

   This Tender does/does not conform.

2. Should the Tender not conform with the requirements of the Request for Tender, the Tenderer must list below:
   a. All areas of non-conformance; and
   b. The reasons for such non-conformance.

3. If the Tender does not conform with the requirements set out in this Request for Tender, each non-conformance listed in this Form must be valued so that if the non-conformance is unacceptable:

   The Tender may be accepted without that non-conformance; and

   The Contract sum can be adjusted accordingly.

AREAS OF NON CONFORMANCE AND REASON	**VALUE OF NON CONFORMANCE**
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$

FORM 14 – ACKNOWLEDGEMENT OF ADDENDA

The undersigned hereby acknowledges that the following addenda have been read and incorporated within the Tender:

ADDENDUM	**DATED**
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	
Addendum No.	

Note: You will need to access this site www.tenderlink.com/cabonne in order to read and acknowledge the above referenced Addenda.

Acknowledged By: (Print Name) _____

Signature: _____

FORM 15 – DETAILS OF MATERIALS TO BE USED AND WARRANTIES PROVIDED

The Tenderer must include in this Form details about:

1. The materials and warranties which will be provided for the main items set out in the Specifications, and in particular, pipe materials, and items of mechanical and electrical equipment are to be fully specified;
2. Manufacturers details about the asset life for the main items set out in the Specifications, particularly for pipe materials; and
3. The select material proposed for pipe bedding, embedment, overlay and backfill in accordance with the Specifications.

Attach:

FORM 16 – PROJECT PROGRAMME

1. This form must include a implementation/construction program in the form of a Gantt chart which:
    a. Is sufficiently detailed to allow an assessment to be made of how the various major activities will be integrated to ensure Practical Completion of the Works by the times set out in the tender documents.
    b. The Programme is to clearly show start and finish dates, predecessors and successors for each task/activity including Practical Completion.
    c. Submission of design documents for each package of works and documentation by the Contractor and allowance for reviews by the Superintendent prior to commencing construction
    d. Critical Paths from Contract Award to Practical Completion.
    e. Identify tasks to be undertaken by subcontractors and suppliers, both on and off site.
    f. Submission of Works as Constructed and Operation and Maintenance information as a prerequisite for Practical Completion.
    g. The estimated value of work completed for each calendar month.
    h. Submission of all management plans

Attach:

FORM 17 – SUSTAINABILITY

Consistent with the *Local Government Act 1993 (NSW),* Council requires that all purchasing decisions incorporate principles of sustainability in its decision-making process. The purpose of considering sustainability factors in decision-making is to prefer products or services that have minimal impact on the environment and the community.

The following sustainability principles will therefore be considered by Council when assessing Tenders:

1. Minimise waste – only purchase when a product or service is necessary.
2. Minimise unnecessary purchasing – purchase in accordance with the waste hierarchy of 'avoid, reuse, recycle'.
3. Recycled content – purchase products that contain recycled content and/or that can be recycled.
4. Non-toxic – avoid purchasing chemicals that may harm human health or ecosystems.
5. Energy and water efficiency – purchase products that improve resource efficiency.
6. Biodiversity protection – consider biodiversity and habitat conservation implications of purchases.
7. Greenhouse – purchase products with a lower carbon footprint and that reduce reliance of fossil fuels such as through reduced transportation.
8. Durability – purchase products with a longer lifespan.
9. Minimise soil degradation – purchase products that do not degrade or pollute the soil, or result in erosion in their use.

Attach:

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 4 – GENERAL CONDITIONS OF CONTRACT

Formal Instrument of Agreement

Contract No. 957221 Construction of Water Reticulation System

Cabonne Council (ABN 41 992 919 200) (**Principal**)

[Name of Contractor] (ABN [ABN of Contractor]) (**Contractor**)

Formal Instrument of Agreement

Construction of Water Reticulation System

Parties

Principal	**Name**	Cabonne Council
	Address	101 Bank Street Molong NSW 2866
	ABN	41 992 919 200
Contractor	**Name**	[insert]
	Address	[insert]
	ABN	[insert]

Background

A The Principal issued the Request for Tender in relation to the Works.

B The Contractor lodged the Tender with the Principal.

C The Principal has accepted the Tender.

D This document records the terms upon which the Works will be performed by the Contractor.

Operative provisions

1 Definitions and interpretation

1.1 Defined terms

In this document, words beginning with a capital letter that are defined in Part 1 of **Schedule 1** have the meaning ascribed to them in that schedule.

1.2 Interpretation

The interpretational rules contained in Part 2 of **Schedule 1** apply in the interpretation of this document.

2 Performance of the Works

The Contractor must perform the Works in accordance with:

(1) this document;

(2) General Conditions of Contract; and

(3) the Tender Documentation.

3 Inconsistency

If there is any inconsistency between a term of this document, the General Conditions of Contract and the Tender Documentation, the terms contained in the following documents will prevail in the order of preference set out below:

(1) this document;

(2) the General Conditions of Contract;

(3) the Tender;

(4) the Addendum (if any); and

(5) the Request for Tender.

4 Administrative provisions

4.1 Waiver

The non-exercise of or delay in exercising any power or right of a party does not operate as a waiver of that power or right, nor does any single exercise of a power or right preclude any other or further exercise of it or the exercise of any other power or right. A power or right may only be waived in writing, signed by the parties to be bound by the waiver.

4.2 Cooperation

Each party must sign, execute and deliver all deeds, documents, instruments and act reasonably and effectively to carry out and give full effect to this document and the rights and obligations of the parties under it.

4.3 Counterparts

This document may be executed in any number of counterparts and all of those counterparts taken together constitute one and the same instrument.

4.4 Amendment

This document may only be amended or supplemented in writing signed by the parties.

4.5 Unenforceability

Any provision of this document which is invalid or unenforceable in any jurisdiction is to be read down for the purposes of that jurisdiction, if possible, so as to be valid or enforceable, and is otherwise capable of being severed to the extent of the invalidity or enforceability, without affecting the remaining provisions of this document or affecting the validity or enforceability of that provision in any other jurisdiction.

4.6 Governing law

The law in force in the State of New South Wales governs this document. The parties:

(1) submit to the exclusive jurisdiction of the courts of New South Wales and any courts that may hear appeal from those courts in respect of any proceedings in connection with this document; and

(2) may not seek to have any proceedings removed from the jurisdiction of New South Wales on the grounds of forum non conveniens.

Formal Instrument of Agreement - Schedule 1
Defined terms and interpretation

Part 1 - Definitions

Addendums	means the addenda to the Request for Tender for the Construction of Water Reticulation System (Contract No. 957221).
Conditions of Contract	means the AS4000-1997 General Conditions of Contract, as amended and attached as **Annexure 1**.
Request for Tender	means the request for tender for the Construction of Water Reticulation System issued by the Principal in respect of the Works contained in the Tender Documentation.
Tender	means the tender lodged by the Contractor dated [date] in response to the Request for Tender invited by the Principal.
Tender Documentation	means the: (1) Request for Tender; (2) Information to the tenderers (3) Conditions of tendering (4) Tender Submission Forms/Documents (5) Conditions of the Contract (6) Specifications (7) Drawings (8) Review of Environmental Factors – Cumnock and Yeoval Water Reticulation Upgrades (9) Geotechnical Investigation Reports (10) Addendums (if any); and (11) Clarifications. (12) Any other documents included during tendering period
Works	means all or any of the requirements required to be performed by the Contractor and as described in the Request for Tender.

Part 2 – Interpretational rules

clauses, annexures and schedules	a clause, annexure or schedule is a reference to a clause in or annexure or schedule to this document.
variations or replacements	a document (including this document) includes any variation or replacement of it.
reference to statutes	a statute, ordinance, code or other law includes regulations and other instruments under it and consolidations, amendments, re-enactments or replacements of any of them.
singular includes plural	the singular includes the plural and vice versa.
person	the word “person” includes an individual, a firm, a body corporate, a partnership, joint venture, an unincorporated body or association or any government agency.
executors, administrators, successors	a particular person includes a reference to the person’s executors, administrators, successors, substitutes (including persons taking by novation) and assigns.
dollars	Australian dollars, dollars, $ or A$ is a reference to the lawful currency of Australia.
calculation of time	if a period of time dates from a given day or the day of an act or event, it is to be calculated exclusive of that day.
reference to a day	a day is to be interpreted as the period of time commencing at midnight and ending 24 hours later.
accounting terms	an accounting term is a reference to that term as it is used in accounting standards under the *Corporations Act 2001* (Cth) or, if not inconsistent with those standards, in accounting principles and practices generally accepted in Australia.
reference to a group of persons	a group of persons or things is a reference to any two or more of them jointly and to each of them individually.
meaning not limited	the words “include”, “including”, “for example” or “such as” are not used as, nor are they to be interpreted as, words of limitation, and, when introducing an example, do not limit the meaning of the words to which the example relates to that example or examples of a similar kind.
next day	if an act under this contract to be done by a party on or by a given day is done after 4.30pm on that day, it is taken to be done on the next day.
next Business Day	if an event must occur on a stipulated day which is not a business day then the stipulated day will be taken to be the next business day.
time of day	time is a reference to Sydney time.
headings	headings (including those in brackets at the beginning of paragraphs) are for convenience only and do not affect the interpretation of this document.
agreement	a reference to any agreement, deed or instrument includes the same as varied, supplemented, novated or replaced from time to time.

gender	a reference to one gender extends and applies to the other and neuter gender.

Annexure 1

AS 4000-1997 - GENERAL CONDITIONS OF CONTRACT

Australian Standard™

This is an amended form of General conditions of contract Based upon AS 4000 – 1997 (Incorporating Amendment Nos 1, 2 & 3)

This Australian Standard was prepared by Committee OB/3 – General Conditions of Contract. It was approved on behalf of the Council of Standards Australia on 25 July 1997 and published on 5 August 1997.

The following interests are represented on the Committee OB/3:
Association of Consulting Engineers Australia/Australasian Railways Association
Australian Chamber of Commerce and Industry
Australian Procurement and Construction Council
AUSTROADS
Construction Industry Engineering Services Group
Construction Policy Steering Committee
Electricity Supply Association of Australia
Institution of Engineers, Australia
Institution of Professional Engineers, New Zealand
Law Council of Australia
Master Builders Australia
National Construction Council / MTIA
Process Engineers and Constructors Association
Royal Australian Institute of Architects

This Standard was issued in draft form for comment as DR 96319.

Originated as part of AS CA24—1952.
Previous edition AS 2124—1992.
Revised and designated AS 4000—1997.
Reissued incorporating Amendment No. 1 (August 1999),
Amendment No. 2 (October 2000), and Amendment No. 3 (March 2005).

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Web Shop at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Global Standard*, has a full listing of revisions and amendments published each month.

Australian Standards™ and other products and services developed by Standards Australia are published and distributed under contract by SAI Global, which operates the Standards Web Shop.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to the Chief Executive, Standards Australia, GPO Box 5420, Sydney, NSW 2001.

Published by Standards Australia, GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 1375 0

Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee OB/3, General Conditions of Contract.

This Standard incorporates Amendment 1 (August 1999), Amendment 2 (October 2000), and Amendment 3 (March 2005). The changes required by the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure, or part thereof affected.

This Standard is the result of a consensus among Australian and New Zealand representatives on the Joint Committee to produce it as an Australian Standard.

Subclauses 8.6 and 29.2 (prefixed by an asterisk) are optional, and may be omitted in the Contract, where necessary, without making consequential amendments but such omission should be clearly shown on the face of the document by striking out these subclauses or indicating clearly in clause 1 of **Annexure Part B** or elsewhere that they are *not to apply*. See paragraph (i) of clause 1 on page 5 for the effect of stating deletions in **Annexure Part B**.

Warning

Users of this Australian Standard are warned that clause 15 (Damage to persons and property other than work under the Contract ('WUC')) does not limit the liability of parties for special, indirect or consequential losses.

This unlimited liability applies notwithstanding any limitations or exclusions permitted under insurance clauses 16 (Insurance of the Works) and 17 (Public liability insurance).

Parties wishing to limit their liability should seek insurance and legal advice before entering a contract under this Standard.

A2 **Legislation has come into force in some jurisdictions dealing with security of payments. Parties intending to use this Standard should seek expert advice as to their rights and obligations under such legislation.**

Table of Contents

Australian Standard

General Conditions of Contract

1 Interpretation and construction of Contract

1.1 Definitions

In the *Contract*, except where the context otherwise requires:

adjoining site means any property adjoining the *site.*

Approvals means any certificate, licence, consents, permits, approval, endorsements, licence conditions or requirements (including any variation to them) required by:

(1) any *legislative requirement* arising out of or in any way connected with *WUC*;

(2) any organisation; or

(3) *Authority*,

having jurisdiction in connection with the carrying out of *WUC*.

Authority means any governmental or non governmental or local government authority, administrative or judicial body or tribunal, department, commission, public authority, agency, Minister, statutory corporation or instrumentality and any private electricity, telecommunications or other utility company having statutory rights in relation to *the Works* or the *WUC*

business day means any day which is not:

(1) a Saturday, Sunday or public holiday in New South Wales; or

(2) 27, 28, 29, 30 and 31 December.

certificate of practical completion has the meaning in subclause 34.6.

compensable cause means:

(1) any act, default or omission of the *Superintendent*, the *Principal* or its consultants, agents or other contractors (not being employed by the *Contractor*) other than any act or omission permitted under the *Contract*; or

(2) those listed in *Item* 26.

construction plant means appliances and things used in the carrying out of *WUC* but not forming part of *the Works*.

construction program has the meaning in clause 32.

contamination means the presence in, on or under land (including both surface and ground water and air) of a substance (whether solid, liquid, gas odour, heat, sound, vibration or radiation) at a concentration above the concentration at which the substance is normally or naturally present in, on or under (respectively) land (including both surface and ground water) or waters in the same locality, being a presence that presents a risk of harm to human health or any aspect of the environment. The terms ‘contaminant’ and ‘contaminated’ and ‘contaminate’ have corresponding meanings.

Contract has the meaning in clause 6.

Contract Documents means

(1) Formal Instrument of Agreement

(2) the *Contract*

(3) the *Tender Documents*

(4) any drawings, specifications, shop drawings, calculations and other documents and information, meeting the requirements of clause 8.3, which the *Contractor* must use to perform *the Works* in accordance with the *Contract*.

contract sum means [$insert lump sum] including *provisional sums* but excluding any additions or deductions which may be required to be made under the *Contract*.

Contractor means the Contractor stated in *Item 3*.

date for practical completion means:

(1) where *Item* 7(a) provides a date for *practical completion*, the date;

(2) where *Item* 7(b) provides a period of time for *practical completion*, the last day of the period,

but if any *EOT* for *practical completion* is directed by the *Superintendent* or allowed in any arbitration or litigation, it means the date resulting from that *direction*.

date of practical completion means:

(1) the date evidenced in a *certificate of practical completion* as the date upon which *practical completion* was reached; or

(2) where another date is determined in any arbitration or litigation as the date upon which *practical completion* was reached, that other date.

deed of guarantee, undertaking and substitution has the meaning in subclause 5.6.

defects has the meaning in clause 35 and includes omissions.

defects liability period has the meaning in clause 35.

dispute has the meaning in subclause 41.2.

direction	includes agreement, approval, assessment, authorisation, certificate, decision, demand, determination, explanation, instruction, notice, order, permission, rejection, request or requirement.
EOT (from 'extension of time')	has the meaning in subclause 34.3.
excepted risk	has the meaning in subclause 14.3.
final certificate	has the meaning in clause 37.
final payment	has the meaning in clause 37.
final payment claim	means the final payment claim referred to in clause 37
GST	has the meaning given in s195-1 of the GST Act.
GST Act	means *A New Tax System (Goods and Services Tax) Act 1999* (Cth).
hazardous materials	means any material that is or is potentially damaging to the environment and includes all Dangerous Goods (as that term is defined by the *Dangerous Goods Act 1975* as amended from time to time) and any waste, *contamination* or pollution referred to in the *Environmentally Hazardous Chemicals Act 1985*, *Contaminated Land Management Act 1997* or the *Protection of the Environment Operations Act 1997* as amended from time to time.
inclement weather	means rain and/or hail or other extreme weather conditions at the *site* (excluding the effects thereof) which has, in the opinion of the *Superintendent,* been sufficient in intensity to delay (and has in fact delayed) an activity on the critical path of *the Works.*
Intellectual property right	means any patent, registered design, trademark or name, copyright or other protected right.
Item	means an *Item* in **Annexure Part A** of the conditions of the contract.
latent condition	has the meaning in subclause 25.1.
legislative requirement	includes: (1) Acts, Ordinances, regulations, by-laws, orders, awards and proclamations of the jurisdiction where *WUC* or the particular part thereof is being carried out; (2) the requirements of any *Approvals* and/or *Authorities* with jurisdiction in connection with the carrying out of *WUC*; and (3) fees and charges payable in connection with the foregoing. including but not limited to development consents issued by any *Consent Authority* relating to the performance of *WUC*.

payment schedule has the meaning in clause in subclause 37.2

PPSA means the *Personal Property Securities Act 2009* (Cth)

practical completion is that stage in the carrying out and completion of *WUC* when:

(1) *the Works* concerned have been substantially completed in accordance with the requirements for those *works* under the *Contract*, save for insignificant omissions and *defects*:

(a) which do not prevent *the Works* from being used for their stated purpose;

(b) which the *Superintendent* determines the *Contractor* has reasonable grounds for not promptly rectifying;

(c) the rectification of which will not prejudice the use of *the Works*; and

(2) those *tests* which are required by the *Contract* to be carried out and passed before *the Works* reach *practical completion* have been carried out and passed;

(3) (including Work As Constructed documentation) and other information required under the *Contract* which, in the *Superintendent's* opinion, are essential for the use, operation and maintenance of *the Works* have been supplied;

(4) all services and equipment incorporated into *the Works* have been commissioned, tested and are fully functional;

(5) all debris, rubbish, building materials and *construction plant* has been removed from the *site* and the *site* has been cleaned, and

(6) a *defects* inspection has been carried out by the *Superintendent* and the *Contractor* and, in respect of all *defects* identified at the date of the inspection a program for rectification of the *defects* has been approved by the *Superintendent.*

Principal means the Principal stated in *Item 1*.

Protection Officer means a worker with appropriate qualifications as required by *Rail Operator* who is responsible for safe working protection within the *Railway Corridor.*

provisional sum has the meaning in clause 3 and includes monetary sum, contingency sum and prime cost item.

public liability policy has the meaning in clause 17.

qualifying cause of delay means:

(1) any act, default or omission of the *Superintendent*, the *Principal* or its consultants, agents or other contractors (not being employed by the *Contractor*); or

(2) other than:

(a) a *direction* of a *variation*;

(b) a breach or omission by the *Contractor*;

(c) industrial conditions or *inclement weather* occurring after the *date for practical completion*; and

(d) stated in *Item* 23.

Rail Operator's Representative means the person that the *Rail Operator* appoints to be its representative and includes any delegate of the *Rail Operator* notified to the *Contractor* in writing by the *Principal* from time to time;

Railway Corridor means land which is leased, owned or occupied by the *Rail Operator* used for the transportation of passengers or freight (or both) on a railway track;

Rail Facilities means any and all railway track, railway stations, tunnels, civil works associated with track structures, over track structures, signalling systems, train control systems, communication systems, equipment nodes, conduits, ducting, cable, cable support structures and other plant, equipment, buildings or facilities owned, leased or used by the *Rail Operator* on, or in relation to, or in any way connected to, the *Railway Corridor*;

Rail Laws means:

(1) the Transport Administration Act 1988 (NSW)

(2) the Rail Safety National Law (NSW);

(3) all rules, procedures, standards, protocols and manuals relating to rail safety from time to time, including without limitation:

(a) rail network rules or any updated or replacement network rules; and

(b) rail network procedures or any updated or replacement network procedures

issued by the *Rail Operator;*

Rail Operator means John Holland Rail, who has entered into a commercial agreement or understanding with Transport for NSW to operate and maintain trains/railway infrastructures on the *Railway Corridor*;

site means the lands and other places to be made available and any other lands and places made available to the *Contractor* by the *Principal* for the purpose of the *Contract.*

Superintendent means the person stated in *Item* 5 as the *Superintendent* or other person from time to time appointed in writing by the *Principal* to be the *Superintendent* and notified as such in writing to the *Contractor* by the *Principal* and, so far as concerns the functions exercisable by a *Superintendent's Representative*, includes a *Superintendent's Representative*.

Superintendent's Representative means an individual appointed in writing by the *Superintendent* under clause 21.

survey mark in clause 26 means a survey peg, bench mark, reference mark, signal, alignment, level mark or any other mark for the purpose of setting out, checking or measuring *WUC*.

temporary works means *work* used in carrying out and completing *WUC*, but not forming part of *the Works*.

Tender Documents means:

(1) the *Principal's* Request for Tender and all documents included as part of that Request for Tender;

(2) any addendums or clarifications to the Request for Tender;

(3) the Tender lodged by the *Contractor* in response to the Request for Tender;

(4) the letter of acceptance of the Tender issued by the *Principal.*

test has the meaning in subclause 30.1 and includes examine and measure.

the Works means the whole of the *work* to be carried out and completed in accordance with the *Contract*, including *variations* provided for by the *Contract*, which by the *Contract* is to be handed over to the *Principal*;

Track Possession means any prescribed period that *Rail Operator* notifies the *Contractor* that it may have temporary access to a defined portion of the *Railway Corridor* for the purposes of carrying out the *WUC*;

variation has the meaning in clause 36.

work includes the provision of materials.

WUC (from 'work under the Contract') means the *work* which the *Contractor* is or may be required to carry out and complete under the *Contract* and includes *variations*, remedial *work*, *construction plant* and *temporary works*.

1.2 Interpretation

In the *Contract*:

(1) Unless otherwise specified:

(a) references to days mean calendar days;

(b) reference to a working day means days on which the *Contractor* is authorised under the *Contract* to undertake the *WUC;* and

(c) references to a person include an individual, firm or a body, corporate or un-incorporate;

(2) time for doing any act or thing under the *Contract*, if it ends on a Saturday, Sunday or Statutory or Public Holiday, is to be deemed to end on the day next following which is not a Saturday, Sunday or Statutory or Public Holiday;

(3) clause headings and subclause headings in these General Conditions of Contract do not form part of these General Conditions and are not be used in the interpretation of the *Contract*;

(4) words in the singular include the plural and words in the plural include the singular, according to the requirements of the context. Words importing a gender include every gender;

(5) communications between the *Principal*, the *Superintendent* and the *Contractor* must be in the English language;

(6) measurements of physical quantities must be in legal units of measurement of the jurisdiction in *Item* 8;

(7) unless otherwise provided, prices are in the currency in *Item* 9(a) and payments must be made in that currency at the place in *Item* 9(b); and

(8) the law governing the *Contract*, its interpretation and construction, and any agreement to arbitrate, is the law of the jurisdiction in *Item* 8.

2 Nature of Contract

2.1 Performance and payment

The *Contractor* must carry out and complete the *WUC* in accordance with the *Contract* and *directions* authorised by the *Contract*.

Subject to the provisions of the *Contract,* the *Principal* must pay the *Contractor* the *contract sum,* adjusted by any additions or deductions made pursuant to the *Contract*.

The *Contractor* acknowledges and agrees that the *contract sum*, adjusted by any additions or deductions made pursuant to the *Contract*:

(1) is the fixed lump sum price for the *WUC*; and

(2) is not subject to any adjustment in respect of *site* allowances or because of fluctuations in changes in the costs of labour and materials or otherwise.

The *Contractor* further acknowledges and agrees that it is not entitled to any reimbursement or additional payment whatsoever in respect of any payments which the *Contractor* may be obliged to make on behalf of its employees in respect of any superannuation fund, scheme or

arrangement for the benefit of workers or otherwise which is in existence at the date of the *Contract* or which comes into existence after the date of the *Contract*.

2.2 Not used.

2.3 Not used.

2.4 Not used.

2.5 Not used.

2.6 Costs and Expenses

Unless the *Contract* expressly provides otherwise, any and all of the *Contractor's* obligations under the *Contract* are to be discharged by the *Contractor* at its own cost and expense.

2.7 No security interest

The *Contractor* must not assign any right under the *Contract* or create any *security interest* or allow any *security interest* to subsist over the *Contract* without the *Principals* prior written consent.

2.8 Contractor to Inform itself

(1) Without limiting any other provisions in the *Contract*, the *Contractor* warrants to the *Principal* that it has fully informed itself with respect to all matters that are relevant to the completion of the *WUC*, including but not limited to:

(a) the nature and requirements of the *work* and materials necessary for the execution of *the Works* and the means of access to and facilities at the *site* and transport facilities for deliveries to or from the *site*;

(b) the availability and cost of labour including, without limitation, the costs of complying with obligations imposed by an agreement between the relevant building industry unions and employers relating to the execution of construction and building work nationally and in the State or Territory in which *the Works* are situated and the materials required;

(c) the correctness and sufficiency of the *contract sum* and that the *contract sum* covers all costs of complying with all its obligations under the *Contract* and of all matters and things necessary for the due and proper performance and completion of *the Works*, taking account of all exigencies or risk inherent in the performance of the *WUC* or assumed by the *Contractor* under the *Contract*;

(d) quantities, if mentioned, in *Principal* documents are estimated tentative quantities only and the *Contractor* has itself examined and assessed the *design,*

Tender Documents and the *site* to quantify the actual quantities required to complete *WUC,* the cost of which is included in the *contract sum.*

(e) all *legislative requirements* in relation to *the Works*;

(f) that it will at all times be suitably qualified and experienced, and will exercise due skill, care and diligence in the execution and completion of the *WUC*;

(g) that *construction plant* and any goods and materials to be supplied in connection with *WUC* not otherwise specified will be new and will be fit for the purposes for which they are intended as set out in this *Contract*;

(h) it has the resources, commitment and appropriate and experienced personnel available to carry out the *WUC*;

(i) it has examined all information obtainable by the making of reasonable enquiries and relevant to the risks, contingencies and other circumstances having an effect on the *WUC*;

(j) *the Works* are capable of being constructed in accordance with the *Contract*; and

The *Contractor* will execute and complete *the Works*:

(k) in accordance with the *Contract*;

(l) so that when completed, *the Works* comply with all the requirements of the *Contract* and all *legislative requirements*.

(2) The *Contractor* further warrants and represents that it has thoroughly and comprehensively:

(a) examined all the information made available to it by the *Principal* for the purpose of tendering including the drawings, specification, schedules, conditions of tendering, reports, diagrams, contract conditions, *Approvals* and the like;

(b) examined all information relevant to the risks, contingencies and other circumstances which could affect its tender and the *contract sum*, which is obtainable by the making of reasonable enquiries;

(c) carefully examined the *site*, existing works, services, utilities and their surroundings; and

(d) informed itself of all issues concerning the existence of potentially *hazardous materials* (including asbestos) and work health and safety issues that may arise

in connection with the *WUC* and the performance by the *Contractor* of its obligations under the *Contract*.

(3) The *Contractor* acknowledges and agrees that any breach of a warranty provided by the *Contractor* under paragraphs (1) or (2) will not relieve the *Contractor* of its liability to perform and complete the *WUC* in accordance with the *Contract*.

3 Provisional sums

3.1 Effect of inclusion in *Contract*

A *provisional sum* included in the *Contract* is not itself payable by the *Principal* and will only become due and payable by the *Principal* in accordance with this clause 3.

Where, pursuant to a *direction* of the *Superintendent*, the *work* or item to which a *provisional sum* relates is carried out or supplied by the *Contractor*:

(1) the *Contractor* must submit the price for the *work* or item in accordance with subclause 36.2 as if the *Superintendent's direction* was a *direction* to submit a price for the *work* as a *variation;*

(2) the *Superintendent* may exercise any of the rights conferred on him in subclause 36.2 in respect of the price submitted by the *Contractor*; and

(3) if the *work* or item is carried out or supplied by the *Contractor,* that the *work* or item will be priced by the *Superintendent* in accordance with subclause 36.4, and the difference will be added to or deducted from the *contract sum*.

3.2 Carried out by a subcontractor

Where any part of such *work* or item referred to in subclause 3.1 is carried out or supplied by a *subcontractor*, the *Superintendent* will allow the amount payable by the *Contractor* to the *subcontractor* for the *work* or item, disregarding:

(1) any damages payable by the *Contractor* to the *subcontractor* or vice versa; and

(2) any deduction of cash discount for prompt payment,

plus an amount for profit and attendance calculated by using the percentage thereon stated in *Item* 12 or elsewhere in the *Contract*, or, if not so stated, as assessed by the *Superintendent*.

4 Separable portions

Separable portions may be *directed* by the *Superintendent*, who will clearly identify for each, the:

(1) portion of *the Works*;

(2) *date for practical completion*;

(3) the conditions precedent for *practical completion* of the relevant *separable portion*; and

(4) respective amounts for *security*, bonus (if applicable), liquidated damages and delay damages (all calculated pro-rata according to the ratio of the *Superintendent*'s valuation of the *separable portion* to the *contract sum*).

5 Security

5.1 Provision

Security must be provided in accordance with *Item* 13 or 14 prior to the commencement of the *WUC* and as a precondition to payment under the *Contract.*

Unless and until the *Contractor* has provided the *security* the *Principal* is not required to make the *site* available to the *Contractor*, however may do so at its discretion without waiving any of its other rights under the *Contract*.

5.2 Recourse

(1) The *Contractor* acknowledges and agrees that:

(a) the *security* is provided as security for the performance of the obligations of the *Contractor* under the *Contract*; and

(b) the *Principal* may call on the *security* without notice to the *Contractor* to:

(i) satisfy any debt owed to the *Principal* by the *Contractor* under the *Contract*; or

(ii) compensate the *Principal* for any loss or damage suffered by the *Principal* as a result of a breach of the *Contract* by, or negligence of, the *Contractor*; and

(c) The *Principal* may convert the *security* into cash where the *Principal* believes (acting reasonably):

(i) the *Contractor* is in breach of any of its obligations under the *Contract*; or

(ii) it is entitled to terminate the *Contract*.

(2) If the *Principal* has recourse to the *security* in accordance with the terms of the *Contract*, the *Contractor*, within ten (10) *business days* of being requested to do so, must provide

the *Principal* with additional *security* so that the value of the *security* which the *Principal* holds under the *Contract* equals the amount specified in *Item* 13(b).

5.3 Change of security

It is an essential term of this *Contract* that the *Contractor* ensure that the *security* remains effective until the *Principal* is obliged to return the *security* to the *Contractor*.

If the *security* has an expiry date, the *Contractor* must ensure that a replacement of the *security* is provided to the *Principal* no later than fifteen (15) *business days* before that expiry date.

5.4 Reduction and release

Upon the issue of the *certificate of practical completion* the *Contractor's* entitlement to *security* (other than in *Item* 13(e)) shall be reduced by the percentage or amount in *Item* 13(f) or 14(d) as applicable, and the reduction shall be released and returned within ten (10) *business days* to the *Contractor*.

The *Principal's* entitlement to *security* in *Item* 13(e) will cease ten (10) *business days* after incorporation into *the Works* of the plant and materials for which that *security* was provided.

The *Contractor's* entitlement otherwise to *security* shall cease ten (10) *business days* after *final certificate*.

The *Contractor* acknowledges that it will not at any time take steps to injunct or otherwise restrain:

(1) any issuer of any *security* contemplated in this clause 5 from paying the *Principal* pursuant to any *security*; or

(2) the *Principal* from:

(a) taking any steps to obtain payment under any *security*;

(b) using the moneys received under any *security*;

(c) using any retention moneys held by the *Principal*.

5.5 Trusts and interest

If the *Principal* holds cash security at any time under the *Contract*, the *Principal* is under no obligation to invest that cash, or if it chooses to do so, to pay any interest earned on it to the *Contractor*.

5.6 Deed of guarantee, undertaking and substitution

Where the *Contractor* is a related or subsidiary corporation (as defined in the *Corporations Act 2001* (Cth) the *Contractor* must, within ten (10) *business days* after receiving a written request

from the *Principal* provide a *deed of guarantee, undertaking and substitution* duly executed, enforceable and in a form approved by the *Principal*.

6 Evidence of Contract

6.1 Formation of the Contract

The *Contractor* acknowledges and agrees that the *Contract* is formed in accordance with, and subject to, the terms contained in the *Tender Documents* issued by the *Principal* in respect to *the Works*.

6.2 Execution of a Formal Instrument of Agreement

(1) The *Contractor* must execute a Formal Instrument of Agreement evidencing the terms of the *Contract* in accordance with the *Tender Documents* issued by *Principal* with respect to *the Works.*

(2) If the *Contractor* fails to comply with paragraph (1):

(a) the *Principal* is not required to make the *site* available to the *Contractor*, however may do so at its discretion without waiving any of its other rights under the *Contract*;

(b) the *Contractor* is not entitled to payment from the *Principal* under the *Contract*; and

(c) the *Principal* may terminate the *Contract* immediately by notice in writing to that effect to the *Contractor.*

7 Service of notices

A notice (and other documents) is deemed to have been given and received:

(1) if addressed or delivered to the relevant address in the *Contract* or last communicated in writing to the person giving the notice; and

(2) on the earliest date of:

(a) actual receipt;

(b) confirmation of correct transmission of fax, provided that if a fax is transmitted after 4.00 pm (at the place of receipt) it is deemed to have been received on the next business day; or

(c) three (3) days after posting.

(3) Excluding notices given under clauses 39 and 41.2, notices under the *Contract* may be sent by email and will be deemed to have been received once sent unless:

(a) the sender receives notice that the email transmission has been unsuccessful or could not be delivered;

(b) an out of office notice indicates that the recipient is unavailable; or

(c) the email is sent on a day which is not a *business day* in which case it will be deemed to have been received on the next *business day.*

8 Contract documents

8.1 Discrepancies

When construing the documents which form the *Contract* the following rules of construction apply:

(1) in the event of any inconsistency between the documents which form the *Contract*, the documents comprising the *Contract* must be construed in the order of precedence they are listed in the Formal Instrument of Agreement;

(2) notwithstanding the paragraph (1):

(a) where inconsistent levels of quality are required, the higher level of quality applies;

(b) figured dimensions take precedence over scaled dimensions; and

(c) drawings made to larger scales take precedence over drawings made to smaller scales,

(3) where the requirements of quality or any aspect of *WUC* are not expressly specified or depicted, the quality will be consistent with the intended purpose of the *Works*; and

(4) drawings showing particular parts of *WUC* take precedence over drawings for more general purposes.

8.2 Principal supplied documents

(1) The *Principal* must supply to the *Contractor* the documents and number of copies thereof, both stated in *Item* 15.

(2) Those items:

(a) remain the *Principal's* property and be returned to the *Principal* on written demand; and

(b) must not be used, copied nor reproduced for any purpose other than *WUC*.

(3) The *Principal* does not warrant, guarantee or make any representation about the accuracy of any information data and documents made available to the *Contractor* by the *Principal* or anyone on behalf of the *Principal* before the date of commencement of the *WUC* and to the extent permitted by law, the *Principal* will not be liable upon any claim by the *Contractor* arising out of, or in any way connected with, such information, data and documents.

8.3 Contractor-supplied documents

(1) The *Contractor* must supply to the *Superintendent* the documents and number of copies thereof, both stated elsewhere in the *Contract*.

(2) If the *Contractor* submits documents to the *Superintendent*, then except where the *Contract* otherwise provides:

(a) the *Superintendent* is not required to check such documents for errors, omissions, inconsistencies, ambiguities, discrepancies or compliance with the *Contract*;

(b) notwithstanding clause 20, any *Superintendent's* acknowledgment or approval does not prejudice the *Contractor's* obligations; and

(c) if the *Contract* requires the *Contractor* to obtain the *Superintendent's direction* about such documents, the *Superintendent* will give, within the time stated in

Item 16, the appropriate *direction*, including reasons if the documents are not suitable.

(3) Copies of documents supplied by the *Contractor* are the *Principal's* property but will not be used or copied otherwise than for the use, repair, maintenance or alteration of *the Works*.

8.4 Availability

The *Contractor* must keep available to the *Superintendent* and the *Principal*:

(1) on *site*, one complete set of documents affecting *WUC* and supplied by a party or the *Superintendent*; and

(2) at the place of manufacture or assembly of any significant part of *WUC* off *site*, a set of the documents affecting that part.

8.5 Confidential information

(1) Subject to the obligations of the parties in subclause 8.7, the parties must ensure that there are kept confidential such documents, samples, models, patterns and other information as are supplied and clearly identified as confidential.

(2) If required in writing by a party, the other party must enter into a separate agreement not to disclose to anyone else any confidential matter even after *final certificate* or earlier termination of the *Contract*. If so required by the *Contractor*, the *Principal* must ensure that the *Superintendent* also enters into such an agreement.

8.6 Media*

The *Contractor* must not disclose any information concerning the project for distribution through any communications media without the *Principal's* prior written approval (which will not be

unreasonably withheld). The *Contractor* must refer to the *Principal* any enquiries from any media concerning the project.

8.7 The Government Information (Public Access) Act 2009

(1) The *Contractor* acknowledges that the *Principal* is required to comply with the provisions of the Government Information (Public Access) Act 2009.

(2) The *Contractor* must, within five (5) *business days* of receiving a written request from the *Principal*, provide the *Principal* with immediate access to the following information contained in records held by the *Contractor*:

(a) information that relates directly to the performance of the *WUC* by the *Contractor* pursuant to the *Contract*;

(b) information collected by the *Contractor* from members of the public in relation to *WUC*; and

(c) information received by the *Contractor* from the *Principal* to enable it to perform the *WUC*.

(3) For the purposes of paragraph (2), information does not include:

(a) information that discloses or would tend to disclose the *Contractor's* financing arrangements, financial modelling, cost structure or profit margin (other than where this is already disclosed under or forms part of the *Contract*);

(b) information that the *Contractor* is prohibited from disclosing to the *Principal* by provision made by or under any Act, whether of any State or Territory, or of the Commonwealth; or

(c) information that, if disclosed to the *Principal*, could reasonably be expected to place the *Contractor* at a substantial commercial disadvantage in relation to the *Principal*, whether at present or in the future.

(4) The *Contractor* must provide copies of any of the information in paragraph (2), as requested by the *Principal*, at the *Contractor's* own expense and within the timeframe notified in any request.

(5) Any failure by the *Contractor* to comply with a request by the *Principal* under this subclause 8.7 will be considered a substantial breach of the *Contract*.

8.8 Clarification

(1) Where the *Contractor* considers that there is an ambiguity or discrepancy between the documents comprising the *Contract*, it may advise the *Superintendent* in writing, who must give the *Contractor* a *direction* as to the interpretation to be followed.

(2) The *Contractor* is not entitled to any compensation as a consequence of a *direction* given by the *Superintendent* under this subclause 8.8 which is consistent with the rules of construction set out in subclause 8.1.

(3) If a *direction* given by the *Superintendent* under this subclause 8.8 is not consistent with the rules of construction set out in subclause 8.1 the *direction* of the *Superintendent*

under this subclause 8.8 will be deemed to be a *direction* for a *variation* to which clause 36 applies.

9 Assignment and subcontracting

9.1 Assignment

The *Contractor* must not, without the *Principal's* prior written approval (including terms) assign the *Contract* or any payment or any other right, benefit or interest thereunder.

9.2 Subcontracting generally

The *Contractor* must not without the *Superintendent's* prior written approval (which will not be unreasonably withheld):

(1) subcontract or allow a *subcontractor* to subcontract any *work* described in *Item* 17; or

(2) allow a *subcontractor* to assign a subcontract or any payment or any other right, benefit or interest under the relevant subcontract.

With a request for approval, the *Contractor* must give the *Superintendent* written particulars of the *work* to be subcontracted and the name and address of the proposed subcontractor. The *Contractor* must give the *Superintendent* other information which the *Superintendent* reasonably requests, including the proposed subcontract documents without prices.

Within ten (10) *business days* of the *Contractor's* request for approval, the *Superintendent* will give the *Contractor* written notice of approval or of the reasons why approval is not given.

Approval may be conditional upon the subcontract including:

(1) provision that the *subcontractor* must not assign nor subcontract without the *Contractor's* written consent; and

(2) provisions which may be reasonably necessary to enable the *Contractor* to fulfil the *Contractor's* obligations to the *Principal*.

The *Contractor* agrees that:

(1) all *subcontractors* engaged in connection with carrying out the *WUC* are engaged as independent contractors to the *Contractor;* and

(2) it will not hold itself out, or purport to hold itself out, as being the agent of the *Principal* in connection with the execution of any subcontract or any subcontract works.

9.3 Selected subcontract work

If the *Principal* has included in the *Tender Documents* a list of one or more *selected subcontractors* for particular *work*, the *Contractor* must subcontract that *work* to a *selected*

subcontractor and thereupon give the *Superintendent* written notice of that *selected subcontractor's* name.

If no *subcontractor* on the *Principal's* list will subcontract to carry out the *selected subcontract work*, the *Contractor* must provide a list for the written approval of the *Superintendent*.

The *Contractor* must provide, at no cost to any *selected subcontractors,* the normal facilities for the proper performance of the nominated subcontract works concerned, including the following:

(1) storage areas,

(2) messing, changing, and sanitary accommodation, and

(3) water, power, lighting and other services necessary for the performance of the *work*.

9.4 Novation

When directed by the *Principal*, the *Contractor*, without being entitled to compensation, must promptly execute a deed of novation in a form required by the *Principal*, acting reasonably, such deed being between the *Principal*, the *Contractor* and the *subcontractor* or *selected subcontractor* stated in *Item* 18 for the particular part of *WUC*.

9.5 Contractor's responsibility

Except where the *Contract* otherwise provides, the *Contractor* is liable to the *Principal* for the acts, defaults and omissions of *subcontractors* (including *selected subcontractors*) and employees and agents of *subcontractors* as if they were those of the *Contractor*.

Approval to subcontract does not relieve the *Contractor* from any liability or obligation under the *Contract*.

9.6 Subcontractor warranties

The *Contractor* must procure a warranty in favour and for the benefit of the *Principal* from all *subcontractors* providing the *work*, material or goods forming part of *the Works* as listed in the

Tender Documents specification (or whose trades or areas of work are listed) and for the periods set out in the specification.

Any such warranty must be a deed in a form to be approved by the *Principal*, acting reasonably.

Where any such warranty is not procurable from a *subcontractor*:

(1) the *Contractor* must itself provide an equivalent warranty; and

(2) the *Contractor* holds the benefit of any such warranty to which it is entitled from the relevant *subcontractor* on trust for the benefit of the *Principal*.

The *Contractor* must hand over to the *Principal* all such warranties prior to and as a condition precedent to *practical completion*.

10 Intellectual property rights

10.1 Principal's warranty

The *Principal* warrants that, unless otherwise provided in the *Contract*, materials, documents and methods of working, each specified in the *Contract* or provided or directed by the *Principal* or the *Superintendent* does not infringe any *intellectual property right*.

10.2 Contractor's warranty

The *Contractor* warrants that any materials, documents and methods of working, each provided by the *Contractor,* or its *subcontractors* do not infringe any *intellectual property right*.

10.3 Indemnity

Each party indemnifies the other against such respective infringements.

11 Legislative requirements

11.1 Compliance

The *Contractor* must satisfy all *legislative requirements* (including those related to the protection of the environment and the management, handling and removal from *site* of any *contamination*

or *hazardous materials*) except those in *Item* 19(a) or directed by the *Superintendent* to be satisfied by or on behalf of the *Principal*.

The *Contractor*, upon finding that a *legislative requirement* is at variance with the *Contract*, must promptly give the *Superintendent* written notice thereof.

11.2 Changes

If a *legislative requirement*:

(1) necessitates a change:

(a) to *the Works*;

(b) being the provision of services by an *Authority* in connection with *WUC*; or

(c) in a fee or charge or payment of a new fee or charge;

(2) comes into effect after the 7th day before the closing of tenders but could not reasonably then have been anticipated by a competent contractor; and

(3) causes the *Contractor* to incur more or less cost than otherwise would have been incurred,

the difference will be assessed by the *Superintendent* and added to or deducted from the *contract sum*.

11.3 Australian Standards

The *Contractor* must do all acts, matters and things necessary on its part to be done to ensure that the *WUC* is executed in accordance with the appropriate Australian Standards current at the time when the *WUC* is being executed.

11.4 Long Service Levy

Before commencing *WUC*, the *Contractor* will, where applicable:

(1) pay to the Building and Construction Industry Long Service Payments Corporation or the Corporation's agent, the amount of the long service levy payable under the Building and Construction Industry Long Service Payments Act 1986 (NSW); and

(2) provide evidence of the payment of the long service levy to the *Superintendent*.

12 Protection of people and property

12.1 Obligations of the Contractor

Insofar as compliance with the *Contract* permits, the *Contractor* must:

(1) take measures necessary to protect people and property;

(2) avoid unnecessary interference with the passage of people and vehicles; and

(3) prevent nuisance and unreasonable noise and disturbance.

If the *Contractor* damages property, the *Contractor* shall promptly rectify the damage and pay any compensation which the law requires the *Contractor* to pay.

If the *Contractor* fails to comply with an obligation under this clause, the *Principal*, after the *Superintendent* has given reasonable written notice to the *Contractor* and in addition to the *Principal's* other rights and remedies, may have the obligation performed by others. The cost

thereby incurred shall be certified by the *Superintendent* as moneys due from the *Contractor* to the *Principal*.

12.2 Protection of the Environment

The *Contractor* must:

(1) ensure that in carrying out *WUC* it does not pollute, *contaminate* or otherwise damage the environment and must immediately make good any pollution*, contamination* or damage to the environment arising out of or in connection with *WUC*;

(2) carry out all *WUC* in accordance with all applicable environmental *legislative requirements*; and

(3) include in its *contract sum* an amount, being a percentage of the total cost for all the items for the protection of the environment from the *WUC* (up to and including miscellaneous items).

12.3 Risk Management System

The *Contractor* must demonstrate for the duration of the *WUC,* its specific understanding of the risk management requirements of *the Works* to be undertaken.

The risk management policies and procedures, the *Contractor's* safe working policies and procedures and all other relevant documents prepared by the *Contractor* in accordance with the *Contract* must demonstrate that:

(1) the *Contractor* has a good understanding of the hazards and risk associated with the activities being undertaken;

(2) the *Contractor* has established systems and procedures for managing risks;

(3) the *Contractor* has secured all required licenses for relevant activities to be undertaken as part of *the Works*, including all required employee competencies and licences;

(4) all *construction plant* and equipment to be used in the performance of *the Works* are appropriately licensed or registered, maintained and inspected on a regular basis; and

(5) the *Contractor* has carried out or caused to be carried out contract specific risk assessments to ensure that all risk associated with the performance of the *Works* have been identified and are being controlled.

12.4 Traffic and Pedestrian Management Plan

(1) For the purpose of this subclause 12.4 a Traffic and Pedestrian Management Plan is a fully detailed engineering plan which includes specifications of:

(a) all works, line marking, signage and assessment of pedestrian and vehicle access in and around the *site* for each stage of the *WUC;*

(b) all internal driveways, car parking areas, delivery areas, accesses (including installation of signage) to appropriately control vehicles entering the *site* ;

(c) stipulates the date that it was prepared; and

(d) is signed by the nominated *Contractor's* representative.

(2) The *Contractor* must prepare and provide to the *Principal* a Traffic and Pedestrian Management Plan before commencing any of the *WUC* on the *site.*

(3) After review of the Traffic and Pedestrian Management Plan the *Superintendent* may issue a *direction* that additional items be added that are otherwise missing or inaccurately detailed.

(4) The *Contractor* must promptly comply with any *direction* issued under paragraph (3).

(5) The *Contractor* must include in its *contract sum* an amount being a percentage of the total cost for all of the items for the provision of traffic (vehicular and pedestrian) management (including miscellaneous items).

(6) The *Contractor* must ensure that its activities do not interfere with the access to and the normal operation of:

(a) *adjoining sites;* and/or

(b) any business, school or residence in the vicinity of the *site* and will provide suitable public access (temporary access for vehicles and pedestrians). This access must be maintained in good condition at all times, and any disturbances or damage to any roads or footpaths must be rectified immediately.

(7) The *Contractor* must:

(a) co-ordinate any *works* carried out by any relevant services *Authorities* as required under the *Contract*;

(b) co-ordinate and agree its programs of *work* with the *Superintendent* and the *Principal* to minimise the impact of *WUC* on the amenity of the locality of the *site;* and

(c) ensure all traffic controllers hold a current Roads and Maritime Services Traffic Controllers Certificate.

(8) Excavations in public access ways must be properly protected by barricades and lights, promptly backfilled and the surface reinstated on the completion of the *work* and its testing and acceptance (if applicable), to minimise the disruption of the free movement of the public.

12.4 Notification to Residents

(1) The *Contractor* is required to provide the *Superintendent* with a draft letter outlining how *the Works* will affect residents, organisations and *Authorities* located in *adjoining sites*

and/or within the vicinity of the *site* who may be affected and/or have their access interrupted by the *WUC*.

(2) The draft letter prepared by the *Contractor* must be approved by the *Superintendent* prior to being distributed.

(3) The *Contractor* must ensure that the letter is delivered to all affected residents, organisations and *Authorities* a minimum of seventy-two (72) hours prior to the commencement of *the Works* or that stage of *the Works* affecting those properties.

12.5 Environmental Management Plan

(1) Prior to the commencement of the *WUC,* the *Contractor* must submit an Environmental Management Plan (**EMP**) to the *Superintendent*. The EMP must include:

(a) a statement of commitment - overall objectives of the EMP;

(b) a sediment and erosion control plan for the *site* prepared by a suitably qualified person in accordance with the principles outlined in the *Managing Urban*

Stormwater Soils and Construction' (Volume 1) dated March 2004 by Landcom NSW;

(c) worksheets completed by the *Contractor* and a list of likely environmental issues and impacts associated with *WUC*;

(d) any environmental requirements deriving from the project *Approvals* for the *WUC*;

(e) any additional environmental requirements imposed by any *Authority* (for example, sampling and the like);

(f) an environmental emergency response plan and incident reporting procedures;

(g) monitoring requirements including a site environmental logbook comprising weekly log sheets;

(h) a quality management system for the identified environmental issues and impacts associated with *WUC*, including:

(i) the *Contractor's* statement of responsibilities and duties as to environmental management;

(ii) a clear indication and communication of the environmental responsibilities on the site; and

(iii) environmental awareness and training for site personnel and *subcontractors*.

(2) All *WUC* must be conducted in compliance with the EMP at all times.

12.6 Vibration Management Plan

(1) In consideration of the proximity of the *WUC* to *adjoining sites*, the *Contractor* must prepare and provide to the *Superintendent* a Vibration Management Plan (**VMP**) before commencement of any demolition or excavation on the *site.*

(2) A VMP must:

(a) be prepared by an appropriately experienced geotechnical engineer or engineering geologist;

(b) include recommendations for:

(i) performance standards to be met during the *WUC* (in terms of acceptable ground vibration);

(ii) strategies for the management of ground vibration and monitoring requirements for vibration through the *WUC*; and

(c) be kept on the *site* at all times.

(3) After review of the VMP the *Superintendent* may issue a *direction* that additional items be added that are otherwise missing or inaccurately detailed.

(4) The *Contractor* must promptly comply with any *direction* issued under paragraph (3).

(5) When conducting the *WUC* the *Contractor* must:

(a) select appropriate demolition methods and equipment to minimise the effect of vibration and concussion on buildings in the vicinity of *the Works;*

(b) comply with all *legislative requirements* relating to noise and its suppression.

(6) All *construction plant* and/or equipment must be fitted with noise suppressors, so that noise is minimised. Jackhammers and other noise generating tools used in the performance of the *work* must be fitted with effective silencers of a type recommended by the relevant jackhammer manufacturer. Tools and silencers must be kept in good working condition.

(7) Compressor sets used in the performance of *the Works* must be fitted with effective acoustic canopies and engine exhaust silencers of a type recommended by the relevant compressor manufacturer, or purpose built machines for quiet operation. Compressor sets and canopies must be kept in good working condition. Access panels in acoustic canopies must be kept closed while sets are running.

(8) The *Superintendent* may instruct that noise generating activities be suspended at certain additional times during the course of the *WUC*.

12.7 Dust control during demolition and generally

(1) The *Contractor* must in the course of any demolition works adopt techniques which will minimise the release of dust into the atmosphere.

(2) Before commencing demolition work, any existing accumulations of dust are to be collected, placed in suitable containers and removed from the *site* by the *Contractor*. Selection of appropriate collection techniques, such as vacuuming or hosing down, shall take account of the nature of the dust and the type of hazard it presents (eg., explosive, respiratory etc).

(3) Dust which is generated during stripping or during the breaking down of any or all building fabric to removable sized pieces must be kept damp until it is removed from the *site* or can be otherwise contained. .

12.8 Conservation and Protection of trees

(1) The *Contractor* must conserve and maintain established streetscape and other canopy trees in and around the *site* by establishing Tree Protection Zones (**TPZ**) around all

trees to be retained on the *site* in a manner consistent with the Australian Standard 4970-2009 for the Protection of Trees on Development Sites.

(2) The TPZ must encompass the maximum possible area around the drip line of the canopy, but must be located at a distance of no less than 2.5 metres from the base of the trees.

(3) An inspection of the structures associated with the TPZ must be arranged with the *Superintendent* or a qualified arborist to verify that the TPZ have been correctly installed prior to the commencement of *the Works*.

(4) The *Contractor* must ensure TPZ are maintained in good order during the *WUC* by ensuring that there is:

(a) no excavation, trenching or soil removal carried beyond those *works* indicated on approved plans, without the prior written consent of the *Superintendent*.

(b) no:

(i) storage of goods or materials;

(ii) parking or operation of vehicles;

(iii) dumping of refuse or stockpiling of waste; and

(iv) chemical run-off (including concrete wash, paint wash etc.)

in the TPZ.

(5) Should an encroachment into the TPZ becomes necessary as *the Works* progress the *Contractor* must arrange for the TPZ to be reviewed by a qualified arborist and obtain the written consent of the *Superintendent* before carrying out any such *works.*

(6) If, in the course of the *WUC*, any tree proposed for retention suffers accidental damage to the primary root zone, trunk, crown or major branching, the *Contractor* must ensure that the tree(s) is treated as soon as it is practicable and in any event within 48 hours by an Arborist or a qualified horticulturalist.

(7) If repair work is attempted and fails, or is impracticable, additional vegetation removal may be undertaken only after the *Contractor* has notified the *Superintendent* and the *Superintendent* approves.

(8) The *Contractor* must replace any tree damaged by planting advanced to super-advanced species, characteristic of the locality, or of the same species as the tree which was the subject of the damage. Where an alternative species is proposed by the *Contractor* the selection must be approved by the *Superintendent*.

13 Urgent protection

13.1 If urgent action required

If urgent action is necessary to protect *WUC*, other property or people and the *Contractor* fails to take the action, in addition to any other remedies of the *Principal*, the *Superintendent* may take the necessary action. If the action was action which the *Contractor* should have taken at

the *Contractor's* cost, the *Superintendent* will certify the cost incurred as moneys due from the *Contractor* to the *Principal*.

13.2 Notice by Superintendent

If time permits, the *Superintendent* will give the *Contractor* prior written notice of the intention to take action pursuant to this clause 13.

14 Care of the work and reinstatement of damage

14.1 Care of WUC

Except as provided in subclause 14.3, the *Contractor* is responsible for care of:

(1) the whole of *WUC* from and including the date of commencement of *WUC* to 4:00 pm on the *date of practical completion*, at which time responsibility for the care of *the Works* (except to the extent provided in paragraph (2)) passes to the *Principal*; and

(2) outstanding *work* and items to be removed from the *site* by the *Contractor* after 4:00 pm on the *date of practical completion* until completion of outstanding *work* or compliance with clauses 29, 30 and 35.

The *Contractor* is responsible for the care of unfixed items accounted for in a *payment schedule* and the care and preservation of things entrusted to the *Contractor* by the *Principal* or brought onto the *site* by *subcontractors* or transported or delivered to the *site* for carrying out *WUC*.

14.2 Reinstatement

If loss or damage, other than that caused by an *excepted risk*, occurs to *WUC* during the period of the *Contractor's* care, the *Contractor*, at its cost, must rectify such loss or damage.

In the event of loss or damage being caused by any of the *excepted risks* (whether or not in combination with other risks), the *Contractor* must to the extent directed by the *Superintendent*, rectify the loss or damage and such rectification will be a deemed *variation*. If loss or damage

is caused by a combination of *excepted risks* and other risks, the *Superintendent* in pricing the *variation* will assess the proportional responsibility of the parties.

14.3 Excepted risks

The *excepted risks* causing loss or damage, for which the *Principal* is liable, are:

(1) any negligent act or negligent omission of the *Superintendent*, the *Principal* or its consultants, agents, employees or other contractors (not being employed by the *Contractor*;

(2) any risk specifically excepted elsewhere in the *Contract*;

(3) war, invasion, acts of foreign enemies, hostilities (whether war be declared or not), civil war, rebellion, revolution, insurrection or military or usurped power, martial law or confiscation by order of any Government or public authority;

(4) ionising radiations or contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel not caused by the *Contractor* or its *subcontractors* or either's employees or agents;

(5) use or occupation (except that permitted by the *Contract*) of any part of *WUC* by the *Principal* or its consultants, agents or other contractors (not being employed by the *Contractor*); and

(6) defects in the design of *WUC*, other than design provided by the *Contractor*.

15 Damage to persons and property other than WUC

15.1 Indemnity by Contractor

(1) Insofar as this subclause applies to property, it applies to property other than *WUC*.

(2) The *Contractor* indemnifies the *Principal* against any cost, expense, loss, damage or other liability suffered or incurred by the *Principal* resulting from:

(a) loss of or damage to the *Principal's* property; and

(b) personal injury, death, disease or illness (including mental illness) or loss of, or damage to, any other property or the environment,

arising out of or as a consequence of the carrying out of *WUC*, but the indemnity will be reduced proportionally to the extent that any negligent act or negligent omission of the *Superintendent*, the *Principal* or its consultants, agents or other contractors (not being

employed by the *Contractor*) may have contributed to the cost, expense, loss, damage or liability.

(3) This subclause 15.1 does not apply to:

(a) the extent that the *Contractor's* liability is limited by another provision of the *Contract*;

(b) exclude any other right of the *Principal* to be indemnified by the *Contractor*;

(c) things for the care of which the *Contractor* is responsible under subclause 14.1;

(d) damage which is the unavoidable result of the construction of *the Works* in accordance with the *Contract*; and

(e) claims in respect of the *Principal's* right to have *WUC* carried out.

15.2 Indemnity by Principal

The *Principal* indemnifies the *Contractor* in respect of damage referred to in subclause 15.1(3)(d) and claims referred to in subclause 15.1(3)(e).

16 Insurance of the Works

The Alternative in *Item* 20(a) applies.

Alternative 1: Contractor to insure

(1) Before commencing *WUC*, the *Contractor* must insure all the things referred to in subclause 14.1 against loss or damage resulting from any cause until the *Contractor* ceases to be responsible for their care.

(2) Without limiting the generality of the obligation to insure, such insurance must cover the *Contractor's* liability under subclause 14.2 and things in storage off *site* and in transit to the *site* but may exclude:

(a) the cost of making good fair wear and tear or gradual deterioration, but will not exclude the loss or damage resulting therefrom;

(b) the cost of making good faulty design, workmanship and materials, but will not exclude the loss or damage resulting therefrom;

(c) consequential loss of any kind, but will not exclude loss of or damage to *the Works*;

(d) damages for delay in completing or for the failure to complete *the Works*;

(e) loss or damage resulting from ionising radiations or contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel resulting from any cause;

(f) loss or damage resulting from the *excepted risks* referred to in paragraphs (2) and (3) of subclause 14.3(3).

(3) The insurance cover must be for an amount not less than the aggregate of the:

(a) *contract sum*;

(b) provision in *Item* 20(b) to provide for costs of demolition and removal of debris;

(c) provision in *Item* 20(c) for *consultants'* fees;

(d) value in *Item* 20(d) of any materials or things to be supplied by the *Principal* for the purposes of *WUC*;

(e) the minimum value required by law in respect of asbestos liability; and

(f) additional amount or percentage in *Item* 20(e) of the total of the items referred to in sub-paragraphs (a) to (e) of this paragraph.

(4) Insurance must be in the joint names of the parties, must cover the parties and all *subcontractors* whenever engaged in *WUC* for their respective rights, interests and liabilities and, except where the *Contract* otherwise provides, must be with an insurer and on terms approved in writing by the *Principal* (which approval will not be unreasonably withheld).

(5) The insurance must be maintained until the *Contractor* ceases to be responsible under subclause 14.1 for the care of anything.

17 Public liability insurance

(1) Before commencing *WUC*, the *Contractor* must effect and maintain for the duration of the *Contract*, a *public liability policy*.

(2) The policy must:

(a) be an occurrence based policy in the joint names of the parties;

(b) cover the:

(i) respective rights and interests; and

(ii) liabilities to third parties,

of the parties, the *Superintendent* and *subcontractors* from time to time, whenever engaged in *WUC*;

(c) cover the parties' respective liability to each other for loss or damage to property (other than property required to be insured by clause 16) and the death of or

injury to any person including mental illness (other than liability which the law requires to be covered under a workers compensation insurance policy);

(d) be endorsed to cover the use of any *construction plant* not covered under a comprehensive or third party motor vehicle insurance policy;

(e) provide insurance cover for an amount in respect of any one occurrence of not less than the sum in *Item* 21(b); and

(f) be with an insurer and otherwise on terms approved in writing by the *Principal* (which approval must not be unreasonably withheld).

17B Other insurances

Construction Plant Insurance

Before commencing *WUC,* the *Contractor* must effect and have in place insurance in relation to *construction plant* it brings to the *site:*

(1) with insurers and on terms satisfactory to the *Principal:* and

(2) in an amount not less than necessary to provide cover for loss or damage for replacement value.

Motor Vehicle Insurance

The *Contractor*, at its cost, must effect and maintain or cause to be effected and maintained motor vehicle insurance covering all vehicles relevant to the performance of the *Contractor's* obligations under the *Contract*, and whether registered or capable of being registered, with

respect to the *Contractor's* liability to the *Principal* pursuant to the indemnity provisions, including:

(1) compulsory third party motor vehicle insurance; and

(2) third party property damage and (in addition to the *public liability policy* required under the *Contract*) personal injury (including mental illness) or death.

18 Insurance of employees

18.1 Contractor must insure

Before commencing *WUC*, the *Contractor* must insure against statutory and common law liability for death of or injury to persons employed by the *Contractor*. The insurance cover must be maintained until completion of all *WUC*.

18.2 Terms of the policies

Where permitted by law, the insurance policy or policies must be extended to provide indemnity for the *Principal's* statutory liability to the *Contractor's* employees.

18.3 Subcontractor's insurance

The *Contractor* must ensure that all *subcontractors* have similarly insured their employees.

19 Inspection and provisions of insurance policies

19.1 Proof of insurance

(1) Before the *Contractor* commences *WUC* and whenever requested in writing by the *Principal*, the *Contractor* must provide satisfactory evidence of the insurance the *Contractor* is required to effect and maintain.

(2) Insurance must not limit liabilities or obligations under other provisions of the *Contract*.

19.2 Failure to produce proof of insurance

If after being so requested, the *Contractor* fails promptly to provide satisfactory evidence of compliance, then without prejudice to other rights or remedies, the *Principal* may insure and the cost thereof will be certified by the *Superintendent* as moneys due and payable from the

Contractor to the *Principal*. The *Principal* may refuse payment until such evidence is produced by the *Contractor*.

19.3 Notices from or to insurer

The *Contractor* must ensure that each insurance policy contains provisions acceptable to the *Principal* which:

(1) requires the insurer to inform both parties, whenever the insurer gives the *Contractor* or a *subcontractor* a notice in connection with the policy;

(2) provides that a notice of claim given to the insurer by either party, the *Superintendent,* or a *subcontractor* will be accepted by the insurer as a notice of claim given by both parties, the *Superintendent* and the *subcontractor*; and

(3) requires the insurer, whenever the *Contractor* fails to maintain the policy, promptly to give written notice thereof to both parties and prior to cancellation of the policy.

19.4 Notices of potential claims

A party must, as soon as practicable, inform the other party in writing of any occurrence that may give rise to a claim under an insurance policy required by the *Contract* and must keep the other party informed of subsequent developments concerning the claim. The *Contractor* must ensure that *subcontractors* in respect of their operations similarly inform the parties.

19.5 Settlement of claims

Upon settlement of a claim under the insurance required by clause 16:

(1) to the extent that reinstatement has been the subject of a payment or allowance by the *Principal* to the *Contractor*, if the *Contractor* has not completed such reinstatement, insurance moneys received must, if requested by either party, be paid into an agreed bank account in the joint names of the parties. As the *Contractor* reinstates the loss or damage, the *Superintendent* will certify against the joint account for the cost of reinstatement; and

(2) to the extent that reinstatement has not been the subject of a payment or allowance by the *Principal* to the *Contractor*, the *Contractor* is entitled immediately to receive from insurance moneys received, the amount of such moneys so paid in relation to any loss suffered by the *Contractor*.

19.6 Cross liability

Any insurance required to be effected in joint names in accordance with the *Contract* must include a cross liability clause in which the insurer agrees to waive all rights of subrogation or action against any of the persons constituting the insured and for the purpose of which the insurer accepts the term ‘insured’ as applying to each of the persons constituting the insured as if a separate policy of insurance had been issued to each of them (subject always to the overall sum insured not being increased thereby).

19.7 Payment of Excesses

The excess, as quoted in the insurance policies required to be taken out by the *Contractor,* is the responsibility of, and must be paid by, the *Contractor* on demand unless the claim for which

the excess applies relates to the acts or omissions of the *Principal*, or employees or agents of the *Principal*.

Any excess payable but unpaid by the *Contractor* will be treated as a debt due and payable from the *Contractor* to the *Principal* or may be deducted by the *Principal* from any monies which may be payable by the *Principal* to the *Contractor* or from any *security* provided under the *Contract*.

20 Superintendent

20.1 Obligations of the Principal

The *Principal* must ensure that at all relevant times there is a *Superintendent*.

The *Contractor* acknowledges and agrees that the *Superintendent*:

(1) may be an employee of, or a consultant engaged by, the *Principal*;

(2) does not act as an independent certifier, assessor or valuer.

20.2 Form of directions

(1) Subject to paragraph (2) and except where the *Contract* otherwise provides, the *Superintendent* may give a direction orally but, as soon as practicable, will confirm any such oral direction in writing.

(2) If the *Contractor* requests in writing for the *Superintendent* to confirm an oral direction, the *Contractor* is not bound (unless the urgency of the situation so demands) to comply with the oral direction until the *Superintendent* does so.

20.3 Power of the Superintendent

The *Superintendent* is empowered to issue any *direction* of whatsoever nature relating to any act, matter or thing arising out of or in connection with *the Works* as the *Superintendent* considers appropriate, provided that such *direction* is in compliance with the *Contract*.

The *Contractor* must comply with all such *directions*.

When exercising any role or function under the *Contract*, the *Superintendent*:

(1) is not limited in discussing with or receiving submissions or representations from either the *Principal* or the *Contractor*; and

(2) is not under any obligation to seek any response from a party to, or otherwise raise with that party, any such discussion with or submission or representation received from the other party.

20.4 Manner of the exercise of discretion by the Superintendent

The *Contractor* agrees that except to the extent expressly provided otherwise in the *Contract*:

(1) the *Superintendent* may exercise its discretion and rights under the *Contract* in whatever way the *Superintendent* decides in its absolute discretion; and

(2) the *Superintendent* may grant, refuse or grant subject to conditions any consent required from the *Superintendent* in its absolute discretion.

The *Superintendent* may (to the extent the *Superintendent* considers it reasonable to do so) refer to the information contained in the *Tender Documents* for the purposes of the assessment

of any request for approval or any claim by the *Contractor* or any other purpose under or in connection with the *Contract*.

21 Superintendent's Representative

The *Superintendent* may from time to time appoint individuals to exercise delegated *Superintendent's* functions, provided that:

(1) no aspect of any function will at any one time be the subject of delegation to more than one *Superintendent's Representative;*

(2) delegation does not prevent the *Superintendent* exercising any function;

(3) the *Superintendent* forthwith gives the *Contractor* written notice of respectively:

(a) the appointment, including the *Superintendent's Representative's* name and delegated functions; and

(b) the termination of each appointment; and

(4) if the *Contractor* makes a reasonable objection to the appointment of a *Superintendent's Representative*, the *Superintendent* will terminate the appointment.

22 Contractor's representative

22.1 Obligations of the Contractor

The *Contractor* must superintend *WUC* personally or by a competent representative. Matters within a *Contractor's representative's* knowledge (including *directions* received) is deemed to be within the *Contractor's* knowledge.

The *Contractor* must forthwith give the *Superintendent* written notice of the representative's name and any subsequent changes.

The *Contractor's representative* identified in the written notice must be on *site* and at all other places where *WUC* are being carried out at all times while *WUC* are being carried out.

The *Contractor's representative* must be a qualified engineer, or a person with equivalent qualifications, who has experience in executing works of a similar nature and scope to the *WUC*.

22.2 Superintendent may object

If the *Superintendent* makes a reasonable objection to the appointment of a *Contractor's representative*, the *Contractor* must terminate the appointment and appoint another representative.

23 Contractor's employees and subcontractors

The *Superintendent* may direct the *Contractor* to have removed, within a stated time, from the *site* or from any activity of *WUC*, any person employed on *WUC* who, in the *Superintendent's* opinion, is incompetent, negligent or guilty of misconduct.

The *Contractor* and any *subcontractors* must ensure that their employees when at the *Principal's* premises and/or undertaking *the Works*, conduct themselves in the following manner at all times:

(1) wear identification cards and/or a uniform for easy identification when on *site*;

(2) refrain from using indecent language;

(3) act in a sober, civil, obliging and inoffensive manner when undertaking *the Works* under this *Contract*;

(4) not seek, demand or accept any fee, reward or gratuity in respect of the performance of *the Works* (other than their remuneration as paid to them by the *Contractor*);

(5) refrain from causing any property damage;

(6) wear appropriate Personal Protective Equipment;

(7) comply with and observe all *legislative requirements*; and

(8) comply with all road rules.

24 Site

24.1 Possession

Provided the *Contractor* has complied with the following clauses:

(1) 5.1 (Provision of Security);

(2) 5.6 (Deed of Guarantee) – if applicable;

(3) 6.2 (Execution of a Formal Instrument of Agreement);

(4) 16 (Insurance of the Works);

(5) 17 (Public Liability Insurance); and

(6) 44 (WH&S Obligations of the Contractor),

the *Principal* must before the expiry of the time in *Item* 22, give the *Contractor* possession of sufficient of the *site* for commencement of *WUC* on *site*. If the *Principal* has not given the

Contractor possession of the whole *site*, the *Principal* must give the *Contractor* possession of such further portions of the *site* as may, from time to time, be necessary for carrying out *WUC*.

Subject to subclause 39.7, delay by the *Principal* in giving possession must not be a breach of the *Contract*.

Possession of the *site* confers on the *Contractor* a right to only such use and control as is necessary to enable the *Contractor* to carry out *WUC* and excludes camping, residential purposes and any purpose not connected with *WUC*, unless approved by the *Superintendent*.

24.2 Access for Principal and others

The *Principal* and the *Principal's* employees, consultants and agents may at any time after reasonable written notice to the *Contractor*, have access to any part of the *site* for any purpose. The *Contractor* shall permit persons engaged by the *Principal* to carry out work on the *site* other than *WUC* and shall cooperate with them. The *Principal* shall give to the *Contractor* the names and roles of the persons so engaged.

The *Contractor* shall at all reasonable times give the *Superintendent* access to *WUC*.

The *Principal* shall ensure that none of the persons referred to in this subclause impedes the *Contractor*.

24.3 Minerals, fossils and relics

Valuable minerals, fossils, articles or objects of antiquity or of anthropological or archaeological interest, treasure trove, coins and articles of value found on the *site* are as between the parties

be and remain the property of the *Principal*. Immediately upon the discovery of these things the *Contractor* must:

(1) take precautions to prevent their loss, removal or damage; and

(2) give the *Superintendent* written notice of the discovery.

All costs so incurred by the *Contractor* will be assessed by the *Superintendent* and added to the *contract sum*.

24.4 Site Conditions

The *Contractor* is deemed to have examined the *site* and its surroundings and to have taken all necessary *tests* and made all necessary enquiries to satisfy itself as to:

(1) the nature of the physical conditions and characteristics of the *site*;

(2) any existing structures or improvements, including the condition and position of and possible affectation to adjacent buildings and *adjacent sites*; and

(3) the surface and sub-surface conditions and characteristics of both the *site* and those adjacent buildings and *adjacent sites*.

The *Contractor* acknowledges that it has:

(1) been allowed adequate access to the *site*;

(2) had sufficient time to thoroughly review the *Principal* supplied documents; and

(3) been allowed to do its own investigations of the *site* and its surroundings,

before the date of the *Contract* to reach its own conclusions about *site* conditions.

24.5 Dilapidation Survey

(1) For the purpose of this subclause 24.5 a Dilapidation Survey is a report which:

(a) consists of a written and photographic record of the then condition of the Works and the site and the surrounding areas (including adjoining *sites* and public areas); and

(b) stipulates the date that it was prepared.

(2) The *Contractor* must ensure that each Dilapidation Survey is signed by any persons reasonably nominated by the *Superintendent*, so as to evidence that parties' agreement with the content of the Dilapidation Survey.

(3) The *Contractor* must carry out a Dilapidation Survey:

(a) before commencing any of the *WUC* on the *site*;

(b) on the *date of practical completion*; and

(c) prior to the expiration of the last *defects liability period*.

(4) The *Contractor* must:

(a) promptly lodge a copy of each Dilapidation Survey with the *Superintendent*;

(b) keep a copy of the then current Dilapidation Survey on the *site* at all times; and

(c) provide a copy of the relevant parts of the Dilapidation Survey to any owners of adjoining *sites* that sign the Dilapidation Survey.

(5) Upon each Dilapidation Survey being provided to the *Superintendent*, the *Contractor* is deemed to have warranted that the Dilapidation Survey is true and correct. The Contractor is responsible for any discrepancy between the conditions described in a Dilapidation Survey and the actual conditions of the *site*, adjoining *sites* and public areas.

(6) Prior to *practical completion,* the *Contractor* must reinstate any property identified in a Dilapidation Survey which has been damaged arising out of or as a consequence of the *Contractor* undertaking *WUC* to the condition detailed in the earlier Dilapidation Survey prepared for that property.

(7) If the *Contractor* fails to comply with any obligation to reinstate the property in accordance with this subclause 24.5 the *Superintendent* may direct the *Contractor* to rectify the non-compliance and the time for rectification.

(8) If:

(a) the *Contractor* fails to comply with a direction under subclause 24.5(7); and

(b) that failure has not been made good within five (5) *business days* after the *Contractor* receives notice from the *Superintendent* notifying the *Contractor* of its failure to comply with the *direction* under subclause 24.5(7),

the *Principal* may have carried out by others what was required by the *direction* under subclause 24.5(7) but without prejudice to any other rights and remedies the *Principal*

may have and the *Superintendent* will certify the cost incurred as moneys due and payable from the *Contractor* to the *Principal*.

24.6 Establishment

(1) The *Contractor* must include in the *contract sum* an amount being a percentage of the total cost for all the items (up to and including miscellaneous items) for the *Contractor's* establishment on the *site*.

(2) The establishment figure is to include an amount to cover the costs of:

(a) all equipment floatage;

(b) *site* facilities for the use of the *Contractor* and the *Superintendents Representative* including:

(i) potable water supply;

(ii) telephone and electricity supply;

(iii) portable amenities;

(iv) a *site* office; and

(c) safety fencing of the *site*.

24.7 Entry to Private Property

(1) Any negotiations to secure agreement for the *Contractor* to enter onto private property for the purpose of accessing the *site* or necessary for the performance of the *WUC* will be the *Contractor's* responsibility. The *Contractor* must inform the *Superintendent* and take consent from the concerned landowners.

(2) The *Contractor* must cause minimum disturbance to private property and, as far as practicable, must reinstate all surfaces to the satisfaction of the *Superintendent*.

(3) Any fences that must be removed in order to allow the *WUC* to be carried out must be reinstated to the satisfaction of the *Superintendent*. If any private land on which a fence

must be removed holds stock, temporary stock-proof fencing must be erected by the *Contractor* clear of the *WUC* to prevent stock from straying.

24.8 Payment for Services

The *Contractor* must pay:

(1) charges for all electricity, gas, oil, water and sewerage metered and consumed in or on the *site*;

(2) all charges in respect of telephone or internet and/or other communication services connected to the *site*; and

(3) all other charges and impositions imposed by any *Authority* for the supply of any service required by the *Contractor* separately supplied to the *site*,

on or before the due date for payment to the relevant persons or *Authority* or if those charges are charged to the *Principal,* by way of reimbursement to the *Principal* within thirty (30) days after the *Contractor* receives a notice from the *Principal* of the relevant amount payable.

24.9 Railway Corridor Track Possession

The *Contractor* acknowledges that in order to carry out the *WUC,* it will require *Track Possession* and that it must:

(1) obtain a *Track Possession* timetable from *Rail Operator Representative*;

(2) meet with *Rail Operator Representative* and choose available dates from the *Track Possession* timetable; and

(3) the dates chosen in paragraph (2) will be set aside for the *Contractor* to perform *the Works* within the *Railway Corridor*, unless *Rail Operator Representative* notifies *the Contractor* that the date (or dates) are no longer available;

The *Contractor* agrees that access to the *Railway Corridor* may be unavailable at certain times, including the date or dates chosen for *Track Possession* under this clause and expressly releases the *Principal* from and indemnifies the *Principal* in relation to all cost, expense, loss, damage or other liability suffered or incurred (howsoever arising) in connection with any delay in the *Rail Operator* granting or refusing to grant a *Track Possession* or during a *Track Possession* or the loss of the date (or any part of the date) chosen for a *Track Possession* under this subclause 24.9.

25 Latent Conditions

25.1 Scope

Latent conditions are physical conditions on the *site* and its near surrounds, including artificial things but excluding weather conditions, which differ materially from the physical conditions

which should reasonably have been anticipated by a competent *Contractor* at the time of the formation of the *Contract* if the *Contractor* had inspected:

(1) all written information made available by the *Principal* to the *Contractor* with respect to the *site* and the *WUC*;

(2) all information influencing allocation of risk with respect to the *WUC* and reasonably obtainable by the making of reasonable enquiries; and

(3) the *site* and its near surrounds.

Survey information, levels, and the results of site tests included in the drawings and associated documents provided by the *Principal* are given without prejudice to the *Principal* and for the assistance of the *Contractor* which must make its own assessment of the nature, complexity and extent of *the Works*.

Without limitation to subclause 24.4, the *Contractor*, at its own expense, must arrange any *tests* required to accurately determine the sub-surface condition of the *site*.

25.2 Notification

Upon becoming aware of a *latent condition* while carrying out *WUC*, the *Contractor* must promptly, and where possible before the *latent condition* is disturbed, give the *Superintendent* written notice of the general nature of the condition.

If required by the *Superintendent* promptly after receiving that notice, the *Contractor*, as soon as practicable, must give the *Superintendent* a written statement of:

(1) the *latent condition* encountered and the respects in which it differs materially;

(2) the additional *work*, resources, time and cost which the *Contractor* estimates to be necessary to deal with the *latent condition*; and

(3) other details reasonably required by the *Superintendent*.

25.3 Deemed variation

The effect of the *latent condition* shall be a deemed *variation*, priced having no regard to additional cost incurred before the date on which the *Contractor* gave the notice required by the first paragraph of subclause 25.2.

25.4 Extent of Entitlement

The *Contractor* will have no entitlements as a consequence of any *latent condition* in relation to which the *Contractor* has not:

(1) given the *Principal* written notice strictly in accordance with subclause 25.2;

(2) taken such steps as may be necessary to avoid, overcome or minimise the costs associated with the *latent condition*.

If the *Contractor* has given the *Principal* a written notice strictly in accordance with subclause 25.2, the *work* associated with the *latent condition* is to be priced under clause 36 as a *variation*

and may give rise to an *EOT* under clause 34, however may not be claimed by the *Contractor* as a *compensable cause* under subclause 39.4.

25.5 Earthworks

(1) For the purposes of the *Contract* "Rock" is defined as:

(a) material which in the opinion of the *Superintendent* is so hard it cannot be removed until broken up by rippers or percussion tools;

(b) material such as hard Hawkesbury Sandstone, including Ironstone Bands occurring therein, igneous rock and concrete which occurs in solid masses, but does not include Sandstone which can be crushed in the hand after excavation.

(2) The cost of excavating Rock and/or materials of all classes encountered in excavation as part of the *WUC* is included in the *contract sum*.

(3) Should any dispute or difference arise with regard to the proper classification of excavation, the decision of the *Superintendent* as to the classification of the material is final and binding on the *Contractor*.

(4) It will be necessary for all subgrade material to undergo a roller test. The *Contractor* will be required to cooperate with the *Superintendent* and to supply, without charge, such assistance as may be required for the purpose of performing this test.

(5) To avoid undue delays, the *Contractor* is required to provide the *Superintendent* with twenty-four (24) hours notice as to when such tests will be required.

26 Setting out the Works

26.1 Setting out

The *Principal* will ensure that the *Superintendent* gives the *Contractor* the survey data, and like information necessary for the *Contractor* to set out *the Works*, together with those *survey marks*

specified in the *Contract*. The *Contractor* must then set out *the Works* in accordance with the *Contract*.

The *Contractor* must set out *the Works* in accordance with the *Contract* and must provide all instruments and things necessary for that purpose.

26.2 Errors in setting out

The *Contractor* must rectify every error in the position, level, dimensions or alignment of any *WUC* after promptly notifying the *Superintendent* and unless the *Superintendent* directs otherwise within three (3) *business days* of receiving any such notice.

26.3 Care of survey marks

The *Contractor* must keep in their true positions all *survey marks* supplied by the *Superintendent*.

The *Contractor* must reinstate any *survey mark* disturbed during the conduct of the *WUC* after promptly notifying the *Superintendent* and unless the *Superintendent* within three (3) *business days* directs otherwise.

If the disturbance was caused by the *Superintendent* or a representative of the *Principal*, the cost incurred by the *Contractor* in reinstating the *survey mark* will be assessed by the *Superintendent* and added to the *contract sum*.

27 Cleaning up

27.1 Site to be kept clean and tidy

The *Contractor* must:

(1) keep the *site* and *WUC* clean and tidy, regularly remove rubbish and surplus material, dispose of all rubbish to an authorised waste disposal facility and pay any waste disposal fees that are payable for the disposal of that rubbish;

(2) keep all pavements and areas adjacent to the *WUC* free of rubbish, debris and other deleterious matter at all times to the satisfaction of the *Superintendent*; and

(3) clean and repair damage caused by the installation or use of *temporary work* and facilities and restore existing facilities used during the performance of *the Works* to their original condition.

27.2 Removal after practical completion

Within ten (10) *business days* after the *date of practical completion*, the *Contractor* must remove *temporary works* and *construction plant*. The *Superintendent* may extend the time to enable the *Contractor* to perform remaining obligations.

27.3 Contractor's failure

If the *Contractor* fails to comply with the preceding obligations in this clause 27, the *Superintendent* may direct the *Contractor* to rectify the non-compliance and the time for rectification.

If:

(1) the *Contractor* fails to comply with such a *direction*; and

(2) that failure has not been made good within five (5) *business days* after the *Contractor* receives written notice from the *Superintendent* that the *Principal* intends to have the subject *work* carried out by others,

the *Principal* may have that *work* so carried out and the *Superintendent* must certify the cost incurred as moneys due from the *Contractor* to the *Principal*. The rights given by this paragraph are additional to any other rights and remedies.

28 Materials, labour and construction plant

Except where the *Contract* otherwise provides, the *Contractor* must supply everything necessary for the proper performance of the *Contractor's* obligations and discharge of the *Contractor's* liabilities.

In respect of any materials, machinery, *construction plant* or equipment to be supplied by the *Contractor* in connection with the *Contract*, the *Superintendent* may direct the *Contractor* to:

(1) supply particulars of the mode and place of manufacture, the source of supply, the performance capacities and other related information; and

(2) arrange reasonable inspection at such place or sources by the *Superintendent*, the *Principal* and persons authorised by the *Principal*.

The *Superintendent* may give the *Contractor* a written *direction* not to remove materials or *construction plant* from the *site*. Thereafter the *Contractor* must not remove them without the *Superintendent's* prior written approval (which must not be unreasonably withheld).

29 Quality

29.1 Quality of material and work

Unless otherwise provided in the *Tender Documents*, the *Contractor* must use suitable new materials and proper and tradesmanlike workmanship.

The *Contractor* must perform and undertake the *WUC*:

(1) using its best endeavours;

(2) in a competent and professional manner;

(3) in accordance with the *Tender Documents*; and

(4) to the satisfaction of the *Principal's* representative.

Any unsatisfactory performance with respect to the quality of material and *work* must be promptly rectified by the *Contractor* at the *Contractor's* expense.

29.2 Quality assurance

The *Contractor* must:

(1) plan, establish and maintain a conforming quality system; and

(2) ensure that the *Superintendent* has access to the quality system of the *Contractor* and *subcontractors* so as to enable monitoring and quality auditing.

Any such quality system must be used only as an aid to achieving compliance with the *Contract* and to document such compliance. Such system does not discharge the *Contractor's* other obligations under the *Contract*.

29.3 Defective work

If the *Superintendent* becomes aware of *work* done (including material provided) by the *Contractor* which does not comply with the *Contract*, the *Superintendent* will, as soon as practicable, give the *Contractor* written details thereof. If the subject *work* has not been rectified, the *Superintendent* may direct the *Contractor* to do any one or more of the following (including times for commencement and completion):

(1) remove the material from the *site*;

(2) demolish the *work*;

(3) reconstruct, replace or correct the *work*; and

(4) not deliver it to the *site*.

If:

(1) the *Contractor* fails to comply with such a *direction*; and

(2) that failure has not been made good within ten (10) *business days* after the *Contractor* receives written notice from the *Superintendent* that the *Principal* intends to have the subject *work* rectified by others,

the *Principal* may have that *work* so rectified and the *Superintendent* will certify the cost incurred as moneys due from the *Contractor* to the *Principal*. The rights given by this paragraph are additional to any other rights and remedies.

29.4 Acceptance of defective work

(1) Instead of a *direction* pursuant to subclause 29.3, the *Superintendent* may direct the *Contractor* that the *Principal* elects to accept the subject *work*, whereupon there will be a deemed *variation* to which the balance of this subclause 29.4 applies.

(2) The price for any *variation* deemed to have occurred under paragraph (1) will be a decrease in the *contract sum* in an amount equal to the greater of the following as assessed by the *Superintendent*:

(a) the cost of remedying the material or *work* priced in accordance with subclause 36.4; and

(b) the resulting decrease in the value to the *Principal* of the *Works* and any other loss which the *Principal* is likely to suffer, including the likely increase in

operational and maintenance costs which may be incurred by the *Principal* if it accepts the material or *work*.

(3) The decrease in the *contract sum* may be:

(a) recovered by the *Principal* as a debt due to the *Principal* by the *Contractor*;

(b) set-off or deducted by the *Principal* from any monies which may then be or thereafter become payable to the *Contractor* by the *Principal*; and/or

(c) may be paid by recourse to the *security*.

29.5 Timing

The *Superintendent* may give a *direction* pursuant to this clause at any time before the expiry of the last *defects liability period*.

30 Examination and testing

30.1 Tests

At any time before the expiry of the last *defects liability period*, the *Superintendent* may direct that any *WUC* be tested. The *Contractor* must give such assistance and samples and make accessible such parts of *WUC* as may be directed by the *Superintendent*.

30.2 Covering up

The *Superintendent* may direct that any part of *WUC* must not be covered up or made inaccessible without the *Superintendent's* prior written *direction*.

30.3 Who conducts

Tests must be conducted as provided elsewhere in the *Contract* or by the *Superintendent* or a person (which may include the *Contractor*) nominated by the *Superintendent*.

30.4 Notice

The *Superintendent* or the *Contractor* (whichever is to conduct the *test*) must give reasonable written notice to the other of the date, time and place of the *test*. If the other does not attend, the *test* may nevertheless proceed.

30.5 Delay

Without prejudice to any other right, if the *Contractor* or the *Superintendent* delays in conducting a *test*, the other, after giving reasonable written notice of intention to do so, may conduct the *test*.

30.6 Completion and results

On completion of the *tests*, the *Contractor* must make good *WUC* so that it fully complies with the *Contract*.

Results of *tests* must be promptly made available by each party to the other and to the *Superintendent*.

30.7 Costs

Costs in connection with *testing* pursuant to this clause must be borne by the *Principal* except where the *Contract* otherwise provides or the *test* is consequent upon, or reveals a failure of the *Contractor* to comply with the *Contract* (including this clause).

31 Working hours

If the working hours and working days on the *site* are not stated elsewhere in the *Contract*, they will be as notified by the *Contractor* to the *Superintendent* before commencement of *work* on *site*. They will not be varied without the *Superintendent's* prior written approval, except when, in the interests of safety of persons or property, the *Contractor* finds it necessary to carry out *WUC* otherwise, whereupon the *Contractor* must give the *Superintendent* written notice of those circumstances as early as possible.

32 Programming

32.1 Provision of information

The *Contractor* must give the *Superintendent* reasonable advance notice of when the *Contractor* needs information, materials, documents or instructions from the *Superintendent* or the *Principal*.

The *Principal* and the *Superintendent* are not obliged to give any information, materials, documents or instructions earlier than the *Principal* or the *Superintendent*, as the case may be, should reasonably have anticipated at the *date of acceptance of tender*.

32.2 Superintendent may direct

The *Superintendent* may direct in what order and at what time the various stages or portions of *WUC* must be carried out (including a power to direct the *Contractor* to accelerate the progress of *WUC* and to bring forward the *date for practical completion* by a reasonable period).

If the *Contractor* can reasonably comply with the *direction*, the *Contractor* must do so. If the *Contractor* cannot reasonably comply, the *Contractor* must give the *Superintendent* written notice of the reasons.

32.3 Alteration of cost

If compliance with any such *directions* under subclause 32.2, except those pursuant to the *Contractor's* default, causes the *Contractor* to incur more or less cost than otherwise would have

been incurred had the *Contractor* not been given the *direction*, the difference will be assessed by the *Superintendent* and added to or deducted from the *contract sum*.

32.4 Construction program

(1) A *construction program* is a written statement showing the dates by which, or the times within which, the various stages or portions of *WUC* are to be carried out or completed.

(2) The *Contractor* will maintain a *construction program* (in the format of a Gantt Chart MS Project) for the *WUC* which reflects the day to day status of each component of the *WUC*.

(3) The *construction program* must:

(a) be submitted to, and be approved by, the *Superintendent* before *WUC* are allowed to commence;

(b) account for any *EOT* that has been granted;

(c) allow for the completion and compilation of all *Approvals,* data, *test* results and reports that are required by the *Contract* to be provided to the nominated parties;

(d) allow the number of working days in *Item* 23B for *inclement weather;*

(e) make allowance for all public holidays and industry approved Rostered Days Off. These will not be included for the purpose of calculating *EOT* allowances; and

(f) include:

(i) major project milestones, construction and commissioning activities, *Authority* inspections;

(ii) critical path activities;

(iii) all activity dependencies;

(iv) *defects* inspection by *Principal;* and

(v) *defects* rectification and final clean by the *Contractor.*

(4) The *Contractor* must promptly notify the *Superintendent* of any departure from a *construction program* and promptly submit a revised *construction program* to the *Superintendent* for approval.

32.5 Directions in relation to construction program

(1) Any response or communication by the *Superintendent* in relation to a *construction program* or draft *construction program* is not a *direction* to accelerate.

(2) The power of the *Superintendent* to require the *Contractor* to provide a *construction program* includes a power to *direct*:

(a) the *Contractor* to provide an updated *construction program* where there has been a change in the *date for practical completion* or where there have occurred any circumstances which have affected the progress of *WUC*;

(b) what form the *construction program* must take, what information must be contained in it and the level of detail required of that information; and

(c) that the *Contractor* furnish the *Superintendent* with 'as built' *construction programs* (in the same form as the *construction program*) with each progress payment (or at such other time as the *Superintendent* may require) which show the 'as built' progress of *WUC* in sufficient detail to enable a comparison to be made between the 'as-built' progress of *WUC* and the progress of *work* contemplated under the *construction program*.

(3) Notwithstanding the provisions of this subclause 32.5 and review or approval by the *Superintendent* of any documents submitted to the *Superintendent*, the *Contractor* remains responsible for all construction methods, means, techniques, sequences and procedures employed in and about the conduct of the *WUC*.

32.6 Alteration of cost

If compliance with any such *directions* under subclause 32.5, except those arising as a result of the *Contractor's* default, causes the *Contractor* to incur more or less cost than otherwise would have been incurred had the *Contractor* not been given the *direction*, the difference will be assessed by the *Superintendent* and added to or deducted from the *contract sum*.

32.7 Departure Notice

(1) If the *Superintendent* considers that:

(a) the *Contractor* has departed from any *construction program*; and

(b) that departure may cause a delay in the *date of practical completion*, or have adversely affected the progress of *WUC*,

the *Superintendent* may serve a notice on the *Contractor*:

(c) advising of the concerns of the *Superintendent*; and

(d) requesting an explanation of the reasons for the departure from the *construction program*; and/or

(e) *directing* an updated *construction program* be provided; and/or

(f) *directing* the *Contractor* to provide any other information required by the *Superintendent* in order satisfy the *Superintendent* that *practical completion* will

be reached by the *date for practical completion* notwithstanding the departure from the *construction program*, and

(g) stipulating the time by which the *Contractor* must respond to that notice, which must be a reasonable time,

(**Departure Notice**).

(2) The *Contractor* must comply with a Departure Notice.

(3) After having considered the *Contractor's* response to a Departure Notice, if the *Superintendent* believes that *practical completion* will not be reached by the *date for practical completion* on account of the departure from the *construction program* by the *Contractor* for a cause which is not a *qualifying cause of delay,* the *Superintendent* may:

(a) *direct* the *Contractor* to provide an updated *construction program* pursuant to which *practical completion* will be reached by the *date for practical completion*; and/or

(b) *direct* that the *Contractor* only depart from the then current, or any revised, *construction program* in accordance with a *direction* to that effect by the *Superintendent*.

(4) The *Contractor* may not make any claim, and is not entitled to any additional payment or time (including a *direction* for acceleration of the progress of the *WUC*) as a result of a *direction* under this subclause 32.7.

33 Suspension

33.1 Superintendent's suspension

The *Superintendent* may direct the *Contractor* to suspend the carrying out of the whole or part of *WUC* for such time as the *Superintendent* thinks fit, if the *Superintendent* is of the opinion that it is necessary:

(1) because of an act, default or omission of:

(a) the *Superintendent*, the *Principal* or its employees, consultants, agents or other contractors (not being employed by the *Contractor*); or

(b) the *Contractor*, a *subcontractor* or either's employees or agents,

(2) for the protection or safety of any person or property; or

(3) to comply with a court order.

33.2 Contractor's suspension

If the *Contractor* wishes to suspend the carrying out of the whole or part of *WUC*, otherwise than pursuant to subclause 39.3, the *Contractor* must obtain the *Superintendent's* prior written

approval. The *Superintendent* may approve the suspension and may impose conditions of approval.

33.3 Recommencement

As soon as the *Superintendent* becomes aware that the reason for any suspension no longer exists, the *Superintendent* will direct the *Contractor* to recommence suspended *WUC* as soon as reasonably practicable.

The *Contractor* may recommence *WUC* suspended pursuant to subclause 33.2 or 39.9 at any time after reasonable notice to the *Superintendent*.

33.4 Cost

The *Contractor* must bear the cost of suspension pursuant to subclause 33.1(1)(b) and subclause 33.2. If the *Contractor* made the protection, safety or court order necessary, the *Contractor* must bear the cost of suspension pursuant to subclause 33.1(2) or 33.1(3). If the *Contractor* otherwise incurs more or less cost than otherwise would have been incurred, the

difference will be assessed by the *Superintendent* and added to or deducted from the *contract sum*.

34 Time and progress

34.1 Progress

The *Contractor* must ensure that *WUC* reaches *practical completion* by the *date for practical completion*.

34.2 Notice of delay

(1) On becoming aware of anything which may or will probably cause delay to *WUC* the *Contractor* must promptly, and in any event within five (5) *business days* of becoming aware, give the *Superintendent* written notice which contains:

(a) full details of the cause of delay;

(b) the date the delay might commence (or, if the cause of delay has already commenced, the date it commenced);

(c) the estimated period of the delay; and

(d) where the delay results from a *qualifying cause of delay*, whether the *Contractor* intends to make a claim for an *EOT* in relation to that delay.

(2) If the delay continues for a period of five (5) *business days* or more, then the *Contractor* must give the *Superintendent* written notice of continuing delay in accordance with paragraph (1) each five (5) *business days* that the delay continues.

34.3 Claim

At any time prior to the *date for practical completion,* the *Contractor* will be entitled to claim an extension of time (*EOT*) for carrying out *WUC* (including reaching *practical completion*) as the *Superintendent* assesses, if:

(1) the *Contractor* is or will be delayed in reaching *practical completion* by a *qualifying cause of delay* which is on the critical path and where the delay occurs prior to the *date for practical completion*; and

(2) the *Contractor* gives the *Superintendent*, within ten (10) *business days* of when the *Contractor* became aware or should reasonably have become aware of the causation for the delay occurring, a written claim for an *EOT* evidencing:

(a) the facts of causation and of the delay to *WUC* (including extent);

(b) the number of days *EOT* claimed in relation to the *date for practical completion;*

(c) the steps taken by the *Contractor* to minimise the consequences of the delay and prevent the occurrence of the delay; and

(3) If further delay results from a *qualifying cause of delay* evidenced in a claim under paragraph (2) of this subclause, the *Contractor* shall claim an *EOT* for such delay by

promptly giving the *Superintendent* a further written claim evidencing the facts of that delay.

(4) The *Contractor* is not entitled to an *EOT* for *inclement weather* occurring on any of the days set out in *Item* 23B.

(5) A claim by the *Contractor* for an *EOT* based on *inclement weather* must state:

(a) the date;

(b) the type of weather;

(c) number of hours during the period claimed;

(d) working hours; and

(e) include a report issued by the local weather station or bureau of meteorology as evidence of the statements contained in the claim.

(6) In addition to the requirements of this subclause 34.3, it is a condition precedent to the *Contractor's* entitlement to an *EOT* that the *Contractor* has taken proper and reasonable steps to avoid or minimise the occurrence of the cause of the delay to the extent practicable and to avoid or minimise the effects thereof.

(7) Notwithstanding anything to the contrary, if the *Contractor* fails to give the *Superintendent* notice in accordance with paragraphs (2) and/or (3), the *Contractor* is

not entitled to additional time or money arising out of or in connection with the delay that should have been subject to the relevant notice.

34.4 Assessment

(1) When both non-qualifying and *qualifying causes of delay* overlap, the *Superintendent* will apportion the resulting delay to *WUC* according to the respective causes' contribution.

(2) In assessing each *EOT* the *Superintendent* will consider the impacts of the delay on the *Contractors* critical path in its *construction program* and disregard questions of whether:

(a) *WUC* can nevertheless reach *practical completion* without an *EOT*; or

(b) the *Contractor* can accelerate,

but will have regard to what prevention and mitigation of the delay has not been effected by the *Contractor*.

34.5 Extension of time

(1) Within twenty (20) *business days* after receiving a valid *EOT* Claim the *Superintendent* will give to the *Contractor* a written notice as to what *EOT* is allowed, if any. The *date for practical completion* is extended in accordance with any such notice.

(2) The *Superintendent* may, at any time and from time to time in their absolute discretion, by written notice to the *Contractor* grant an *EOT* notwithstanding that the *Contractor* is not otherwise entitled to an *EOT*.

(3) If the *Superintendent* fails to respond to, a valid *EOT* Claim within twenty (20) *business days* after receipt it will be deemed as having been approved by the *Superintendent* and will cause the *date for practical completion* to be changed by the period stipulated in the *EOT* Claim.

34.6 Preconditions to practical completion

(1) The *Contractor* acknowledges and agrees that notwithstanding anything to the contrary in the *Contract*, any damage caused by it to the *site* and surrounding areas (including all disturbed areas, damage to *adjoining sites*, public areas and all or any damage or disturbance in a road reserve), must be rectified and/or reconstructed by the *Contractor* as a precondition to achieving *practical completion*.

(2) The *Contractor* must give the *Superintendent* at least ten (10) *business days* written notice of the date upon which the *Contractor* anticipates that *practical completion* will be reached.

(3) When the *Contractor* is of the opinion that *practical completion* has been reached, the *Contractor* must in writing request the *Superintendent* to issue a *certificate of practical*

completion. Within ten (10) *business days* after receiving the request, the *Superintendent* will give the *Contractor* and the *Principal* either:

(a) a *certificate of practical completion* evidencing the *date of practical completion*; or

(b) a written notice which specifies why the *Superintendent* considers that *practical completion* has not been reached.

(4) If the *Superintendent* provides a notice under paragraph (3)(b), the *Contractor*, upon receipt of such reasons, must attend to the matters identified in that notice and such other matters required to bring *the Works* to *practical completion*. Upon the completion of those *works*, the relevant parties must again undertake the procedure set out in paragraphs (2) and (3) until *practical completion* has been reached.

34.7 Liquidated damages

(1) If *WUC* does not reach *practical completion* by the *date for practical completion*, the *Contractor* will be indebted to the *Principal* for liquidated damages at the rate stated in *Item* 24 for every day after the *date for practical completion* to and including the earliest of the *date of practical completion* or termination of the *Contract* or the *Principal* otherwise taking *WUC* out of the hands of the *Contractor*.

(2) If an *EOT* is directed after the *Contractor* has paid or the *Principal* has set off liquidated damages, the *Principal* must forthwith repay to the *Contractor* such of those liquidated damages as represent the days the subject of the *EOT*.

(3) The *Contractor* acknowledges that the liquidated damages in *Item* 24 are a genuine pre-estimate of the *Principal's* loss that will arise as a result of any delay in *practical completion*.

(4) The *Contractor* acknowledges and agrees that if *Item* 24 is completed by words which indicate that liquidated damages do not apply to the *Contract* (whether by the use of the words "nil", "not applicable" or otherwise), the *Principal* does not waive its entitlement to claim against the *Contractor* at law on account of any delay in *practical completion*.

34.8 Not Used.

34.9 Delay Costs

For every day the subject of an *EOT* for a *compensable cause* and for which the *Contractor* gives the *Superintendent* a claim for delay costs pursuant to subclause 41.1, the delay costs that the Contractor has incurred due to the *compensable cause* the subject of the *EOT*, as certified by the *Superintendent* under subclause 41.3, shall be due and payable to the *Contractor*.

34.10 Acceleration of the Works

(1) The *Principal*, at any time and from time to time, may by notice in writing to the *Contractor* direct the *Contractor* that the *WUC* (or any part of it) be accelerated by

means of overtime, additional crews, additional shifts or otherwise, and the *Contractor* must comply with such *direction* to the extent reasonably practicable.

(2) Before the issue of a *direction* under paragraph (1), the *Principal* may require the *Contractor* to submit, within five (5) *business days* of being requested to do so, reasonably detailed information regarding a proposed acceleration, including:

(a) if applicable, the additional work that will be required to achieve p*ractical completion* by the *date for practical completion*; and

(b) the likely additional actual costs to be incurred by the *Contractor* in complying with the proposed *direction*.

(3) Subject to paragraph (4), the *Contractor* is entitled to be compensated by the *Principal* for the additional actual necessary costs incurred by it to the extent to which it has complied with a *direction* under paragraph (1).

(4) If a *direction* is issued under paragraph (1) as a consequence of a breach of the *Contract* by the *Contractor,* the *Contractor* is not entitled to make a claim for time or payment in respect of any costs incurred or suffered by the *Contractor* arising out of or in connection with the *direction.*

35 Defects liability

35.1 Period

The *defects liability period* stated in *Item* 27 commences at 4.00pm from the date indicated in the *certificate of practical completion* as the *date of practical completion*.

35.2 Obligations of the Contractor

(1) The *Contractor* will carry out rectification of all *defects* identified in the *defects liability period* at times and in a manner causing as little inconvenience to the occupants or users of *the Works* as is reasonably possible.

(2) As soon as possible after the *date of practical completion*, the *Contractor* must rectify all *defects* existing at the *date of practical completion*.

35.3 Superintendent may give direction

At any time prior to the expiry of the *defects liability period*, the *Superintendent* may give the *Contractor* a *direction* to rectify a *defect* which:

(1) must identify the *defect* and the date for completion of its rectification; and

(2) may state a date for commencement of the rectification and whether there will be a separate *defects liability period* therefore (not exceeding that in *Item* 27, commencing at 4:00 pm on the date the rectification is completed and governed by this clause).

35.4 Failure to rectify

If the rectification in accordance with a *direction* issued under subclause 35.3 is not commenced or completed by the stated dates, the *Principal* may have the rectification carried out by others

but without prejudice to any other rights and remedies the *Principal* may have. The cost thereby incurred will be certified by the *Superintendent* as moneys due and payable to the *Principal*.

36 Variations

36.1 Directing variations

(1) The *Contractor* must not vary *WUC* except as *directed* in writing by the *Superintendent* or the *Principal*.

(2) The *Superintendent*, before the *date of practical completion*, may direct the *Contractor* to vary *WUC* by any one or more of the following which is nevertheless of a character and extent contemplated by, and capable of being carried out under, the provisions of the *Contract*:

(a) increase, decrease or omit any part including omitting any part;

(b) change the character or quality;

(c) change the levels, lines, positions or dimensions;

(d) carry out additional *work*; and/or

(e) demolish or remove material or *work* no longer required by the *Principal*.

(3) *Variations* will not be authorised for unnecessary or additional *work* due to disputes between trades or *subcontractors* and the *Contractor*.

(4) Delays by third parties such as service *Authorities* are not a reason for granting an *EOT* or a *variation*. The *Contractor* will remain responsible for the co-ordination of service *Authority* works within the construction period.

(5) Written site instructions issued by the *Superintendent* will not authorise work to be carried out as a *variation*. Should the *Contractor* consider that compliance with a site instruction does involve a *variation*, the *Contractor* may submit a claim for a *variation* to

the *Superintendent*, in writing within five (5) *Business Days* of the *Superintendent* issuing the relevant site instruction.

(6) The *Contractor* must not carry out any *work* in respect of a site instruction which the *Contractor* seeks a *variation* under paragraph (5) without the *Superintendent's* prior written approval.

36.2 Variations proposals

(1) The *Superintendent* may *direct* the *Contractor* to submit a proposal for a *variation* (**Variation Proposal**).

(2) The *Contractor* must provide the following information in response to such a *direction* within the time specified in that *direction*, or if there is no such time specified, within five (5) *business days* of the *direction*:

(a) detailed breakdown of the price for the proposed *variation*;

(b) a detailed scope of the proposed *variation* (including any drawings or technical details); and

(c) the effect (if any) of the proposed *variation* on the *date for practical completion*;

(3) Upon receipt of a Variation Proposal, the *Superintendent* may in the sole discretion of the *Superintendent* do any one of the following:

(a) *direct* the *Contractor* to provide further information;

(b) accept the Variation Proposal and give the *Contractor* a *direction* to carry out the *variation* on the terms contained in the Variation Proposal in which case the *variation* will not be priced under subclause 36.4 and the *contract sum* will only be varied in the manner set out in the Variation Proposal (if any); or

(c) not accept the Variation Proposal.

36.3 Variations for convenience of Contractor

If the *Contractor* requests the *Superintendent* to direct a *variation* for the convenience of the *Contractor*, the *Superintendent* may do so. The *direction* must be written and may be

conditional. Unless the *direction* provides otherwise, the *Contractor* is not entitled to an *EOT* or an increase in the *contract sum* on account of the *variation*.

36.4 Pricing

The *Superintendent* will, as soon as possible, price each *variation* using the following order of precedence:

(1) prior agreement;

(2) rates or prices in the *Contract* to the extent it is reasonable to use them;

(3) to the extent that it is not reasonable to use rates or prices in the *Contract,* the trade cost of the *work* comprising the *variation* (including warranties and certificates costs, if any) as assessed by the *Superintendent*; and

(4) the amount determined by applying the percentage specified in *Item* 33 for preliminaries, profit and on-*site* and off-*site* overheads to the amount assessed in paragraph (3).

That price will be added to or deducted from the *contract sum*.

37 Payment

37.1 Payment claims

The *Contractor* may claim payment progressively in accordance with *Item* 28.

An early payment claim is deemed to have been made on the date for making that claim.

Each payment claim must be given in writing to the *Superintendent* and must include:

(1) the date of issue;

(2) details of the *WUC* to which the payment claim relates and a brief description of any item(s) and quantity supplied;

(3) the price of the goods or services without GST;

(4) the amount of GST payable; and

(5) the total amount payable including GST (where the payment claim includes items that are GST-taxable and GST free details of both must be shown separately); and

(6) a Supporting Statement that complies with the requirements of the *Security of Payment Act*; and

(7) any other information reasonably requested by the *Superintendent.*

37.2 Payment Schedules

The *Superintendent* will, within ten (10) *business days* after receiving such a payment claim, issue to the *Principal* and the *Contractor* a *payment schedule* evidencing the *Superintendent's*

opinion of the moneys due from the *Principal* to the *Contractor* pursuant to the payment claim and reasons for any difference.

If the *Contractor* does not make a payment claim in accordance with *Item* 28, the *Superintendent* may issue the *payment schedule* with details of the calculations.

If the *Superintendent* does not issue the *payment schedule* within ten (10) *business days* of receiving a payment claim in accordance with subclause 37.1, that payment claim is deemed to be the relevant *payment schedule*.

Subject to subclause 37.7 the *Principal* must within five (5) *business days* after receiving the *payment schedule*, or within fifteen (15) *business days* after the *Superintendent* receives the payment claim, pay to the *Contractor* the balance of the *payment schedule* or if the *payment schedule* produces a negative balance, the *Contractor* must pay that balance to the *Principal* within five (5) *business days* of receiving written notice thereof.

Neither a *payment schedule* nor payment of monies are evidence that the subject *WUC* has been carried out satisfactorily. Payment other than *final payment* will be payment on account only.

37.3 Unfixed plant and materials

The *Principal* is not liable to pay for unfixed plant and materials unless they are listed in *Item* 29 and the *Contractor*:

(1) provides the additional *security* in *Item* 13(e); and

(2) satisfies the *Superintendent* that the subject plant and materials have been paid for, properly stored and protected, and labelled the property of the *Principal*.

Upon payment to the *Contractor* and the release of any additional *security* in paragraph (1), the subject plant and materials are the unencumbered property of the *Principal* and, if not yet on the *site*, must be available for immediate delivery to the *site*.

37.4 Final payment claim and certificate

Within twenty (20) *business days* after the expiry of the last *defects liability period*, the *Contractor* must give the *Superintendent* a written *final payment claim* endorsed 'Final Payment Claim' being a payment claim together with all other claims whatsoever in connection with the subject matter of the *Contract*.

Within ten (10) *business days* after receiving the *final payment claim* the *Superintendent* will issue to both the *Contractor* and the *Principal* a *final certificate* evidencing the moneys finally

due and payable between the *Contractor* and the *Principal* on any account whatsoever in connection with the subject matter of the *Contract*.

Those moneys certified as due and payable must be paid by the *Principal* or the *Contractor*, as the case may be, within five (5) *business days* after the debtor receives the *final certificate*.

The *final certificate* is conclusive evidence of accord and satisfaction, and in discharge of each party's obligations in connection with the subject matter of the *Contract* except for:

(1) fraud or dishonesty relating to *WUC* or any part thereof or to any matter dealt with in the *final certificate*;

(2) any *defect* or omission in *the Works* or any part thereof which was not apparent at the end of the last *defects liability period*, or which would not have been disclosed upon reasonable inspection at the time of the issue of the *final certificate*;

(3) any accidental or erroneous inclusion or exclusion of any *work* or figures in any computation or an arithmetical error in any computation; and

(4) unresolved issues the subject of any notice of *dispute* pursuant to clause 41.2, served before the seventh (7^{th}) day after the issue of the *final certificate*.

37.5 Interest

Interest in *Item* 30 is due and payable after the date of default in payment.

37.6 Other moneys due

The *Principal* may set off against moneys due and owing by it to the *Contractor* under this *Contract* any sum of money owed by the *Contractor* to the *Principal* whether in connection with the subject matter of the *Contract* or as a consequence of another unrelated matter or contract.

37.7 Set off

The *Principal* may deduct from moneys due from the *Principal* to the *Contractor* under the *Contract* or in connection with the subject matter of the *Contract* any money due from the *Contractor* to the *Principal* under the *Contract* including any money due under subclause 37.6.

38 Payment of workers and subcontractors

38.1 Workers and subcontractors

The *Contractor* must give in respect of a payment claim, documentary evidence of the payment of moneys due and payable to:

(1) workers of the *Contractor* and of the *subcontractors*;

(2) *consultants*;

(3) *subcontractors;*

in respect of *WUC* the subject of that claim together with its Supporting Statement in accordance with requirements of subclause 37.1.

If the *Contractor* is unable to give such documentary evidence, the *Contractor* will give other documentary evidence of the moneys so due and payable to workers, *consultants*, *subcontractors,* suppliers and manufacturers.

Documentary evidence, except where the *Contract* otherwise provides, must be to the *Superintendent's* satisfaction.

38.2 Withholding payment

Subject to the next paragraph, the *Principal* may withhold moneys certified due and payable in respect of the payment claim until the *Contractor* complies with subclause 38.1.

The *Principal* must not withhold payment of such moneys in excess of the moneys evidenced pursuant to subclause 38.1 as due and payable to workers and *subcontractors*.

If a *subcontractor* serves a Payment Withholding Request on the *Principal* in accordance with the *Security of Payment Act*, the *Principal* will be entitled to withhold from money due and payable to the *Contractor* under the *Contract* an amount equivalent to the amount claimed in that request (**Retained Money**).

The *Principal* will be entitled to withhold any Retained Money until the first of the following occurs:

(1) the adjudication application for the *subcontractor's* payment claim ('Adjudication Application') is withdrawn;

(2) the *Contractor* can demonstrate to the *Principal's* satisfaction that it has paid the *subcontractor* the amount claimed to be due under the payment claim;

(3) the *subcontractor* serves a notice of claim on the *Principal* for the purposes of section 6 of the *Contractors Debts Act* in respect of the payment claim; or

(4) a period of twenty (20) *business days* elapses after a copy of the adjudicator's determination of the Adjudication Application is served on the *Principal* by the *subcontractor*.

If the *Principal*, in making a payment to the *Contractor* under the *Contract*, fails to comply with a Payment Withholding Request served on the *Principal* by a *subcontractor*, such that under the *Security of Payment Act* the *Principal* becomes jointly and severally liable with the *Contractor* in respect of the whole or any part of a debt owed by the *Contractor* to the *subcontractor*, the

Superintendent will certify the debt so incurred as moneys due and payable from the *Contractor* to the *Principal*.

For the purposes of this subclause 38.2, terms such as 'Payment Withholding Request', 'payment claim', 'adjudication application' and 'adjudicator' have the meaning ascribed to them in the *Security of Payment Act*.

38.3 Direct payment

Before *final payment*, the *Principal*, if not aware of a relevant relation-back day (as defined in the Corporations Law) may pay unpaid moneys the subject of subclause 38.1 or 38.2 directly to a worker or a *subcontractor* where:

(1) permitted by law;

(2) given a court order in favour of the worker or *subcontractor*;

(3) requested in writing by the *Contractor*; or

(4) the *Superintendent* determines that the worker, *consultant* or *subcontractor* remains unpaid after the due date for payment.

Such payment and a payment made to a worker or *subcontractor* in compliance with a *legislative requirement* is deemed to be part-satisfaction of the *Principal's* obligation to pay pursuant to subclause 37.2 or 37.4, as the case may be, irrespective of whether, in the case of a payment to a *subcontractor*, the amount paid by the *Principal* to the *subcontractor* is greater than the amount which the *Contractor* is ultimately required to pay the *subcontractor*.

The *Contractor* acknowledges that the *Principal* and the *Superintendent* have the right to contact employees of the *Contractor,* any *subcontractor* and employees of any *subcontractor* to

determine whether any such employee or *subcontractor* remains unpaid after the due date for payment.

39 Default or insolvency

39.1 Preservation of other rights

If a party breaches (including repudiates) the *Contract*, nothing in this clause prejudices the right of the other party to recover damages or exercise any other right or remedy.

39.2 Contractor's default

If the *Contractor* commits a substantial breach of the *Contract*, the *Principal* may, by hand or by registered post, give the *Contractor* a written notice to show cause.

Substantial breaches include, but are not limited to:

(1) failing to:

(a) provide *security*;

(b) provide evidence of insurance;

(c) comply with a *direction* of the *Superintendent*; or

(d) use the materials or standards of *work* required by the *Contract*;

(2) wrongful suspension of *work*;

(3) substantial departure from a *construction program* without reasonable cause or the *Superintendent's* approval;

(4) where there is no *construction program*, failing to proceed with due expedition and without delay; and

(5) in respect of clause 38, knowingly providing documentary evidence containing an untrue statement.

39.3 Principal's notice to show cause

A notice under subclause 39.2 must state:

(1) that it is a notice under clause 39 of these General Conditions of Contract;

(2) the alleged substantial breach;

(3) that the *Contractor* is required to show cause in writing why the *Principal* should not exercise a right referred to in subclause 39.4;

(4) the date and time by which the *Contractor* must show cause (which must not be less than seven (7) clear days after the notice is received by the *Contractor*); and

(5) the place at which cause must be shown.

39.4 Principal's rights

If the *Contractor* fails to show reasonable cause by the stated date and time, the *Principal* may by written notice to the *Contractor*:

(1) take out of the *Contractor's* hands the whole or part of the *work* remaining to be completed and suspend payment until it becomes due and payable pursuant to subclause 39.6; or

(2) terminate the *Contract*.

39.5 Take out

The *Principal* may complete *work* taken out of the *Contractor's* hands and may:

(1) use materials, equipment and other things intended for *WUC* which are located on or in the vicinity of the *site*; and

(2) without payment of compensation to the *Contractor*:

(a) take possession of, and use such of the *construction plant* and other things on or in the vicinity of the *site* as were used by the *Contractor*; and

(b) contract with such of the *Contractor's subcontractors* and consultants,

as are reasonably required by the *Principal* to facilitate completion of *WUC*.

If the *Principal* takes possession of *construction plant* or other things, the *Principal* must maintain them and, subject to subclause 39.6, on completion of the *work*, must return such of them as are surplus.

The *Superintendent* will keep records of the cost of completing the *work*.

Any reasonable cost incurred by the *Principal* arising out of the *Principal* taking the *work* out of the hands of the *Contractor* must be paid by the *Contractor*.

39.6 Adjustment on completion of work taken out

When *work* taken out of the *Contractor's* hands has been completed, the *Superintendent* will assess the cost thereby incurred and will certify as moneys due and payable accordingly the difference between that cost (showing the calculations of that difference) and the amount which would otherwise have been paid to the *Contractor* if the *work* had been completed by the *Contractor*.

If the *Contractor* is indebted to the *Principal*, the *Principal* may retain *construction plant* or other things taken under subclause 39.5 until the debt is satisfied. If after reasonable notice, the *Contractor* fails to pay the debt, the *Principal* may sell the *construction plant* or other things and

apply the proceeds to the satisfaction of the debt and the costs of sale. Any excess must be paid to the *Contractor*.

39.7 Principal's default

If the *Principal* commits a substantial breach of the *Contract*, the *Contractor* may, by hand or by registered post, give the *Principal* a written notice to show cause.

Substantial breaches include, but are not limited to:

(1) failing to:

(a) Not used;

(b) Not used;

(c) rectify inadequate *Contractor's* possession of the *site* if that failure continues for longer than the time stated in *Item* 31; or

(d) make a payment due and payable pursuant to the *Contract*; and

(2) the *Superintendent* not giving a *certificate of practical completion* or reasons as referred to in subclause 34.6.

39.8 Contractor's notice to show cause

A notice given under subclause 39.7 must state:

(1) that it is a notice under clause 39 of these General Conditions of Contract;

(2) the alleged substantial breach;

(3) that the *Principal* is required to show cause in writing why the *Contractor* should not exercise a right referred to in subclause 39.9;

(4) the date and time by which the *Principal* must show cause (which must not be less than seven (7) clear days after the notice is received by the *Principal*); and

(5) the place at which cause must be shown.

39.9 Contractor's rights

If the *Principal* fails to show reasonable cause by the stated date and time, the *Contractor* may, by written notice to the *Principal*, suspend the whole or any part of *WUC*.

The *Contractor* must remove the suspension if the *Principal* remedies the breach.

The *Contractor* may, by written notice to the *Principal*, terminate the *Contract*, if within twenty eight (28) days of the date of suspension under this clause, the *Principal* fails:

(1) to remedy the breach; or

(2) if the breach is not capable of remedy, to make other arrangements to the reasonable satisfaction of the *Contractor*.

Costs incurred by the *Contractor* by reason of the suspension will be assessed by the *Superintendent*, who will certify them as moneys due and payable to the *Contractor*.

39.10 Termination

If the *Contract* is terminated pursuant to subclause 39.4(2) or 39.9, the parties' remedies, rights and liabilities are the same as they would have been under the law governing the *Contract* had the defaulting party repudiated the *Contract* and the other party elected to treat the *Contract* as at an end and recover damages.

39.11 Insolvency

If:

(1) A party informs the other in writing, or creditors generally, that the party is insolvent or is financially unable to proceed with the *Contract*;

(2) execution is levied against the party by a creditor;

(3) the party is an individual person or a partnership including an individual person, and that person:

(a) commits an act of bankruptcy;

(b) has a bankruptcy petition presented against him or her or presents his or her own petition;

(c) is made bankrupt;

(d) makes a proposal for a scheme of arrangement or a composition; or

(e) has a deed of assignment or deed of arrangement made, accepts a composition, is required to present a debtor's petition, or has a sequestration

order made, under Part X of the *Bankruptcy Act 1966* (Cth) or like provision under the law governing the *Contract*; or

(4) In relation to a party being a corporation:

(a) notice is given of a meeting of creditors with a view to the corporation entering a deed of company arrangement;

(b) it enters a deed of company arrangement with creditors;

(c) a controller or administrator is appointed;

(d) an application is made to a court for its winding up and not stayed within fourteen (14) days;

(e) a winding up order is made in respect of it;

(f) it resolves by special resolution that it be wound up voluntarily (other than for a member's voluntary winding up); or

(g) a mortgagee of any of its property takes possession of that property,

then, where the other party is:

(A) the *Principal*, the *Principal* may, without giving a notice to show cause, exercise the right under subclause 39.4(a); or

(B) the *Contractor*, the *Contractor* may, without giving a notice to show cause, exercise the right under subclause 39.9.

The rights and remedies given by this subclause are additional to any other rights and remedies. They may be exercised notwithstanding that there has been no breach of *Contract*.

40 Termination by frustration

If the *Contract* is frustrated:

(1) the *Superintendent* will issue a *payment schedule* for *WUC* carried out to the date of frustration, evidencing the amount which would have been payable had the *Contract*

not been frustrated and had the *Contractor* been entitled to and made a payment claim on the date of frustration;

(2) the *Principal* must pay the *Contractor*:

(a) the amount due to the *Contractor* evidenced by all unpaid *payment schedules*;

(b) the cost of materials and equipment reasonably ordered by the *Contractor* for *WUC* and which the *Contractor* is liable to accept, but only if they will become *Principal's* property upon payment; and

(c) the costs reasonably incurred:

(i) removing *temporary* works and *construction plant*;

(ii) returning to their place of engagement the *Contractor*, *subcontractors* and their respective employees engaged in *WUC* at the date of frustration; and

(iii) by the *Contractor* in expectation of completing *WUC* and not included in any other payment; and

(3) subject to any right to have recourse to the *security* by the *Principal* will promptly release and return all *security* provided by the *Contractor*.

41 Notification of claims

41.1 Applies to all claims

Except for those under subclauses 36 and 37.1, this clause 41 applies to all claims by the *Contractor* in relation to any matter or thing arising under the *Contract* or out of the performance of *WUC*.

41.2 Prescribed Notice

(1) For any claim to which this clause 41 applies to be validly made, the *Contractor* must by hand or by registered post, provide the *Principal* and the *Superintendent* with written notice (**Prescribed Notice**) of the claim.

(2) To be valid, a Prescribed Notice must:

(a) be provided to the *Principal* within twenty (20) *business days* of the date upon which the *Contractor* became aware or should reasonably have become aware

that there would be an adverse impact on the *Contractor* as a consequence of the events or circumstances on which the claim is based; and

(b) contain detailed particulars of the claim sufficient to identify the matter at issue and to enable the *Principal* and the *Superintendent* to understand the precise nature and content of the claim including at least the following information:

(i) Each item of the claim and the basis for it.

(ii) The clauses in the *Contract* and the documents upon which each item of claim is based.

(iii) If a *direction* of the *Superintendent* or any other person is relied upon, the date of the *direction*, who gave it, whether it was given orally or in writing, and the terms of the *direction*.

(iv) If an act or omission of the *Superintendent*, the *Principal* or any employee or agent of the *Superintendent* or the *Principal* is relied upon, the nature of the act or omission, the date of the act or omission, whether it was oral or in writing, and the terms of the act or omission.

(v) The amounts (including particulars of those amounts) claimed in respect of each item of claim of if no amount is claimed, a statement to that effect.

(vi) Any other decision sought in respect of the claim.

(3) A Prescribed Notice must be given regardless of whether or not:

(a) the event or circumstance upon which the claim is based are continuing; and/or

(b) the loss, expense or damage has crystallised or can be fully particularised.

(4) If details of the claim cannot be provided in a Prescribed Notice (for example on account of the matters referred to in subclause 41.2(3) any such details must be provided in a further Prescribed Notice within five (5) *business days* of the day that they do crystallise or can be fully particularised.

(5) If the *Contractor* fails to provide such a further Prescribed Notice by the time required in paragraph (4), its claim will be limited to those matters set out in any Prescribed Notice

provided within the time required under the *Contract*, as assessed and certified by the *Superintendent*.

41.3 Response to Prescribed Notice

Either the *Principal* or the *Superintendent* may respond to a Prescribed Notice.

If neither the *Principal* nor the *Superintendent* respond to a Prescribed Notice:

(1) within twenty (20) *business days* of receiving it; or

(2) if subclause 40.3(4) applies, within 20 *Business Days* of receiving the further Prescribed Notice required under that clause,

the parties are deemed to be in dispute.

42 Dispute resolution

42.1 Notice of dispute

If a difference or dispute (together called a 'dispute') between the parties arises in connection with the subject matter of the *Contract*, including a *dispute* concerning:

(1) a *Superintendent's direction*; or

(2) a claim:

(a) in tort;

(b) under statute;

(c) for restitution based on unjust enrichment or other quantum meruit; or

(d) for rectification or frustration,

or like claim available under the law governing the *Contract*,

then either party may, by hand or by registered mail, give the other and the *Superintendent* a written notice of *dispute* adequately identifying and providing details of the *dispute*.

Notwithstanding the existence of a *dispute*, the parties must, subject to clauses 39, 40 and subclause 42.4, continue to perform the *Contract*.

42.2 Conference

Within ten (10) *business days* after receiving a notice of *dispute*, the parties must confer at least once to resolve the *dispute*. At every such conference each party must be represented by a

person having authority to agree to such resolution or methods. All aspects of every such conference except the fact of occurrence is privileged.

If the *dispute* has not been resolved within twenty (20) *business days* of service of the notice of *dispute*, that *dispute* must be and is hereby referred to arbitration.

42.3 Arbitration

If within a further ten (10) *business days* the parties have not agreed upon an arbitrator, the arbitrator shall be nominated by the person in *Item* 32(a). The arbitration shall be conducted in accordance with the rules in *Item* 32(b).

42.4 Summary relief

Nothing in the *Contract* prejudices the right of a party to institute proceedings to enforce payment due under the *Contract* or to seek injunctive or urgent declaratory relief.

43 Waiver of conditions

Except as provided at law or in equity or elsewhere in the *Contract*, none of the provisions of the *Contract* may be varied, waived, discharged or released, except with the prior written consent of the parties.

44 Safety management on Site

44.1 Engagement as principal contractor

On the formation of the *Contract*:

(1) the *Contractor* is engaged by the *Principal* as the "principal contractor" for the *WUC* for the purposes of Chapter 6 of the Work Health & Safety Regulation 2011 (NSW) (**WHS Regulation**); and

(2) is authorised by the *Principal* to have management and control of the *site* and to discharge the duties of a *principal contractor* under Chapter 6 of the WHS Regulation.

44.2 WHS obligations of the Contractor

The *Contractor*, at its cost, must:

(1) comply with all relevant *legislative requirements*, standards, codes and guidelines, including but not limited to:

(a) Work Health and Safety Act 2011 (NSW) (**WHS Act**) and the WHS Regulation (together **WHS Laws**);

(b) SafeWork NSW requirements including but not limited to accident notification requirements, improvement notices and prohibition notices;

(c) SafeWork NSW - Asbestos: Code of Practice and Guidance Notes, in particular the code of Practice for the Safe Removal of Asbestos included therein; and

(d) Environmentally Hazardous Chemicals Act 1985 (NSW);

(2) ensure that a *site* specific Work Health & Safety Plan (**WHS Plan**) is prepared in accordance with Part 6.4 of Chapter 6 of the WHS Regulation and subclause 44.3;

(3) ensure that the WHS Plan is updated when and if necessary so as to ensure compliance with the WHS Laws;

(4) carry out and complete *the Works* in such a way as to ensure that all its *subcontractors* comply with the WHS Plan and that there is no breach of obligations by any party under the WHS Laws;

(5) obtain a written safe work method statement from *subcontractors* prior to their commencing *WUC*;

(6) during the course of *the Works* ensure that all *subcontractors* comply with their respective safe work method statements and the WHS Laws;

(7) immediately inform SafeWork NSW and the *Principal* in accordance with section 38 of the WHS Act of:

(a) any non-disturbance incident (as defined by the WHS Laws);

(b) any accident or other matter as prescribed by Part 3 of the WHS Regulation; and

(c) within one (1) *business day* of any non-disturbance incident or accident occurring, provide the *Superintendent* and the *Principal* with an accident or incident report.

44.3 Specific matters concerning the WHS Plan

(1) It is a condition precedent to the *Contractor's* right to possession of the *site* that the *Superintendent* has confirmed in writing to the *Contractor* that the *Contractor's* WHS

Plan (which for the purpose of this clause must include relevant sub components such as Safe Work Method Statements etc.) is acceptable to the *Superintendent*.

(2) If the *Superintendent* notifies the *Contractor* that the WHS Plan is not satisfactory in the opinion of the *Superintendent* within ten (10) *business days* of its receipt, then the *Contractor* must:

(a) make appropriate modifications to the WHS Plan; and

(b) resubmit the amended WHS Plan for the approval of the *Superintendent*.

(3) If the *Superintendent* fails to issue a notice in accordance with paragraph (2) the WHS Plan will be deemed to have been accepted.

(4) The *Contractor* must make provision for the submission and approval of its WHS Plan in any *construction program* and is not entitled to an *EOT* or costs should there be any delay in obtaining the *Superintendent's* approval of the *Contractors* WHS Plan.

(5) The risk of obtaining the approval of the WHS Plan is the *Contractors*.

44.4 Principal's Safety Policy

(1) The *Contractor* must provide relevant certification that all persons engaged in the conduct of the *WUC* have received the appropriate level of training in the area of safe worksite practices.

(2) No person may enter upon the *site* unless:

(a) the *Contractor* has provided the *Superintendent* with written evidence of that person's current WorkSafe Work Health and Safety General Induction Training certification; and

(b) the person has been inducted in relation to the *site* by the *Contractor*.

(c) The person has been inducted as per the Principal's WHS policy.

(3) All vehicle entrances into the *site* must be appropriately signposted as being a Construction Site, with access permitted only with the approval of the *Contractor*. The

same signage must be erected at regular intervals around the perimeter of the *site*, where pedestrian access might be possible.

45 Goods and Services Tax

45.1 Definitions

In this clause 45 terms used have the meaning given to them and as defined in Section 195-1 of the *GST Act*.

45.2 Liability to pay GST

(1) If either the *Principal* or the *Contractor* (for the purposes of this clause the **Supplier**) makes a supply under or in connection with the *Contract* and is liable by law to pay GST on that supply, the consideration otherwise payable by the recipient of the supply will be increased by an amount equal to the GST paid or payable by the Supplier.

(2) If the *Contract* requires either the *Principal* or the *Contractor* to pay for, reimburse or contribute to any expense, loss or outgoing (**reimbursable expense**) suffered or incurred by the other party, the amount required to be paid, reimbursed or contributed by the first party is the amount of the reimbursable expense net of any input tax credit or reduced input tax credit to which the other party is entitled in respect of the reimbursable expense.

(3) If either the *Principal* or the *Contractor* has the benefit of an indemnity for a cost, expense, loss or outgoing (**indemnified cost**) under the *Contract*, the indemnity is for the indemnified cost net of any input tax credit or reduced input tax credit to which that party is entitled in respect of the indemnified cost.

(4) Each party agrees to do all things, including providing invoices or other documentation containing stipulated information that may be necessary or desirable to enable or assist

the other party to claim any set off, rebate or refund in relation to any GST included in any payment made under the *Contract*.

46 Security of Payment Act

46.1 Definitions

For the purpose of this clause 46 terms used in this clause have the meaning ascribed to them in the *Security of Payment Act.*

46.2 Limits on application

This clause 46 only applies to the extent that it is permitted to do so under the *Security of Payment Act*.

46.3 Security of Payment Act provisions

For the purposes of contractually defining the rights of the parties to the *Contract* under the *Security of Payment Act*, the *Contractor* acknowledges and agrees as follows:

(1) The reference date is the date determined in accordance with *Item* 28.

(2) The amount of each progress payment to which the *Contractor* is entitled, and the valuation of construction work carried out or undertaken to be carried out, or related goods and services supplied or undertaken to be supplied, under the *Contract*, is to be determined strictly in accordance with the *Contract*.

(3) The due date for payment of any progress payments is the date for payment of payment claims under subclause 37.2 or in respect of any *final payment claim* it is the date for payment of the *final payment claim* under subclause 37.4, subject to any rights of the *Principal* under the *Contract* to withhold payment.

46.4 Notices

The *Contractor* must:

(1) promptly give the *Principal* a copy of any notice received by the *Contractor* under section 15, 16 or 24 of the *Security of Payment Act*; and

(2) promptly notify the *Principal* if it becomes aware that any *subcontractor* intends to exercise a statutory lien under section 11(3) of the *Security of Payment Act* over unfixed

plant and materials supplied by the *subcontractor* for use in carrying out *work* forming part of the *WUC.*

46.5 Indemnity

The *Contractor* continually indemnifies the *Principal* against any claim, action, damage, loss, liability, cost, charge, expense, outgoing or payment (including legal costs on a full indemnity basis) which the *Principal* pays, suffers, incurs or is liable for arising out of or in connection with:

(1) the *Contractor's* failure to comply with a provision of the *Contract* in respect of the *Security of Payment Act*;

(2) any lawful suspension of *work* by *subcontractors*; and

(3) any other right or remedy lawfully exercised by the *subcontractors*,

pursuant to the *Security of Payment Act*.

47 Civil Liability Act

It is agreed that, to the extent permitted by law, the operation of Part 4 of the *Civil Liability Act 2002* (NSW) is excluded in relation to all and any rights, obligations and liabilities arising under or in relation to the *Contract* howsoever such rights, obligations or liabilities are sought to be enforced.

The *Contractor* further agrees that in each subcontract into which it enters for the carrying out of the *WUC,* it will include provisions that, to the extent permitted by law, effectively excludes the operation of Part 4 of the *Civil Liability Act 2002* (NSW) in relation to all rights, obligations or

liabilities arising under or in relation to each subcontract howsoever such rights, obligations or liabilities are sought to be enforced.

48 Personal Property Securities Act 2009 (Cth) (PPSA)

48.1 Definitions

For the purpose of this clause:

(1) the terms, “purchase money security interest”, “security interest”, “financing statement” and “financing change statement” have the meaning ascribed to those terms in the PPS Law;

(2) **PPSA** means the *Personal Property Securities Act 2009* (Cth);

(3) **PPS Law** means the PPSA and any regulation made at any time under the PPSA, including any incidental regulations; and

(4) **Relevant Equipment** means those materials, equipment *construction plant* and other things intended for the *WUC* and which the *Principal* is entitled to take possession under subclause 39.5.

48.2 PPSA

(1) The *Contractor* must not create, attempt to create or permit to exist any *security interest* in relation to the Relevant Equipment.

(2) The retention of title terms applicable to the Relevant Equipment in this *Contract* give rise to a purchase money security interest under the PPS Law in favour of the *Principal* over the Relevant Equipment immediately and irrevocably:

(a) on delivery and/or acceptance on to the *site* regardless of payment by the *Principal* or otherwise; or

(b) on payment for the *Principal* whether on site or off-site.

(3) If in the opinion of the *Principal,* the *PPSA* applies, or will in the future apply to the *Principal’s* rights pursuant to subclause 39.5 and that the *PPSA*:

(a) affects or could affect the *Principal’s* security position or the rights and obligations of the *Principal* under or in connection with the *Contract;* and

(b) enables our would enable the *Principal’s* security position to be improved,

the *Contractor* must do all such things and sign all such documents and/or provide any further information as are necessary and reasonably required to enable the *Principal* to

acquire a perfected security interest in the Relevant Equipment in the event it exercises its rights under subclause 39.5 including:

(a) registering a financing statement or financing change statement in relation to a security interest;

(b) registering any other document required to be registered by the PPS Law; or

(c) correcting a defect in a statement registered under the PPS Law.

48.3 Further assurance

The *Contractor* agrees:

(1) that the *Principal* need not comply with s95, 118, 121(4), 125, 130, 132(3)(d) and 132(4) of the *PPSA* if enforcing its security interests under Chapter 4 of the *PPSA*;

(2) not to exercise its rights under s142 and 143 of the PPSA if the *Principal* enforces its security interests under Chapter 4 of the *PPSA*;

(3) to waive its right to receive Notice of Verification Statements (as that term is used in the *PPSA*) from the *Principal*;

(4) to do, at its own expense, all things which the *Principal* asks to ensure the *Principal's* security interests are enforceable, perfected and otherwise effective and have the priority the *Principal* requires; and

(5) if and to the extent the arrangements contemplated by this *Contract* give rise to a security interest which has or will be granted by the *Principal* in favour of the *Contractor*, the *Contractor* irrevocably and unconditionally agrees that it will not itself, or allow another person to, perfect or take any steps to perfect that security interest in any manner whatsoever.

49 Compliance with Building Code 2013

The *Contractor* must:

(1) comply with the Building Code 2013 (Cth) (**Code**) from the time of submitting its tender for *the Works*;

(2) ensure compliance with the Code by all *subcontractors* engaged in *the Works*, including by confirming compliance at all *site* and project control meetings;

(3) ensure that all subcontracts expressly require compliance with the Code and impose obligations equivalent to the obligations under this clause 49; and

(4) not appoint a *subcontractor* where:

(a) the appointment would breach a sanction imposed by the Code Monitoring Group, the Minister for Education, Employment and Workplace Relations or the Commonwealth; or

(b) the *subcontractor* has had an adverse Court or Tribunal decision (not including decisions under appeal) for a breach of workplace relations laws, work health

and safety law, or workers' compensation law and has not fully complied, or is not fully complying, with the order.

(5) Compliance with the Code will not relieve the *Contractor* from its other obligations under the *Contract* or otherwise arising out of or in connection with *the Works*.

50 Demolition and Construction Management

50.1 Demolition work

(1) All demolition work is to be carried out in accordance with the Australian Standard 2601-1991.

(2) In consideration of the need to minimise the impact of the demolition and construction works on *adjoining sites,* surrounding properties, car parking areas and roads, the *Contractor* must prepare and provide to the *Superintendent* a Demolition and Construction Management Plan (**DCMP**) before commencement of any demolition or excavation on the *site.*

(3) A DCMP must address (but is not limited to) the following:

(a) working hours;

(b) appropriate staging of *the Works* to minimise impacts on *adjoining sites*;

(c) maintenance of pedestrian and vehicle access in accordance with the Traffic and Pedestrian Management Plan;

(d) proposed delivery/loading/storage and *Contractor* parking locations. (to be contained wholly within the *site*);

(e) construction vehicle access;

(f) location of site office, toilets and other construction amenities;

(g) how the structure(s) to be demolished and all its components will be maintained in a stable and safe condition at all stages of the demolition, the temporary bracing, shoring or any combination of these, which are to be added for stability where necessary;

(h) the precautions which will be taken to ensure that the stability of all parts of the structure and the safety of persons on and outside the *site* are maintained,

particularly in the event of sudden and severe weather changes. Severe weather changes refer primarily to the localised high winds; and

(i) the security of the *site* all times against the unauthorised entry of persons or vehicles.

(4) After a review of the DCMP the *Superintendent* may issue a *direction* that additional items be added that are otherwise missing or inaccurately detailed.

(5) The *Contractor* must promptly comply with any *direction* issued under paragraph (4).

50.2 Demolition of Buildings containing asbestos cement

(1) The *Contractor* is to notify the *Principal* and owners or tenants of *adjoining sites* in writing at least ten (10) *business days* prior to the date scheduled for the demolition of buildings known to contain asbestos cement. Such notification is to be on at least size A4 paper, include the date demolition work is scheduled to commence and be placed

by hand in the letterbox of every premises (including every residential flat or unit) either side and immediately to the rear of the *site.*

(2) All asbestos material, including asbestos cement is to be disposed of by the *Contractor* to an approved waste management facility which is licensed to receive asbestos.

(3) The *Contractor* must display appropriate asbestos/demolition warning signage prior to and during demolition works.

51 Project control group

51.1 Attendance

During the execution by the *Contractor* of the *WUC*, the *Contractor* must attend project control group ("PCG") meetings at the intervals or times directed by the *Superintendent.*

51.2 PCG agenda

The PCG shall be a forum for discussion of:

(1) the performance and progress by the *Contractor* of the *WUC*;

(2) any issues arising out of the *WUC*;

(3) identifying problems and outstanding issues and allocating responsibility and tasks to resolve those issues, including WHS matters; and

(4) any other items required by the *Superintendent* and/or *Principal*.

51.3 Meeting delegates

The *Contractor* must ensure that PCG meetings which it is requested to attend are attended by its representatives who have the knowledge and authority to respond to queries raised by the attendees and to propose solutions to those queries.

51.4 Monthly Reports

(1) The *Contractor* will prepare, update and submit to the *Superintendent* on a monthly basis up until *practical completion* a report to include the following:

(a) a copy of the *construction program* marked up to show actual progress achieved and any expediting arrangements implemented or proposed where work is behind schedule.

(b) actual start and completion dates of all activities during the month.

(c) any change to the critical path.

(d) comment on forward planning based on the *Contractor's* current progress.

(e) list all *subcontractor*s on *site* during the report period.

(f) cash flow chart which includes details of:

(i) the value of progress payments made to date;

(ii) variations to date (approved and unapproved);

(g) number of lost time injuries.

(h) number of medical treatment injuries.

(i) number and comment on any safety incidents.

(j) number and comment on any environmental incidents.

(k) Industrial relations or Industrial Actions issues.

(l) *Approvals* from *Authorities*.

(m) *EOT*s approved.

(n) *EOT*s claimed but not approved.

(o) Comment on general progress.

(2) This report shall be a reporting medium only and will not represent amended completion dates for the *WUC*.

Part A

Annexure to the
Australian Standard General Conditions of Contract
AS 4000 – 1997

This Annexure will be completed and issued as part of the tender documents and, subject to any amendments to be incorporated into the *Contract*, is to be attached to the General Conditions of Contract and will be read as part of the *Contract*.

Item		
1	*Principal* (clause 1)	Cabonne Council ..... Principal's Representative: Cabonne Council's Director of Engineering and Technical Services..... ABN 41 992 919 200
2	*Principal's* address	101 Bank Street, Molong NSW 2866 ....
3	*Contractor* (clause 1)	.... ABN .....
4	*Contractor's* address	....
5	*Superintendent* (clause 1)	Cabonne Council's Manager Technical Services .....
6	*Superintendent's* address	As per the Principal ....
† 7	a) *Date for practical completion* (clause 1)	31 October 2019
	OR	
	b) Period of time for *practical completion* (clause 1)	.....
8	Governing law (page 5, clause 1(h))	New South Wales ..... If nothing stated, that of the jurisdiction where the *site* is located
9	a) Currency (page 5, clause 1(g))	AUD..... If nothing stated, that of the jurisdiction where the *site* is located

† If applicable, delete and instead complete equivalent *Item* in the *separable portions* section of the Annexure Part A

	b)	Place for payments (page 5, clause 1(g))	Principal's address .....
	c)	Place of business of bank (page 3, clause 1(d))	..... If nothing stated, the place nearest to where the *site* is located
10	*Bills of quantities* (subclause 2.2)		
	a)	Alternative applying (subclause 2.2)	Not Used
	b)	If Alternative 2 applies, is the *bill of quantities* to be priced? (subclause 2.2)	Not Used
	c)	Lodgement time (subclause 2.3(b))	Not Used..... If nothing stated, 28 days after *date of acceptance of tender*
11	Quantities in *schedule of rates,* limits of accuracy (subclause 2.5(b)		Not used. ....
12	*Provisional sum*, percentage for profit and attendance (clause 3)		NA
† 13	*Contractor's security*		
	a)	Form (clause 5)	Two (2) x Unconditional Bank Guarantee both for an amount equivalent to 2.5% of *Contract* sum (totalling 5% of contract sum), drawn in terms acceptable to the Principal.
	b)	Amount or maximum percentage of *contract sum* (clause 5)	Five (5)% of contract sum .....

† If applicable, delete and instead complete equivalent *Item* in the *separable portions* section of the Annexure Part A

	c)	If retention moneys, percentage of each *progress certificate* (clause 5 and subclause 37.2)	Not applicable
	d)	Time for provision (except for retention moneys) (clause 5)	Not applicable
	e)	Additional *security* for unfixed plant and materials (subclauses 5.4 and 37.3)	No additional security is required for unfixed plant or materials .... $.....
	f)	*Contractor's security* upon *certificate of practical completion* is reduced by (subclause 5.4)	50% of amount held.
† 14	*Principal's security*		
	a)	Form (clause 5)	Not applicable .....
	b)	Amount or maximum percentage of *contract sum* (clause 5)	Not applicable
	c)	Time for provision (clause 5)	Not applicable

† If applicable, delete and instead complete equivalent *Item* in the *separable portions* section of the Annexure Part A

	d)	*Principal's security* upon *certificate of practical completion* is reduced by (subclause 5.4)	Not applicable

15	*Principal*-supplied documents (subclause 8.2)	Document	No. of copies
		The documentation contained in the Principal's Request for Tender and all other information supplied or made available to the *Contractor* by the *Principal.*	
16	Time for *Superintendent's direction* about documents (subclause 8.3)	Fourteen (14) days	
17	Subcontract *work* requiring approval (subclause 9.2)	All *WUC*	
		.....	
		.....	
		.....	
		.....	
		.....	
		.....	
18	Novation (subclause 9.4)	Not applicable	
19	*Legislative requirements*		
	a) Those excepted (subclause 11.1)	Nil	
		.....	
		.....	
	b) Identified *WUC* (subclause 11.2(a)(ii))	Nil	
		.....	

20	Insurance of *the Works* (clause 16)	
	a) Alternative Applying	Alternative 1 .....
	If Alternative 1 applies	.....
	b) Provision for demolition and removal of debris	..... $..... OR .....% of the *contract sum*
	c) provision for consultants fees	.... $..... OR .....% of the *contract sum*
	d) Value of materials or things to be supplied by the *Principal*	.... $.....
	e) Additional amount or percentage	.... $..... OR .....% of the total of paragraphs (a) to (d) in clause 16
21	Public liability insurance (clause 17)	
	a) Alternative applying	Alternative 1 applies
	If Alternative 1 applies	
	b) Amount per occurrence will be not less than	Twenty (20) million dollars ($20,000,000) .....

22	Time for giving possession (subclause 24.1)	Within seven (7) days of formation of the contract
23	*Qualifying causes of delay* Causes of delay for which *EOTs* will not be granted (page 3, paragraph (b)(iii) of clause 1 and subclause 34.3)	(1) Contractor's failure to adhere to the agreed project commencement date; (2) Nationwide or statewide strikes, lockouts or other industry disputes which are not specific to the *Contractor* or it's employees, agents or sub-contractors; (3) anything required to be done by the *Contractor* to secure the environmental protection of *WUC* or to avoid damage to the environment while the *WUC* are being carried out; (4) Any claim for an *EOT* made by the *Contractor* on the basis of *inclement weather* prior to the *Contractor* fully using the allowance in *Item* 23B.
23B	number of days of *inclement weather* (subclause 32.4)	the first 15 working days of *inclement weather* occurring prior to the *date for practical completion*
24	Liquidated damages, rate (subclause 34.7)	Two Thousand Dollars ($2,000) per week or part thereof. .....
25	Bonus for early *practical completion* (subclause 34.8)	Not applicable
	a) Rate	....per day $ .....per day
	b) Limit	.... $ ..... OR ..... % of *contract sum* If nothing stated, there is no waiver
26	Delay damages, other *compensable causes* (page 1, clause 1 and subclause 34.9)	Nil ....

27	*Defects liability period* (clause 35)	12 months .....
28	Payment Claims (subclause 37.1)	
	a) Times for payment claims	*By 21st day of each month for WUC done to the last day of the previous month.* ....
	OR	
	b) Stages of *WUC* for payment claims	Not applicable ....
29	Unfixed plant and materials for which payment claims may be made (subclause 37.3)	The Contractor is not entitled to any payment before the plant or materials are incorporated into the works. ....
30	Interest rate on overdue payments (subclause 37.5)	Nil
31	Time for *Principal* to rectify inadequate possession (subclause 39.7)	Fourteen (14) days
32	Arbitration (subclause 42.3)	The Resolution Institute
	a) Person to nominate an arbitrator	the President of the Resolution Institute

		b) Rules for arbitration	Rules 5-18 of the Rules of The Resolution Institute for the Conduct of Commercial Arbitrations;
A3		c) Appointing Authority under UNCITRAL Arbitration Rules	Not applicable
	33	Percentage amount for preliminaries, profit and onsite and off site overheads for variations (subclause 36.4)	Ten percent (10%)

- This section should be completed only if the Contract provides for separable portions.
- Complete separate pages for each separable portion, which should be numbered appropriately. Any balance of the *Works* should also be a separable portion.

- This section should be completed only if the Contract provides for separable portions.
- Complete separate pages for each separable portion, which should be numbered appropriately. Any balance of the *Works* should also be a separable portion.

	Separable portion (clause 1)	No. .....
	Description of *separable portion* (clause 1)	.....
		.....
		.....
Item		
7	a) *Date for practical completion* (clause 1)	.....
	OR	
	b) Period of time for *practical completion* (clause 1)	.....
13	*Contractor's security*	
	a) Form (clause 5)	.....
	b) Amount or maximum percentage value of this *separable portion* (clause 5)	..... If nothing stated, 5% of value of this *separable portion*
	c) If retention moneys, percentage of each *progress certificate* applicable to this *separable portion* (clause 5 and subclause 37.2)	..... % If nothing stated, 10%, until the limit in *Item* 13(b)
	d) Time for provision (except for retention moneys) (clause 5)	..... If nothing stated, within 28 days after *date of acceptance of tender*
	e) Additional *security* for unfixed plant and materials (subclauses 5.4 and 37.3)	.... $ .....
	f) *Contractor's security* upon *certificate of practical completion* is reduced by (subclause 5.4)	.....% of amount held If nothing stated, 50% of amount held
14	*Principal's security*	
	a) Form (clause 5)	.....

- This section should be completed only if the Contract provides for separable portions.
- Complete separate pages for each separable portion, which should be numbered appropriately. Any balance of the *Works* should also be a separable portion.

	b) Amount or maximum percentage of value of this *separable portion* (clause 5)	..... If nothing stated, nil
	c) Time for provision (clause 5)	..... If nothing stated, within 28 days after *date of acceptance of tender*
	d) *Principal's security* upon *certificate of practical completion* is reduced by (subclause 5.4)	.....% of amount held If nothing stated, 50% of amount held
24	Liquidated damages, rate (subclause 34.7)	..... per day $.....per day
25	Bonus for early *practical completion* (subclause 34.8)	
	a) Rate	..... per day $.....per day
	b) Limit	..... $..... OR .....% of value of *separable portion* If nothing stated, there is no waiver
26	Delay damages, other *compensable causes* (page 1, clause 1 and subclause 34.9)	....

Deletions, amendments and additions

1 The following clauses have been deleted from the General Conditions in AS 4000 – 1997

As shown in a comparison document of the amended General Conditions against the standard AS4000-1997 General Conditions of Contract .....

.....

.....

.....

.....

.....

.....

2 The following clauses have been amended and differ from the corresponding clauses in AS 4000 – 1997

As shown in a comparison document of the amended General Conditions against the standard AS4000-1997 General Conditions of Contract .....

.....

.....

.....

.....

.....

.....

.....

3 The following clauses have been added to those of AS 4000 – 1997

As shown in a comparison document of the amended General Conditions against the standard AS4000-1997 General Conditions of Contract .....

.....

.....

.....

.....

.....

.....

Approved form of unconditional undertaking

(clause 1 – *security*)

At the request of ..... ('the *Contractor*') and in consideration of .....('the *Principal*') accepting this undertaking in respect of the *Contract* for .....
.....
..... (`the *financial institution'*) unconditionally undertakes to pay on demand any sum or sums which may from time to time be demanded by the *Principal* to a maximum aggregate sum of.....
..... ($.....)

The undertaking is to continue until notification has been received from the *Principal* that the sum is no longer required by the *Principal* or until this undertaking is returned to the *financial institution* or until payment to the *Principal* by the *financial institution* of the whole of the sum or such part as the *Principal* may require.

Should the *financial institution* be notified in writing, purporting to be signed by.....
.....for and on behalf of the *Principal* that the *Principal* desires payment to be made of the whole or any part or parts of the sum, it is unconditionally agreed that the *financial institution* will make the payment or payments to the *Principal* forthwith without reference to the *Contractor* and notwithstanding any notice given by the *Contractor* not to pay same.

Provided always that the *financial institution* may at any time without being required so to do pay to the *Principal* the sum of .....
..... ($.....)
less any amount or amounts it may previously have paid under this undertaking or such lesser sum as may be required and specified by the *Principal* and thereupon the liability of the *financial institution* hereunder will immediately cease.

Dated at.....this.....day of.....20.....

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 5 – SCOPE OF WORKS AND TECHNICAL SPECIFICATIONS

SCOPE OF WORKS

The Works under this Contract consists of Supply and Installation of the following pipelines:

- A reticulation main from Yeoval reservoir to Yeoval town;
- New reticulation pipelines at various locations within Cumnock town;
- New reticulation pipelines at various locations within Yeoval town.
- Molong reticulation works

The Contractor shall supply all plant, labour and materials and install all the pipelines specified in this Contract. All accessories required to install the pipelines such as pipes, fittings, valves, reducers/enlargers, thrust blocks, supports/brackets, concrete pits, surface boxes, hydrants etc. shall be provided by the Contractor. Pipe laying includes verification of utilities, setting out, excavation, bedding, supply, laying, jointing, backfilling, compacting, testing, disinfection and restoration.

In addition to the new pipelines, the Contractor shall clean, flush and disinfect all the existing pipelines in order to supply potable water through the system.

In addition to the above works the Contractor shall carry out the following works, which are essential for the proper completion of the Works.

- Site inspections and rectifying defects during the Defects Liability Period;
- Provision of Work-As-Executed documentation;
- Provision of Quality Assurance Documentation;
- Other minor works not stated above but necessary for the proper completion of the Works;
- All temporary works such as environmental management, establishment, disestablishment etc. as necessary.

This Sub Section specifies the general technical requirements for the above works. Details are shown on the contract drawings attached to this Tender Document. Detailed specifications are given in Sub Section 2 – Pipelines.

SEPARABLE PORTIONS

The contract has three (3) separable portions:

Separable Portion 1 (SP1)

Construction of Cumnock and Yeoval Water Reticulation Pipelines and Associated Structures.

Separable Portion 2 (SP2)

Flushing and Disinfection of all existing pipelines.

Separable Portion 3 (SP3)

Construction of Molong Water Reticulation Pipelines and Associated Structures – Molong Reticulation Works

Molong Reticulation Works

Separable Portion for Molong Reticulation Works
The Molong Reticulation Works is a separable portion of the Cabonne Council Reticulation Works contract.
The Molong Reticulation Works pipeline is shown in red on the attached drawing.

Pipelength
The approximate distance from the Molong reticulation works is 1400 metres.
There is a peg about 15 metres from Molong Bore. There is a peg near the western boundary of the Molong WTP. The distance between the pegs is 1400 metres (estimated length).

Pipe type
The pipe shall be 150 mm PVC pipe, PN 16, RRJ.

Marking
The pipeline to be constructed (transferring untreated groundwater) should be plastic covered to distinguish it from the existing Molong reticulation (transferring potable water – that is treated and chlorinated).

Air Valves
Air valves are required on high points on the pipeline.
Three air valves are to be installed.
The air valve construction on this pipeline is to be similar to those on the recently installed Molong – Yeoval pipeline – ie as per the MWH standard drawings. (Type 2). Drawing C201.

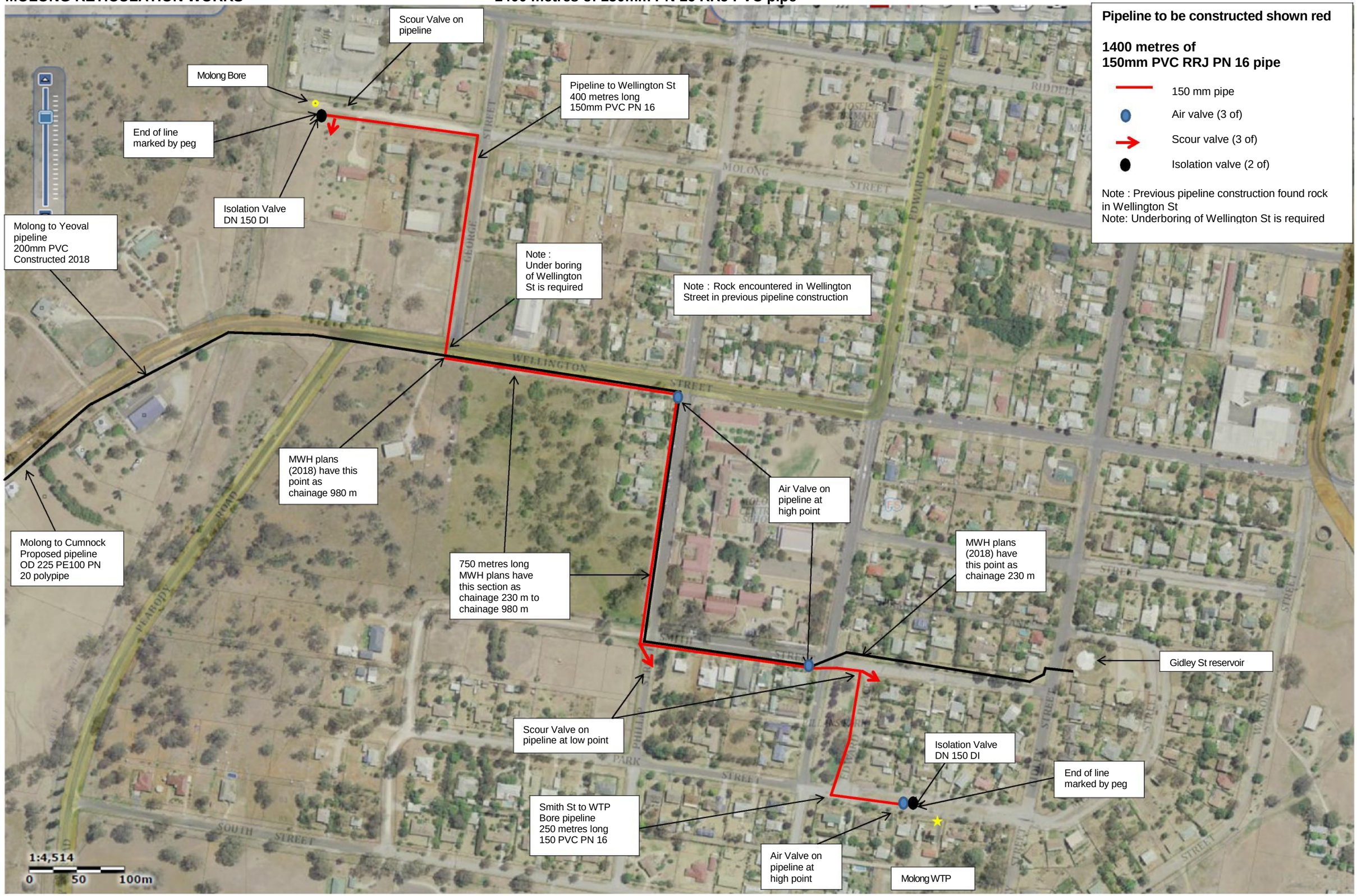
Scour Valves
Scour valves are required at low points on the pipeline.
Three scour valves are required.
The scour valve construction on this pipeline are to be similar to those on the recently installed Molong – Yeoval pipeline – ie as per the MWH standard drawings. Drawing C202.

Isolation Valves
Isolation valves are required at each end of the pipeline.
Two isolation valves are required.
The locations of isolation valves are marked in the field by a peg. One is about 15 metres from the existing Molong bore. The other is near the western boundary of the Molong WTP.
Isolation valve construction on this pipeline is to be similar to those on the recently installed Molong – Yeoval pipeline. ie as per the MWH standard drawings. Drawing G003.

Road Crossing – Wellington Street

There is to be a pipeline road crossing of Wellington Street. This is to be open cut subject to the approval of relevant road authority.

MOLONG RETICULATION WORKS **1400 metres of 150mm PN 16 RRJ PVC pipe**



The Molong Reticulation Works : The pipeline (shown in red) is a separable portion. It is 1400 metres long. Valve installation on pipeline is as per MWH standard drawings. Road underboring is as per MWH standard drawings.

CONSTRUCTION OF CUMNOCK & YEOVAL WATER RETICULATION PIPELINES

TECHNICAL SPECIFICATION

This is a blank page to facilitate double sided copying/printing

SUB SECTION 1 – GENERAL REQUIREMENTS

This is a blank page to facilitate double sided copying/printing.

CONTENTS

1 GENERAL REQUIREMENT

1.1 INTRODUCTION

1.1.1 Overview

Cabonne Shire Council, located in the Central West of NSW, operates the following water supply networks:

- Molong water supply - provides potable water to the community of Molong;
- Cumnock water supply – provides non-potable water to the community of Cumnock;
- Yeoval water supply – provides non-potable water to the community of Yeoval.

The existing system in Cumnock, including the majority of the current reticulation was installed in 1955. Water is sourced from the Bell River and pumped to a high level "Turkeys Nest" dam before it gravitates to a small reservoir where it is chlorinated and directed into the town reticulation system. There is no potable water system in Cumnock.

A similar situation exists for the Yeoval water scheme which was built in 1964. Water is sourced from the Buckinbah Creek and chlorinated at the intake pump station before being delivered to a high level concrete reservoir through the town reticulation. Two bore water sources are used to supplement the creek supply when either the water demand is high or surface water quality is very poor. There is no potable water system in Yeoval.

1.1.2 Proposed Augmentation Works

Cabonne Shire Council (hereinafter called “Council”) intends to provide potable water to Cumnock and Yeoval from the Molong water treatment plant (WTP) via a new trunk main from Molong to Cumnock & Yeoval. There will be a new pump station at Molong to pump potable water from Molong WTP to a new reservoir at a high point about 1.4 km before Cumnock. Water from this reservoir will gravitate to Cumnock and Yeoval. The trunk main from the new reservoir will feed the existing reticulation network in Cumnock and the existing reservoir in Yeoval from where it will gravitate to the pipe network in Yeoval.

Under the proposed augmentation, the existing reservoir in Cumnock will be abandoned.

The proposed works also include additional reticulation pipes in the two systems to inter-connect dead ends of the existing reticulation pipes.

1.1.3 Scope of Works

The Works under this Contract consists of Supply and Installation of the following pipelines:

- A reticulation main from Yeoval reservoir to Yeoval town;
- New reticulation pipelines at various locations within Cumnock town;
- New reticulation pipelines at various locations within Yeoval town.

The Contractor shall supply all plant, labour and materials and install all the pipelines specified in this Contract. All accessories required to install the pipelines such as pipes, fittings, valves, reducers/enlargers, thrust blocks, supports/brackets, concrete pits, surface boxes, hydrants etc. shall be provided by the Contractor. Pipe laying includes verification of utilities, setting out, excavation, bedding, supply, laying, jointing, backfilling, compacting, testing, disinfection and restoration.

In addition to the new pipelines, the Contractor shall clean, flush and disinfect all the existing pipelines in order to supply potable water through the system.

OTHER Works

In addition to the above works the Contractor shall carry out the following works, which are essential for the proper completion of the Works.

- Site inspections and rectifying defects during the Defects Liability Period;
- Provision of Work-As-Executed documentation;
- Provision of Quality Assurance Documentation;
- Other minor works not stated above but necessary for the proper completion of the Works;
- All temporary works such as environmental management, establishment, disestablishment etc. as necessary.

This Sub Section specifies the general technical requirements for the above works. Details are shown on the contract drawings attached to this Tender Document. Detailed specifications are given in Sub Section 2 – Pipelines.

1.2 DESCRIPTION OF SCOPE OF WORKS

Scope of Works is described below in detail. The Works have been divided into two Separable Portions A and B. The tenderers may or may not be awarded one or both separable portions.

1.2.1 Separable Portion A – Construction of Pipelines

This work consists of supply of all materials, plant, equipment and labour and construction of the following pipelines under this Contract:

- Reticulation main from Yeoval reservoir to Yeoval town. This pipeline shall be a 0.96 km long DN200 PVC-M pipeline.
- Reticulation pipelines at various locations within Cumnock town. The new pipelines shall be DN100 PVC-M pipes and have a total length of approximately 1.1 km.
- Reticulation pipelines at various locations within Yeoval town. The new pipelines shall consist of 2.5 km of DN100 PVC-M pipes and 0.5 km of DN150 PVC-M pipes,

All accessories required for the installation of the pipelines such as pipes, fittings, valves, reducers/enlargers, couplings, thrust blocks, concrete pits etc. shall be provided by the Contractor. Pipe laying includes verification of existing utilities, setting out, excavation, bedding, supply, laying, jointing, backfilling, compacting, pressure testing and restoration.

1.2.2 Separable Portion B - Flushing and Disinfection of Existing Pipelines

The reticulation networks at both Cumnock and Yeoval shall be cleaned, flushed and disinfected prior to the connection of the new pipelines into the network. After connecting all of the new pipelines, the entire system shall be filled with potable water and flushed through hydrants as necessary in order to ensure that the system is suitable to supply potable water.

1.2.3 Temporary Works

Temporary works associated with all above permanent works are briefly described below but not limited to:

(a) Preparation of Safe Work Method Statement, Environmental Management Plan, Safety Plan and Quality Assurance Inspection and Testing Plan, Traffic Management Plans, and Erosion and Sediment Control Plan;

(b) Submission of necessary details to various authorities and obtaining approvals for the works;

(c) Site establishment and disestablishment;

(d) Erosion and sediment controls, dewatering, shoring and all temporary works required during construction;

(e) Site restoration of disturbed areas during construction;

(f) Inspection and Testing; and

(g) Provision of Work-As-Executed documentation and drawings.

1.3 THE SITE

All the proposed pipelines are located within Cumnock & Yeoval villages. The sites are accessible via main roads and byroads in the respective areas.

1.4 CO-ORDINATION

To achieve a successful project, the Contractor shall fully co-operate and maintain a close co-ordination of the construction activities with Cabonne Shire Council as the Principal, the supervisory staff nominated by the Principal, operational personnel of the existing Cumnock & Yeoval water supply systems and any other personnel who will be directly involved with contract works.

1.5 WORKMANSHIP

The Contractor is responsible for ensuring that all operations and methods of construction, supply materials (which are new, free from defects and suitable for the purpose) and standards of workmanship and work methods are in conformity with the Contract, relevant Australian Standards and all lawful requirements of Commonwealth, State, Territory and local legislation and subordinate regulations, ordinances, by-laws, orders and proclamations.

1.6 CONNECTION OF NEW PIPELINES TO AC PIPES

This contract may include connecting some of the new pipelines to existing Asbestos Cement (AC) pipes. These connections shall be made using a special fitting nominated by the Principal (refer to Clause 3 of this Sub Section). The Contractor shall take necessary safety precautions during these connections to ensure that people are not exposed to potential contamination by asbestos.

As a precautionary measure, the Contractor shall prepare an asbestos management plan in case an asbestos pipe is damaged during construction.

2 REFERENCES

2.1 DRAWINGS

The following drawings form part of the contract and are attached to the tender document.

DRAWING NUMBER	TITLE
General	
	COVER PAGE
17/16033-G1	PROJECT LOCALITY PLAN AND LIST OF DRAWINGS
Yeoval	
17/16033-P1	YEOVAL – LINE YSM ROUTE PLAN & LONGITUDINAL SECTION CH. 0.0 - CH. 664.5
17/16033-P2	YEOVAL – LINE YSM ROUTE PLAN & LONGITUDINAL SECTION CH. 664.5 - CH. 947.6
17/16033-P3	YEOVAL ROUTE PLAN – LINES 2A, 3A AND 4A
17/16033-P4	YEOVAL ROUTE PLAN – LINE 5A
17/16033-P5	YEOVAL ROUTE PLAN – LINES 6A AND part 8A
17/16033-P6	YEOVAL ROUTE PLAN – LINES 7A AND part 8A
17/16033-P7	CONNECTION DETAILS NEAR EXISTING YEOVAL RESERVOIR
Cumnock	
17/16033-P8	CUMNOCK ROUTE PLAN – LINES 3A AND 4A
17/16033-P9	CUMNOCK ROUTE PLAN – LINES 1A AND 2A
Other drawings	
17/16033-P10	THRUST BLOCKS DETAILS
17/16033-P11	PIPELINE TRENCH BACKFILL DETAILS
17/16033-P12	PROPOSED CONNECTION TO EXISTING LINE ENDING AT HYDRANT OR SLUICE VALVE
17/16033-P13	PROPOSED TEE CONNECTION TO EXISTING LINE WITH AND WITHOUT HYDRANT

All references to drawing numbers shall refer to the latest issue of that drawing as included in the Tender Documents.

2.1.1 Principal's Drawings

NEW WORK: Check all Drawings carefully and advise the Principal of any discrepancies, errors or omissions. The Principal will give instructions for amendments to the Contractor should any discrepancies, errors or omissions be found.

EXISTING WORK: Check all dimensions relating to existing work on-site.

2.1.2 Contractor's Drawings

If required under this contract, the drawings prepared by the Contractor shall meet the following requirements.

All drawings shall be prepared using a Computer Aided Drafting (CAD) system. Manually prepared drawings are not acceptable. Drawings shall be drawn on "A1" size, however, may be printed on A3 size in black on a white background. All Drawings shall conform to AS 1100 Technical Drawings. Abbreviations and units shall be in accordance with AS 1000; dimensions shall be in metric units.

2.2 STANDARD TECHNICAL SPECIFICATION

2.2.1 Water Services Specification (WS-SPEC)

This specification has references to WS-SPEC, which is available for free download from http://www.apcc.gov.au.

Strategic Products: Unless otherwise specified elsewhere, adopt Public Works Advisory (formerly Department of Commerce) practices for all strategic products as detailed in the individual SP-Sections.

Construction: Unless otherwise specified elsewhere in this document, adopt Public Works Advisory (formerly Department of Commerce), practices for all construction activities as detailed in the individual TR-Sections.

2.3 AGENCY STANDARDS

2.3.1 Standards Australia

Australian, British and International Standards cited in this Specification are available from Standards Australia (SA).

2.3.2 RMS Standards

This specification may refer to the standard RMS QA Specification. Relevant Standard Specifications or Procedures, Descriptions of Test Methods and Standard Drawings are directly cited in this Specification and in others those may be referred to indirectly. In the absence of any particular specification in these documents, relevant RMS specification shall be referred to. The RMS QA Specification is available from the website:
http://www.rms.nsw.gov.au/publicationsstatisticsforms/index.html

2.4 RELEVANT STUDIES AND REPORTS

The following documents are attached to this tender document. These documents form part of the tender.

- Cumnock Water Supply Reticulation Mains, Geotechnical Investigation, Report Number 17-GT27A, prepared by Public Works Advisory, February 2017;

- Yeoval Water Supply Distribution Main and Reticulation Pipelines, Geotechnical Investigation, Report Number 17-GT28A, prepared by Public Works Advisory, February 2017;

- Cumnock & Yeoval Water Reticulation Upgrades, Review of Environmental Factors, Report Number DC17011, prepared by Public Works Advisory, February 2017.

2.5 SITE INSPECTIONS

Notwithstanding the information given in this Specification for the site, it will be assumed that the Contractor has read all the available reports and visited the site (prior to tendering) to fully familiarise himself with the work involved and the true nature of the site and conditions above and below ground.

Claims for extra remuneration by the Contractor on the ground of not being furnished with sufficient information, will not be considered.

3 PREFERRED / NOMINATED EQUIPMENT

The connections of the new pipelines to the existing asbestos (AC) pipelines shall be made using the following fitting:

- Stainless Steel Tapped Offtake Clamps 2P, manufactured by Cadia Group, Orange. Cadia Group may be contacted on 02 6361 2466 or info@cadia.com.au.

This is applicable for “T” connections with AC pipes only. Continuation of existing pipelines (i.e. extensions) or connections between PVC pipelines may be made using standard fittings.

4 ACCESS TO WORKS

4.1 SITE ACCESS

All sites are accessible from roads within Cumnock and Yeoval.

4.1.1 Load Restrictions

The Contractor shall not use Council, State roads or bridges for heavy construction traffic or tracked equipment unless arrangements have been made with the Council concerned or RMS, as appropriate, and the approval of all relevant authorities to such arrangements has been obtained.

4.1.2 Traffic

The Contractor is responsible for the safety of traffic during the progress of the Work. Where obstructions to traffic cannot be avoided (for short periods), make arrangements for the control of traffic and the provision of sidetrack, detours and signs conforming to RMS or Council requirements.

Where required, the Contractor shall prepare a traffic management plan and obtain the approval from the relevant authority prior to construction.

4.1.3 Fencing and Signs

Fencing and signs shall be provided to safeguard all sites, maintenance staff, nearby the residents, road users and the general public.

Where fences or gates have to be removed for the construction works, arrangements shall be made with the Council or respective landowners for any temporary fences required. Fences temporarily removed shall be restored to the condition that was prior to the removal.

5 METHOD STATEMENT

The Contractor shall submit a Method Statement without limiting the requirements of this Section. The Method Statements shall present the detailed methodology of the proposed works including the followings.

- Proposed plant and equipment list to be used
- Proposed environmental protection
- Proposed access to the works
- Proposed Contractors works areas and facilities
- Proposed erosion and sediment control
- Proposed temporary works for stormwater diversion and dewatering
- Proposed site security
- Proposed site survey method/s to be employed
- Proposed hours of work
- QA Statement
- Proposed Work, Health and Safety plan
- Proposed material contribution (including sources of supply) for pipelines and specials
- Methodology for pipe laying and connections

Within 14 days of Award of Contract, the Contractor shall submit a revised Method Statement for approval of the Principal's Authorised Person. This shall include but not limited to the following.

- A revision of the construction program attached to the bid
- Details of all temporary works
- Details of proposed staffing, including detailed CV's and company profiles for all sub-contractors and relevant Work Health and Safety provisions
- Details of the tests, which will be carried out.

6 CONTRACTOR'S WORKS AREAS AND FACILITIES

6.1 LOCATION

Submit full details of proposed works areas, offices, sanitary facilities and stockpile areas at least 5 working days in advance of the intended setting up. Include as appropriate, the written approval from the relevant landowner and/or authority. The use of such sites or adjacent areas is subject to the prior written approval of the Principal's Authorised Person.

6.2 ACCOMMODATION

Comply with all the requirements of Local Authorities and any statutes for accommodation provided. No residential accommodation is permitted on site.

6.3 SERVICES

6.3.1 Water

Piped raw water supply is available at both Cumnock and Yeoval. Make arrangements with Council for purchase of water and connection of water supply to the Contractor's facilities.

Install and maintain all necessary pipes and equipment to supply water to the Contractor's facilities and the works. On completion, disconnect and remove temporary services.

6.3.2 Electricity

Main electricity supply is currently available in Cumnock and Yeoval.

Arrange with relevant energy authority for provision, distribution and maintenance of the temporary services necessary for execution of the Work under the Contract, or use portable generators. On completion, disconnect and remove temporary services, including temporary poles and cables etc.

6.3.3 Telecommunication

Make arrangements with Telstra or any other service provider for all lines needed for construction purposes, or use mobile facilities. On completion, disconnect and remove temporary services, including temporary poles and cables etc.

6.3.4 Waste Water/Sewerage Disposal

Install and maintain all necessary services. Obtain necessary approvals for the disposal of wastewater to Council requirements. On completion, disconnect and remove all traces.

6.3.5 Garbage Disposal

Disposal of garbage or other putrescent rubbish from the Contractor's activities on or around the site is not permitted. Make arrangements with Council for disposal off-site to an approved Waste Disposal Centre.

6.3.6 Demobilisation

Upon completion of the Works, disconnect and remove all temporary services, clear away all traces and restore areas in accordance with this Specification.

6.3.7 Use of facilities

The Principal's Authorised Person must be given full and free use of all services and of ablution and sanitary facilities provided by the Contractor for the Contractor's employees.

7 SECURITY

Provide and maintain security by means of fences, gates or other approved methods to exclude the general public and other personnel from the Works area at all times for the period of the Contract or until the particular Works are handed over to the Principal. Provide for the security of all materials, plant and equipment on the site. The Contractor shall take responsibility for the security of all materials equipment, components and other property, whether incorporated in the Works or not, until the Works are handed over to the Principal at Practical Completion.

Provide keys of all security gates to the Principal's Authorised Person and ensure free access for authorised personnel at all times for operation or maintenance of the facilities.

8 SURVEY & SETTING OUT

The Contractor shall set out the works as shown in the drawings and to the following requirements. Do not commence clearing and excavation works until the approval from the Principal has been granted.

The alignment of the pipelines is shown in the drawings. There are a few areas where the pipeline alignment runs close to trees and/or sites with potential Aboriginal heritage significance. Refer to Sub Section 2 – Pipelines, drawings and REF report for details. During the setting out work, the Contractor shall liaise with the Principal's Authorised Person and slightly deviate the pipeline at those locations as necessary. It is recommended that the Contractor undertake a joint inspection with the Principal's Authorised Person prior to and after carrying out setting out works.

Initial, intermediate, checking, final surveys and any other survey required to execute the work shall be carried out by the Contractor.

8.1 LOCATION OF EXISTING SERVICES

It shall be noted that the locations of all existing water pipes, sewer pipes, stormwater pipes, Telstra and other services shown in the survey plans may be approximate. Some of the existing services may not be shown on the Drawings. The Contractor shall verify all existing services with relevant authorities.

The Contractor shall take every precaution to prevent damage to existing services. If, however, a service is damaged, the Contractor shall notify the responsible person or Authority immediately and take appropriate action to repair the damage with the approval of the Principal and the relevant authority. The Contractor must meet all costs involved in repairing such damages if it is proven that the damage is due to the negligence of the Contractor.

9 VIDEO RECORD OF SITE WORKS

Prepare a detailed video record of all stages of site works and all areas, which will be affected by construction including stockpile, storage areas and access tracks. This will provide a record, including all damages and defects, of the site prior to construction activities.

The video shall be in MP3 format saved in USBs and include appropriate commentary. The date of the recording is to be displayed on the screen at all times. The commentary shall include, but not limited to:

- Appropriate identification of the site existing and new structures during construction, updates and restoration under this Contract.

- Condition prior to construction works, during construction and at completion.
- Any specialised construction works such as pressure testing, disinfection, connecting to existing pipelines etc.

Index shall be supplied together with each USB so that areas can be identified.

Complete the video for the initial condition and supply all USBs with index to the Principal prior to commencing any work on the site.

Provide additional video records as work proceeds and at the completion.

10 MATERIAL AND EQUIPMENT

10.1 TEMPORARY STORAGE OF MATERIALS

Materials shall be stored so as to ensure the preservation of their quality and fitness for the Work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surface, and not on the ground, and/or they shall be placed undercover. Stored materials shall be located so as to facilitate easy inspection. Private property shall not be used for storage purposes without the written permission of the property owner or lessee.

10.2 LABELS

All equipment such as valves and instruments installed under this contract shall be identified using traffolyte labels with black lettering engraved on a white background. Labels exposed to the weather shall be engraved brass infilled with black paint.

Labels shall be screwed to equipment or walls with Type 304 stainless steel screws. Minimum size of lettering shall be 10 mm high.

11 ENVIRONMENTAL MANAGEMENT

11.1 GENERAL

11.1.1 Requirement

A Review of Environmental Factors (REF) has been prepared for the Works. The REF (titled below) is attached to Appendix 2 of this tender document.

- Cumnock & Yeoval Water Reticulation Upgrades, Review of Environmental Factors, Report Number DC17011, prepared by Public Works Advisory, February 2017.

The mitigation strategies recommended in the REF shall be adopted by the Contractor during the construction works. The Contractor shall provide measures and employ methods that will protect and minimise impacts on the existing environments from site activities during construction.

The Contractor shall prepare a Construction Environmental Management Plan (CEMP) and obtain necessary approvals as specified in this specification and the REF.

11.2 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

11.2.1 Requirement

The Contractor shall prepare a Construction Environmental Management Plan (CEMP) in accordance with the requirements of this Specification, REF, all relevant Acts and Regulations, and accepted best practice management procedures before commencing any work on site.

Submit the CEMP to the relevant authorities for approvals, licences or permits for construction. Provide copies of correspondence with relevant authorities within three (3) working days of transmittal or receipt of the same. The CEMP must:

- Cover specific environmental management strategies and objectives;
- Define the role, responsibility and authority of all personnel involved;
- Define reporting and recording systems;
- Define training requirements for all personnel involved in the contract to ensure compliance with the CEMP;
- Define monitoring and inspection requirements for all environmental elements and activities associated with the contract. This shall include, but not limited to, procedures, protocols (i.e. frequency and location), specific testing and performance criteria;
- Define non-compliance and remediation requirements;
- Include response plans for dealing with accidents and other non-conformances during the contract; and
- List all statutory obligations as well as any other obligations required.

Specific environmental elements to be addressed in the CEMP shall include, but not be limited to:

– Noise;
– Heritage;
– Traffic and access;
– Waste management;
– Flora and fauna;
– Air quality; and
– Water quality.

12 SOIL AND WATER MANAGEMENT

12.1 DISPOSAL OF PUMPED WATERS

The Contractor shall observe relevant authorities and Council conditions and licensing requirements. Incorporate silt traps and protect stormwater and open drains from entry of silt, spoil and other materials.

Direct water pumped from excavated trenches through sediment filters to undisturbed ground and dispose in an acceptable manner.

12.2 CONTAMINATION

Prevent contamination of waterways and other lands. If contamination occurs, notify the Principal, the Council and other relevant authorities and comply with their requirements. Make good any damage.

12.2.1 Contaminated Soil

Imported material shall not contain any weeds or organic material. Clear any noxious weeds identified. Poison weeds in accordance with Council's requirements. Do not transport contaminated soil off the site.

12.3 CLEANING OF ROAD PAVEMENTS

Prevent excavated and other material from deposition on roadways. Ensure roads are left clean at the end of every working day.

12.4 ACCESS TRACKS

Where an access track is to be constructed, the finished surface level should be similar to the adjacent ground levels. Construction should encourage run off to sheet across the track where there is natural side slop and not be concentrated or diverted by the track.

Do not form new access tracks without informing the Principal.

13 EROSION AND SEDIMENTATION CONTROL

The Contractor shall prepare an Erosion and Sediment Control Plan (ESCP) by an accredited erosion and sediment control specialist in general conformance with *Managing Urban Stormwater, Soils and Construction* (Landcom 2004) and obtain necessary approvals prior to commencement of construction work.

In the ESCP, specific erosion and sedimentation control measures shall be included for all work areas encompassing diversion channels and drains, table drains and roadway shoulders, diversionary works and revegetation and stabilisation of steep slopes using hydraulic seeding and mulching, and the revegetation program for all areas incorporating native trees and shrubs.

The Contractor shall:

- plan and carry out the whole of the Works to avoid unnecessary disturbance to the ground surface which would lead to erosion and sedimentation of the site, surrounding country, watercourses, drainage systems and water bodies

- Comply with the requirements of the Protection of the Environment Operations Act 1997, the Rivers and Foreshores Improvement Act 1948, Water Management Act 2000, the Soil Conservation Act 1938 and the Water Act 1912.

Areas requiring erosion and sediment control measures shall include:-

- Construction areas including pipeline corridors;

- Access and haulage tracks;

- Stockpile and storage areas;

- Spoil disposal areas (both on-site and off-site);

- Compound areas, such as Contractor's facilities and pipe and material storage areas.

Soil erosion, sedimentation controls and stormwater management must be planned and applied before the proposed construction activity, and be maintained properly throughout the construction period until the site has been fully stabilised.

Temporary control measures shall be removed by the Contractor when revegetation has established to the specified cover on formerly exposed areas and the site is stable. All materials used therein shall be removed from the site and disposed by the Contractor.

14 FIRE CONTROL

14.1 SCOPE

Comply with all regulations in force regarding fire protection. Establish suitable procedures for the prevention and warning of fire outbreaks caused by the Contractor. Extinguish any fires caused by the execution of the Works.

14.2 TRAINED PERSONNEL AND EQUIPMENT

Have suitable equipment and trained personnel ready at all times for use in the prevention and extinguishing of any fires.

14.3 PERMISSION TO BURN

Burning of trees and vegetation is not permitted.

If any burning is required, permits shall be obtained from the appropriate Statutory Authorities prior to burning of any combustible materials. Under no circumstances light fires during any period of prohibition which has been gazetted for the particular area under the provisions of the Rural Fires Act 1997.

If any burning is required, it shall be conducted, with permission, in a manner so as not to affect existing vegetation.

15 DUST CONTROL

15.1 DUST SUPPRESSION

The Contractor shall employ construction methods that will keep the dust pollution to a minimum and apply measures including those listed below, as required, to ensure that airborne pollutants from the Contractor's activities do not cause undue disruption or inconvenience in the vicinity of the Works:

(a) the spraying of earthwork formations and foundations with water or other suitable liquids approved by the Principal;

(b) the removal of mud from the wheels and bodies of haulage equipment before it enters public roads or other sealed pavements by means of facilities such as truck wash downs and wheel washes;

(c) the removal of mud spilt by construction equipment on to public roads or other sealed pavements;

(d) the establishment of suitable cover crop or provision of other covering over topsoil stockpiles;

(e) the erection of dust screens around and/or spraying of stockpiles with suitable stabilising agents;

(f) fitting rock drilling equipment with dust collection devices;

(g) cease dust generating activities which cannot be adequately controlled by water or other means;

(h) maintaining dust control equipment so that this equipment is available when required including periods of dust generating activities or high wind speed, and

(i) undertaking periodic visual checks of exhaust systems emissions.

16 RESTORATION WORKS

All areas disturbed from the construction works shall be restored as per the following specification.

Remove temporary works including all debris, rocks and the like from areas where temporary works occupied. Deep rip disturbed works areas to a depth of at least 150mm, except where the area is a levee crest or batter.

Obtain topsoil from stockpiles. If sufficient topsoil is not available from these sources, import additional weeds free topsoil as required from an approved source. Spread topsoil over the area to a depth of 150mm on flat areas and 40-60mm on slopes.

Trim topsoil so placed to a uniform surface such that runoff is not concentrated and ponding does not occur. Tyne, harrow or disc topsoil to loosen all surfaces to a depth of 50mm immediately prior to seeding.

Apply fertiliser (Starter 12/15) over the area to be seeded evenly at a rate of 200kg/ha. Apply a suitable seed mixture to existing grass. Check with Council regarding seed mixtures applicable to the area.

The Contractor is responsible for the proper establishment and continue watering, reseeding of bare patches where necessary and general maintenance of all grassed and erosion controlled surfaces until the end of the Defects Liability Period.

17 QUALITY ASSURANCE REQUIREMENTS

Arrange Witness and Hold Points so that all inspections for the Witness and Hold Points can be completed by the Principal's Authorised Person by 4.30 pm, unless otherwise agreed and arranged. Provide at least 7 days notice to the Principal's Authorised Person to arrange technical specialists.

The points listed below shall be included in the Inspection and Test Plans. Include additional "Hold" and "Witness" Points which are considered necessary for the Contractor's verification such as mandatory inspections by Statutory Authorities. Further details are given in PRELIMINARIES, QUALITY ASSURANCE.

Table 1 – Quality Assurance Requirements

Activity Requiring Inspection and Test Plan	**Stage of Work Requiring Inspection or Test**	**H or W Point (for Attendance by Principal's Authorised Person)**
GENERAL (FOR ALL SITES)		
WHS Plan; QA Requirement, Erosion and Sediment Control Plan; Environmental Management, Traffic Management	Prepare Safe Work Method Statement, CEMP, Safety Plan, Inspection and Test Plan and ERSC Plan, Traffic Management Plan	H
Potential Asbestos Management	Asbestos Management Plan	H
Environmental protection	Environmental measures in place prior to commencement of physical works	H

PIPELINES		
Setting out	After setting out	H
Bedding material	Product certificates	H
Pipe laying	Completion of excavation/ Prior to laying pipes	W
Installation	Random inspections during installation	W
Pressure testing	Random inspections during installation Test certificates	W H
Disinfection of new pipelines	Random inspections during installation Test certificates	W H
Cleaning and flushing of existing pipelines	Submission of flushing program Cleaning and flushing of each section	H W

GENERAL (FOR ALL SITES)		
Video record of site of works	Pre-development condition All works carried out on site	W W
Final disinfection	Water quality testing at various location of the reticulation	H
WAE Drawings	Within four weeks after each work completed	W
Completion of contract	Site restoration Final inspection (11th month after completion)	W H

(Note: Further hold and witness points may be specified in individual sub sections. Principal's Authorised Person may add, omit or amend the above schedule)

18 WORK-AS-EXECUTED DRAWINGS

All drawings forming part of this contract (drawings submitted by the Principal and drawings produced by the Contractor), after completion of construction and installation, shall be amended by the Contractor to show in detail the "work-as-executed" condition. Amendments necessary to depict "work-as-executed" details shall be carefully and accurately prepared. Maintain an up-to-date set of drawings of the works which show the work-as-executed details as construction of each item has been completed. Submit draft digital drawings in PDF format within two (2) weeks of completion of each area of work. Submit final work-as-executed drawings three (3) weeks after receiving feedback from Principal's Authorised Person.

Final Work-as-Executed drawings shall be in PDF and AutoCad (*.dwg) and *.dxf formats.

Drawings are to be clearly drawn to scale by certificated draftspersons. Drawings shall specifically relate to this project. Drawings of a generalised nature applicable to a number of models or equipment types are not acceptable.

Submit drawings with border and title block layouts similar to the contract drawings provided.

END OF SUB SECTION 1 – GENERAL REQUIREMENTS

SUB SECTION 2 - PIPELINES

This is a blank page to facilitate double sided copying/printing

CONTENTS

1 EXTENT OF WORKS

This Sub Section provides specification for all pipelines in this Contract.

The Works covered in this sub section comprise the supply of all plant, labour and materials and installation of all pipelines in this Contract. Pipe laying includes verification of utilities, setting out, excavation, bedding, supply, laying, jointing, backfilling, compacting, testing, disinfection and restoration.

The following pipelines shall be constructed under this Contract:

- Reticulation main from Yeoval Reservoir to Yeoval town. This pipeline shall be a 0.96 km long DN200 PVC-M pipeline.

- Reticulation pipelines at various locations within Cumnock town. The new pipelines shall be DN100 PVC-M pipes and have a total length of approximately 1.1 km.

- Reticulation pipelines at various locations within Yeoval town. The new pipelines shall consist of 2.5 km of DN100 PVC-M pipes and 0.5 km of DN150 PVC-M pipes.

- All the above pipelines shall consist of all accessories (such as bends, tees, isolation valves, hydrants, special fittings, concrete pits, thrust blocks etc.) necessary for the proper completion of the pipelines as specified in this specification and drawings.

In addition to the above, flushing and disinfection of the existing reticulation pipelines at Cumnock and Yeoval, as well as the flushing and re-disinfection of the newly connected pipelines, is also included in this Contract.

2 STANDARDS

The following standard specifications are applicable to this contract.

1. AS 4765 - Modified PVC (PVC-M) pipes for pressure applications
2. AS 2280 - Ductile iron pipes and fittings
3. AS 4087 - Metallic flanges for waterworks purposes
4. AS 1646 - Elastomeric seals for waterworks purposes
5. AS 2566 - Buried flexible pipelines
6. AS 2638 - Gate valves for water works purposes
7. AS 9352 - Spring hydrant valve for waterworks purposes
8. Water Services Specification, issue 3 Rev 0 June 2000 (WS-SPEC)
9. Water Supply Code of Australia, 2011 (WSA 03)
10. Other standards and codes referred throughout in this specification.

3 PIPES AND FITTINGS - SUPPLY

3.1 GENERAL

The following pipes and fittings are suitable for this project.

- All pipelines shall be PVC-M pressure class 16 with rubber ring joints.

- DICL fittings shall be used for bends, and installation of isolation valves and other specials. Buried DICL pipes and fittings shall be wrapped with polyethylene sleeving. DICL pipes and fittings shall be PN16.

- Tee connections between the new PVC-M reticulation pipelines and the existing Asbestos Cement (AC) pipes shall be made with Stainless Steel Tapped Offtake Clamps 2P, manufactured by Cadia Group, Orange.

- All flanges to be PN16. Bolts, nuts and washers for flanged joints shall comply with the relevant Australian Standard requirements.

3.2 PVC-M PIPES

To AS 4765, WS SPEC - SP4 and the following:

INFORMATION TO BE SUPPLIED	**PROJECT REQUIREMENTS (*See Practices Table of Sections SP4 & SP15)**
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	*Potable water, pressure pipes*
Series 1 (metric) or Series 2 (cast iron OD)	*Series 2*
Pipes - Nominal size(s) - Class(es) - Type (s)	 *As shown in drawings* *As stated in Section 3.1* *Rubber ring joints*
Fittings - Type (pressure, non-pressure) - Nominal size(s) - Class(es) - Types	 *Not applicable. DICL fittings to be used*
Elastomeric seal material and lubricant	*Required*
Bactericidal lubricant	*Not required*
Acceptable Product Verification Report	*Manufacturers without Product Cert. to supply*
Certification of Compliance, to Section SP4	*Manufacturer to supply*

3.3 ELASTOMERIC SEALS

To WS SPEC - SP15 and the following:

INFORMATION TO BE SUPPLIED	**PROJECT REQUIREMENTS (* See Practices Table of Section SP15)**
Elastomers - Material - Type - Hardness - Profile	 *Natural rubber to AS 1646* *To pipe and fitting manufacturer's details* *ditto* *ditto*
Root inhibitor	*Not required*
Acceptable Product Verification Report	*Manufacturers without Product Cert. to supply*
Certificate of Compliance, to Section SP15	*Manufacturer to supply*

3.4 DICL PIPES AND FITTINGS (FOR SPECIAL APPLICATIONS)

To AS 2280, and WS-SPEC SP2 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (* See Practices Table of Sections SP2 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	*Pressure, potable water*
Pipes - Nominal size(s) - Class(es) - Jointing - Coating and lining	 *Refer to drawings* *Fitting to be PN16 or Flanged class.* *Flanged or socketed joints as required* *Internally cement lining; externally bitumen coating or synthetic resin base coating*
Fittings - Nominal size(s) - Class(es) - Type and jointing - Coating and lining	 *As shown in drawings* *Flanged class. PN16 flanges to AS 4078* *Flanged or socketed joints as shown in drawings* *Internally cement lining or thermal bonded polymeric coating; Externally bitumen coating or synthetic resin base coating or thermal bonded polymeric coating*
Flanged joint bolting selection (excl valves)	*Hot dip galvanised*
Flange gaskets, O-rings and lubricant	*Required*
Bactericidal lubricant	*Not required*
Polyethylene sleeving	*Required for buried pipes and fittings*
Adhesive tape, straps and buckles	*Required*
Hydrostatic testing of fittings	*Required*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP2	Manufacturer to supply

4 VALVES AND HYDRANTS - SUPPLY

4.1 GENERAL

The valves shall be supplied in accordance with WS-SPEC requirements or with the appropriate Australian Standard requirements if not covered by WS-SPEC. All valves shall be suitable for the function intended and shall be in accordance with the following requirements:

- All isolation valves shall be resilient seated flanged gate valves PN16. Resilient seats shall be easily replaceable. Spindle valves shall be clockwise closing. Refer to Clause 4.2 for product specification.

- Hydrants shall be DN80 “spring type” manufactured in accordance with AS 3952 and installed in accordance with AS 2419.2. Supply of hydrants shall comply with the requirements of WS-SPEC SP28.

- All bolts on bonnets and glands shall be stainless steel Grade 316, with Grade 304 nuts and washers.

- Do not chip away or reduce the cement lining in pipes to provide clearance for valves, discs or working parts of valves.
- Valve flanges shall be PN16 to AS 4087. Flange gaskets are required.

4.2 GATE VALVES

To WS-SPEC SP2 and the following:

INFORMATION TO BE SUPPLIED (See AS 2638.2)	**PROJECT REQUIREMENTS (*See Practices Table of Sections SP21 & SP30)**
Valve size(s), class(es) and flange class(es)	*As specified in drawings, Class 16, flanges – PN16 to AS4087*
Materials: - Body and bonnet - Steel retainer - Wedge core (and encapsulation) - Stem - Gear box housing	 *DI AS 1831 400-12 minimum* *Gunmetal AS 1565 C83600* *DI AS 1831 400-12 or Gunmetal AS 1565 C83600* *Not required*
Closure direction	*Clockwise*
Flanged joint bolting selection (fasteners)	*SS 316 ASTM A276*
Coatings	*nylon coated*
Additional testing	-
Acceptable Product Verification Report	*Manufacturers without Product Cert. to supply*
Flange gaskets, O-rings and lubricants	*Rubber AS 1646*
Bactericidal lubricant	*Not required*
Type Test Results	*If no Aust. Std., manufacturer to supply*
Certificate of Compliance, to Section SP21	*Manufacturer to supply*
Test Certificate of Results, obtained to establish compliance to Section SP21	*If no Aust. Std., manufacturer to supply*

4.3 HYDRANTS

To WS-SPEC SP28 and the following:

INFORMATION TO BE SUPPLIED	**PROJECT REQUIREMENTS**

(See AS 3952)	(*See Practices Table of Sections SP28 & SP30)
Class(es) and flange class(es)	*As shown in drawings, flanges to be PN16.*
Materials: - Body - Yoke - Dome - Resilient seal	*The minimum material requirements for the hydrant components are:* *Ductile cast iron to AS 1831. Minimum grade 400-12.* *Ductile cast iron to AS 1831. Minimum grade 400-12.* *Copper alloy to AS 1568. Minimum grade C48600.* *Synthetic elastomer to AS 1646. Minimum grade EPDM 67-73 IRHD.*
Flanged joint bolting selection (fasteners)	*Stainless steel to ASTM A276. Fasteners to have a minimum grade of 316.*
Flange gaskets, O-rings and lubricant	*To AS 4087*
Bactericidal lubricant	*Not required*
Coatings	*Internal and external surfaces of the body and yoke shall be coated with a polymeric coating in accordance with AS/NZS 4158. Surfaces that cannot be coated and tested shall be of corrosion-resistant material.*
Additional testing	*Testing to comply with AS 3952.*
Acceptable Product Verification Report	*Manufacturers without Product Cert. to supply*
Type Test Results	*If no Aust. Std., manufacturer to supply*
Certificate of Compliance, to Section SP28	*Manufacturer to supply*
Test Certificate of Results, obtained to establish compliance to Section SP28	*If no Aust. Std., manufacturer to supply*

4.4 COUPLINGS

Couplings and dismantling joints shall be used where shown in the drawings or as required. These fittings shall be suitable for pressure class PN16.

4.5 HYDROSTATIC AND PERFORMANCE TESTING OF VALVES

Hydrostatic and performance testing of gate valves shall be carried out at the manufacturer's works, in accordance with the test requirements and test pressures nominated in AS 2638 and AS 4794 respectively.

Each valve shall be supplied complete with a test certificate. The certificates shall be signed by an approved authority and shall include the test results (e.g. hydrostatic test pressures).

If testing is not carried as per the specified requirements or the results do not satisfy the specified requirements, the valve will be rejected. The Contractor shall arrange for re-testing or replace with another valve which complies with this Specification.

5 PRESSURE PIPELINE INSTALLATION

5.1 GENERAL

Pipeline installation shall be carried out in accordance with the following:

Contractor's work includes:

- Undertaking all pre-construction works, carrying out temporary works, locating and verifying all existing services and setting out including minor adjustments to the pipeline alignment where required.
- Clearing of the line, barricading, excavating the trench in all classes of material including rock of all hardness and freshness, trench supports and dewatering, supply and installation of pipeline, backfilling of the trench including selected backfill and supply bedding materials, compaction of the bedding and backfilling, testing, disinfection, disposal of cleared vegetation, rubbish and surplus excavated material and restoration of surfaces.
- Construction/provision of thrust and anchor blocks, pipeline supports such as trenchstops and bulkheads, polyethylene sleeving and corrosion protection of fittings and joints.
- Installation of associated fittings and specials such as isolation valves, hydrants etc. with necessary valve pits and surface boxes.
- Connection of the new pipelines to existing pipelines.
- Supply and installation of indicator posts, direction change posts and marker plates.
- Other minor works associated with pipeline construction for the proper completion of the system.

Setting Out

Setting out of all works shall be carried out by the Contractor in consultation with the Principal.

The Contractor shall verify all services along the pipeline corridors by means of vacuum excavation, using metal detectors, probing or by any other means. Inform the Principal if any of the existing services overlap with the pipeline construction. Determine the depth of the existing services that will cross the new pipeline prior to commencement of the excavation.

Peg the entire pipeline at all bends, inter-connections, hydrant points, valves and at 200m spacing or shorter spacing if any two adjoining pegs are not visible to each other. Inform the Principal after pegging all pipelines so that the Principal's Authorised Person will undertake additional inspection and grant approval so that the construction work could commence.

Provide all labour, materials and other assistance that the Principal may require at any time to check the setting out of the works or to make progress measurements.

Some pipelines may require local deviation. Refer to Clause 5.3.

Excavation

Carry out pipeline excavation in accordance with WS SPEC - TR 12.

Necessary erosion preventive measures shall be put in place during and after construction to prevent eroding or washing away the excavated material or backfilled trenches.

Trees shall not be removed unless required for the permanent works. Refer to REF for details.

Rock Excavation

Rock may be encountered in some locations. The Contractor shall refer to geotechnical investigation report and use appropriate machinery. The geotechnical investigation report is attached to this tender document.

Pipe Laying

Install pressure pipelines in compliance with WS SPEC - TR13 and the following:

INFORMATION TO BE SUPPLIED		**PROJECT REQUIREMENTS**
SECTION TR13	**CLAUSE**	**DETAILS**
Pipe and fitting materials and sizes	3.1	*Refer to drawings*
Valve types and sizes	3.1	*Refer to drawings and Clause 3.1 of this sub Section*
Markings and marker tape	5.13	*Required*
Flange joint bolting and accessories not elsewhere supplied (eg pipes, valves)	3.1	*Hot dip galvanised steel*
Corrosion protection systems	5.6	*Buried DICL pipelines to be wrapped with polyethylene. Buried couplings and flange joints shall be wrapped with adhesive tapes.*
Geotechnical	-	*Geotechnical investigation report is attached to this tender document*
Embedment details - pipeline minimum covers - bedding minimum thicknesses - clearance minimum widths - overlay minimum thicknesses - embedment materials - trench fill materials		*To WS SPEC TR13*
Service connections	5.11	*Not required*
Pipe supports		*Required as shown in drawings*
Thrust/anchor blocks	5.2	*Required as shown in drawings*
Trench stops and bulkheads	5.2	*Required as shown in drawings*
Field pressure testing	5.12	*Refer to drawings and this specification*

Provide and use drag scrapers or “detectors” to ensure that the interior of the pipeline is clean and free from obstructions. Timber or plugs shall be provided and used to prevent any material from entering sections of the pipeline, which are left incomplete overnight. Take all precautions necessary to prevent floating of pipes in flooded trenches.

In extremely wet conditions, place separation membrane such as Bidim U34, Terram 1000 UV or equivalents.

Pipe lengths shall be cut as needed or directed to suit closing lengths, to replace damaged parts, or to remove sockets if necessary when jointing to a socketed fitting.

In the case of pipelines with flexible joints, deflections at joints shall form gradual changes in grade or alignment. The manufacturer’s recommendations with respect to maximum deflection for each joint shall be complied with. No joint shall be angled to such an extent as to impair its effectiveness and tightness.

Existing Services

It should be noted that the locations of all existing water pipes, sewer pipes, stormwater pipes, telephone cables, electrical cables and services shown on the drawings may not be accurate. There may be other services which are not shown in the drawings. Prior to commencing any excavation work, the contractor shall contact the relevant service authorities and locate all the existing services accurately.

Take every precaution to prevent damage to existing services. If, however, a service is damaged, notify the responsible person or Authority.

Where an existing underground pipe or conduit or other service interferes with a new pipeline to be constructed under this contract, deviate the new pipeline in consultation with the Principal avoiding those services.

It has been assumed that all stop valves on the existing AC pipelines are Flange-Flange fittings. Allowance has also been made for the supply of a dismantling joint and construction of an anchor block at every point where the new pipeline connects to an existing AC pipe at a stop valve. If, however, these components are already installed on the stop valve, the Contractor shall verify that they are in good working condition before making new pipeline connections.

Isolation of Existing Services

The Contractor shall liaise with the Principal and make sure that the existing reticulation main from Yeoval reservoir to Yeoval town is isolated prior to the connection of the new reticulation main. The isolation can be made by closing the applicable valves.

Cover to Pipeline

The reticulation pipelines are generally expected to have a cover of 750 mm. However, the cover varies depending on the pipeline gradient and terrain. The reticulation main from Yeoval reservoir to Yeoval town shall be constructed in accordance with the longitudinal section provided in drawings 17/16033-P1 and 17/16033-P2.

During the setting out work, if it is noticed that the pipeline cover significantly differs to what is shown in the drawings, it shall be brought to the notice of the Principal who will give necessary instructions.

Bedding

Provide bedding material around the pipe evenly, ensuring a uniform support along the pipe barrel. Provide suitable chases in foundations and bedding to ensure pipes and fittings do not bear on sockets or flanges.

Supply, place and compact the bedding material in accordance with WS SPEC – TR13.

Pipe Joints Near Trees

Pipe joints near large trees shall be wrapped with adhesive tapes such as “Denso” to prevent possible ingress of tree roots. This should be done where large trees are within 2m of the pipeline.

5.2 SUPPORTS AND THRUST BLOCKS

Concrete Encasement

In an unavoidable case where the cover is less than 600 mm in trafficable areas or less than 450 mm in non-trafficable areas, the pipe should be encased with Grade 25 concrete for at least 150 mm above and below the pipe and 150 mm each side or the width of the trench, whichever is the greater. Concrete encasement shall be carried out in accordance with drawing WAT 1204 of WSA code.

Thrust Blocks

Thrust blocks shall be constructed for all bends, tapers, tees, valves and other locations where unbalanced forces are expected. All thrust blocks shall be capable of withstanding a pressure of 1200 kPa. Typical thrust block details are given in drawing 17/16033-P10. Dimensions for each thrust block shall be determined using these details considering the bend angle, sub surface conditions etc. at each location.

Thrust blocks shall be constructed of concrete Grade 25, reinforced as shown on the drawings, and cast against undisturbed soil. For “T” connections between existing AC pipes and PVC-M reticulation

pipes, thrust blocks shall be constructed on the existing AC lines immediately upstream and downstream of the Stainless Steel Tapped Offtake Clamp as shown in drawing 17/16033-P13.

Trench stops, bulkheads and anchor blocks

Trenchstops and bulkheads shall be provided for pipelines where gradient exceeds 5% and 15% respectively. Details of trench stops and bulkheads are given in TR 13 and Drg WAT-1209 of WSA code.

Anchor blocks shall be provided for isolation valves as shown in the drawings.

5.3 ABORIGINAL ARTEFACTS SITES AND SCARRED TREES

The pipelines may pass through areas with potential Aboriginal heritage significance. The Contractor shall take necessary precautions during construction of these pipelines. Refer to the REF report for details.

There are two areas where the pipeline alignment passes through potential sites of Aboriginal heritage significance. In these two areas, the pipeline alignment shall be deviated locally through disturbed areas as shown in drawing 17/16033-P3. The Contractor shall liaise with the Principal to confirm the final alignment of all pipelines in this Contract prior to the construction works.

5.4 PRIVATE AND PUBLIC PROPERTY

Where the Contractor finds it necessary to enter neighbouring property to gain access to the pipeline it shall be the Contractor's responsibility to gain the necessary permission from the affected owner.

Where any section of existing fence is temporarily removed to gain access to the site, a temporary gate shall be provided and kept closed at all times when not being used for access. Pipelaying across drive ways shall be completed as soon as possible. The Contractor shall inform the respective land owner prior to carrying out any excavation works across drive ways.

Prevent all unnecessary damage to private and public land and to any improvements on or about such land. All damages caused by the Contractor shall be made good by the Contractor’s expense. Prior to the issue of the Final Certificate the Contractor may be requested to furnish the Principal with declarations by affected property owners that restoration of damage has been satisfactorily completed.

Maintain in working order all improvements, which are affected by his activities. The Contractor shall also maintain access to all private and public properties where such access is affected by the Contractor's activities.

Restore at least to pre-existing condition of all land and improvements, which have been affected by his activities.

Improvements shall be deemed to include roads, fences, gates, crops, gardens, driveways and all other structures.

5.5 HANDLING OF PIPES AND OTHER MATERIALS

The methods used for handling, laying and stacking pipes, fittings, valves and other materials shall be such as to avoid damage to the pipes, pipe coating and lining, and to other material, and shall comply with any recommendations made by the manufacturer. Cranes, skids or other approved devices shall be provided and used to ensure that pipes are not dropped or bumped during loading, cartage, unloading or when being placed in the trench. Pipes shall not be lifted or suspended from hooks, lifting dogs, or other devices placed at their ends.

Rubber gaskets and PVC pipes shall be stored in a cool, dry place out of sunlight.

5.6 CORROSION PROTECTION

Corrosion protection systems for various pipes, fittings and valves materials are given in Clause ***CORROSION PROTECTION SYSTEMS*** on ***SECTION TR13*** of the ***WS-SPEC.***

Pipes:

- PVC, nil

Fittings (plain):

- DI/CI, CL-PS-PS (part)

Valves:

- DI/CI, TB-TB-PLT

5.7 PIPELINE CROSSINGS

Road Crossings

The pipeline crosses through a number of minor roads which are sealed or unsealed. All of these pipeline crossings shall be constructed via open trenching. Backfilling and restoration shall be carried out in accordance with Clause 5.10. The Contractor shall liaise with Council regarding pipelaying across minor roads and obtain their prior approval for the works.

5.8 TRANSMISSION LINES

No part of any excavation machine shall come within two (2) meters, measured horizontally, of any transmission line pole.

Any work in the vicinity of high voltage transmission lines must be carried out in accordance with the relevant supply authority.

5.9 TRAFFIC CONTROL

The Contractor shall prepare a traffic management plan for the construction works and submit to Cabonne Council or RMS, as appropriate, for their approval. The program shall indicate duration of road closures or partial road closures, management of traffic, proposed detours if required and other details related to traffic.

5.10 RESTORATION

Backfilling and Restoration of Roads and Access

Where the pipeline is excavated through road or road shoulder, backfill material shall be a mixture of sand and cement in the ratio of 27 parts sand to one part cement. The sand shall meet the requirements specified in the table below and mixed with the cement before being placed in the trench.

Sieve Size Aperture Width (AS 1152)	**Equivalent BS Sieve Size (BS 410)**	**Percentage Passing**
9.5 mm	3/8 inch	100
6.7 mm	1/4 inch	90-100
425 µm	No. 36	40-90
150 µm	No. 100	0-40

The sand cement material shall be supplied and compacted to the full depth of the trench.

Except for bitumen or concrete pavements, which are to be restored immediately after backfilling, restoration of surfaces and improvements shall be carried out within five (5) working days after trench backfilling.

Immediately after the backfilling of a trench excavated through a pavement has been completed, the pavement shall be restored to a trafficable condition.

For bitumen or concrete pavements, this initial restoration may be of a temporary nature, in which event a pre-mixed asphaltic material shall be used. Maintain temporary restoration until final restoration is carried out. Final restoration of the pavement shall be carried out to restore the pavement and its sub-base to the original condition or better. Final restoration shall include the removal of temporary restoration.

Final restoration of bitumen or concrete pavements shall be completed within one month after temporary restoration.

Where trenches are excavated through surfaces which are concrete or bitumen sealed, the pavement must be cut by saw or other approved method to provide a neat straight line free from broken edges.

Disturbed areas outside the pavements shall be restored in accordance with "Sub Section – General Requirements".

5.11 CONNECTIONS TO THE EXISTING SYSTEMS

All the new pipelines (after successful pressure testing and disinfection) shall be connected to the corresponding reticulation network as explained below.

If there is a hydrant at the end of the existing pipeline to which the new pipeline is to be connected, the hydrant shall be removed and re-installed using a Tee after connecting the new pipeline. Refer to drawing 17/16033-P12 for connection details.

If the new pipeline is to be connected to an existing AC pipeline as a "T", the connection shall be made using a "Stainless Steel Tapped Offtake Clamps 2P", manufactured by Cadia. Refer to drawing 17/16033-P13 for connection details. Necessary safety precautions and acceptable practices shall be adopted when dealing with asbestos pipes.

If the new pipeline is to be connected to an existing PVC pipeline as a "T", the connection shall be made using a standard PVC or DICL "T".

The proposed DN200 reticulation main pipeline in Yeoval shall be connected to the existing outlet pipelines of the Yeoval Reservoir as shown in drawing 17/16033-P7. All new pipes and fittings shown in drawing 17/16033-P7 shall be DICL.

All new connections shall be provided with isolation valves, anchor blocks and other fittings as shown in drawings. Prior approval from the Principal must be obtained prior to cutting into existing pipes.

5.12 HYDROSTATIC PRESSURE TESTING

Field testing of pressure pipelines shall be carried out in accordance with AS/NZS 2566.2.

The permissible leakage rate for the rising main and the reticulation main is given by the following formula:

Allowable loss rate (L/hr) = $1.4 \times 10^{-7} \times D \times L \times H$

where: D = pipe DN (mm)

L = pipeline length (m)

H = average test head (m) on section under test

Test progressively as the pipeline is installed. If the test is not successful, the Contractor shall repair, replace and re-test the pipeline. All the costs involved in pressure testing including supplying water shall be borne by the Contractor.

Ensure that the pipe work under test is fully isolated from pre-existing pipe work.

Test pressure for all the new pipelines is 1200 kPa. Supply test results (reports) to the Principal at the successful completion of each hydrostatic pressure test.

5.13 MARKER POSTS / TAPES

Provide location markers at 200 m spacing, at all isolation valves, air valves, scour valves, and change of pipeline direction. Erect markers prior to acceptance testing. Cover markers with tape until completion of acceptance testing or until the main is put into service, whichever occurs later. Supply and install markers in accordance with TR13. In areas where the pipeline runs within the access track, place maker posts outside the track indicating the off-set distance.

Provide marker tapes for pipelines in accordance with TR13.

6 FLUSHING AND DISINFECTION OF PIPELINES

The Contractor shall clean, flush and disinfect all the existing pipelines as per the following specification and requirements.

The requirements set forth in this specification specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of converting an existing raw water supply pipe network to supply potable water. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Principal's approval of any aspect of any operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorised under the Contract. If the Contractor’s method of disinfection deviates from the given specification, those deviations shall be clearly stated in the tender submission.

The information provided in the tender document may not sufficiently describe the existing pipe network and it is the Contractor’s responsibility to carry out further investigation as necessary for the selection of the appropriate methods.

Disinfection of the existing pipe network shall be done in two stages. All the existing pipelines shall be cleaned, flushed and disinfected prior to connecting new pipelines (this step is called “Stage 1”). After connecting the new pipelines, the entire system shall be tested by continuous flushing until the desired water quality is achieved everywhere in the network (Stage 2). The disinfection of the new pipelines shall be carried out as per clause 6 of this Section. Disposal of chlorinated water used for the disinfection shall be carried out in accordance with the guidelines given in Appendix C.

Disinfection of the existing pipelines – Stage 1

The existing pipelines have been conveying untreated water for over a period of 50 years and therefore may contain silts and other deposits. Prior to the Contractor’s disinfection process, the Council will make sure that internal plumbing of all consumers are disconnected from rainwater systems and would not have any cross connections with other water supply pipes. Council may also take necessary steps such as installing check valves at each consumer connection to prevent any potential contamination of the system through consumer connections as an additional precaution.

The Council will close all the consumer connections a day before the Contractors work, and will open a day after the completion of the disinfection process (both stages). Council will advise consumers to flush their internal pipework sufficiently with the new treated water prior to using water. It would be a requirement to boil water used for drinking purposes during the first week.

The Contractor may disinfect one or more pipeline segments at any time (a segment is defined as a pipeline section between inter-connections or isolation valves). The affected pipeline segment shall be isolated from the network using existing isolation valves prior to commencing the disinfection process.

The segment should be flushed with treated water until there is no change in the water quality in the segment. This should be confirmed by comparing the following water quality of the treated water used for flushing and the samples taken from the other end of the pipeline segment:

- Turbidity
- Colour
- Odour

Note: There can be situations where the water quality can slightly be changed due to chemical reactions within the treated water such as oxidising dissolved manganese in the treated water which can cause slight increase in colour and turbidity. It is assumed that the treated water supplied from the Molong WTP has already been settled by the time the water has reached the retic.

If the water quality deviates slightly from the above, the flushing should continue until the required quality is achieved. If the water quality deviates significantly, it may require swabbing which will be paid as a variation.

When all the test results are satisfactory, the system should be filled with water and sealed until the entire system is disinfected and new lines are connected.

Council may also collect water samples from random locations and test to verify the results.

Disinfection of the existing pipelines – Stage 2

After the successful disinfection of the entire existing network as well as the new pipelines, all the new pipelines shall be connected to the existing system. The combined system shall then be flushed with treated water from the reservoir or the feeding point (i.e. The Yeoval Reservoir for Yeoval network and the Trunk Main connection point at PRV location for Cumnock).

All the hydrants should be left opened for sufficient period (not less than 30 minutes) so that all impurities if any left over in the system to be flushed out.

Samples from all the hydrants located at the end of each line and from other intermediate hydrants shall be re-tested for the following water quality parameters.

- Turbidity
- Colour
- Odour
- E-coli

As E-coli sample require specific skills in water sampling, Council's water quality officer can help the contractor to collect samples.

The Principal may select additional points for testing at random locations. All the tests shall be performed by NATA accredited lab, preferably the NSW Health department's lab in Lidcombe. Contact details are:

Division of Analytical Laboratories

480 Weeroona Road

Lidcombe NSW 2141

Telephone: (02) 9646 0222

Fax: (02) 9646 0333

If the water quality at any particular location or a segment deviates significantly from the anticipated results, the particular segment shall be isolated, re- flushed and disinfected in order to bring the system to required level.

Tenderers shall outline the methodology of the disinfection process they intend to follow in the Tender.

END OF SUB SECTION – PIPELINES

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 6 – DRAWINGS

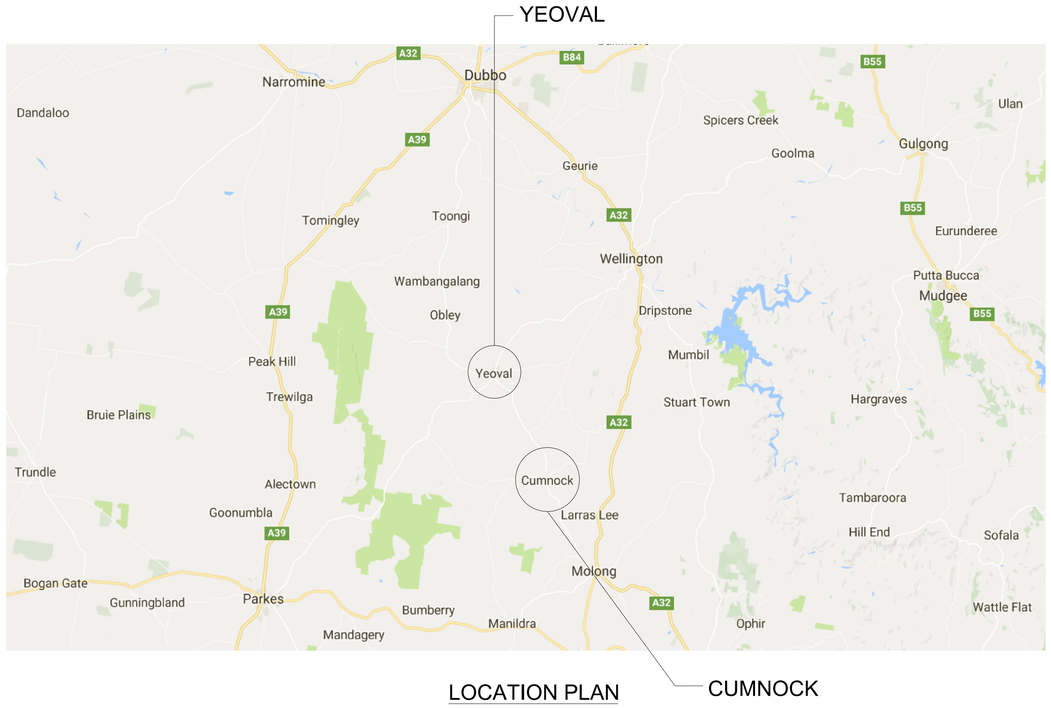
CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

CONTRACT NO. 957221

DRAWINGS

MARCH 2017

PROPOSED PIPELINE ROUTES AT YEOVAL



LOCATION PLAN

PROPOSED PIPELINE ROUTES AT CUMNOCK

DRAWING LIST

DRAWING NUMBER	TITLE
	GENERAL
	COVER PAGE
17/16033-G1	PROJECT LOCALITY PLAN AND LIST OF DRAWINGS
	YEOVAL
17/16033-P1	YEOVAL – LINE YSM ROUTE PLAN & LONGITUDINAL SECTION CH. 0.0 - CH. 664.5
17/16033-P2	YEOVAL – LINE YSM ROUTE PLAN & LONGITUDINAL SECTION CH. 664.5 - CH. 947.6
17/16033-P3	YEOVAL ROUTE PLAN – LINES 2A, 3A AND 4A
17/16033-P4	YEOVAL ROUTE PLAN – LINE 5A
17/16033-P5	YEOVAL ROUTE PLAN – LINES 6A AND part 8A
17/16033-P6	YEOVAL ROUTE PLAN – LINES 7A AND part 8A
17/16033-P7	CONNECTION DETAILS NEAR EXISTING YEOVAL RESERVOIR
	CUMNOCK
17/16033-P8	CUMNOCK ROUTE PLAN – LINES 3A AND 4A
17/16033-P9	CUMNOCK ROUTE PLAN – LINES 1A AND 2A
	OTHER DRAWINGS
17/16033-P10	THRUST BLOCKS DETAILS
17/16033-P11	PIPELINE TRENCH BACKFILL DETAILS
17/16033-P12	PROPOSED CONNECTION TO EXISTING LINE ENDING AT HYDRANT OR S.V.
17/16033-P13	PROPOSED TEE CONNECTION TO EXISTING LINE WITH AND WITHOUT HYDRANT

LIST OF DRAWINGS

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

PROJECT LOCALITY PLAN AND LIST OF DRAWINGS

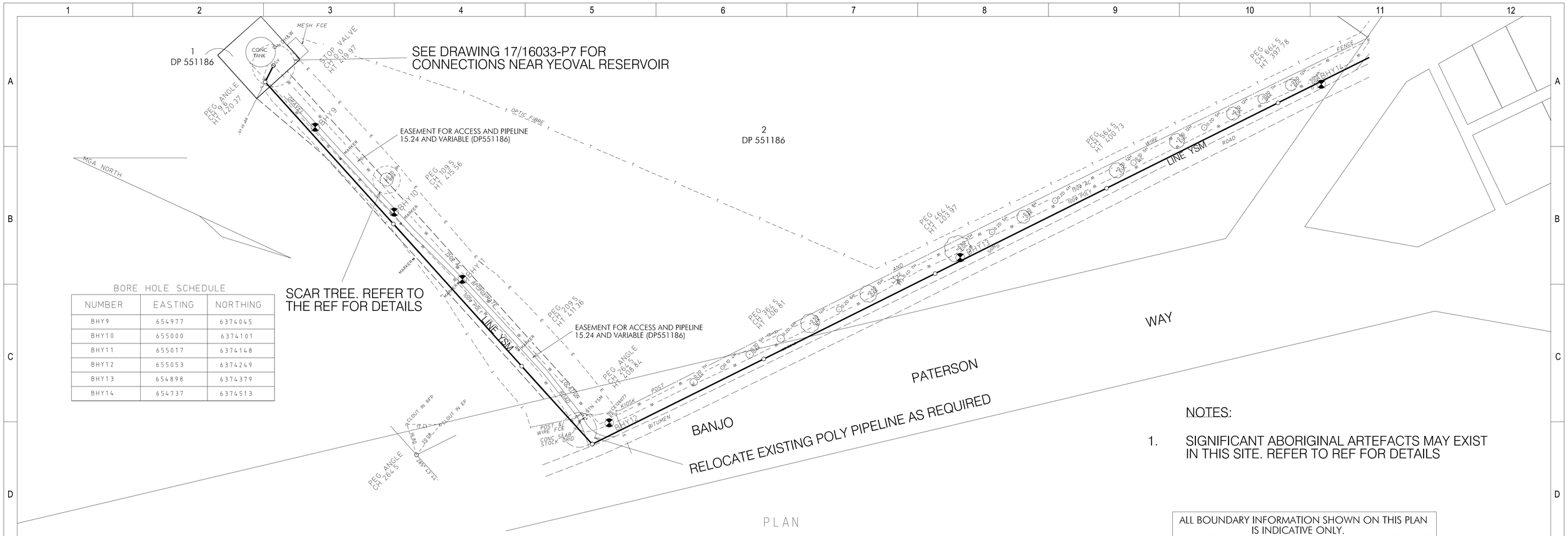
PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-G1 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

23/03/2017 11:42:25 AM \\Waterserv\Projects\Cabonne_SCIReltic-CumnockYeovalDes-2\4-Work_Drawings\17_16033_G1_LocalityPlan&ListofDrawings.dgn



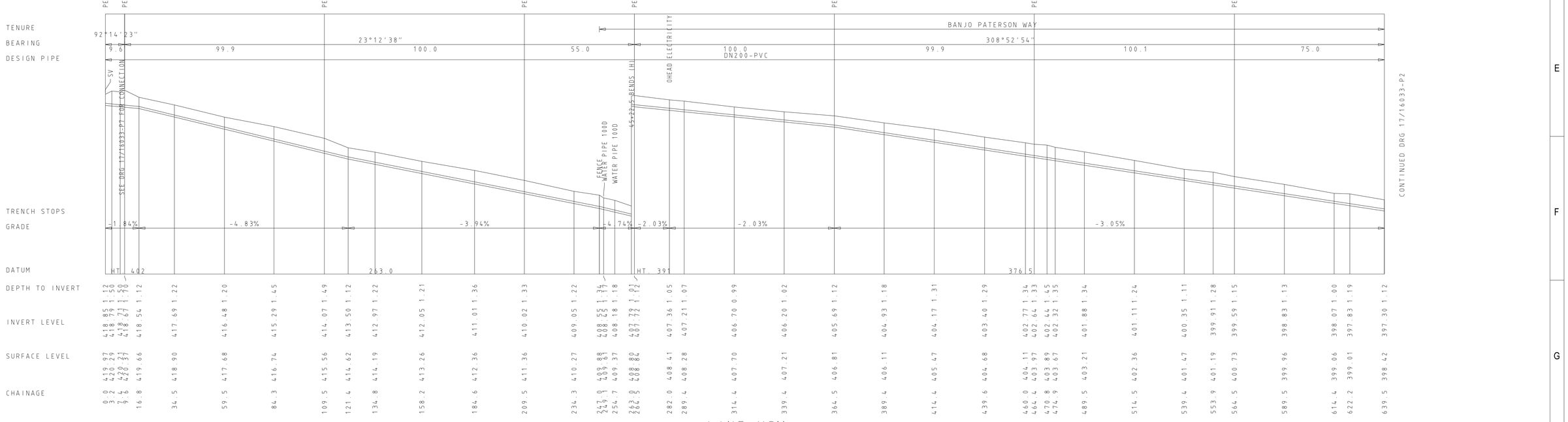
BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY9	654977	6374045
BHY10	655000	6374101
BHY11	655017	6374148
BHY12	655053	6374249
BHY13	654898	6374379
BHY14	654737	6374513

NOTES:

1. SIGNIFICANT ABORIGINAL ARTEFACTS MAY EXIST IN THIS SITE. REFER TO REF FOR DETAILS

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED



LINE YSM

LONGITUDINAL SECTION

1:200 V 0 4 8 12 16 20m
1:1000 H 4 2 0 20 40 60 80 100m
20 10

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - LINE YSM
ROUTE PLAN & LONGITUDINAL SECTION
CH.0.0 - CH.664.5

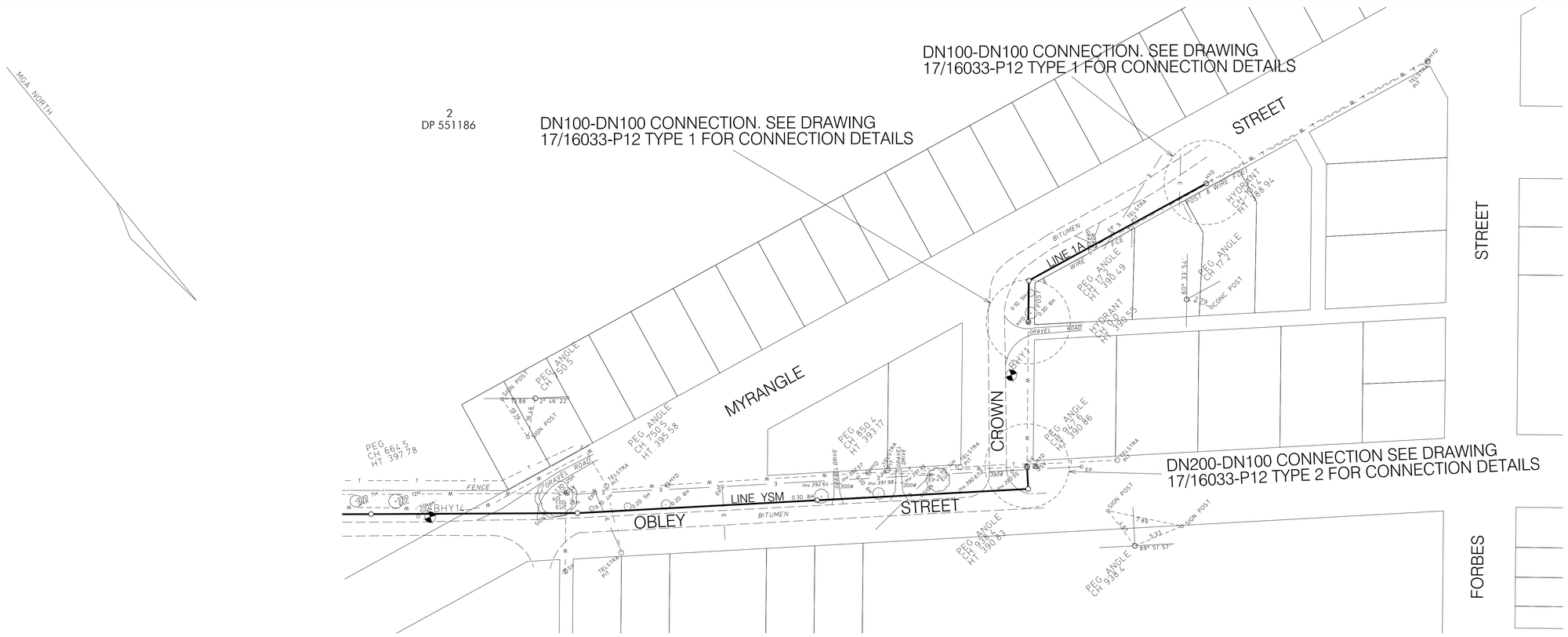
PROJECT/CONTRACT No.

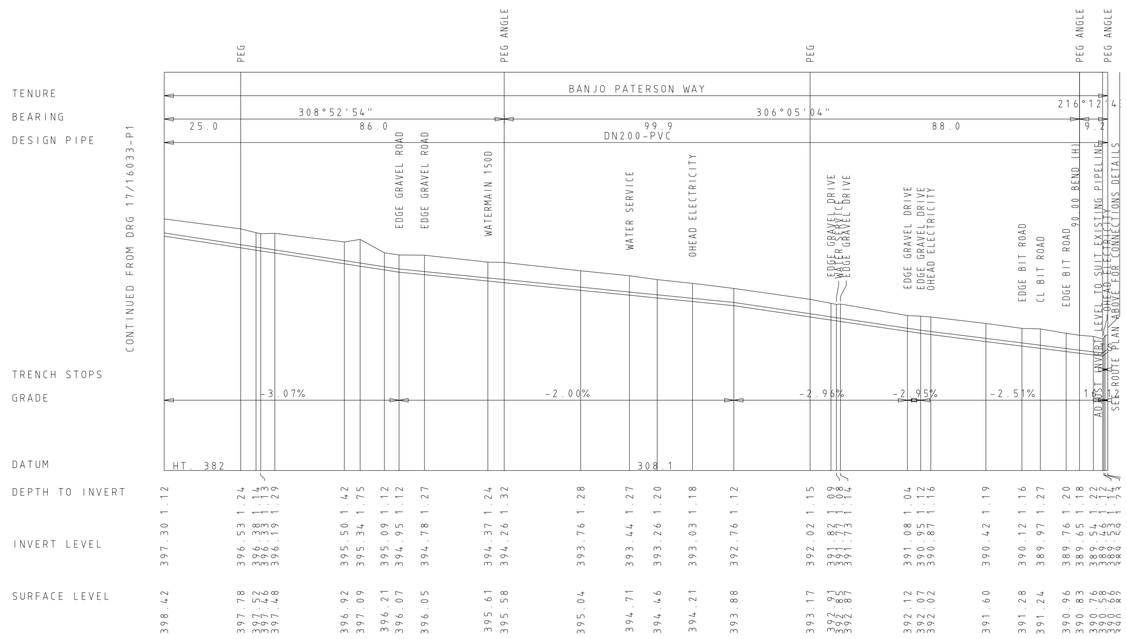
A1 SCALE @ A1

DRAWING No. 17/16033-P1

REV 0

CONFIRM SCALE 100mm ON A1 ORIGINAL





ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY1	654512	6374620
BHY14	654737	6374513

1:200 V 0 4 8 12 16 20m
1:1000 H 4 2 0 20 40 60 80 100m
20 10

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - LINE YSM
ROUTE PLAN & LONGITUDINAL SECTION
CH.664.5 - CH.947.6

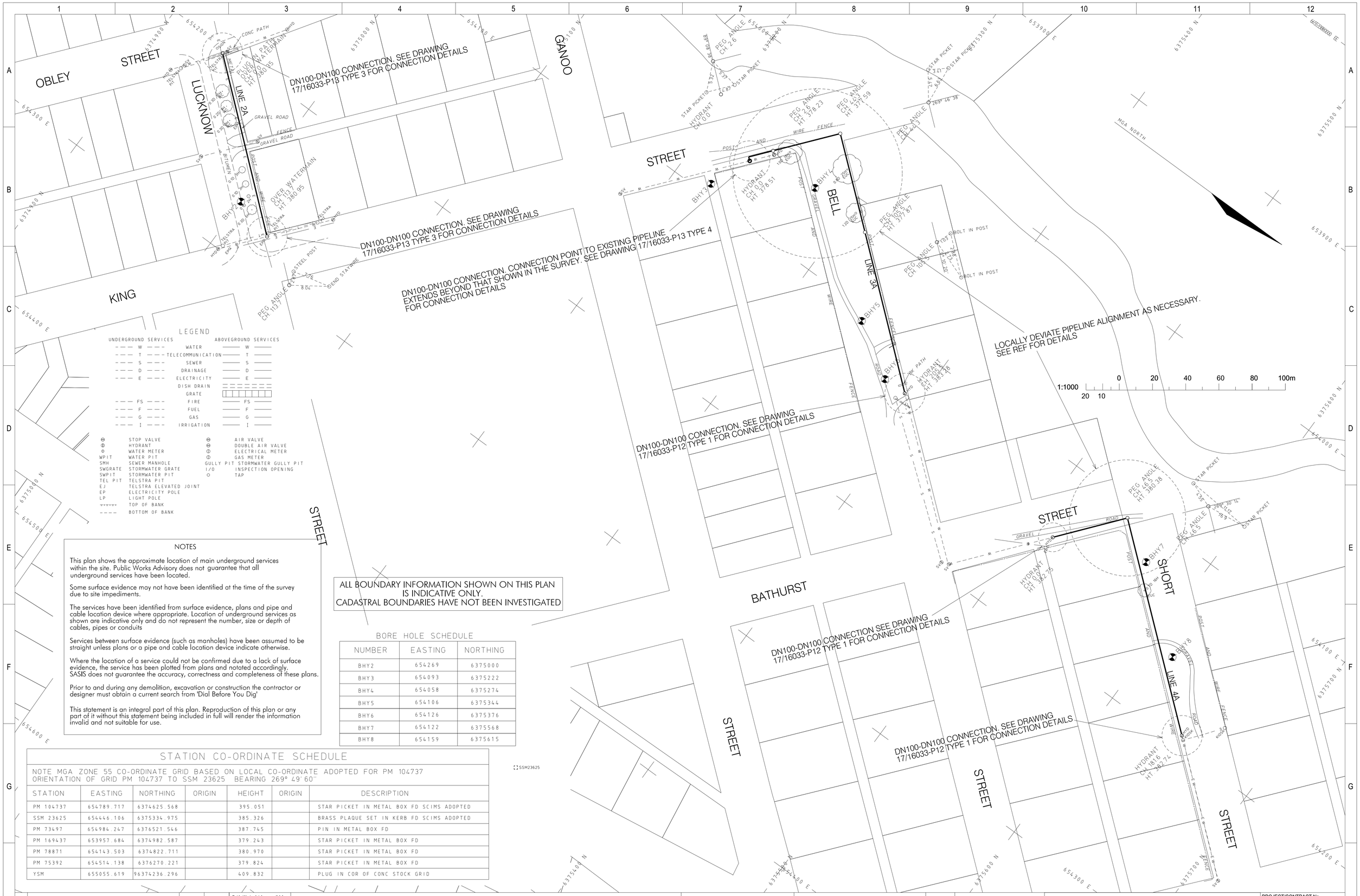
PROJECT/CONTRACT No.

A1 SCALE @ A1

DRAWING No. 17/16033-P2

REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL



LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
	TOP OF BANK		
	BOTTOM OF BANK		

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY. CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY2	654269	6375000
BHY3	654093	6375222
BHY4	654058	6375274
BHY5	654106	6375344
BHY6	654126	6375376
BHY7	654122	6375568
BHY8	654159	6375615

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - ROUTE PLAN
LINES 2A, 3A AND 4A

PROJECT/CONTRACT No.

A1 | SCALE @ A1 1:1000

DRAWING No. 17/16033-P3 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

DN100-DN100 CONNECTION SEE DRAWING
17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING
17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY15	654528	6375715
BHY16	654454	6375884
BHY17	654480	6376095
BHY18	654499	6376245

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly.
SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
------	TOP OF BANK		
----	BOTTOM OF BANK		

RAILWAY
LINE 5A
PARADE
BITUMEN
WIRE FENCE
POST AND WIRE FENCE
BARB WIRE FENCE
CONCRETE BRIDGE
BOLT IN BITUMEN CH 0.0 HT 375.95
BOLT IN BITUMEN CH 0.0
BARRIER POST
SHACKLE
TELSTRA PIT
RAILWAY PARADE
PEG ANGLE CH 1416 HT 375.08
PEG ANGLE CH 1375 HT 374.76
PEG ANGLE CH 1576 HT 374.63
PEG ANGLE CH 2517 HT 374.99
PEG ANGLE CH 1416
PEG ANGLE CH 1975
PEG ANGLE CH 2199
STAR PICKET
ANGLE POST
BHY15
BHY16
BHY17
BHY18
Inv 373.9 600 S
Inv 374.7 600 N
Inv 374.5
Inv 374.5 CULVERT BOX CULVERT 1200MM
HYDRANT CH 2517 HT 379.4
PM75392
TELSTRA PIT COVER/LOCK
MGA NORTH
1:1000
0 20 40 60 80 100m
20 10

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT PublicWorks Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - ROUTE PLAN
LINE 5A

PROJECT/CONTRACT No.

A1 | SCALE @ A1 1:1000

DRAWING No. 17/16033-P4 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY19	655371	6376170
BHY20	655409	6376384
BHY24	655062	6376702
BHY25	654997	6376561

LEGEND

UNDERGROUND SERVICES / ABOVEGROUND SERVICES

- WATER — W
- TELECOMMUNICATION — T
- SEWER — S
- DRAINAGE — D
- ELECTRICITY — E
- DISH DRAIN
- GRATE
- FIRE — FS
- FUEL — F
- GAS — G
- IRRIGATION — I

- STOP VALVE
- HYDRANT
- WATER METER
- WPIT WATER PIT
- SMH SEWER MANHOLE
- SWGRATE STORMWATER GRATE
- SWPIT STORMWATER PIT
- TEL PIT TELSTRA PIT
- EJ TELSTRA ELEVATED JOINT
- EP ELECTRICITY POLE
- LP LIGHT POLE
- TOP OF BANK
- BOTTOM OF BANK
- AIR VALVE
- DOUBLE AIR VALVE
- ELECTRICAL METER
- GAS METER
- GULLY PIT STORMWATER GULLY PIT
- I/O INSPECTION OPENING
- TAP

LOCALLY BEND ALIGNMENT TO ACHIEVE TEE CONNECTION. DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN150-DN100 CONNECTION. CONNECTION POINT TO EXISTING PIPELINE IS AS SHOWN HERE. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

1:1000 0 20 40 60 80 100m
20 10

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - ROUTE PLAN
LINES 6A AND PART 8A

PROJECT/CONTRACT No.

A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P5 REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY21	655580	6376737
BHY22	655544	6376875
BHY23	655217	6376935

DN150-DN100 CONNECTION. CONNECTION POINT TO EXISTING PIPELINE EXTENDS BEYOND THAT SHOWN IN THE SURVEY. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

CONNECT NEW DN100 PIPELINE TO EXISTING DN40 PIPELINE USING A DN40 x DN100 TAPER

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
++++++	TOP OF BANK		
----	BOTTOM OF BANK		

1:1000 — 0 20 40 60 80 100m; 20 10

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

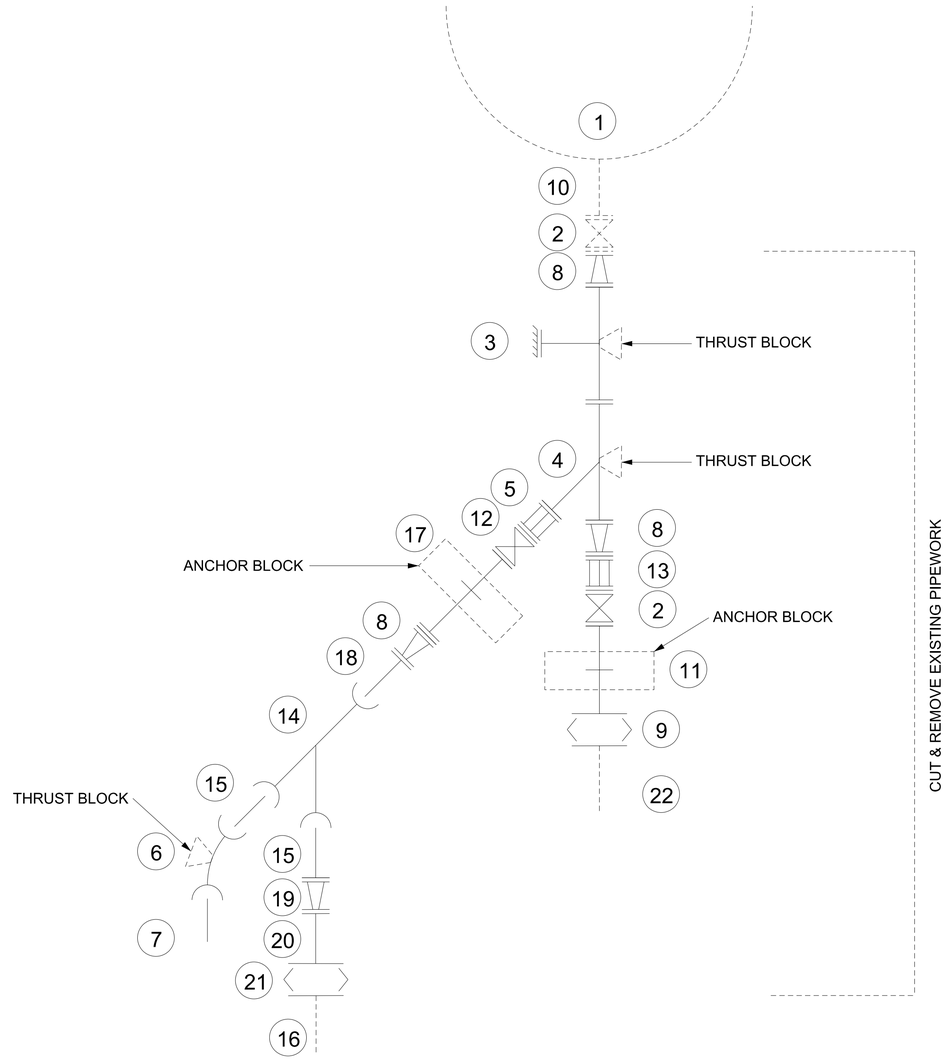
YEOVAL - ROUTE PLAN
LINES 7A AND PART 8A

PROJECT/CONTRACT No.

A1 | SCALE @ A1 1:1000

DRAWING No. 17/16033-P6 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL



PLAN
YEOVAL RESERVOIR CONNECTION DETAILS

PIPEWORK SCHEDULE

ITEM	DESCRIPTION
1	YEOVAL RESERVOIR
2	DN150 GATE VALVE (FL-FL)
3	DN200 DICL ALL FLANGED TEE WITH BLANK FLANGE
4	DN200 DICL ALL FLANGED 45 ANGLE BRANCH TEE
5	DN200 THRUST DISMANTLING JOINT (FL-FL)
6	DN200 45 DEG BEND SO-SO
7	NEW DN200 PIPELINE
8	DICL 150x200 FLANGED TAPER
9	DN150 V-G COUPLING
10	EXISTING DN150 PIPELINE
11	DICL DN150 2m LONG FL-SP PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
12	DN200 GATE VALVE (FL-FL)
13	DN150 THRUST DISMANTLING JOINT (FL-FL)
14	DN200 DICL ALL SOCKETED 45 ANGLE BRANCH TEE
15	DN200 DICL PIPE (SP-SP). LENGTH TO SUIT
16	EXISTING DN100 POLY PIPELINE
17	DICL 2m DN200 LONG FL-FL PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
18	DN150 DICL PIPE (FL-SP)
19	DICL 200x100 FLANGED TAPER
20	DN100 DICL PIPE (FL-SP)
21	DN100 V-G COUPLING
22	EXISTING DN150 AC PIPELINE

NOTES:

1. VERIFY SIZE/TYPE/ALIGNMENT OF EXISTING PIPELINES FOR COMPATIBILITY PRIOR TO ORDERING
2. OBTAIN APPROVAL OF THE PRINCIPAL PRIOR TO CUTTING ANY EXISTING PIPEWORK

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

CONNECTION DETAILS NEAR EXISTING YEOVAL RESERVOIR

PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-P7 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 111369
ORIENTATION OF GRID PM 111369 TO PM 111367 BEARING 89° 05' 59"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 111369	664110.763	6354624.016		510.456		STAR PICKET IN METAL BOX FD
PM 111367	664492.609	6355618.728		509.684		STAR PICKET IN METAL BOX FD
PM 111368	664594.292	6354943.957		517.178		STAR PICKET IN METAL BOX FD
PM 44572	664123.779	6355322.695		504.781		STEEL PIN IN METAL BOX FD
SSM 110017	664065.929	6355703.094		499.444		BRASS PLAQUE SET IN COR TELSTRA PIT FD
SSM 110018	663627.690	6355145.455		509.376		BRASS PLAQUE SET IN CONC PATH FD

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

⊖	STOP VALVE	⊖	AIR VALVE
⊕	HYDRANT	⊖	DOUBLE AIR VALVE
Ⓦ	WATER METER	Ⓔ	ELECTRICAL METER
WPIT	WATER PIT	Ⓖ	GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT	○	TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
++++++	TOP OF BANK		
----	BOTTOM OF BANK		

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 2 FOR CONNECTION DETAILS

83
DP 220176

1:1000 0 20 40 60 80 100m
20 10

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHC6	664227	6355335
BHC7	664253	6355474
BHC8	664278	6355643

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

CUMNOCK - ROUTE PLAN
LINES 3A AND 4A

PROJECT/CONTRACT No.

A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P8 REV 0

CONFIRM SCALE 100mm ON A1 ORIGINAL

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

CONNECTION TO EXISTING DN100 LINE WITH NEW HYDRANT SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

MCLAUGHLAN STREET

OBLEY STREET

GOOGODERY STREET

HAIG STREET

BEATTY STREET

BURRAWONG ROAD

LINE 1A

LINE 2A

BHC1

BHC2

BHC3

BHC4

BHC5

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
HYD	HYDRANT		DOUBLE AIR VALVE
WM	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
	TOP OF BANK		
	BOTTOM OF BANK		

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHC1	663943	6354832
BHC2	663860	6355028
BHC3	664386	6354970
BHC4	664371	6354880
BHC5	664279	6354815

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY. CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 111369 ORIENTATION OF GRID PM 111369 TO PM 111367 BEARING 89° 05' 59"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 111369	664110.763	6354624.016		510.456		STAR PICKET IN METAL BOX FD
PM 111367	664492.609	6355618.728		509.684		STAR PICKET IN METAL BOX FD
PM 111368	664594.292	6354943.957		517.178		STAR PICKET IN METAL BOX FD
PM 44572	664123.779	6355322.695		504.781		STEEL PIN IN METAL BOX FD
SSM 110017	664065.929	6355703.094		499.444		BRASS PLAQUE SET IN COR TELSTRA PIT FD
SSM 110018	663627.690	6355145.455		509.376		BRASS PLAQUE SET IN CONC PATH FD

1:1000 0 20 40 60 80 100m 20 10

PM111368

MGA NORTH

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

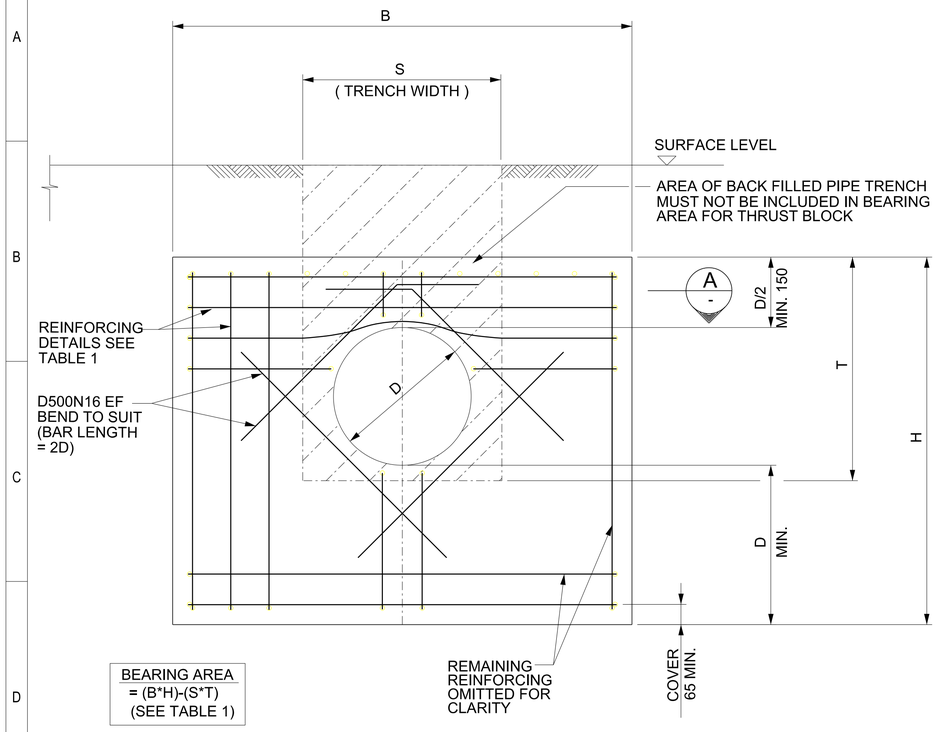
CUMNOCK - ROUTE PLAN
LINES 1A AND 2A

PROJECT/CONTRACT No.

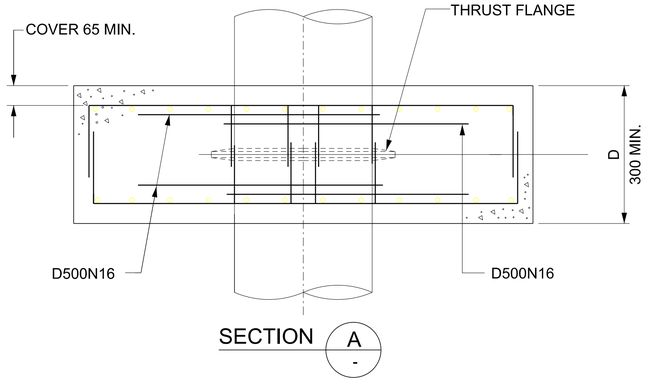
A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P9 REV 0

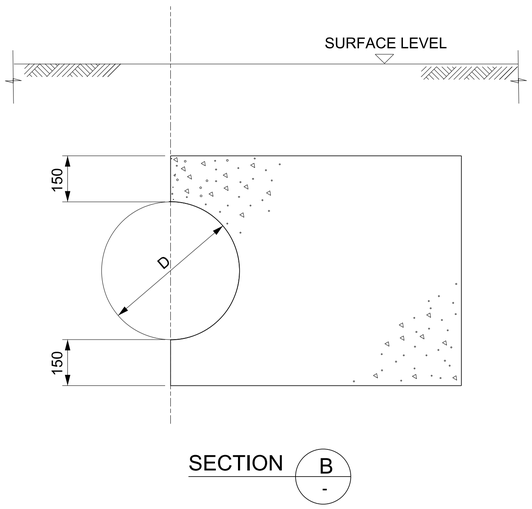
CONFIRM SCALE 100mm ON A1 ORIGINAL

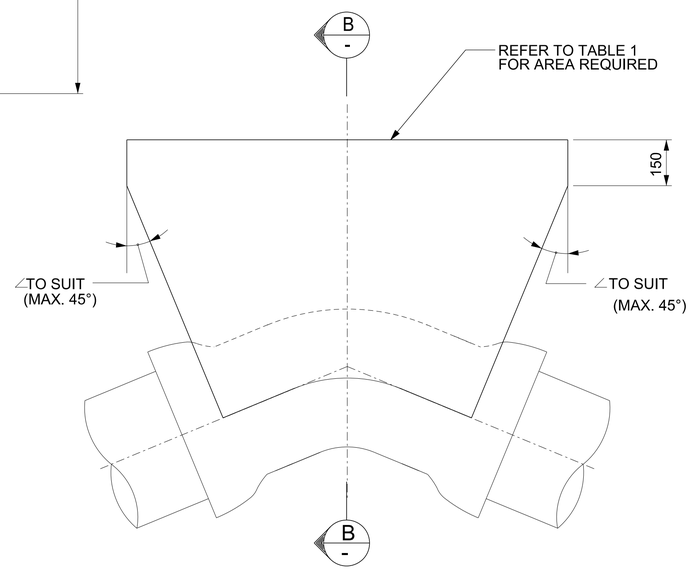


ELEVATION



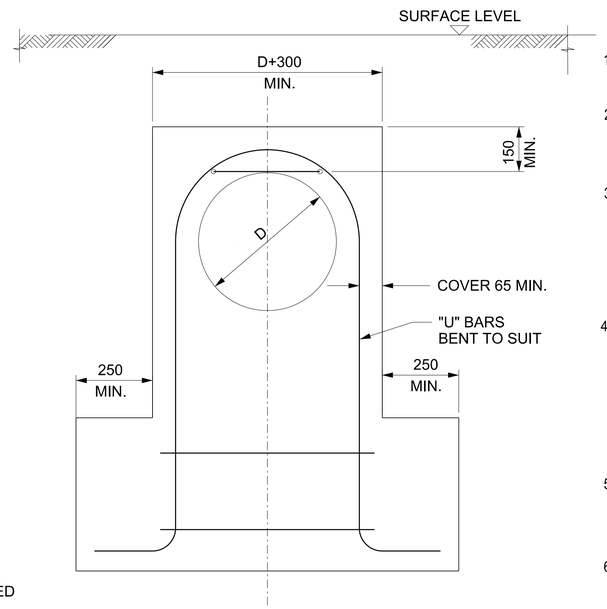
DETAILS OF THRUST BLOCK AT THRUST CONNECTOR





PLAN

DETAILS OF THRUST BLOCK AT HORIZONTAL BEND

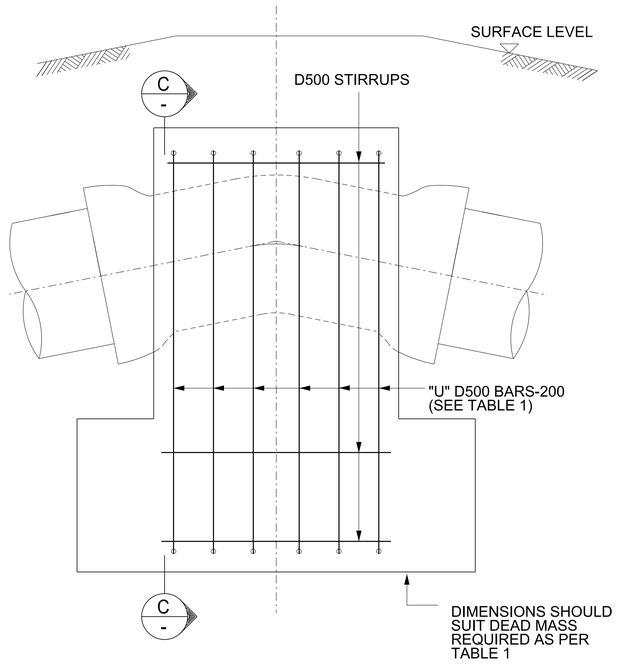


NOTES:

1. THRUST BLOCK FOR HORIZONTAL THRUST AND VERTICAL DOWNTHRUST SHALL BE CAST AGAINST UNDISTURBED MATERIAL.
2. THOSE AREAS OF THRUST BLOCKS LESS THAN 300 mm BELOW NATURAL SURFACE OR WITHIN BACK FILLED PIPE TRENCH SHALL NOT BE CONSIDERED IN HORIZONTAL BEARING CALCULATIONS.
3. TABLE 1 IS BASED ON AN ASSUMED SAFE BEARING CAPACITY OF 100 KPa ON THE UNDISTURBED SOIL. WHERE IT IS FOUND THAT THIS CAPACITY IS NOT OBTAINABLE THE CONTRACTOR SHALL EITHER PROPORTIONALLY INCREASE THE BEARING AREA OF THE THRUST BLOCK TO SUIT THE AVAILABLE SAFE BEARING CAPACITY OF THE SOIL.
4. FOR VERTICAL THRUST ACTING UPWARDS THE REQUIRED STABLE DEAD MASS ON EACH FITTING IS GIVEN IN TABLE 1. THE DEAD MASS MAY BE CONSIDERED AS THE COMBINED MASS OF THE CONCRETE AND THAT PROJECTED VOLUME OF PERMANENT STABLE FILL WHICH IS AFFECTED BY THE UPWARD THRUST OF THE CONCRETE MASS.
5. THE BEARING AREA REQUIREMENTS SHOWN IN TABLE 1 HAVE BEEN CALCULATED FOR NORMAL DRY CONDITIONS. FOR SATURATED SOILS THE BEARING AREAS MUST BE INCREASED.
6. THE BEARING AREAS GIVEN IN TABLE 1 MAY BE REDUCED FOR MATERIALS HAVING A HIGHER SAFE BEARING CAPACITY THAN THAT ASSUMED IN NOTE 3.
7. ASSUMED SAFETY FACTOR FOR HORIZONTAL THRUST CALCULATION IS 1.5
8. CONCRETE TO BE GRADE 25. COVER TO REINFORCEMENT TO BE 50mm

TABLE 1

PIPE SIZE D	PIPE INTERNAL DIAMETER	PIPE MATERIAL	TEST HEAD	THRUST BLOCKS FOR HORIZONTAL AND VERTICAL (DOWNTHRUST)) BENDS, TEES, END CAPS AND THRUST CONNECTORS								ANCHOR BLOCKS FOR VERTICAL BENDS (UPTHRUST)					
				THRUST CONNECTOR REINFORCEMENT		REQUIRED BEARING AREA FOR HORIZONTAL THRUST BLOCKS (m^2)						REQUIRED DEAD MASS (TONNES)			REINFORCEMENT - TOTAL NUMBER OF N12 U BARS		
DN	mm		m	HORIZONTAL (EF)	VERTICAL (EF)	11.25 BEND	22.5 BEND	45 BEND	90 BEND	TEE (BRANCH SIZE)	END CAP	11.25 BEND	22.5 BEND	45 BEND	11.25 BEND	22.5 BEND	45 BEND
100	110	PVC-M	120	N20-200	N20-200	0.03	0.07	0.13	0.24	0.17	0.17	0.23	0.45	0.89	4	4	4
150	160	PVC-M	120	N20-200	N20-200	0.07	0.14	0.28	0.51	0.36	0.36	0.48	0.96	1.88	4	4	4
200	210	PVC-M	120	N16-200	N16-200	0.12	0.24	0.48	0.88	0.62	0.62	0.83	1.65	3.24	4	4	4



DETAILS OF ANCHOR BLOCK FOR VERTICAL BEND

DRAWING NOT TO SCALE

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

THRUST BLOCKS DETAILS

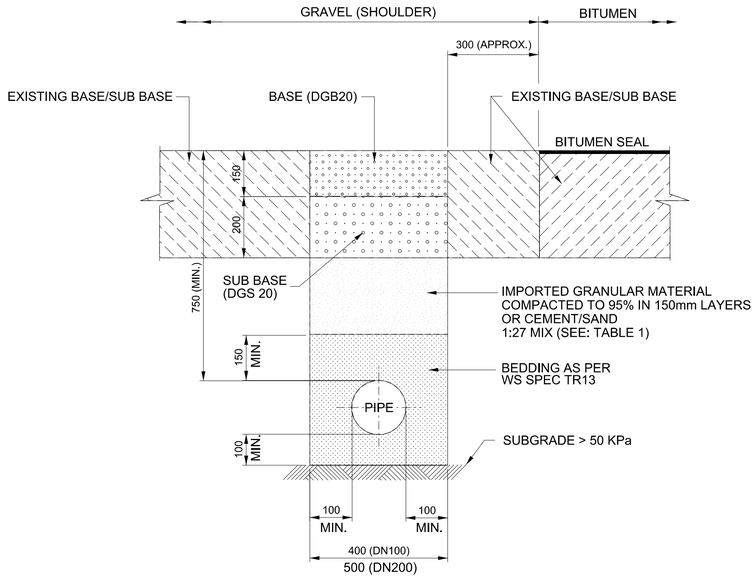
PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

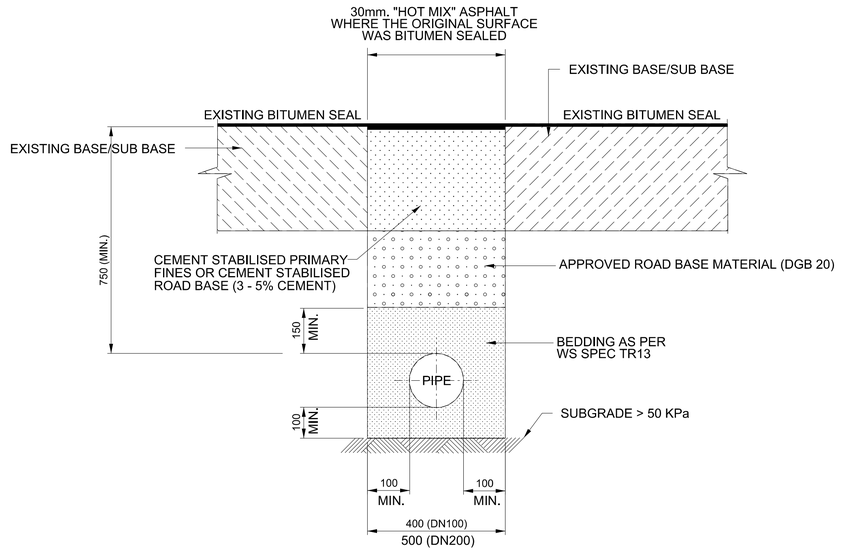
DRAWING No. 17/16033-P10 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

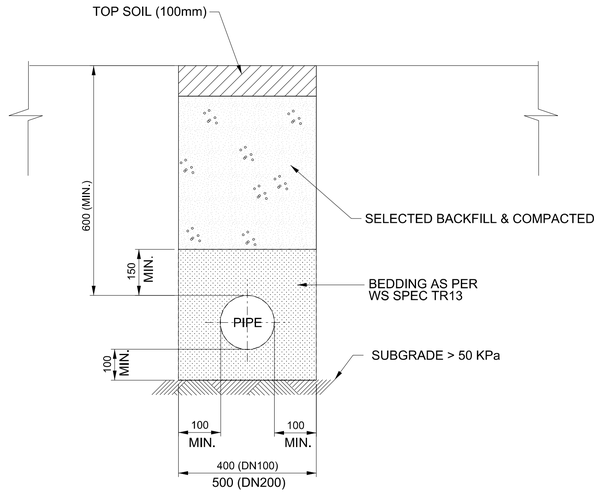
G:\Waterserv\Projects\Cabonne_SC\Relic-CumnockYeovalDes-2\4-Work_Drawings\17_16033_P10_ThrustBlocksDetails.dgn
11:28:34 AM
23/03/2017



TRENCH DETAILS - TYPE 'A' (ON ROAD SHOULDER)



TRENCH DETAILS - TYPE 'B' (UNDER BITUMEN)



TRENCH DETAILS - TYPE 'C' (OUTSIDE ROAD PAVEMENT)

TABLE 1

SIEVE SIZE APERTURE WIDTH (AS1152)	EQUIVALENT BS SIEVE SIZE (BS410)	PERCENTAGE PASSING
9.5 mm	3/8 inch	100
6.7 mm	1/4 inch	90-100
425 µm	No. 36	40-90
150 µm	No.100	0-40

NOTE:

1. THE PIPE SHALL BE CONCRETE ENCASED IF THE MINIMUM COVER CANNOT BE PROVIDED.
2. DRAWING NOT TO SCALE

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

PIPELINE TRENCH BACKFILL DETAILS

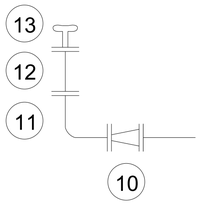
PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

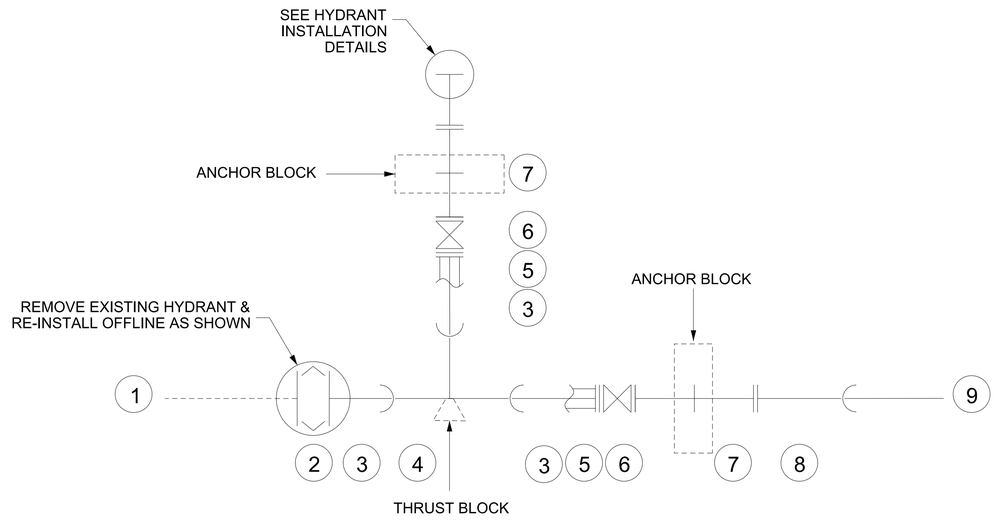
DRAWING No. 17/16033-P11 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

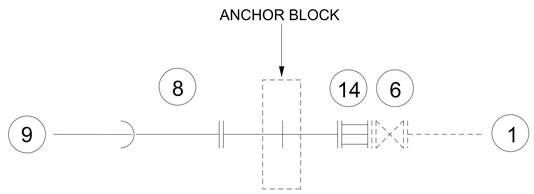
23/03/2017 11:29:19 AM G:\Watersen\Projects\Cabonne_SC\Reticulation-CumnockYeovalDes-2\4-Work_Drawings\17_16033_P11_TrenchBackfillDetails.dgn



ELEVATION
HYDRANT INSTALLATION DETAILS



PLAN
TYPE 1 - PROPOSED CONNECTION TO EXISTING PIPELINE ENDING AT HYDRANT



PLAN
TYPE 2 - PROPOSED CONNECTION TO EXISTING LINE ENDING AT S.V.

PIPEWORK SCHEDULE

ITEM	DESCRIPTION
1	EXISTING PIPELINE
2	V-G COUPLING
3	DICL SP-SP PIPE. LENGTH TO SUIT
4	DICL SOCKETED TEE WITH DN100 BRANCH
5	NON-THRUST DISMANTLING JOINT
6	GATE VALVE (FL-FL)
7	DICL 2m LONG FL-FL PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
8	DICL FL-SO CONNECTOR
9	NEW PIPELINE
10	DICL DN100xDN80 FLANGED TAPER
11	DN80 90 DEG BEND FL-FL
12	DN80 DICL FL-FL HEIGHT TO SUIT
13	DN80 HYDRANT
14	THRUST-TYPE DISMANTLING JOINT

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

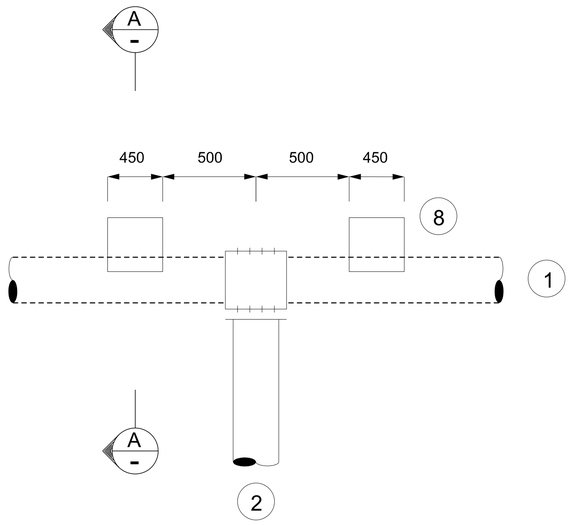
PROPOSED CONNECTION TO EXISTING LINE ENDING AT HYDRANT OR SLUICE VALVE

PROJECT/CONTRACT No.

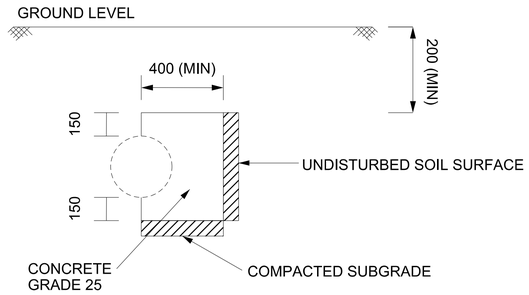
A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-P12 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL



PLAN

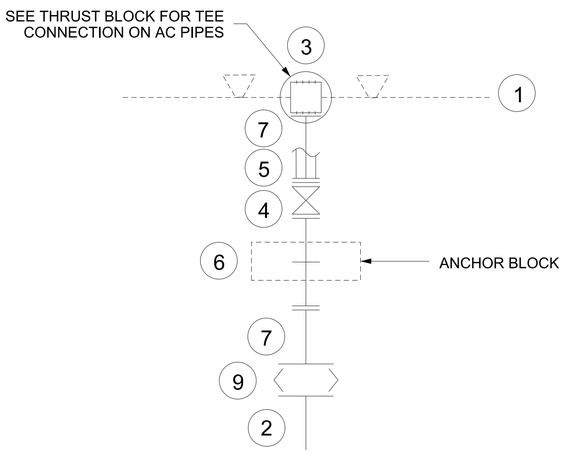


SECTION A -

THRUST BLOCK FOR TEE CONNECTION ON AC PIPES

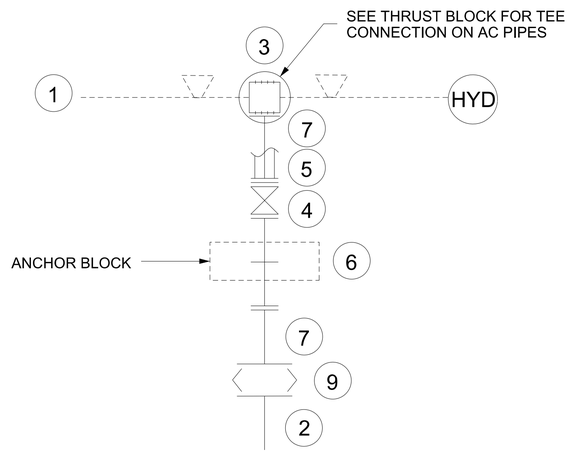
PIPEWORK SCHEDULE

ITEM	DESCRIPTION
1	EXISTING PIPELINE
2	NEW PIPELINE
3	STAINLESS STEEL FLANGED OFF-TAKE CLAMP
4	GATE VALVE (FL-FL)
5	NON-THRUST DISMANTLING JOINT
6	DICL 2m LONG FL-FL PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
7	DICL FL-SP. LENGTH TO SUIT
8	THRUST BLOCK
9	V-G COUPLING



PLAN

TYPE 3 - PROPOSED PVC TO AC TEE CONNECTION



PLAN

TYPE 4 - PROPOSED PVC TO AC CONNECTION WITH EXISTING HYDRANT

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

PROPOSED TEE CONNECTION TO EXISTING PIPELINE WITH AND WITHOUT HYDRANT

PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-P13 | REV 0

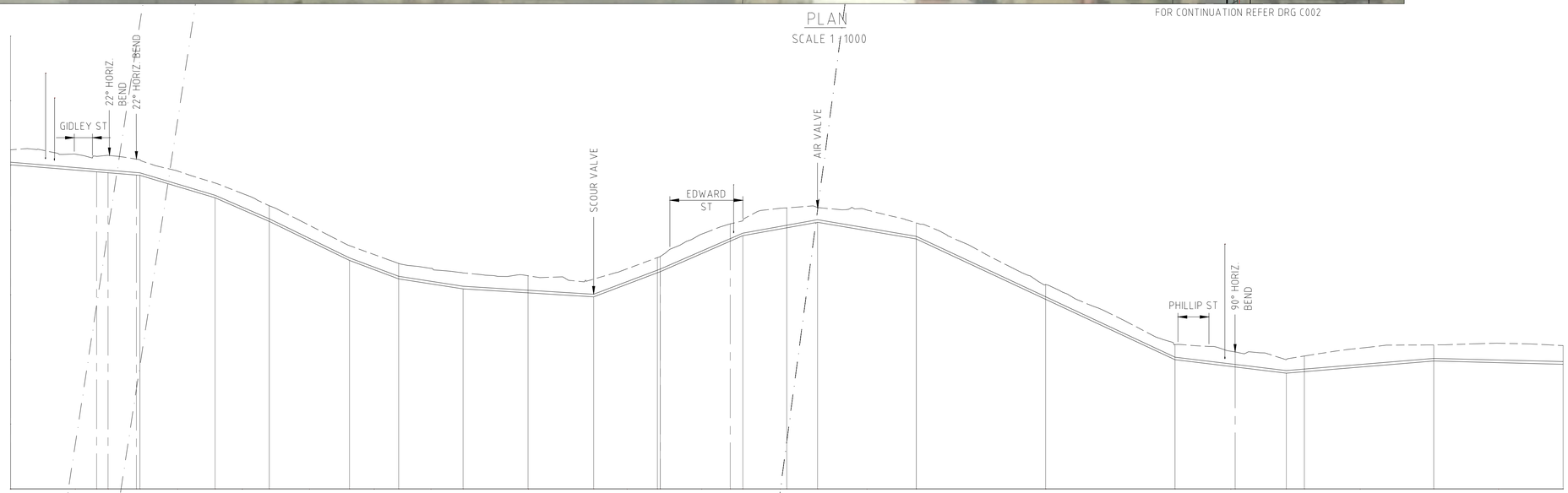
CONFIRM SCALE — 100mm ON A1 ORIGINAL

CONFIRMATION OF SERVICE LOCATION

NOTWITHSTANDING THAT THE PRESENT OR PROPOSED POSITIONS OF UNDERGROUND SERVICES MAY BE INDICATED ON THE DRAWINGS, THEIR POSITION AND DEPTH IS APPROXIMATE ONLY. PRIOR TO ANY EXCAVATION THE CONTRACTOR SHALL CONTACT ALL RELEVANT AUTHORITIES AND SHALL POT-HOLE ALL SERVICES TO OBTAIN DETAILED LOCATIONS. THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT OF ANY CONFLICTS BETWEEN THE PROPOSED MAIN AND THE EXISTING SERVICES.

PLAN

SCALE 1 / 1000



LONGITUDINAL SECTION

SCALES - H 1 : 1000
V 1 : 200

10 0 10 20 30 40 50m
SCALE 1:1000

5 0 5 10m
SCALE 1:200

LEGEND

- PROPOSED PIPELINE
- CADASTRAL BOUNDARY
- EXISTING FENCE
- EXISTING TELSTRA
- ELECTRICITY - O/H
- EXISTING SEWER
- EXISTING DRAIN
- EXISTING WATER
- EXISTING RAIL TRACK
- EXISTING STORMWATER
- CONTOUR LINE
- EDGE OF BITUMEN
- EDGE OF FORMATION
- EXISTING TREE
- AV — AIR VALVE
- SV — SCOUR VALVE
- IS — ISOLATION VALVE
- BH 40 — BOREHOLE
- HDD — HORIZONTAL DIRECTIONAL DRILLING
- SIGN

NOTES:

1. ALL DIMENSIONS AND LEVELS SHOWN IN METERS UNO.
2. REFER TO DRG NO. 83503550-01-001-G003 FOR GENERAL NOTES.
3. REFER TO DRG NO. 83503550-01-001-G005 FOR SHEET LAYOUT PLAN.
4. AERIAL IMAGERY SOURCED FROM BING MAPS AND IS PROVIDED FOR GUIDANCE ONLY.

WORK AS EXECUTED
THESE DRAWINGS ARE AN ACCURATE REPRESENTATION OF THE WORK AS-EXECUTED AS AT 30/10/2018 IN ACCORDANCE WITH CABONNE COUNCIL STANDARDS
COMPANY: ENGINEERING SURVEY P/L — NAME: DANIEL BARKER — SIGNED: SURVEYOR — DATE: 30/10/2018
COMPANY: LEED ENGINEERING & CONST. P/L — NAME: MICK RALEIGH — SIGNED: GRADUATE ENGINEER — DATE: __/__/__

REV	REVISIONS	DRN	CHK	APP	DATE
X	WAE	DB			30-10-18
3	ISSUED FOR CONSTRUCTION - CHANGE IN PIPE MATERIAL	SDS	CM	JC	01.12.17
2	ISSUED FOR CONSTRUCTION - INCORPORATION OF MANILDRA SUPPLY CONNECTION	SDS	CM	JC	06.03.17
1	ISSUED FOR CONSTRUCTION	SDS	CM	JC	16.01.17

SURVEYED		
DESIGNED	Jan Van Herel	08.2016
DRAWN	Saudagar Sawant	08.2016
CAD REVIEW	Max Dyer	05.12.17
DESIGN CHECK	Calum Murray	05.12.17
DESIGN REVIEW	Calum Murray	05.12.17
APPROVED	Josh Cody	05.12.17
PROF REGISTRATION:		

MWH®

Client: Australia's Food Basket — CABONNE COUNCIL

MOLONG TO CUMNOCK AND YEOVAL PIPELINE

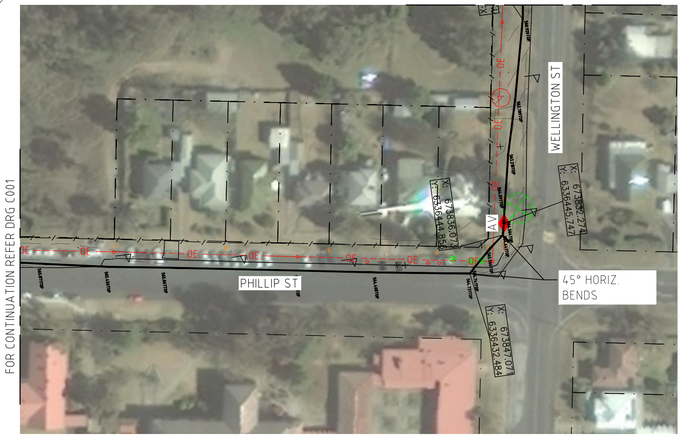
MOLONG PS TO CUMNOCK RESERVOIR
PLAN AND LONGITUDINAL SECTION - SHEET 1 OF 34

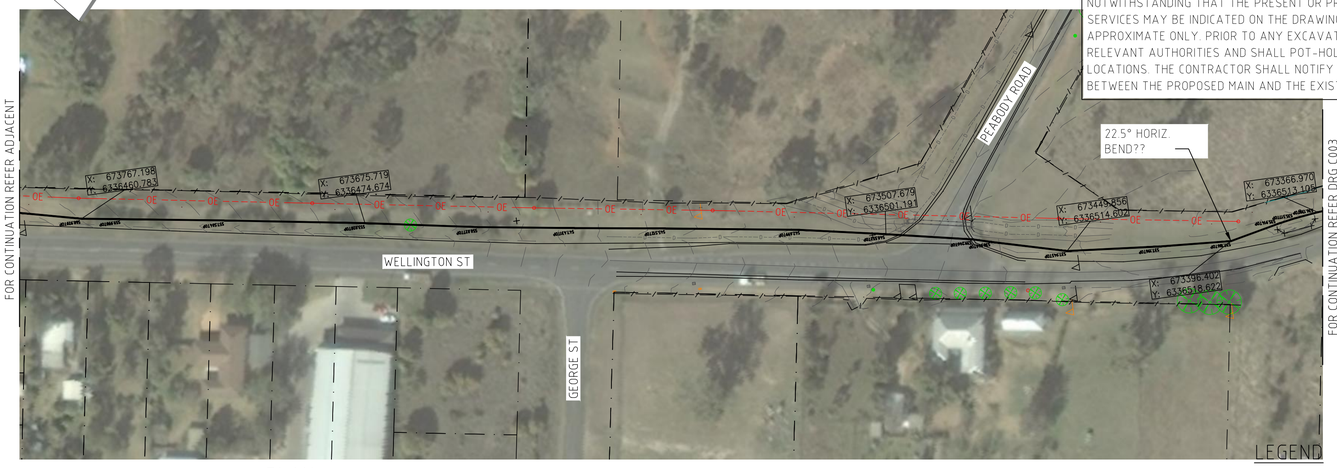
Status Stamp: **WORK AS EXECUTED**
Date Stamp: **30-10-18**
Scales: AS SHOWN
Drawing No.: 83503550-01-001-C001
Rev.: X

pw:\\asiavpwint04.mwhglobal.com:AP_PROJECTS\Documents\Australian Clients\Cabonne Council\83503550 - Molong to Cumnock and Yeoval pipeline\01\Civil\83503550-01-001-C001

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

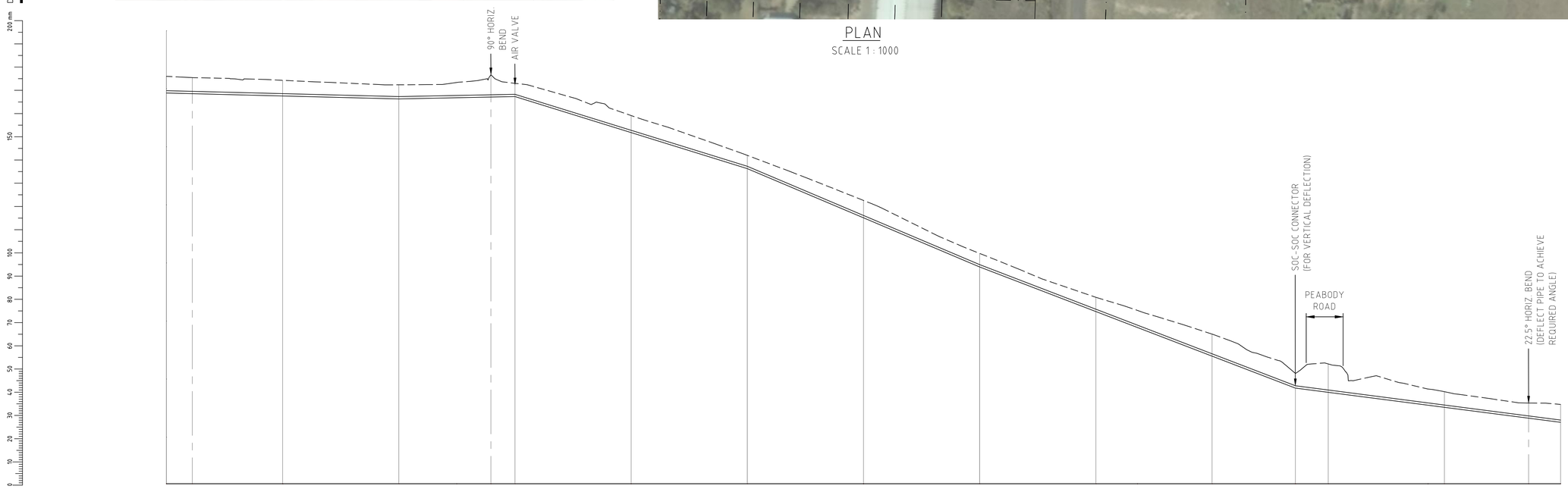




PLAN
SCALE 1 : 1000

CONFIRMATION OF SERVICE LOCATION

NOTWITHSTANDING THAT THE PRESENT OR PROPOSED POSITIONS OF UNDERGROUND SERVICES MAY BE INDICATED ON THE DRAWINGS, THEIR POSITION AND DEPTH IS APPROXIMATE ONLY. PRIOR TO ANY EXCAVATION THE CONTRACTOR SHALL CONTACT ALL RELEVANT AUTHORITIES AND SHALL POT-HOLE ALL SERVICES TO OBTAIN DETAILED LOCATIONS. THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT OF ANY CONFLICTS BETWEEN THE PROPOSED MAIN AND THE EXISTING SERVICES.



LONGITUDINAL SECTION
SCALES - H 1 : 1000
V 1 : 200

SCALE 1:1000 (10 0 10 20 30 40 50m)
SCALE 1:200 (5 0 5 10m)

LEGEND

- PROPOSED PIPELINE
- CADASTRAL BOUNDARY
- EXISTING FENCE
- EXISTING TELSTRA (T)
- ELECTRICITY - O/H (OE)
- EXISTING SEWER (S)
- EXISTING DRAIN (D)
- EXISTING WATER (W)
- EXISTING RAIL TRACK
- EXISTING STORMWATER (SW)
- CONTOUR LINE
- EDGE OF BITUMEN
- EDGE OF FORMATION
- EXISTING TREE
- AV — AIR VALVE
- SV — SCOUR VALVE
- IS — ISOLATION VALVE
- BH 40 — BOREHOLE
- HDD — HORIZONTAL DIRECTIONAL DRILLING
- SIGN

NOTES:

1. ALL DIMENSIONS AND LEVELS SHOWN IN METERS UNO.
2. REFER TO DRG NO. 83503550-01-001-G003 FOR GENERAL NOTES.
3. REFER TO DRG NO. 83503550-01-001-G005 FOR SHEET LAYOUT PLAN.
4. AERIAL IMAGERY SOURCED FROM BING MAPS AND IS PROVIDED FOR GUIDANCE ONLY.

WORK AS EXECUTED
THESE DRAWINGS ARE AN ACCURATE REPRESENTATION OF THE WORK-AS-EXECUTED AS AT 30/09/2018, IN ACCORDANCE WITH CABONNE COUNCIL STANDARDS
COMPANY: ENGINEERING SURVEY P/L — NAME: DAVID J BARKER — SIGNED: ____ DATE: 30/09/2018 — SURVEYOR
COMPANY: LEED ENGINEERING & CONST. P/L — NAME: MICK BALOGH — SIGNED: ____ DATE: __/__/__ — GRADUATE ENGINEER

REV	REVISIONS	DRN	CHK	APP	DATE
X	WAE	DB			30-09-18
3	ISSUED FOR CONSTRUCTION - CHANGE IN PIPE MATERIAL	SDS	CM	JC	01.12.17
2	ISSUED FOR CONSTRUCTION - INCORPORATION OF MANILDRA SUPPLY CONNECTION	SDS	CM	JC	06.03.17
1	ISSUED FOR CONSTRUCTION	SDS	CM	JC	16.01.17

SURVEYED		
DESIGNED	Jan Van Herel	08.2016
DRAWN	Saudagar Sawant	08.2016
CAD REVIEW	Max Dyer	18.01.17
DESIGN CHECK	Calum Murray	18.01.17
DESIGN REVIEW	Calum Murray	18.01.17
APPROVED	Josh Cody	05.12.17
PROF REGISTRATION:		

MWH®

Client: Australia's Food Basket — CABONNE COUNCIL

MOLONG TO CUMNOCK AND YEOVAL PIPELINE

MOLONG PS TO CUMNOCK RESERVOIR
PLAN AND LONGITUDINAL SECTION - SHEET 2 OF 34

Status Stamp: **WORK AS EXECUTED**
Date Stamp: **30.09.18**
Scales: AS SHOWN
Drawing No.: 83503550-01-001-C002
Rev.: X

ORIGINAL SIZE A1

DO NOT SCALE - IF IN DOUBT, ASK

pw:\\asiavpwint04.mwhglobal.com:AP_PROJECTS\Documents\Australian Clients\Cabonne Council\83503550 - Molong to Cumnock and Yeoval pipeline\01\Civil\83503550-01-001-C002

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

GENERAL

G1. REFER ANY DISCREPANCY TO THE PRINCIPAL'S REPRESENTATIVE BEFORE PROCEEDING WITH THE WORK.

G2. DO NOT OBTAIN DIMENSIONS BY SCALING FROM THE DRAWINGS.

G3. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS OTHERWISE SHOWN. ALL LEVELS ARE IN METERS TO AUSTRALIAN HEIGHT DATUM. HORIZONTAL DATUM IS MGA 94, ZONE 55.

G4. OBTAIN NECESSARY WORK PERMITS AND APPROVALS FROM RELEVANT AUTHORITIES BEFORE COMMENCING WORK ON SITE.

G5. SURVEY AND SETTING OUT TO BE UNDERTAKEN BY A REGISTERED SURVEYOR.

G6. VERIFY SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS BEFORE CONSTRUCTION AND FABRICATION IS COMMENCED.

G7. MAINTAIN STRUCTURES AND EXISTING SERVICES IN STABLE CONDITION DURING CONSTRUCTION. NO PART SHALL BE OVERSTRESSED. PROVIDE TEMPORARY BRACING AS REQUIRED.

G8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ANY EXISTING STRUCTURES ARE NOT DAMAGED DURING CONSTRUCTION. ANY DAMAGE SHALL BE MADE GOOD BY RE-CONSTRUCTION OR REPAIR AS DIRECTED BY AND TO THE SATISFACTION OF THE PRINCIPAL'S REPRESENTATIVE.

G9. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF RELEVANT AUSTRALIAN STANDARDS AND THE LOCAL LAWS AND ORDINANCES OF THE RELEVANT GOVERNMENT AUTHORITY.

G10. TEMPORARY WORKS SHALL BE DESIGNED BY THE CONTRACTOR UNLESS SHOWN ON THE DRAWINGS.

G11. SUPPORT ALL TRENCHES IN ACCORDANCE WITH THE REQUIREMENTS OF WORK COVER AUTHORITY CODE OF PRACTICE FOR EXCAVATION AND EXCAVATION SUPPORT (CAT.312).

G12. NOTWITHSTANDING THAT THE PRESENT AND/OR PROPOSED POSITIONS OF UNDERGROUND SERVICES MAY BE INDICATED ON THE DRAWINGS, THEIR POSITION AND DEPTH IS APPROXIMATE ONLY. PRIOR TO ANY EXCAVATION THE CONTRACTOR SHALL CONTACT ALL RELEVANT AUTHORITIES AND SHALL POT-HOLE ALL SERVICES TO OBTAIN DETAILED LOCATIONS. THE CONTRACTOR SHALL NOTIFY THE PRINCIPAL'S REPRESENTATIVE OF ANY CONFLICTS BETWEEN THE PROPOSED MAIN AND EXISTING SERVICES. THE PRINCIPAL'S REPRESENTATIVE WILL ADVISE DETAILS OF ANY REQUIRED CHANGES TO ALIGNMENT OR LEVEL, OR ARRANGE FOR CHANGES TO SERVICES. POT HOLING SHALL BE CARRIED OUT SUFFICIENTLY IN ADVANCE OF THE PERMANENT WORKS SUCH THAT ANY REQUIRED CHANGES TO THE PIPELINE ALIGNMENT DO NOT IMPACT ON THE CONTRACTORS SCHEDULE.

G13. PUBLIC ROADS SHALL NOT BE CLOSED FOR THEIR FULL WIDTH EXCEPT FOR TIMES WHEN MOVEMENT OF MATERIALS ARE NECESSARY. TRAFFIC SHALL BE CONTROLLED BY ACCREDITED TRAFFIC CONTROLLERS ONLY.

G14. ALL WORKS INCLUDING MATERIAL SUPPLY, INSTALLATION, TESTING AND COMMISSIONING SHALL BE IN ACCORDANCE WITH WSA 03-2011 VERSION 3.1 AND WSA01-2004 VERSION 3.1. THE CONTRACTOR SHALL ENSURE THAT THEY ARE CONVERSANT WITH ALL CURRENT REVISIONS, AMENDMENTS AND UPDATES THAT THE RELEVANT WATER AGENCY HAS MADE TO THEIR STANDARDS.

G15. CLEARANCE TO OTHER SERVICES SHALL BE IN ACCORDANCE WITH TABLE 5.5 OF WSA03- 2011.

G16. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY MEANS TO SAFEGUARD THE WELFARE OF THE PUBLIC AND THE WORKS INCLUDING BUT NOT LIMITED TO, PUBLIC NOTIFICATION AND CONSULTATION, TRAFFIC CONTROL, CONSTRUCTION PLAN, JSA, SWMS, OH&S PLAN, SAFETY BARRIERS, SIGNAGE, SAFETY WARDEN, LIGHTING, DUST AND NOISE CONTROLS.

G17. THE CONTRACTOR SHALL NOTIFY THE PRINCIPAL'S REPRESENTATIVE OF ANY OPPORTUNITIES TO OPTIMISE OR MODIFY THE PIPELINE ALIGNMENT. EXAMPLES OF THIS COULD BE DEVIATIONS TO AVOID TREE REMOVAL OR OTHER TOPOGRAPHIC FEATURES THAT HAVE NOT BEEN CAPTURED IN THE ORIGINAL GROUND SURVEY.

G18. THE CONTRACTOR SHALL OBTAIN ANY ADDITIONAL GEOTECHNICAL INFORMATION REQUIRED TO ASSESS AND DESIGN ANY SECTIONS OF PIPELINE INSTALLED BY TRENCHLESS CONSTRUCTION METHODS. THE "CENTRAL WEST SECURITY PIPELINES (MOLONG TO YEOVAL) GEOTECHNICAL INVESTIGATION" (MACQUARIE GEOTECH, AUGUST 2016) IS PROVIDED FOR INFORMATION ONLY.

MATERIALS AND FITTINGS

M1. ALL PE PIPES AND FITTINGS SHALL BE PE100 (PRESSURE RATINGS AS SHOWN IN THE DESIGN DRAWINGS) IN ACCORDANCE WITH AS/NZS 4129, AS/NZS 4130, AND THE POLYETHYLENE CODE OF AUSTRALIA WSA 01-2004. JOINTING SHALL BE IN ACCORDANCE WITH AS2566 AND THE MANUFACTURER'S GUIDELINES. ALL PE JOINTS SHALL BE BUTT WELDED ONLY, UNO.

M2. ALL PE PIPE SIZES SHOWN ON THE DRAWINGS ARE OUTSIDE DIAMETER (OD).

M3. FLANGES SHALL BE RAISED FACE IN ACCORDANCE WITH AS 4087, CLASS 35 DUCTILE IRON PIPE.

M4. ALL NON-BURIED FLANGE BOLT SETS SHALL BE GALVANISED MILD STEEL GRADE 8.8.

M5. FLANGE GASKET MATERIAL AND THICKNESS SHALL BE 1.5MM COMPRESSED FIBRE.

M6. BURIED FLANGED CONNECTIONS AND BOLT ARRANGEMENTS SHALL BE 316SS WITH 304SS NUTS OR 316SS NUTS WITH ANTI SEIZE APPLIED FULLY WRAPPED WITH DENSO TAPE. BURIED BACKING RINGS FOR HDPE STUB FLANGES SHALL BE 316SS.

M7. ALL ISOLATION VALVES SHALL BE DI FLANGED METAL SEATED VALVES IN ACCORDANCE WITH AS 2638 AND INSTALLED IN ACCORDANCE WITH WAT-1301. ALL VALVES TO BE ANTI-CLOCKWISE CLOSING. SURFACE FITTINGS SHALL BE TYPE D IN TRAFFICABLE AREAS.

M8. ALL PUDDLE FLANGES SHALL BE FACTORY FABRICATED AND CAPABLE OF FULL THRUST RESTRAINT.

M9. ALL DI SPIGOT AND SOCKET PIPEWORK SHALL BE CEMENT LINED CLASS PN35. ALL FLANGED DI PIPEWORK SHALL BE CEMENT LINED FLANGE CLASS PIPE. ALL DI FITTINGS SHALL BE COATED INTERNALLY AND EXTERNALLY WITH FUSION BONDED NYLON (FBN) OR FUSION BONDED EPOXY (FBE).

2

M10. UNLESS NOTED OTHERWISE, ALL PVC PIPES SHALL BE PVC-O PN16 OR PN25 (SERIES 2) IN ACCORDANCE WITH AS/NZS 4441 AND AS 1646. ALL PVC PIPES SHALL BE SOCKET-SPIGOT RUBBER RING JOINTED (ELASTOMETRIC RING JOINTING) IN ACCORDANCE WITH AS/NZS 2032 AND THE MANUFACTURER'S GUIDELINES.

M11. ALL BURIED FLEXIBLE PIPES SHALL BE INSTALLED IN ACCORDANCE WITH AS/NZS 2500 AND MANUFACTURER'S GUIDELINES.

M12. ALL FLANGED JOINTS BETWEEN DISSIMILAR METALS SHALL BE ISOLATED IN ACCORDANCE WITH WAT-1313

TESTING, ASSET ACCEPTANCE AND LIVE CONNECTIONS

T1. POST CONSTRUCTION ACTIVITIES SUCH AS SWABBING, WATER QUALITY TESTING, PRESSURE TESTING AND CHLORINATION SHALL BE CARRIED OUT IN ACCORDANCE WITH WSA03. ALL TEST RESULTS SHALL BE DOCUMENTED AND REPORTED TO THE PRINCIPAL'S REPRESENTATIVE.

T2 TEST PRESSURE SHALL BE AS PER TABLE BELOW:

PIPE SECTION	TEST PRESSURE
MOLONG PUMPING STATION TO CUMNOCK SERVICE RESERVOIR	RL 750m AHD
CUMNOCK SERVICE RESERVOIR TO CUMNOCK PRV	RL 680m AHD
CUMNOCK PRV TO YEOVAL SERVICE RESERVOIR	RL 656m AHD

ENVIRONMENTAL AND VEGETATION PROTECTION REQUIREMENTS:

V1. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATION, SITE ENVIRONMENTAL MANAGEMENT PLAN, PERMIT SPECIFICATIONS AND DRAWINGS.

V2. THE CONTRACTOR SHALL LIAISE WITH THE PRINCIPAL'S REPRESENTATIVE PRIOR TO REMOVAL OF OR PRUNING ANY TREES. VEGETATION SHALL BE DISTURBED ONLY TO THE MINIMUM EXTENT NECESSARY TO EXECUTE THE WORKS.

V3. AN ARBORIST SHALL SUPERVISE WORK WITHIN THE STRUCTURAL ROOT ZONE OF A TREE. ROOTS UPTO 50mm IN DIAMETER SHALL BE CLEAN CUT AND COVERED BY SOIL. ROOTS GREATER THAN 50mm DIAMETER MUST BE EXCAVATED AROUND OR MANAGED IN CONSULTATION WITH AN ARBORIST.

V4. SHOULD ANY ADDITIONAL ARCHAELOGICAL, ABORIGINAL OR HERITAGE VALUES BE REVEALED DURING CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY PRINCIPAL'S REPRESENTATIVE IMMEDIATELY AND STOP WORK IN THAT LOCATION.

PIPEWORK CONSTRUCTION

P1. PIPELINE SHALL BE GRADED TO ELIMINATE LOCAL HIGH POINTS AND LOW POINTS. THE CONTRACTOR SHALL NOTIFY THE PRINCIPAL'S REPRESENTATIVE OF ANY HIGH POINTS NOT IDENTIFIED IN THE PROJECT DRAWINGS.

P2. ACHIEVE BEND ANGLES BY DEFLECTING PIPE JOINTS WHERE NOTED ON THE DRAWINGS. DEFLECTION SHALL NOT EXCEED THE MANUFACTURER'S RECOMMENDATIONS.

P3. PE NATURAL BEND RADIUS
- WHERE NO BEND IS SPECIFIED AT A CHANGE IN DIRECTION OFA PIPELINE THE FLEXIBILITY OF PE PIPE SHALL BE USED TO PROVIDE THE DEVIATION OF THE PIPELINE.
- PIPELINE RADII FORMED BY BENDING PIPELINES SHALL BE IN ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATION.
- SECTION OF PIPE WHICH SHOW EVIDENCE OF KINKING DURING BENDING SHALL BE CUT OUT AND REPLACED.

P4. PE FITTING DE-RATING:
- PIPE SDR FOR FITTINGS SHALL BE SUCH THAT THE DE-RATING OF THE FITTING EQUALS OR EXCEEDS THE RATING OF THE CONNECTING PIPELINE.

P5. PIPELINE TO BE PROVIDED WITH A MINIMUM COVER OF 0.75m UNLESS OTHERWISE NOTED ON THE DRAWINGS.

P6. CLOSING JOINTS ON PE PIPELINES SHALL BE UNDERTAKEN WITH CAREFULL MANAGEMENT OF INDUCED STRESSES IN THE PIPELINE FROM THERMAL EXPANSION AND CONTRACTION. BACKFILLING OF PIPELINE SHOULD BE COMPLETED AS CLOSE AS PRACTICABLE TO THE PROPOSED CLOSING JOINT PRIOR TO CONNECTION OF THE JOINT.

P7. ALL BURIED DICL PIPEWORK INCLUDING FLANGED JOINTS, FITTINGS AND MECHANICAL COUPLINGS SHALL BE WRAPPED IN POLYETHYLENE SLEEVING. SLEEVING SHALL COMPLY WITH AS3681.

P8. ALL PROPRIETARY EQUIPMENT SHALL BE PLACED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

P9. DURING PIPELINE CONSTRUCTION, ALL OPEN ENDS OF PIPES ARE TO BE CAPPED OFF TO PREVENT THE ENTRY OF FOREIGN MATTER INTO THE PIPEWORK.

P10. ALL EXCAVATIONS TO BE BACKFILLED AS SOON AS POSSIBLE FOLLOWING PIPE INSTALLATION, TESTING AND ACCEPTANCE.

P11. WHERE PIPE IS TO BE INSTALLED BY TRENCHLESS TECHNOLOGY, THE CONTRACTOR SHALL ATTACH A CONTINUOUS 2mm GRADE 316L STAINLESS STEEL MIG WIRE TO THE PIPE TO ASSIST IN DETECTING THE PIPE AFTER INSTALLATION.

P12. FOOTPATHS, DRIVEWAYS AND ROADS TO BE REINSTATED TO ORIGINAL CONDITION. NOT ALL FOOT PATHS AND DRIVEWAY CROSSINGS HAVE PICKED UP IN THE SURVEY AND LONGITUDINAL DRAWINGS. AERIAL IMAGERY SHOULD BE USED FOR PRICING PURPOSES AND VERIFIED DURING CONSTRUCTION.

P13. CONTRACTOR TO RECORD AS CONSTRUCTED INFORMATION (EASTING, NORTHING, INVERT LEVEL) OF PIPELINE AT MAXIMUM 50m INTERVALS AND AT LOCATIONS OF BENDS, CHANGES OF DIRECTION AND FITTINGS.

P14. EXCAVATIONS TO BE MINIMUM OF 1.5m FROM POWER POLES. CONTRACTOR TO PROVIDE TEMPORARY POLE SUPPORT AS REQUIRED. SUPPORTS SHALL BE IN ACCORDANCE WITH AUTHORITIES STANDARDS.

P15. INDICATOR POSTS AND MARKERS SHALL BE INSTALLED AT ALL VALVES, AIR VALVES, SCOURS AND CHANGES IN ALIGNMENT IN ACCORDANCE WITH WSAA DRAWING WAT-1300.

2

P16. PROVIDE INDICATOR TAPE WITH DETECTABLE WIRE INSERT ALONG THE FULL LENGTH OF THE PIPELINE.

P17. EXISTING NATURE STRIP AREAS, LANDSCAPE MOUNDING, PRIVATE LAND AND FENCING AFFECTED BY THE WORKS ARE TO BE REINSTATED TO THE SATISFACTION OF THE RELEVANT LAND OWNER AND COUNCIL.

2

THRUST BLOCKS:

TB1. PROVIDE THRUST RESTRAINTS AT ALL BENDS AND FITTINGS IN ACCORDANCE WITH WAT-1205, WAT-1206, WAT-1207 AND PROJECT TYPICAL DETAILS.

TB2. FOR THRUST BLOCK THRUST AREAS, REFER TO THRUST BLOCK TABLES IN DWG. NO. 83503550-01-001-C200. THRUST BLOCKS HAVE BEEN SIZED BASED ON PIPE MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP) OF EITHER 1600 kPA OR 2500kPA. THE CONTRACTOR SHALL CONFIRM PIPE MAOP FROM LONGSECTIONS IN ORDER TO DETERMINE THRUST FACE AREAS REQUIRED USING THE THRUST BLOCK TABLES IN THIS DRAWING.

TB3. A SOIL HORIZONTAL BEARING CAPACITY OF 40 kPA HAS BEEN NOMINATED FOR SIZING OF THRUST BLOCK THRUST FACE AREAS AS PER THE GEOTECHNICAL INVESTIGATION REPORT: "CENTRAL WEST SECURITY PIPELINES (MOLONG TO YEOVAL) GEOTECHNICAL INVESTIGATION - GEOTECHNICAL INVESTIGATION REPORT - REPORT NO. B16097", KARL ADDISON, MACQUARIE GEOTECH, 26/08/2016.

TB4. THE CONTRACTOR MUST CONFIRM THE ACTUAL HORIZONTAL BEARING CAPACITY AT THE THRUST BLOCK LOCATIONS BY ALLOWING FOR APPROPRIATE GEOTECHNICAL SITE INVESTIGATION AND ADVICE BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER. IF THE GEOTECHNICAL ENGINEER CONFIRMS THAT THE BEARING CAPACITY ON SITE DIFFERS FROM THE 40 kPA NOMINATED IN THE THRUST BLOCK TABLES IN DWG. NO. 83503550-01-001-C200., THEN THE REQUIRED THRUST FACE AREAS WITHIN THE THRUST BLOCK TABLES MUST BE REVISED ON A PRO-RATA BASIS TO SUIT THE ACTUAL HORIZONTAL BEARING CAPACITY ON SITE.

TB5. THE CONTRACTOR SHALL DISCUSS WITH THE SUPERINTENDENT ANY GROUND CONDITIONS WHICH ARE FOUND TO BE DIFFERENT TO THAT NOMINATED.

TB6. ANY OVER EXCAVATION FOR THRUST BLOCKS SHALL BE BACKFILLED WITH MASS CONCRETE.

TB7. THE THRUST BEARING FACE OF THE THRUST BLOCK MUST BE CAST AGAINST UNDISTURBED GROUND.

TB8. VERTICAL THRUST BLOCK MUST BE EMBEDDED A MINIMUM OF 250mm INTO UNDISTURBED GROUND.

TB9. WHEN POURING CONCRETE AGAINST FITTINGS AND PIPE STRUCTURES PLACE A MEMBRANE OF POLYETHYENE, PVC OR FELT BETWEEN THE CONCRETE AND THE FITTING OR PIPE STRUCTURE TO PREVENT ANY DAMAGE FROM THE CONCRETE. CONCRETE MUST NOT SPILL OVER SOCKET JOINTS.

TB10. CONCRETE MUST BE CURED FOR A MINIMUM OF 48 HRS PRIOR TO CHARGING THE PIPELINE.

TB11. UN-REINFORCED CONCRETE SHALL BE A MINIMUM OF N25. REINFORCED CONCRETE SHALL BE A MINIMUM OF N32. FOR AGGRESSIVE SOILS AND CONDITIONS, SPECIAL GRADES OF CONCRETE ARE TO BE USED TO SUIT.

REV	REVISIONS	DRN	CHK	APP	DATE
2	ISSUED FOR CONSTRUCTION - CHANGE IN PIPE MATERIAL	SDS	CH	JC	01.12.17
1	ISSUED FOR CONSTRUCTION	SDS	CH	JC	16.01.17

MD CM SL

SURVEYED		
DESIGNED	Jan van Herel	01.2016
DRAWN	Saudagar Sawant	10.2016
CAD REVIEW	Max Dyer	18.01.17
DESIGN CHECK	Calum Murray	18.01.17
DESIGN REVIEW	Calum Murray	18.01.17
APPROVED	Josh Cody	05.12.17
PROF REGISTRATION:		

MWH

Client: CABONNE COUNCIL

MOLONG TO CUMNOCK AND YEOVAL PIPELINE

GENERAL CIVIL NOTES

Status Stamp: FOR CONSTRUCTION

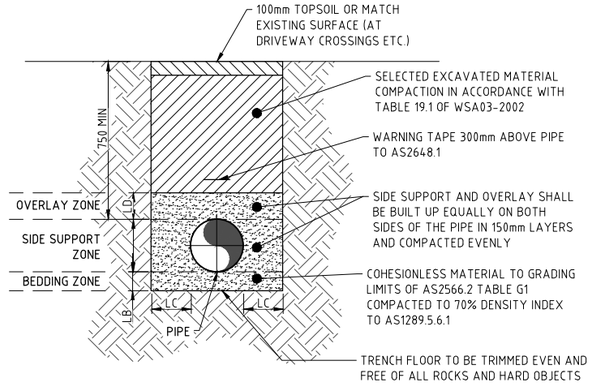
Date Stamp: 01.12.17

Scales: NTS

Drawing No.: 83503550-01-001-G003

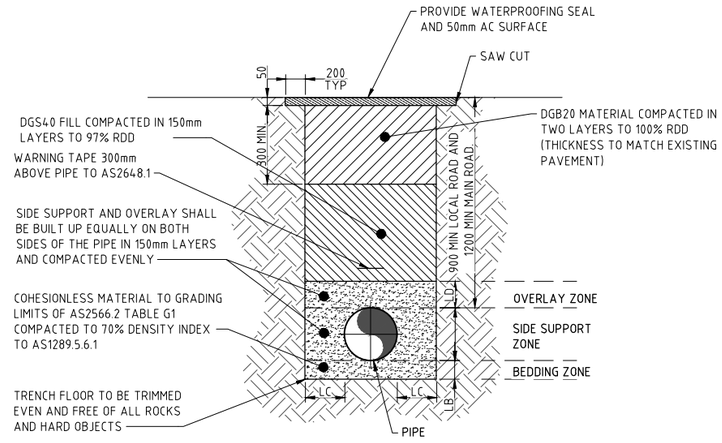
Rev.: 2

pw:\\asiavpwint04.mwhglobal.com:AP_PROJECTS\Documents\Australian Clients\Cabonne Council\83503550 - Molong to Cumnock and Yeoval pipeline\01\General\83503550-01-001-G003



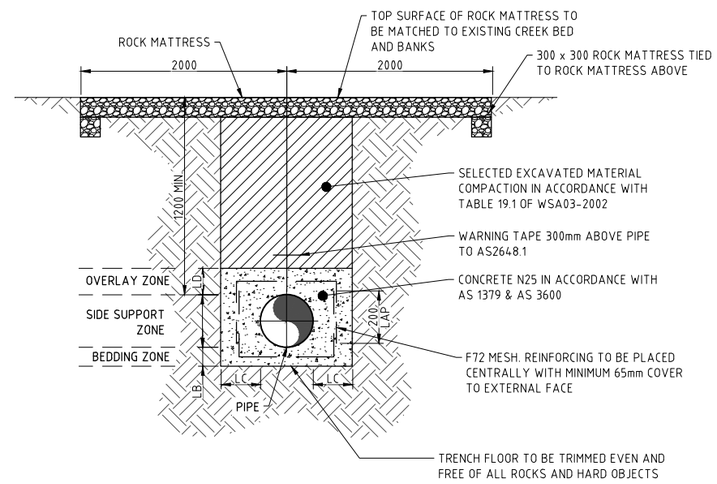
TYPICAL TRENCH DETAIL - TYPE 1 (GENERAL)

SCALE : NTS



TYPICAL TRENCH DETAIL - TYPE 2 (ROAD)

SCALE : NTS



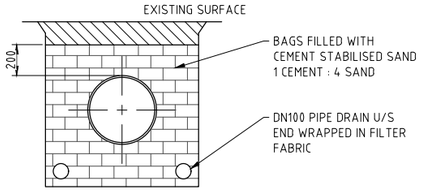
TYPICAL TRENCH DETAIL - TYPE 3 (CREEK CROSSING)

SCALE : NTS

PIPE DIAMETER	MINIMUM VALUES (mm)		
	LB	LC	LD
>150 <300	100	150	150
>300 <450	100	200	150
>450 <900	150	300	150
>900 <1500	150	350	200

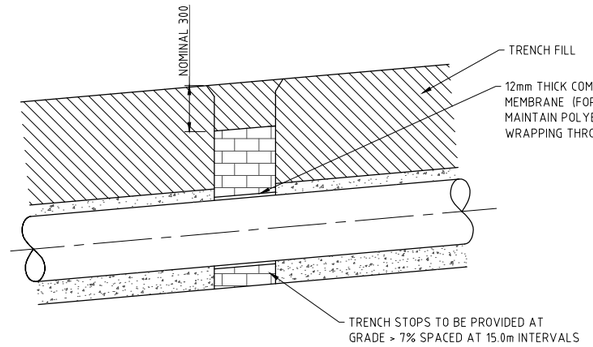
EMBEDMENT GEOMETRY

SCALE : NTS



ELEVATION OF TRENCH STOP

SCALE : 1:20



TRENCH STOP

SCALE : 1:20

2

TEST PRESSURE 1600 kPA

THRUST BLOCK TYPE	THRUST FORCE (kN)	HORIZONTAL BEARING CAPACITY (kPa)	THRUST FACE AREA (m2)
DN150 11.25 DEG ELBOW	7.75	40	0.2
DN150 22.50 DEG ELBOW	15.50	40	0.4
DN150 45 DEG ELBOW	30.25	40	0.8
DN150 90 DEG ELBOW	55.75	40	1.4
DN150 EQUAL TEE	39.50	40	1.0
DN150 BLANK END/ INLINE THRUST WALL	39.50	40	1.0
TYPE 150-90-H-1600-HORIZONTAL FACE (WHERE INDICATED)	39.50	40	1.0
DN200 11.25 DEG ELBOW	13.50	40	0.3
DN200 22.50 DEG ELBOW	26.50	40	0.7
DN200 45 DEG ELBOW	52.00	40	1.3
DN200 90 DEG ELBOW	95.75	40	2.4
DN200 EQUAL TEE	67.75	40	1.7
DN150-DN200 TAPER	28.50	40	0.7
DN200 BLANK END/ INLINE THRUST WALL	67.75	40	1.7
TYPE 200-90-H-1600-HORIZONTAL FACE (WHERE INDICATED)	67.75	40	1.7

TEST PRESSURE 2500 kPA

THRUST BLOCK TYPE	THRUST FORCE (kN)	HORIZONTAL BEARING CAPACITY (kPa)	THRUST FACE AREA (m2)
DN150 11.25 DEG ELBOW	12.25	40	0.3
DN150 22.50 DEG ELBOW	24.00	40	0.6
DN150 45 DEG ELBOW	47.25	40	1.2
DN150 90 DEG ELBOW	87.00	40	2.2
DN150 EQUAL TEE	61.75	40	1.5
DN150 BLANK END/ INLINE THRUST WALL	61.75	40	1.5
TYPE 150-90-A-2500-HORIZONTAL FACE (WHERE INDICATED)	61.75	40	1.5
DN200 11.25 DEG ELBOW	20.75	40	0.5
DN200 22.50 DEG ELBOW	41.25	40	1.0
DN200 45 DEG ELBOW	81.00	40	2.0
DN200 90 DEG ELBOW	149.50	40	3.7
DN200 EQUAL TEE	105.75	40	2.6
DN150-DN200 TAPER	44.25	40	1.1
DN200 BLANK END/ INLINE THRUST WALL	105.75	40	2.6
TYPE 200-90-H-2500-HORIZONTAL FACE (WHERE INDICATED)	105.75	40	2.6

500 0 500mm 1m

SCALE 1:20

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

REV	REVISIONS	DRN	CHK	APP	DATE
2	ISSUED FOR CONSTRUCTION - CHANGE IN PIPE MATERIAL	SDS	CM	JC	01.12.17
1	ISSUED FOR CONSTRUCTION	SDS	CM	JC	16.01.17

SURVEYED		
DESIGNED	Jan Van Herel	09.2016
DRAWN	Deepali Maid	09.2016
CAD REVIEW	Max Dyer	18.01.17
DESIGN CHECK	Calum Murray	18.01.17
DESIGN REVIEW	Calum Murray	18.01.17
APPROVED	Josh Cody	05.12.17
PROF REGISTRATION:		

MWH

Client: Australia's Food Bowl — CABONNE COUNCIL

MOLONG TO CUMNOCK AND YEOVAL PIPELINE

TYPICAL TRENCH DETAILS

Status Stamp: FOR CONSTRUCTION

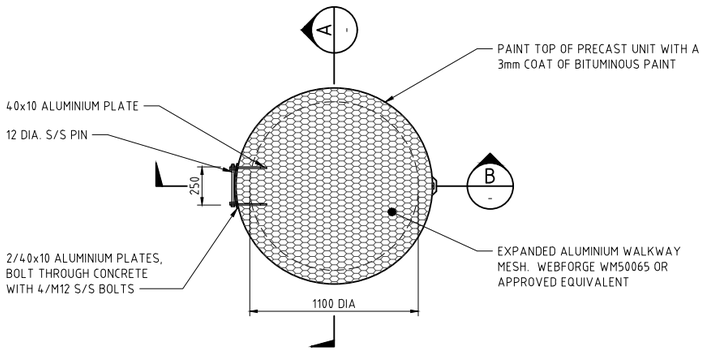
Date Stamp: 01.12.17

Scales: AS SHOWN

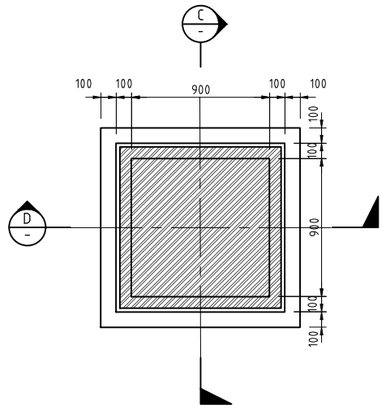
Drawing No.: 83503550-01-001-C200

Rev.: 2

pw:\\asiavpwint04.mwhglobal.com:AP_PROJECTS\Documents\Australian Clients\Cabonne Council\83503550 - Molong to Cumnock and Yeoval pipeline\01\Civil\83503550-01-001-C200



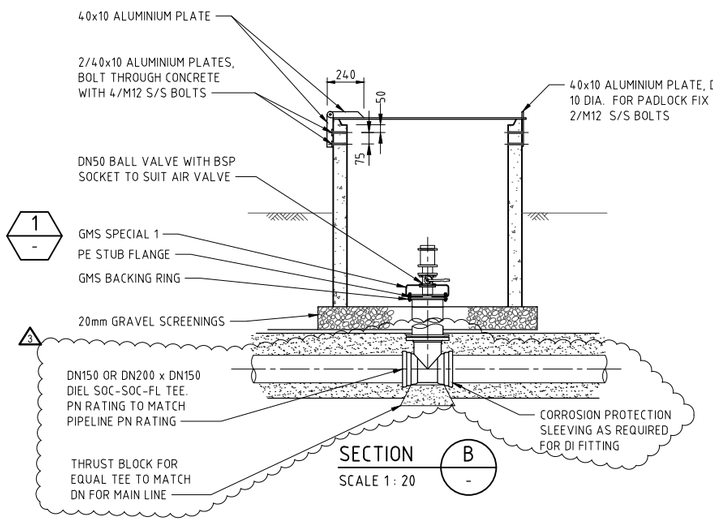
PLAN
SCALE 1 : 20



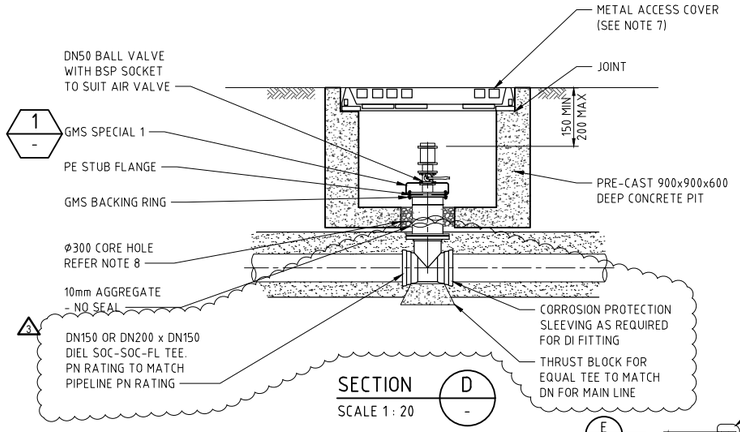
PLAN
SCALE 1 : 20

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. ALL COVER COMPONENTS TO BE FABRICATED FROM ALUMINIUM GRADE 6061-T6 UNLESS OTHERWISE NOTED.
3. ALL BOLTS AND NUTS ARE TO BE GRADE 316 STAINLESS STEEL SHALL BE COATED WITH ANTI GALLING PASTE.
4. PROVIDE NEOPRENE WASHERS AND COLLARS AT ALL STAINLESS STEEL/ALUMINIUM INTERFACES.
5. BOLT HOLES SHALL BE DRILLED 2mm LARGER THAN BOLT DIA
6. ALL CONNECTIONS UNLESS OTHERWISE NOTED, SHALL BE WELDED AS FOLLOWS:
   - 6.A. ALL WELDS TO BE WELD QUALITY B IN ACCORDANCE WITH AS 1665
   - 6.B. WELDS TO BE 6mm FILLET ALL AROUND USING FILLER ALLOY 4043.
7. FOR TYPE 2 ARRANGEMENT METAL ACCESS COVERS TO BE 900x900 (TWO PART), CLASS "D" TYPE. ACCESS COVERS FOR AIR VALVE CHAMBERS TO BE MARKED WITH "AV" & THE WEIGHT OF THE COVER.
8. APPLY EPOXY COATING OVER EXPOSED CUT REINFORCING FABRIC.
9. TYPE 1 ARRANGEMENT SHALL BE USED IN UNMAINTAINED AREAS. TYPE 2 ARRANGEMENTS SHALL BE USED IN TRAFFICABLE AREAS AND MAINTAINED AREAS. THE PRINCIPALS REPRESENTATIVE SHALL CONFIRM TYPE DURING PIPELINE CONSTRUCTION.

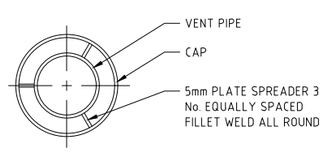


SECTION B
SCALE 1 : 20

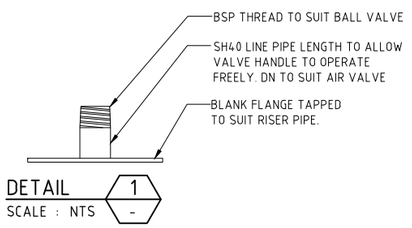


SECTION D
SCALE 1 : 20

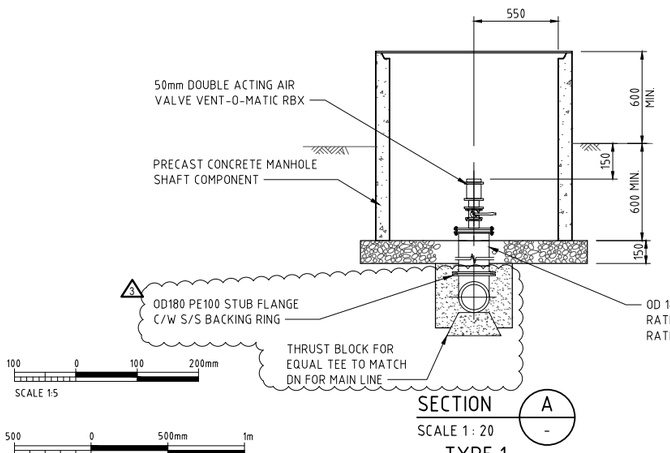
PIPE, BRANCH, VALVE, FITTING TYPES			
DN PIPELINE	DN BRANCH	ISOLATION VALVE	GMS SPECIAL 1
180	180	BALL VALVE	1
225	180		
250	125		
280	140		
315	160		
355	180		
400	200		



SECTION E
SCALE 1 : 5



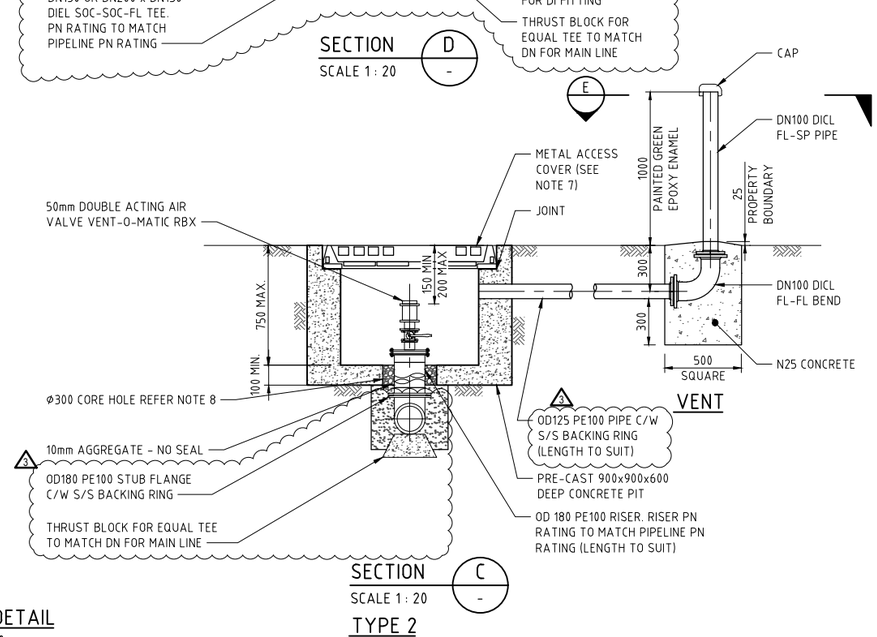
DETAIL 1
SCALE : NTS



SECTION A
SCALE 1 : 20

TYPE 1
(NOTE 9)

AIR VALVE DETAIL
SCALE 1 : 20



SECTION C
SCALE 1 : 20

TYPE 2
(NOTE 9)

G.M.S. SPECIAL 1
(HOT DIP GALVANISED AFTER FABRICATION)

REV	REVISIONS	DRN	CHK	APP	DATE
3	ISSUED FOR CONSTRUCTION - CHANGE IN PIPE MATERIAL	SDS	CM	JC	01.12.17
2	ISSUED FOR CONSTRUCTION - INCORPORATION OF MANILDRA SUPPLY CONNECTION	SDS	CM	JC	06.03.17
1	ISSUED FOR CONSTRUCTION	SDS	CM	JC	16.01.17

SURVEYED		
DESIGNED	Jan van Herel	09.2016
DRAWN	Deepali Maid	09.2016
CAD REVIEW	Max Dyer	18.01.17
DESIGN CHECK	Calum Murray	18.01.17
DESIGN REVIEW	Calum Murray	18.01.17
APPROVED	Josh Cody	05.12.17
PROF REGISTRATION:		

MWH

Client: CABONNE COUNCIL (Australia's Food Basket)

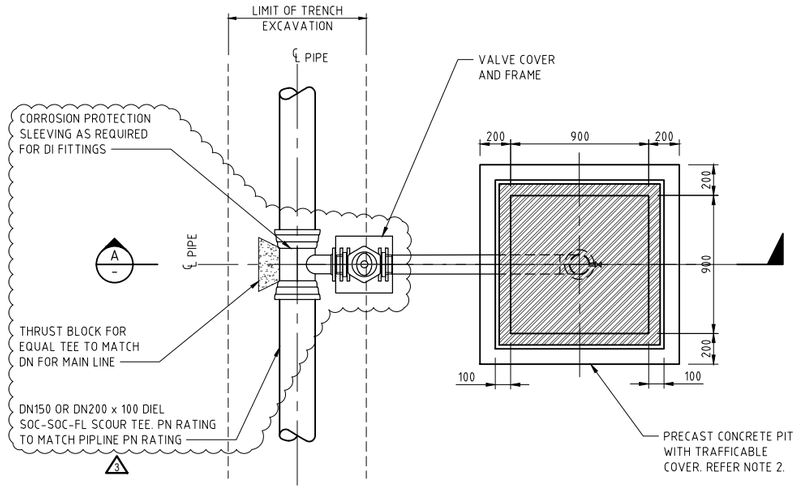
MOLONG TO CUMNOCK AND YEOVAL PIPELINE

TYPICAL AIR VALVE DETAILS

Status Stamp: FOR CONSTRUCTION
Date Stamp: 01.12.17
Scales: AS SHOWN
Drawing No.: 83503550-01-001-C201
Rev.: 3

ORIGINAL SIZE A1
DO NOT SCALE - IF IN DOUBT, ASK

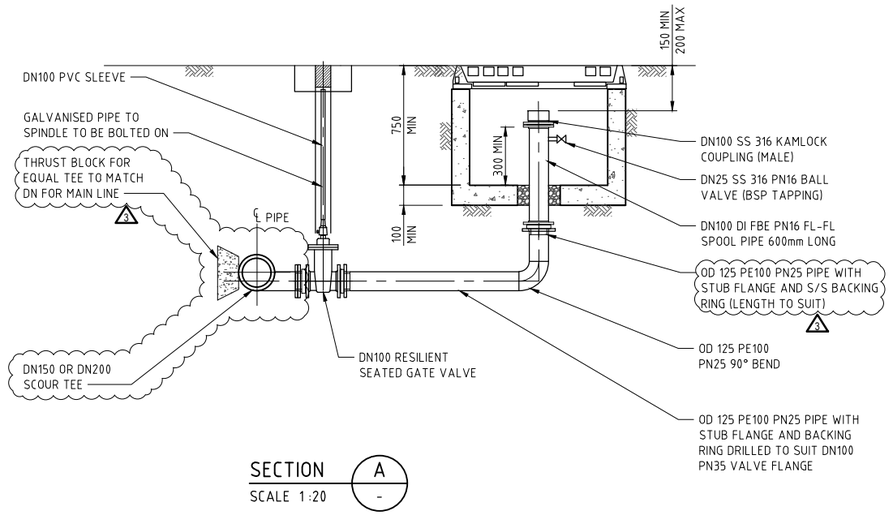
pw:\\asiavpwint04.mwhglobal.com:AP_PROJECTS\Documents\Australian Clients\Cabonne Council\83503550 - Molong to Cumnock and Yeoval pipeline\01\Civil\83503550-01-001-C201



PLAN
SCALE 1 : 20

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. METAL ACCESS COVERS TO BE 900x900 (TWO PART), CLASS "D" TYPE. ACCESS COVERS FOR SCOUR CHAMBERS TO BE MARKED WITH "Sc" & THE WEIGHT OF THE COVER.
3. RESILIENT SEATED GATE VALVE TO BE PN35 RATED.
4. CONCRETE FOR PIT TO BE MIX N32.
5. APPLY EPOXY COATING OVER EXPOSED CUT REINFORCING FABRIC.



SECTION A - A
SCALE 1:20

SCOUR VALVE
SCALE 1 : 20

500 0 500mm 1m
SCALE 1:20

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1

REV	REVISIONS	DRN	CHK	APP	DATE
3	ISSUED FOR CONSTRUCTION - CHANGE IN PIPE MATERIAL	SDS	CM	JC	01.12.17
2	ISSUED FOR CONSTRUCTION - INCORPORATION OF MANILDRA SUPPLY CONNECTION	SDS	CM	JC	06.03.17
1	ISSUED FOR CONSTRUCTION	SDS	CM	JC	16.01.17

SURVEYED		
DESIGNED		
DRAWN	Deepali Maid	09.2016
CAD REVIEW	Max Dyer	18.01.17
DESIGN CHECK	Calum Murray	18.01.17
DESIGN REVIEW	Calum Murray	18.01.17
APPROVED	Josh Cody	05.12.17
PROF REGISTRATION:		

MWH

Client: Australia's Food Basket — CABONNE COUNCIL

MOLONG TO CUMNOCK AND YEOVAL PIPELINE

TYPICAL SCOUR VALVE DETAILS

Status Stamp: **FOR CONSTRUCTION**
Date Stamp: **01.12.17**
Scales: AS SHOWN
Drawing No.: 83503550-01-001-C202
Rev.: 3

pw:\\asiavpwint04.mwhglobal.com:AP_PROJECTS\Documents\Australian Clients\Cabonne Council\83503550 - Molong to Cumnock and Yeoval pipeline\01\Civil\83503550-01-001-C202

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 7 – REVIEW OF ENVIRONMENTAL FACTORS

NSW GOVERNMENT | Public Works Advisory

Cumnock and Yeoval Water Reticulation Upgrades

Review of Environmental Factors

Report Number DC17011

May 2017

Australia's Food Basket
CABONNE COUNCIL

Document Control

Issue / Revision	Author	Reviewer	Approved for Issue	
			Name	Date
Draft v1	Rowan McKay/ Alberto Paludetto	Anastasia Assargiotis	Lara Hess	

Anastasia Assargiotis

Environmental Scientist

Level 13 McKell Building

2 – 24 Rawson Place

SYDNEY NSW 2000

T: 02 9372 7920

E: Anastasia.assargiotis@finance.nsw.gov.au

W: www.finance.nsw.gov.au

Declaration

This Review of Environmental Factors (REF) has been prepared by Public Works Advisory (a division of the Department of Finance, Services and Innovation) on behalf of Cabonne Council. It presents the assessment of potential impacts that may result from activities associated with the proposed pipeline upgrades in the townships of Cumnock and Yeoval, located in Central West NSW.

Cabonne Council is a public authority and a determining authority as defined in the *Environmental Planning and Assessment Act 1979.* The proposal satisfies the definition of an activity under the Act, and as such Cabonne Council must assess and consider the environmental impacts of the proposal before determining whether to proceed.

This REF has been prepared in accordance with Sections 111 and 112 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (NSW EP and A Reg.). It provides a true and fair assessment of the proposed activity and addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

On the basis of the information presented in this REF it is concluded that:

(1) The proposed activity is not likely to have a significant impact on the environment and therefore an Environmental Impact Statement is not required.

(2) The proposed activity is not likely to significantly affect threatened species, populations, ecological communities, or critical habitat. Therefore, a Species Impact Statement (SIS) is not required.

(3) The proposed Activity is not likely to affect any Commonwealth land, is not being carried out on Commonwealth land, or significantly affects any Matters of National Environmental Significance.

Subject to implementation of the measures to avoid, minimise or manage environmental impacts listed in this REF, the proposed activity is recommended for approval.

Name of Author and Qualifications	Rowan McKay, BURP
Designation	Environmental Planner
Name of Reviewer and Qualifications	Anastasia Assargiotis, BEnvSc (Hons)
Designation	Environmental Scientist
Organisation	Public Works Advisory, Department of Finance, Services and Innovation
Signature	
Date	

Verification and Determination

Verifier

I have examined this REF and the Declaration by the author Rowan McKay and accept the report on behalf of Cabonne Council.

Name	
Designation	
Organisation	
Signature	

Determination

I determine that the activity is approved and may proceed.

Name	
Designation	
Organisation	
Signature	

Table of Contents

PAGE

LIST OF FIGURES

PAGE

LIST OF TABLES

PAGE

LIST OF PLATES

PAGE

List of Abbreviations

AHD	Australian Height Datum
CEMP	Construction Environmental Management Plan
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
LEP	Local Environmental Plan
LGA	Local Government Area
NPW Act	*National Parks and Wildlife Act 1974*
OEH	NSW Office of Environment and Heritage
POEO Act	*Protection of The Environment Operations Act 1997*
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
RMS	Roads and Maritime Services
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan
TSC Act	*Threatened Species Conservation Act 1995*
WM Act	*Water Management Act 2000*
WMP	Waste Management Plan

1 Introduction

1.1 Background

The 'Restart NSW Water Security for Regions' is a program run by the NSW government to secure long term water supply to those regional areas that can be periodically affect by drought. Funding has been granted to establish new pipelines to secure the urban town water supply of several regional areas throughout rural NSW. Under this program, a delivery team of Orange City Council, Central Tablelands Water and Cabonne Council have secured funding to establish two pipelines in these council LGAs, in central western NSW.

DPI Water are delivering the Restart NSW Water Security for Regions program, with the aim of achieving long term water supply security to regional areas. This would be achieved through the provision of two major pipelines as follows;

- 65 km of pipeline from Orange to Molong Dam and from Molong to Cumnock and Yeoval
- 57 km of pipeline from Orange to Carcoar via Spring Hill, Millthorpe and Blayney

As minor component of these larger projects funding has also been obtained to address the town water supplies of Cumnock and Yeoval. These townships are located approximately 50 km and 70 km north-west of Orange respectively and connected via Banjo Patterson Way (see Figure 1-1).

The existing water supply reticulation systems in Cumnock and Yeoval supply raw water to consumers. This proposal includes the transfer this existing system to supply drinking water to consumers of both Cumnock and Yeoval townships. Potable water would be supplied from the Molong Water Treatment Plant to these two townships.

1.2 Overview of the Proposed Works

The proposal would comprise installation of 1.1 km and 3 km of pipelines in Cumnock and Yeoval, respectively. Pipelines to be installed in Yeoval would be 100 mm, 150 mm and 200 mm in diameter, while pipelines in Cumnock would be 100 mm in diameter.

The proposed pipeline sections are shown in Figure 1-2, Figure 1-3 and Appendix A.

The pipelines would be constructed via open trenching and would be confined to a narrow strip (approximately 2 m wide corridor). Minor deviations in the pipeline alignment would be undertaken to minimise vegetation disturbance and avoid sensitive sites.

1.3 Land Ownership

The proposed works are located within Crown road reserves under the management of Cabonne Council.

Figure 1-1: General Project Area Map

Source: Google Maps, April 2017

Figure 1-2: Pipeline upgrades within the township of Cumnock

Source: Eco Logical Australia, March 2017

Figure 1-3: Pipeline upgrades within the township of Yeoval

Source: Eco Logical Australia, March 2017

2 Statutory Planning Framework

This section presents the statutory planning and strategic policy context for the proposal.

2.1 Environmental Planning Instruments

2.1.1 Cabonne Local Environmental Plan 2012

The proposed project is located within Cabonne Local Government Area (LGA). Land zoning of the pipeline alignment under the Cabonne Local Environmental Plan 2012 is detailed in Table 2-1.

Table 2-1: Land use zoning of the proposed pipeline route

Pipeline Section	Zoning	LGA	Drawing/Plan
Haig St – McLaughlin St	RU5 Village	Cabonne	Line 1A and 2A; Sheet 06
Beatty St – Burrawang St	RU1 Primary Production RU5 Village	Cabonne	Line 1A and 2A; Sheet 02
Black St - Keay St	RU5 Village	Cabonne	Line 3A and 4A; Sheet 01
Banjo Patterson Way Obley St	SP2 Classified Road	Cabonne	Sheet 01
Crown St – Myrangle St	RU5 Village	Cabonne	Sheet 02
Obley St - Lucknow St	RU5 Village	Cabonne	Lines 2A, 3A, 4A; Sheet 03
King St – Bell St	RU1 Primary Production RU5 Village	Cabonne	Line 2A and 3A; Sheet 03
Bathurst St – Short St	RU5 Village	Cabonne	Lines 2A, 3A, 4A; Sheet 03
Railway Parade	RE1 Public Recreation	Cabonne	Line 5A; Sheet 04
Avon Rd	RU1 Primary Production	Cabonne	Line 6A and 8A; Sheet 05
Tremain Dr – Tobins Rd	SP2 Infrastructure RU1 Primary Production	Cabonne	Line 7A; Sheet 06
Renshaw McGregor Way	SP2 Infrastructure	Cabonne	Line 6A and 8A; Sheet 05

Several locally listed heritage items are located within the Cumnock township. None of the proposed works are likely to impact on these heritage items (see Section 5.6).

2.1.2 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (SEPP (Infrastructure)) aims to assist in the effective delivery of public infrastructure by improving certainty and regulatory efficiency. It provides clear definition of the environmental assessment and approval process for public infrastructure and services facilities.

A water reticulation system is defined under clause 124 of the SEPP (Infrastructure) to mean a facility for the transport of water, including pipes, tunnels, canals, bores, pumping stations, related electricity infrastructure, dosing facilities and water supply reservoirs. The proposed pipeline is considered to meet the definition of a water reticulation system.

Clause 125 (1) of the SEPP (Infrastructure) allows works for the purpose of a water reticulation system to proceed without development consent on any land and therefore the proposed works would be permissible without development consent.

2.2 Statutes

2.2.1 Environmental Planning and Assessment Act 1979 (NSW)

The relevant environmental planning instrument for the proposal is SEPP (Infrastructure) 2007 which removes the requirement for compliant activities to obtain development consent. Therefore, the proposal has been assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Cabonne Council is the proponent and the determining authority for the development.

This REF has been prepared in accordance with Section 111 of the EP&A Act, which requires that the proponent take into account to the fullest extent possible all matters affecting or likely to affect the environment due to the proposed activity. Consideration of the factors listed under Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) has been used to assist in assessing the impacts of the proposal (see Appendix B).

2.2.2 National Parks and Wildlife Act 1974 (NSW)

The *National Parks and Wildlife Act* 1974 (NPW Act) provides for the statutory protection of Aboriginal cultural heritage places, objects and features. Part 6 of the NPW Act provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm.

It is a defence against prosecution for unintentionally harming Aboriginal Objects if due diligence had been exercised to determine that no Aboriginal object would be harmed, or the harm or desecration was authorised by an Aboriginal heritage impact permit (AHIP).

A Due Diligence Heritage Assessment has been undertaken for the proposal in accordance with *The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010). This assessment identified that Sections 3, 4, and 5 and the northern side of the road reserve of Section 8 within the township of Yeoval (see Figure 1-3) have the potential to contain subsurface archaeological deposits outside the footprint of disturbance caused by the construction of the road (i.e. the road surface and the surrounding 2m). The likelihood of Aboriginal sites occurring in these areas is moderate to high.

Because of these archaeological constraints, the following design amendments are proposed to avoid impacts:

- Section 3 would be installed between the edge of the existing carriageway and existing Telstra cables in an area of previous disturbance.
- Sections 4 and 5 has been relocated from previously undisturbed land, to nearby man made drainage channels adjacent a previously disturbed carriageway.
- Section 8 of the proposed works would be conducted between the edge of the existing disturbed carriage way and the existing water pipeline.

This assessment is discussed in detail in Section 5.7 and included in full in Appendix D. No further Aboriginal archaeological assessment is recommended and works can proceed without the need for further archaeological investigations or an AHIP.

2.2.3 Heritage Act 1977 (NSW)

The *Heritage Act* 1977 protects the State's natural and cultural heritage and contains measures to protect archaeological remains. More specifically, it provides protection for European/historic relics and sites. A search of the State Heritage Register (SHR) did not identify any SHR listed items located along or in proximity to the pipeline alignment.

2.2.4 Protection of the Environment Operations Act 1997 (NSW)

The NSW Environmental Protection Authority (EPA) is responsible for the administration of the *Protection of the Environment Operations Act* 1997 (POEO Act). The POEO Act regulates air, noise, land and water pollution. Activities listed under Schedule 1 of the POEO Act are scheduled activities which require an environmental protection licence (EPL). The proposal is not a scheduled activity under Sections 47, 49 and Schedule 1 of the POEO Act.

Section 120 of the POEO Act makes it an offence to pollute waters. It is considered that the proposed works can be carried out without causing water pollution and therefore a licence would not be required. The EPA is the Appropriate Regulatory Authority as the work is being undertaken by a public authority.

2.2.5 Protection of the Environment Operations (Waste) Regulation 2014 (NSW)

The *Protection of the Environment Operations (Waste) Regulation* 2014 sets out the provisions with regards to non-licensed waste activities and non-licensed waste transporting, in relation to the way in which waste must be stored, transported, and the reporting and record-keeping requirements. The disposal of construction waste and spoil and operational water by-products would be required to comply with this regulation.

2.2.6 Water Management Act 2000 (NSW)

The objects of the *Water Management Act* 2000 (WM Act) are to provide for the sustainable and integrated management of the water sources of the state for the benefit of both present and future generations.

Section 91B of the WM Act requires a water supply works approval to be obtained for several works, including *a work (such as a water pipe or irrigation channel) that is constructed or used for the purpose of conveying water to the point at which it is to be used*. Therefore, a water supply works approval would be required for the proposed pipelines.

Water sharing plans under the WM Act govern the sharing of water in a particular water source between water users and the environment and rules for the trading of water in a particular water source. Water access licences (WALs) entitle licence holders to specified shares in the available water within a particular water management area or water source (the share component), and to take water at specified times, rates or circumstances from specified areas or locations (the extraction component). WALs may be granted to access the available water governed by a water sharing plan under the *Water Management Act 2000*. The townships of Cumnock and Yeoval are located in the area subject to the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources.* It is assumed that Cabonne Council have an existing WAL for water supply and the proposal would not require an increase to the existing WAL entitlement. If any water is taken from beyond Council's existing entitlement, Council's licence would need to be modified.

2.2.7 Threatened Species Conservation Act 1995 (NSW)

The *Threatened Species Conservation Act 1995* (TSC Act) protects species of threatened flora and fauna, endangered populations and endangered ecological communities and their habitats in NSW. It also lists Key Threatening Processes that adversely affects threatened species, populations or ecological communities or that may cause species, populations or ecological communities that are not threatened. No endangered ecological community, threatened species, populations or their habitat as listed under TSC Act were identified as being impacted by the proposed works (see Section 5.5).

2.2.8 Native Vegetation Act 2003 (NSW)

The *Native Vegetation Act 2003* regulates the clearing of native vegetation in NSW. However, this Act does not apply to any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the EP&A Act if the determining authority has complied with that Part. As this project is an activity within the meaning of Part 5 of the EP&A Act, the *Native Vegetation Act 2003* does not apply.

2.2.9 Roads Act 1993 (NSW)

Section 138(1) of the *Roads Act 1993* requires the consent of the appropriate roads authority to (generally) undertake works within a public road. Cabonne Council is the appropriate roads authority for local roads within Cumnock and Yeoval, as well as the determining authority for these works.

2.2.10 Crown Lands Act 1989 (NSW)

The Crown Lands Act 1989 sets out how Crown land is to be managed in NSW. The Act is administered by Crown Lands Division within the Department of Industry – Lands (DoI – Lands). The road reserves are held under a number of crown leases.

Under s155 of the Act it is an offence to erect a structure, clear or dig up public land without a lawful authority. As such, the works within Crown land would require authorisation by a lease, licence or other permit to allow the use of Public Land (section 45 of the Act). Prior to commencement of works, the required authorisation should be sought from DoI – Lands for the installation of pipelines within this land.

2.2.11 Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

The Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) provides for Commonwealth involvement in development assessment and approval in

circumstances where there exist 'matters of national environmental significance'. Matters of national environmental significance include:

- World heritage properties
- National heritage places
- Wetlands of international importance
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development
- The environment, where actions proposed are on, or will affect Commonwealth land and the environment
- The environment, where Commonwealth agencies are proposing to take an action

No matters of national environmental significance as listed under EPBC Act are likely to be impacted by the proposed works (see Section 5.5).

2.3 Summary of Approvals

The following table provides a summary of the approvals required for the proposal.

Table 2-2: Summary of Approvals

Agency	Requirements	Reference
Cabonne Council	Determination of the proposal	Part 5 of EP&A Act 1979
DoI - Lands	Authorisation to install pipeline in Crown land	s155 of Crown Lands Act 1989

2.4 Consultation

Consultation was undertaken with Cabonne Council, the Office of Environment and Heritage and DPI Water regarding this proposal. A summary of issues raised are provided in Table 2-3 below and responses are provided in full in Appendix C.

Table 2-3: Consultation

Agency	Summary of Comments	Where Addressed in REF
Office of Environment and Heritage	*Flora, Fauna and Threatened Species* A copy of our generic Environmental Impact Assessment requirements for biodiversity is included in Attachment 1. Associated guidance documents are referenced in Attachments 1 and Attachment 2. These guidelines address requirements under the EP&A Act and OEH's areas of responsibility relating to flora, fauna and threatened species, populations and ecological communities and their habitats. OEH is committed to the protection, appropriate management, and where necessary, rehabilitation of native vegetation. For these reasons, OEH considers that careful planning should precede any development that involves further vegetation clearance or other significant impact within areas of remnant vegetation.	Sections 4.2.3, 5.5, 5.10
	Cultural Heritage The importance of protecting Aboriginal Cultural Heritage is reflected in the provisions under Part 6 of the NSW NPW Act, as amended. That Act clearly establishes that Aboriginal objects and places are protected and may not be harmed, disturbed or desecrated without appropriate authorisation. Importantly, approvals under Parts 4 and 5 of the EP&A Act do not absolve the proponent of their obligations under the NSW NPW Act. Under the NPW Act, it is the responsibility of each individual proposing to conduct ground disturbance works to ensure that they have conducted a due diligence assessment to avoid harming Aboriginal objects by the proposed activity. OEH has produced a generic due diligence process, which is not mandatory to follow, however any alternative process followed must be able to demonstrate their process was reasonable and practicable in attempts to avoid harm to Aboriginal objects. Consultation must also be in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010) as set by OEH if impact to cultural heritage is unavoidable.	Section 5.6 and Appendix D
Cabonne Council	The Cabonne Local Environmental Plan 2012 note aspects of biodiversity, Karst and Biodiversity. Some areas of the Cabonne LGA are subject to Koala Habitat in accordance with State Planning Policy 44 and areas of Naturally Occurring Asbestos (NOA).	Sections 4.2, 5.3, 5.7, 5.8, 5.9, 5.11, 5.12
DPI Water	An impact assessment of construction and operation of the pipeline within 40m of the banks of	

Agency	Summary of Comments	Where Addressed in REF
	watercourses should be addressed in the REF. Design and construction of works within waterfront land are recommended to be consistent with DPI Water *Guidelines for Controlled Activities on Waterfront Land*. Potential impacts on groundwater should be considered, including an assessment framework for the NSW Aquifer Interference Policy. The REF should address a commitment to prepare a construction environmental management plan to identify and manage impacts during construction. It is requested that erosion and sedimental constrol is addressed in accordance with the guideline *Managing Urban Stormwater: Soils and Construction* (Landcom 2004).	Sections 4.3, 5.3, 5.4

3 Option Evaluation and Project Justification

3.1 Option Evaluation

The existing water reticulation system in Cumnock and Yeoval currently supplies these townships with raw water. The proposed upgrades would enable raw water systems to be modified to become a potable drinking water supply system. The potable water supply would be sourced from the Molong Water Treatment Plant and piped to these two townships. Based on an analysis of the current functioning of the current systems it has been identified that several pipeline extensions and replacements are required to meet adequate standards for a potable water supply in each of these townships.

The “Do Nothing” option is not considered to be feasible given the need of the Cumnock and Yeoval communities for secure potable water sources.

This proposal consists of installing short sections of new pipelines at stubs of existing pipelines, to complete interconnection of sections. Because of the small scale of such works, the shortest route along road reserve was chosen by onsite discussion between representatives of Cabonne Council and Public Works Advisory design engineers.

In assessing the proposed pipeline alignments, three Aboriginal items were identified near the alignment. The site boundaries were defined and the pipeline route realigned at an appropriate buffer distance to avoid these items.

3.2 Project Justification

Cumnock and Yeoval have been identified as priority townships under the Restart NSW Water Security for Regions program. Installation of potable water pipelines would contribute to the overall sustainable management of water supply and the enhancement of the amenity and water security to these townships and their communities.

4 Description of the Proposal

This section provides a description of the proposal that is assessed in this REF.

4.1 Description of Proposal

The proposal would comprise installation of 1.1 km and 3 km of pipelines in Cumnock and Yeoval, respectively. Pipelines to be installed in Yeoval would be 100 mm, 150 mm and 200 mm in diameter, while pipelines in Cumnock would be 100 mm in diameter.

The proposed pipeline sections are shown in Figure 1-2, Figure 1-3 and Appendix A.

The pipelines would be constructed via open trenching and would be confined to a narrow strip (approximately 2 m wide corridor). Minor deviations in the pipeline alignment would be undertaken to minimise vegetation disturbance and avoid sensitive sites.

4.2 Construction Methodology

The proposed construction methodology would be dependent on several factors including the contractor's chosen method, equipment, and program. A construction methodology has been predicted based on previously constructed similar sized water supply schemes.

4.2.1 Site Establishment

The Contractor would be responsible for negotiation with local Council or private landowner(s) regarding the location of a suitable convenient location to service and store plant and equipment, store excess excavated materials, dangerous goods as may be necessary for plant maintenance and repair and site amenities for construction personnel.

The Contractor would ensure dangerous goods are stored within self-contained facilities and have available spill response and waste recovery from site. All plant and equipment requiring refuelling would be supplied with spill response equipment on the plant or refuelling vehicle and used during resupply activities according to manufacturers' instructions by trained personnel.

4.2.2 Pipeline

Pipeline excavation, installation, and backfilling would be carried out along the defined alignment in accordance with the design specification and drawings issued to the Contractor. A trenching machine would be used to form a trench 900 mm to 1050 mm deep and approximately 400 mm to 500 mm wide. The pipe would be laid into the bed of the trench and backfilled with a minimum cover of 600 mm. The pipe size would vary between 100 mm, 150 mm and 200 mm sections throughout the pipeline network. Backfill materials such as bedding, side and over pipe packing would be supplied, placed and compacted according to Contract specifications.

The excavated materials consisting of virgin natural material, existing engineering fill or other would not be suitable for backfilling the trench. The Contractor would be able to temporarily stockpile excavated materials and imported backfill within the road corridor, on the side of the trench away from the existing carriageway and would need to temporarily cover stockpiled materials with geofabric. No excavated or backfill materials would be left permanently adjacent the pipeline alignment or road corridor unless part of post-installation landscape design specification

Management of erosion and sediment control along the alignment shall follow general principles outlined in Section 6 of Managing Urban Stormwater Vol. 2A-Installation of Services. The Contractor would design and implement temporary runoff diversion measures to ensure the trench is not filled with surface runoff from the adjacent carriageway or private property, install in trench check dams and plugs to minimise in trench erosion and plan to carry out installation, commissioning, compaction and backfilling in a progressive manner to minimise risk to works by rainfall events.

In addition to the pipeline, valves, hydrants, thrust blocks and other reticulation infrastructure would need to be installed at locations along the pipe trench, defined in drawings. Access points to this infrastructure would be left flush to ground and grade at defined locations. The Contractor would be carrying out disinfection, hydrostatic testing and commissioning of the new pipeline sections, according to specifications defined in the Contract.

Where the trench has been installed in the existing carriageway or shoulder, the Contractor shall reinstate engineering fills (subgrade and grade) and pavement materials to agreed specifications supplied in the Contract or in discussion with local council.

4.2.3 Tree Removal and Root Protection

The pipeline would be constructed via open trenching using a trench digger. Minor deviations in the pipeline alignment would be undertaken to minimise vegetation disturbance and avoid sensitive sites. Clearing would be limited to small shrubs with basal diameter less than 150 mm and groundcovers. Areas no longer required for access would be allowed to naturally regenerate.

In the event the pipeline alignment is through the root zone of a larger or more mature tree a tree root barrier would be incorporated within the trench between pipe and root ball, consisting of geotextile fabric, installed to *AS 4970:2009 Trees in Construction Sites*.

4.2.4 Construction Equipment

The following construction equipment would most likely be used:

- Bobcat or to clear vegetation;
- Trucks carrying pipeline construction materials, and excavated material from the site;
- Low loader for trench digger to excavate trenches and lay pipeline;
- Passenger vehicles to transport construction workers; and
- Refuelling tankers

All equipment is to be supplied clean and free of weed and mud from previous operations elsewhere.

4.2.5 Construction Timeframe

Construction works is anticipated to begin in September 2017 and take approximately 6 months.

4.3 Construction Environmental Management

Construction of the proposal would be undertaken in accordance with a Construction Environmental Management Plan (CEMP) that would be prepared by the construction contractor/s and approved by Cabonne Council prior to commencement. The CEMP would

incorporate all of the mitigation measures identified in this REF as well as any conditions of approval and any other licence/approval conditions. The CEMP would also incorporate an emergency response plan in case of a pollution incident, a complaints handling procedure and a 24-hour telephone contact number.

The recommended structure and contents of the CEMP, as well as a complete list of the mitigation measures recommended in this REF, is provided in Section 6.

5 Environmental Assessment

This section identifies and characterises the existing environment, the likely potential impacts associated with the construction and operational phases of the project and any associated mitigation measures. Where considered necessary, feasible mitigation measures are identified for implementation as part of the proponent's environmental management.

5.1 Assessment Methodology

The key objectives of this assessment are to:

- Identify those facets of the environment likely to be affected by the proposal during both construction and operation;
- Identify the sensitivity of the site;
- Identify and characterise the associated impacts; and
- Identify and evaluate feasible mitigation measures for the identified impacts.

Environmental issues of potential relevance to the proposal include:

- Land use and ownership
- Soils and surface waters
- Groundwater and water quality
- Flora and fauna
- Cultural heritage
- Noise and vibration
- Air quality
- Traffic and access
- Waste management
- Visual amenity
- Utilities and infrastructure

5.2 Land Use

The pipeline project is located within the townships of Cumnock and Yeoval, within Cabonne Local Government Area (LGA) in the Central West region of NSW approximately 60 km northwest of Orange, off Banjo Patterson Way (see Figure 1-1). Land use zonings applying to the alignment are detailed in Table 2-1.

The land is held under a number of crown leases and is used as road reserve. Surrounding features include rural land uses, urban residential, industrial and rural residential land uses.

The pipeline route has been subject to a high level of disturbance due to vegetation clearing, stock grazing and road construction and operation. A large proportion of these areas are slashed and maintained and serving as drainage swales to collect and divert runoff from adjacent carriageways. Photographs illustrating land use of the alignment and surrounding areas are provided in Plates 1-12 below.

Plate 1: Looking north down Haig Street, Cumnock

Plate 2: Looking east down Betty Street, Cumnock

Plate 3: Looking north down Burrawang Street, Cumnock

Plate 4: Looking north down Keay Street, Cumnock

Plate 5: Looking east towards Banjo Patterson Way, Yeoval

Plate 6: Looking north down Obley Street, Yeoval

Plate 7: Mytrangle Street, Yeoval

Plate 8: Lucknow Street, Yeoval

Plate 9: Corner Kay & Bell Street, Yeoval

Plate 10: Short Street, Yeoval

Plate 11: Railway Parade, Yeoval

Plate 12: Avon Road, Yeoval

5.2.1 Impact Assessment

Given the predominantly rural nature of the alignment, minor and temporary inconvenience to adjacent land users may be expected during the construction period, due to increased traffic, temporary exclusion to driveways, dust and elevated noise levels. The contractor would liaise with the property owners and Council to ensure the proposed works do not interfere with property services and access during the works. These impacts are not anticipated to be significant, assuming implementation of the mitigation measures in 5.2.2.

During operation of the pipeline, access may be required for inspections and maintenance. Maintenance activities would be located at points where control valves and hydrants are located, and inspections of the pipeline may also require localised excavation to allow pipeline access. Appropriate mitigation measures, listed in Section 5.2.2, would minimise these post-construction impacts.

5.2.2 Mitigation Measures

- Prior to commencement of works, the required authorisation should be sought from DoI – Lands for the installation of pipelines within this land.
- Consultation would be undertaken with landowners potentially affected by these works, including those potentially impacted by noise and interruptions to access to private property.
- No construction activities (e.g. tree clearing, stockpiling etc.) would be undertaken on private property adjoining the alignment without prior approval. Appropriate security, supervision and access controls would be put in place and properly monitored to ensure no access by unauthorised personnel, either to the work area or via the work area to adjoining areas not under the ownership of Cabonne Council.
- During construction, ensure the necessary care and maintenance of property facilities and operations, including fences, gates and stock. However, if any damage did occur to property it would be restored to a condition equivalent to the original condition. Temporary fencing and gates would be installed where necessary to exclude animals (stock and ground dwelling native fauna) from the work sites. Any temporary fencing or gates no longer required would be removed at the completion of the construction works.
- Cabonne Council would provide a 24-hour telephone number so that any issues relating to the operation of the new infrastructure can be clarified and complaints dealt with by those able to respond.

5.3 Geology and Soils

The following description of the geology and soils along the pipeline alignments has been summarised from the geotechnical investigations undertaken by Public Works Advisory in March 2017.

The Yeoval reticulation areas are underlain by granodiorite and associated residual deposits comprising silty clays with varying concentrations of sand. The residual, medium to high plasticity clays are typically of very stiff consistency, locally of stiff consistency.

Granodiorite tors are stacked or strewn in the paddock containing the easement for the access to the existing reservoir. Minor bouldery outcrop and Meta-sandstone bedrock was noted in some sections. Minor alluvial sediments occur in the sections of the alignment located in close proximity to Buckinbah Creek.

The Wellington 1:100,000 Geological Series Sheet 8632, First Edition (2000), indicates that the Cumnock reticulation area is located within thick deposits of Quaternary sediments comprising alluvial silt, clay and sand with variable humic content and sporadic pebble- to cobble-sized unconsolidated conglomeratic lenses. To the west, the Quaternary deposits are flanked by a suite of rocks of the Kabadah Formation (Cabonne Group). The formation is Ordovician in age and comprises mafic volcaniclastic sandstone, siltstone, banded cherty

siltstone and minor limestone. The drilling investigations confirmed that the proposed pipeline alignments are located within thick deposits of Quaternary alluvium.

5.3.1 Impact Assessment

Cumnock

The investigation revealed that the Cumnock reticulation area is underlain by cohesive sediments comprising silty clays with varying concentrations of sand and traces of embedded, fine ironstone gravel. The clays are typically of very stiff consistency, locally of stiff consistency. Consequently, bearing capacity is more than adequate while settlement is of no concern.

The mains are expected to be founded at shallow depths. The trench walls are expected to be self-supporting during a short-term construction period.

Excavations to design invert levels should be readily achievable using conventional earth moving equipment such as a backhoe.

Yeoval

The proposed pipelines would be founded within residual clays or extremely weathered granodiorite. Construction difficulties associated with permanent groundwater are not envisaged. However, it should be noted that presence of seepage is subject to prevailing weather conditions at the time of construction.

The proposed pipelines are expected to be founded at shallow depths, typically not exceeding 1m. The trench walls are expected to be self-supporting during a short-term construction period; however, some minor battering back may be required where loose sands were encountered in the upper part of the profile.

Excavations to design invert levels would encounter fill, residual deposits and weathered granodiorite bedrock. The bedrock is typically extremely weathered and displays soil-like characteristics and should be excavatable using conventional earth moving equipment. Locally, embedded boulders may be encountered in the upper part of the soil profile. More competent bedrock was generally not encountered at discrete borehole locations, apart from one borehole where highly weathered meta-sandstone is exposed in the track. In one borehole in Bell Street, geotechnical investigations indicate that hard digging conditions for a backhoe may be expected to a depth of 1m.

Samples encountered along the Cumnock and Yeoval pipeline alignments were tested for corrosion and scaling assessment. Generally, the tested materials are neutral to moderately alkaline. The sulphate and chloride levels are low, indicating the materials are non-aggressive towards concrete and non-corrosive towards steel. Overall, the laboratory's assessment is that the likelihood of aggressive corrosion is low.

5.3.2 Mitigation Measures

- A detailed Soil and Water Management Plan (SWMP) shall be prepared as part of the CEMP. The SWMP would describe the site-specific measures to be implemented for all works areas, in accordance with the guidelines outlined in the 2004 Landcom publication *Managing Urban Stormwater: Soils and Construction*, 4th edition ("The Blue Book") and *Volume 2a Installation of Services*. The SWMP would need to address the following issues to prevent erosion, sediment loss and water quality impacts:

  - Minimisation of disturbance to soil and water adjacent to, and within, all watercourses in the works area.
  - Identification of site specific sediment and erosion control measures wherever erosion is likely to occur.
  - Identification of any environmentally sensitive areas on or near construction sites to ensure runoff is diverted away from sensitive areas.
  - Requirements for vegetation clearing to be kept to a minimum.
  - Retention of all surface runoff on-site.
  - Where possible, diversion of off-site stormwater around the construction site.
  - Backfilling and stabilising of trenches once pipelines are installed.
  - Location of construction compounds (at least 50 m from any drainage lines).
  - Location and management of stockpiles, such as locating stockpiles away from any drainage lines near the works areas.
  - Regular inspection of all erosion and sediment controls, especially when rain is expected and directly after any rain events.
- All areas where ground disturbance has occurred would be stabilised following completion of works to ensure there is no erosion hazard and restored to their pre-construction condition. This would involve, where required, reshaping the ground surface, covering it with topsoil excavated from the site and re-establishing an appropriate vegetation cover.
- Any excess spoil would either be spread across the ground in nearby areas in such a manner as to avoid creating an erosion hazard, or removed off site for disposal in accordance with relevant Cabonne Council and OEH requirements.

5.4 Water

Several creek lines are located within 200 m of the alignments in Yeoval, including Buckinbah Creek (a fifth order creek line) and Sandy Creek (a fourth order creek line). These are illustrated in Figure 5-1.

Geotechnical investigations did not encounter any groundwater to depth of drilling (1-1.5m).

5.4.1 Impact Assessment

The main potential for water quality impacts during construction works is through the movement of sediment material offsite and through the soil profile during the pipe laying activities. Runoff from the earthworks, stockpiled material and trench pump out has the potential to increase turbidity and nutrients entering the receiving waters, which when present in large volumes may impact on water quality and ecological values. Effective implementation of the mitigation measures listed in 5.3.2 and 5.4.2 of this REF in relation to erosion and sediment control, particularly in those areas close to drainage lines, would minimise any adverse impacts to water quality because of these works.

The proposed pipeline trenches would be up to 1050 mm deep and therefore unlikely to encounter groundwater, based on the findings of the geotechnical investigations.

Water may be required during construction works for use in pipeline concrete pressure testing. The contractor would determine any construction water requirements and would negotiate with the relevant water supply authority.

The pipeline alignment to be followed is most often located in the road shoulder and table drain adjacent the local carriageway. As these locations are regularly graded as part of road maintenance works, it would be imperative to:

- Ensure that table drain runoff upstream of works does not enter and concentrate within the pipeline trench.
- The table drain and shoulder should be backfilled and compacted according to Cabonne Council road maintenance requirements as these are considered trafficable areas of any road corridor.
- All trenched areas should be progressively backfilled with suitable certified clean soil.

Operation and maintenance of the new pipelines may occasionally involve scouring (de-silting) as necessary for example after a main break. If this is required, pollution of the environment would be prevented by collecting and disposing of this water containing silt and sediment appropriately.

5.4.2 Mitigation Measures

- The pipeline alignment to be followed is most often located in the road shoulder and table drain adjacent the local carriageway. As these locations are regularly graded as part of road maintenance works, it would be imperative to:
    - Ensure that table drain runoff upstream of works does not enter and concentrate within the pipeline trench.
    - The table drain and shoulder should be backfilled and compacted according to Cabonne Council road maintenance requirements as these are considered trafficable areas of any road corridor.
    - All trenched areas should be progressively backfilled with suitable certified clean soil.
- Adequate procedures would be established and detailed in the CEMP, including notification requirements to the EPA, for incidents that cause material harm to the environment.
- Any disposal of wastewater or fluids generated as part of construction works, including for pipeline commissioning, would be undertaken in a manner that does not cause water pollution. The CEMP would document an appropriate offsite disposal facility for treatment and disposal.
- The contractor would develop a monitoring and flood response plan to detail procedures for monitoring rainfall and waterway flows and to identify subsequent response actions that would be taken to ensure the protection of personnel, equipment and water quality during the construction works.
- In the event of flooding, construction works in affected areas would cease and would not commence until floodwaters have receded. Weather forecasts would be checked regularly so that equipment and materials in flood areas can be secured prior to heavy rainfall events.
- A site-specific spill management plan would be prepared and include the following requirements:

  - Emergency spill kits are to be kept at the site (vehicle kits).
  - Refueling of machinery to be undertaken in a dedicated area within the construction compound appropriately protected as outlined in the spill management plan.
  - Any chemicals and fuels are to be stored in a bunded area at least 50 metres from any waterway or drainage line.
  - Any hazardous materials stored on site would be stored in the compounds and within impervious and bunded enclosures capable of storing 120% of the volume of material stored there.
  - Workers would be trained in the spill management plan and the use of the spill kits.

- In the unlikely event that groundwater is encountered during construction, mitigation measures to manage groundwater would be incorporated into the CEMP, including:
  - Dewatering techniques during excavation;
  - Measures to ensure groundwater quality is not impacted during construction;
  - Techniques to settle, treat or filter groundwater encountered during excavation works i.e. diverting groundwater through baffle tanks or filter membranes; and
  - Appropriate treatment and monitoring regimes if groundwater flows come to the surface, including disposal of groundwater in such a way as to prevent adverse impacts (such as erosion and water pollution). Groundwater should not be discharged to a waterway during construction.

- During operation of the pipeline, any water containing silt and sediment generated because of scouring pipelines would be treated (if required) and disposed of as appropriate. Depending on the resultant water quality, this may involve discharge to a waterway or land application. Any water discharged to a waterway or recycled must be consistent with the requirements of the *Protection of the Environment Operations Act 1997*.

5.5 Flora and Fauna

The proposed works are contained to previously established road reserves, with a study of available historic aerial imagery showing that much of alignments had been subject to vegetation clearance and disturbance through the development (namely road construction) within the towns of Cumnock and Yeoval prior to 1964 (Eco Logical, 2017). The alignments within the township of Cumnock have been highly disturbed by vegetation clearance and works associated with building roads (excavation, and stripping of soils). However Sections 4 and 5 (see Figure 1-3) within the township of Yeoval currently contain large amounts of vegetation including introduced grasses and native trees and shrubs.

A search of the Atlas of NSW Wildlife Database for threatened NSW and Commonwealth listed species (search date 12/11/16) identified that eight birds, one mammal and one plant that are classed as Vulnerable, Threatened or Endangered under the TSC Act or EPBC Act have previously been recorded within a 10 km radius of each of the townships of Cumnock and Yeoval. The proposed alignments are not considered to provide high quality habitat for any threatened species which may be present in the area.

5.5.1 Impact Assessment

There would be a minor impact to flora and fauna as the pipeline has been located in mostly cleared areas of the road reserve or along existing fence lines.

However, groundcover and shrub removal would be required near the intersection of Bell and King Streets, as seen in Plates 13 and 14 below. As a result of previous disturbance in this area, groundcover consists of introduced pastures and declared pest species.

Plate 13: Proposed pipeline alignment through Bell Street

Plate 14: Shrubs requiring removal

The alignment may be located close to mature trees located within the following road reserves:

- Bell Street
- Short Street
- Keays Street
- Renshaw McGirr Way
- Tremain Drive
- Avon Road

The locations of these trees are depicted on the survey plan attached in Appendix A.

It is considered that mature trees can generally be avoided by making minor adjustments to the pipeline alignment during construction. If trees cannot be avoided due to corridor constraints these would be flagged and the construction contractor would undertake non-destructive digging to expose tree roots to ensure that the pipeline can be installed without impacting on any of the tree roots.

It is considered that the existing vegetation within the alignments do not conform to Threatened Ecological Communities listed under the TSC Act and are unlikely to provide quality habitat to threatened species which may be present in the area. No matters of national environmental significance have been identified as being impacted by the proposal and thus referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* is not considered to be required.

5.5.2 Mitigation Measures

- Appropriate flora and fauna management would be addressed in CEMP, including avoiding removal of all trees.
- Pre-clearing surveys would be undertaken by a licensed ecologist familiar with NSW Biodiversity Assessment Guidelines published by OEH and would include surveys for threatened birds and the presence of active nests in the proposal area.
- If clearing works are undertaken from winter to spring, pre-clearance surveys would be undertaken by an ecologist in all woodland areas for nesting threatened birds.
- The Contractor would be aware of local WIRES and Council wildlife protection personnel before commencement. Details of WIRES/wildlife carer to be kept readily available in the case of fauna being discovered or injured during the work.
- Topsoil would be carefully removed and stored appropriately, in particularly where works occur within native vegetation.
- Topsoil would not be mixed with subsoil.
- Topsoil would be returned to the area from which it was stripped and not be mixed with topsoil from other areas, only if not weed infested.
- Prior to the initial ground disturbance, an inspection would be undertaken for any burrows. These burrows would be marked in the field prior to work commencing.
- An ecologist would be present during ground disturbance work at burrows. If any fauna are found, works would stop and not recommence until the fauna have been relocated or have moved from the area. This may require work to be suspended in this location.
- Extra care would be necessary during ground disturbance work at burrows to avoid injury to fauna.
- Declared noxious weeds would be managed according to the requirements stipulated by the local control authority and recommendations made by the Noxious and Environmental Weed Handbook (DPI, 2014), which contains details as to the management of specific noxious weeds.
- Declared weeds found in Cabonne Local Control Area (LCAs), are listed on the NSW DPI website: http://weeds.dpi.nsw.gov.au/, with listed species shown after selecting the names of the two LCAs. The Contractor would be required to treat and remove declared weeds according to weed specific requirements. Topsoil from treated areas containing weed seed or other plant materials or weed suppression chemicals, would not be reused as part of alignment restoration.
- Construction machinery (bulldozers, excavators, trucks, loaders and graders) would be cleaned prior to entering the work site if the machinery is used off the hard stand or road areas and prior to leaving the site if operating in areas containing noxious weeds
- All plant material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules, would be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth.

- Any imported topsoil is to be supplied from a local supplier stipulating it is weed free and not contaminated with dangerous goods.
- All herbicides would be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation.
- Trenches and pits would be filled/closed progressively as works move along the alignment. If they are required to be left open, inspection and rescue measures would be undertaken to ensure fauna would not be trapped in the pits overnight. This may be achieved by placing escape ramps into pits or by covering the pit if practical. The trench/pit would be inspected each morning prior to the commencement of works for trapped fauna.
- Any fallen timber, dead wood and bush rock encountered in the impact area would be relocated to a suitable place nearby (a suitable place would be deemed as an area with similar characteristics as to where the log/dead wood/rock was originally located). These items would not be placed on top of existing habitat features.
- All workers would be made aware of potential threatened flora and fauna during works and understand the procedures if threatened fauna are detected.

5.6 Historic Heritage

A search of NSW Heritage Inventory has identified that there are no listed heritage items in Yeoval, and the following eight listed heritage items in Cumnock:

- Bruce Memorial Church, Bruce Street, Cumnock
- Burrawong Homestead, Obley Street, Cumnock
- CBC Bank and residence, 35 Obley Street, Cumnock
- Courthouse (Part of Historic Village), Obley Street, Cumnock
- Police Station, 21 McLaughlin Street, Cumnock
- Geneffe Homestead, Burrawong Road, Cumnock

5.6.1 Impact Assessment

The proposal would not involve any works which would affect the listed heritage items in Cumnock, as the pipeline works would not enter any heritage listed properties.

5.6.2 Mitigation Measures

- As part of an induction, in the unlikely event that any historical relics or sites are identified workers should be aware of their responsibilities under the provisions of the *Heritage Act 1977*. In this event, all works must cease and the area be protected until a qualified archaeologist inspects the site and provides management advice in consultation with the Heritage Division, OEH.

5.7 Cultural Heritage

Aboriginal Heritage

An Aboriginal Heritage Due Diligence Assessment was undertaken for the proposal by Eco Logical in March 2017, in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010). The following summary of Aboriginal heritage impacts has been taken from this assessment, which is provided in full in Appendix D. It is noted that the Due Diligence Assessment has divided the pipeline alignments into several sections, which are illustrated in Figure 5-1 below.

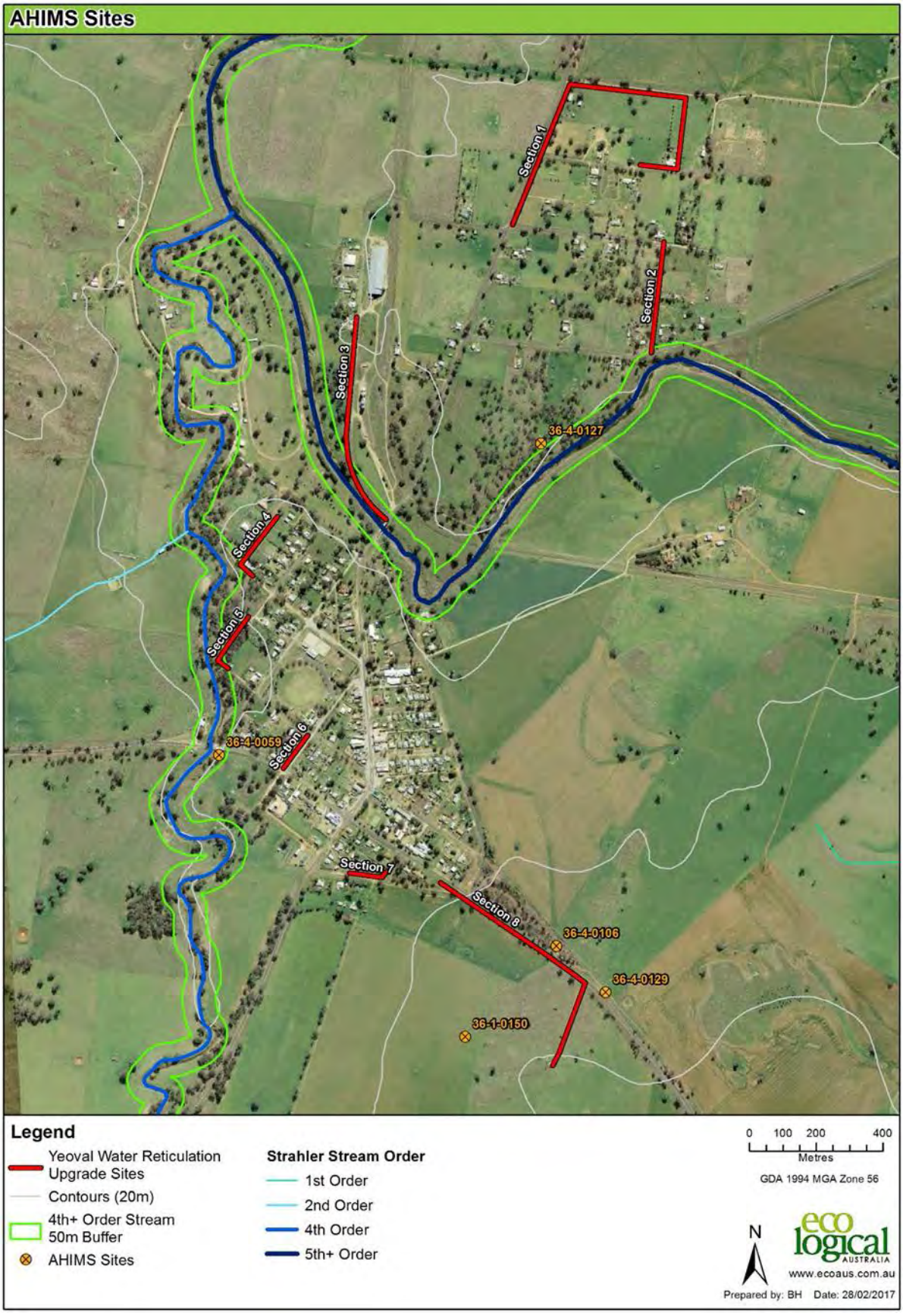
No AHIMS sites are located within the area of works, however two AHIMS sites (36-4-0106, and 36-4-0129) are located within 50 m of the proposed works. The area of proposed works displayed varying levels of previous ground disturbance. The road surface and the surrounding 2 m within each section was assessed as disturbed, as defined by the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010).

No areas of archaeological potential were noted for any sections of works within Cumnock, as they have been highly disturbed by vegetation clearance and works associated with building roads (excavation, and stripping of soils). Within the township of Yeoval, Overall, no areas of archaeological potential were noted for Sections 1, 2, 6, 7 and the southern section of the road reserve in section 8. Section 1 has not been upgraded to an asphalt road and there was very little A horizon soil remaining in this area, with clay observed throughout. Sections 2, 6, and 7 display high levels of disturbance from works associated with the construction of roads, and domestic dwellings. The southern section of the road reserve in section 8 has been subject to previous disturbance associated with the construction and maintenance of Banjo Patterson Way.

However, the road reserves at sections 3, 4, 5, and the northern side of section 8 within the township of Yeoval were assessed as having low levels of previous disturbance outside the footprint of disturbance, caused by the construction of the road (i.e. the road surface and the surrounding 2m). The proximity of Buckinbah Creek and Sandy Creek (major creek lines) as well as low levels of previous disturbance, and previous AHIMS sites being recorded in the local area, indicates that sections 3, 4, and 5 and the northern side of the road reserve of section 8 within the township of Yeoval have the potential to contain subsurface archaeological deposits outside the footprint of disturbance caused by the construction of the road (i.e. the road surface and the surrounding 2 m). The likelihood of further Aboriginal sites occurring within the road reserve outside of the areas of previous disturbance in sections 3, 4, 5, and the northern side of the section 8 road reserve within the township of Yeoval is therefore moderate to high.

Figure 5-1: AHIMS sites in Yeoval

Source: Eco Logical Australia, March 2017



5.7.1 Impact Assessment

No areas of archaeological potential were noted for any sections of works within Cumnock, and Sections 1, 2, 6, 7 and the southern section of section 8 within Yeoval. Therefore, no further Aboriginal archaeological assessment is recommended in these areas and works can proceed without the need for further archaeological investigations or an AHIP.

The areas outside of the disturbance footprint of the road within the road reserve at section 3, 4, 5 and the northern section of Section 8 in the township of Yeoval have the potential to contain subsurface archaeological deposits. As a result, Cabonne Council has made the following design amendments in these areas:

- Section 3 would be installed between the edge of the existing carriageway and existing Telstra cables in an area of previous disturbance.
- Sections 4 and 5 has been relocated from previously undisturbed land, to nearby man made drainage channels adjacent a previously disturbed carriageway.
- Section 8 of the proposed works would be installed between the edge of the existing disturbed carriage way and the existing water pipeline. The southern section of the road reserve in section 8 has been subject to previous disturbance associated with the construction and maintenance of Banjo Patterson Way.

Should works be undertaken outside the area of previous disturbance within these sections, further archaeological assessment would be required in the form of an Aboriginal Cultural Heritage Assessment.

5.7.2 Mitigation Measures

- It is generally recommended that, where possible, all works are contained to areas within previous disturbance footprints in the road reserves (i.e. in or within 2m of the established road surfaces).
- Should works be undertaken outside the area of previous disturbance in section 3, 4, 5 and the northern section of Section 8 in the township of Yeoval, further archaeological assessment in the form of an Aboriginal Cultural Heritage Assessment would be required.
- All contractors working on site should undergo a cultural heritage induction to educate and make them aware of the types of Aboriginal archaeological sites and objects which may be present within the study area.
- Aboriginal objects are protected under the NPW Act regardless if they are registered on AHIMS or not. If suspected Aboriginal objects, such as stone artefacts are located during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.
- In the extremely unlikely event that human remains are found, works should immediately cease and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.

5.8 Noise and Vibration

The worksite environment has low background noise due to its predominantly rural village setting. Noise monitoring was not undertaken as part of the REF however the relative background noise level has been adopted from recent studies undertaken from larger project studies within the region. Based on those studies the predicted background level around the village area of Cumnock and Yeoval is 41 dB(A). Thirty-one (31) properties are located within near the pipeline activities that would be affected at some time during construction works. Residential dwellings are located between 15 and 60 m from the proposed works.

5.8.1 Impact Assessment

The typical A-weighted sound power levels for equipment which may be required to undertake the construction works are listed in Table 3 below (it is noted that this list is not definitive and these levels are taken from the *Australian Standard AS 2436-2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites*).

Table 3 Construction Equipment Sound Power Level

Equipment	Typical Sound Power Levels (dB)	Sound Pressure Level at 30 m distance (dB(A))	Sound Pressure Level at 60 m distance (dB(A))
Backhoe	107	45	39
Truck	104	42	36
Light vehicles	106	44	38
Hand held tools	102	40	34
Excavator	107		
TOTAL (cumulative)		**51**	**45**

Notes: The method specified in AS 2436 suggests that errors are introduced for distances greater than 100 m from the sound source.

Construction management levels for noise at residences are listed in Chapter 4 (Table 2) of the *Interim Construction Noise Guideline* (DECCW, 2009). The guideline states that construction works with a duration of more than three weeks to an individual landowner or sensitive land use should be subject to a quantitative assessment of noise impacts. The works are predicted to take less than three weeks at any one location but take up to two months in total to complete.

As the work sites are in a rural village environment, standard construction hours as listed in the *Interim Construction Noise Guideline* (DECCW, 2009) would be adhered to. The works would generally occur in normal daytime hours and would be temporary, with works progressing rapidly along the pipeline alignment.

It is noted that noise levels would vary depending on the nature of the activities being undertaken and that the use of several items of construction equipment simultaneously is only expected to occur intermittently.

5.8.2 Mitigation Measures

- Construction noise would be managed by a detailed Construction Noise and Vibration Management Plan (CNVMP) and would be prepared by the successful construction contractor prior to commencement of works on site. This would utilise more detailed information in relation to the proposed construction methodology, activities, durations and equipment type and numbers. This would be reviewed by Cabonne Council prior to commencement of works. The CEMP would address site specific issues, including limited work hours and noise and vibration reduction practices, taking into consideration EPA's Interim Construction Noise Guideline (particularly Tables 4 – 10) and Assessing Vibration: A Technical Guideline (particularly mitigation measures in Section 3).

  All reasonable practical steps shall be undertaken to reduce noise and vibration from the site. Mitigation measures to minimise noise and vibration impacts would include:

  - Optimum siting of work areas, vehicle and plant parking areas, materials stockpiles and equipment storage areas in locations where potential acoustic and vibration impacts would be minimised;
  - Regular maintenance of all plant and machinery used for the project;
  - Identify locations where construction noise and vibration is most intrusive and develop strategies to reduce impacts for these areas.
- Community notification would be undertaken where appropriate and where work is likely to cause vibration or offensive noise and impact the public and nearby residents.
- Works would be undertaken during normal work hours i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays; and no work would be undertaken on Sundays, Public Holidays or outside these work hours without notification to affected community and EPA. Notification would provide the following details:
  - The locations and types of surrounding receivers likely to be affected;
  - The nature of the proposed works;
  - The noise characteristics of any powered equipment likely to be used;
  - Measures to be taken to reduce noise emissions; and
  - Any other information EPA may request.

5.9 Air Quality

Air quality is expected to be good due to the predominantly rural village environment. The main factors influencing local air quality are:

- Movement of vehicles and trucks;
- Windborne dust during dry periods, particularly from construction areas and bare areas on adjacent rural properties;
- Annual pollen dumps from local vegetation.

5.9.1 Impact Assessment

The main impact to air quality during construction is expected to arise from the generation of airborne localised dust associated with earthworks and from trucks transporting materials to and around the work sites on unsealed roads. This is not anticipated to cause notable

adverse environmental impacts unless the weather is particularly windy. Dust emission would be minimised by minimising the construction footprint and the area of vegetation removed.

Local air quality may be affected by emissions from construction traffic. These emissions would, however, occur only intermittently, and would be minor and temporary. It would be unlikely that they would contribute to a permanent detectable reduction in local air quality.

With implementation of the recommended mitigation measures, potential air quality impacts during construction are considered minor and unlikely to be significant.

5.9.2 Mitigation Measures

- Construction vehicles and equipment would be suitably serviced within the six-month period prior to commencement of construction activities and all necessary maintenance undertaken during the construction period to meet EPA air quality requirements.
- The excessive use of vehicles and powered construction equipment would be avoided.
- All construction machinery would be turned off when not in use to minimise emissions.
- Construction contractors would monitor dust generation potential.
- Dust suppression methods (including the use of water carts if considered appropriate) would be applied where required, that is, on windy days when earthworks and vehicle movements are generating dust).
- All light vehicle and truck movement would be restricted to maximum speed of 50 km/hr near residential areas, especially when unfavourable wind conditions arise have the potential to create dust issues.
- Any stockpiled spoil/fill would be protected to minimise dust generation to avoid sediment moving offsite.
- Vehicles transporting spoil from the sites would be covered.

5.10 Traffic and Access

Access to the pipeline areas is mostly via sealed local roads. The roads within these townships experience relatively low volumes of traffic.

5.10.1 Impact Assessment

The majority of the works areas would be accessed using existing roads. Due to the unsealed nature and underlying soil conditions of some of the roads, there is the risk of damage if site access is not managed appropriately. The contractor would confirm the suitability of existing roads to withstand heavy vehicle movements and establish strict conditions for access to prevent damaged to existing roads such as King Street, Bell Street, Bathurst Street and Short Street. Vehicles, in particular trucks, may cause damage to properties when accessing the works areas in wet weather.

There may be some impacts to road users if reduced speed limits, part road closures and general disruptions to traffic flow are necessary to carry out the works. Traffic management measures would be required to ensure the safety of construction personnel and motorists and to minimise disruptions during construction.

For the duration of the proposed works there would be a minor increase in vehicle movements using the local road networks for delivery of materials, the arrival and departure

of construction workers, equipment delivery and the removal of waste. The anticipated increased traffic movements would be short term and relatively infrequent, and therefore are not expected to result in a significant impact on the road network.

Works would be carried out to minimise interruption to access for adjoining landowners. The contactor would notify the property owners in advance of the proposed construction work program and advise of any issues such as access restrictions to properties. Whilst some inconvenience to the property owners may occur during the construction works, the timing and limited duration of the works in proximity to each of the affected residents would assist in reducing the impacts.

5.10.2 Mitigation Measures

- The contractor would prepare a Traffic Management Plan as part of the CEMP, to be reviewed by Cabonne Council prior to commencement of works. The Traffic Management Plan would include measures to minimise traffic impacts ensure public safety and would be prepared in accordance with:
    - *RTA's Traffic Control at Work Sites Manual, Issued June 2010, and*
    - *Australian Standard 1742.3 - 2009 Traffic Control for Works on Roads.*
- Prior to the commencement of works, existing access tracks, road and culverts that would be used by heavy vehicles would be assessed for adequacy and upgraded where necessary. Road/carriageway surface repairs may need to be carried out progressively during construction, to ensure continued use by all road users. Strict conditions may need to be established for access to prevent damaged to existing roads such as King Street, Bell Street, Bathurst Street and Short Street. Appropriate drainage would be provided for any unsealed tracks utilised during the works to ensure that vehicle movements do not cause erosion and sedimentation of nearby waterways.
- Any disturbance to landowners because of vehicle movements and noise would be minimised by adhering to the working hours outlined in Section 5.8.2. The contractor would avoid any inconvenience to residences/landowners, and all access gates would be in their original condition following completion of the works.
- Any temporary access tracks required for the works would be located to minimise disturbance to the existing environment. Following completion of the works the temporary tracks would be removed, topsoil provided and re-grassed. Existing tracks would be restored to their condition prior to works.
- Trucks would not access the sites in weather conditions that would cause damage to properties.
- All traffic would comply with all applicable traffic laws and regulations including speed limits. All construction vehicles would comply with the speed limits set for the roads accessing the site.
- The contractor would consult with affected landowners regarding any impacts on access to private property, and ensure alternative access to properties is established or maintained (if required) during works. Restoration of access driveways where required would be carried out using suitable materials and to a standard acceptable to Council and the landowner.

- Any temporary compounds and access roads required for the works would be located so as to minimise disturbance to the existing environment.
- The contractor would monitor weather conditions prior to and during the construction period.
- Vehicles and construction plant would not access the sites in weather conditions that would cause damage to road conditions.

5.11 Waste Management

5.11.1 Impact Assessment

The overall waste generated due to the proposal is anticipated to be low. The construction of the proposal would result in waste in the form of excess spoil, cleared vegetation, redundant infrastructure and general building wastes such as packaging, off cuts, excess materials and workers wastes such as drinks containers, food scraps, etc.

The new pipelines would be approximately 4 km long and between 500 m and 700 mm deep. Spoil created in this excavation would be used to promptly backfill the trench. Any surplus spoil generated would be spread and compacted over the works area of the pipeline to ensure that erosion risk is reduced while the area regenerates. Onsite reuse is the preferred method of dealing with spoil waste, options for which include backfilling redundant drainage channels or gullies or rilling where erosion has occurred. Spoil used as backfill material should be compacted to minimise potential erosion.

To ensure that environmental harm does not occur because of uncontrolled or inappropriate collection, transport and disposal the relevant provisions of the following Acts would be implemented:

- *Waste Avoidance and Resource Recovery Act 2001*
- *Protection of the Environment Operations Act 1997*
- *Protection of the Environment Operations (Waste) Regulation 2014*

The waste management and contamination control procedures and/or measures listed below would be implemented for the proposed works. It is assessed that waste can be adequately managed to avoid impact.

The Contractor would be required to clean and disinfect and commission the pipeline along each section, prior to handover to Cabonne Council. Cleaning, disinfection, rinsing and treatment, disposal of related process liquids would be carried out by the Contractor and described within the CEMP.

5.11.2 Mitigation Measures

- Appropriate waste management procedures would be established and detailed in a Waste Management Plan to be incorporated into the CEMP. The contractor is to assume responsibility for the appropriate disposal of any waste generated. The WMP would follow the resource management hierarchy principles in the *Waste Avoidance and Resource Recovery Act 2001*, to:
    - avoid unnecessary resource consumption;
    - recover resources (reuse, reprocessing, recycling and energy recovery);

- dispose (as a last resort).

The WMP would include notification requirements to EPA for incidents that cause material harm to the environment.

- Onsite re-use of surplus spoil would be undertaken where appropriate. Spoil reuse as backfill material for drainage channels or gullies where erosion has occurred shall be compacted to minimise potential erosion.
- No batched concrete mixing plants would be established in the works areas. Any required concrete would be mixed off-site and transported to the construction areas.
- Following completion of the works, excess concrete would be removed off-site for recycling.
- All waste removed from the site would be classified and disposed of appropriately, and all non-recyclable waste would be disposed of at an appropriate licensed waste disposal facility.
- If any contaminated material is encountered during earthworks, work shall cease, the site secured and a safe work method statement(s) and appropriate practices shall be implemented. Any contaminated material would be classified first and then stored, transported and disposed of in accordance with EPA requirements at an EPA licensed waste facility.
- Cleared vegetation (devoid of weeds) would be mulched and re-used on site as part of site stabilisation and revegetation. Excess mulch would be removed off site and disposed of in accordance with EPA requirements.
- If practicable, surplus excavated materials/fill would be reused onsite as part of rehabilitation and restoration works. Any surplus spoil disposed of in this manner would be seeded to minimise the likelihood of it being transported offsite through wind or water action.
- Any disposal of wastewater or fluids generated as part of construction works, including for pipeline commissioning, would be undertaken in a manner that does not cause water pollution. The CEMP would document an appropriate offsite disposal facility for treatment and disposal.

5.12 Visual Amenity

The proposed works are in a rural landscape. Works would progress daily resulting in visual impacts of the construction work being temporary in nature within each of the locations.

5.12.1 Impact Assessment

There would be minor visual impacts during construction of the proposal due to the presence of construction equipment. However, this would generally only occur for short periods at any one location as construction of the pipeline progresses along the alignment. This impact is not anticipated to be significant due to the temporary nature of the construction works.

Post-construction, the new infrastructure would be located below or at ground level (pipelines, valves etc.) and therefore are not anticipated to have an impact on the visual amenity of the surrounding area. There would be a visual impact within vegetated areas from a cleared easement used to construct the pipeline. However, over time the width of the easement may decrease as vegetation regenerates and any ongoing/maintained clearing

would be restricted to that required for pipeline maintenance purposes. These visual impacts are unlikely to be significant.

5.12.2 Mitigation Measures

- The clearing of vegetation would be kept to the minimum required for the works
- Construction compounds and areas for the parking of vehicles and storing of equipment would be in cleared areas wherever possible.

5.13 Utilities and Infrastructure

The works are considered unlikely to impact upon existing utilities and infrastructure

5.13.1 Mitigation Measures

- Utilities and services which may be impacted by the proposal would be accurately located prior to commencement of works.
- Utility and service providers would be consulted prior to the commencement of and during construction works if impacts on any utilities and services by the proposal are likely.
- Information from existing utilities providers would be used to plan detailed construction work in shared corridors. Any relocation of the pipeline due to existing services would be agreed by Cabonne Council and the relevant providers.
- Any damage to any services infrastructure is to be rectified after contacting the responsible service provider.

6 Environmental Management

6.1 Construction Environmental Management Plan

Preparation of a Construction Management Plan (CEMP) is mandatory for all projects undertaken by or on behalf of government agencies or where funding is being provided by the government (NSW Government Code of Practice for Procurement, 2005).

The CEMP would be developed to ensure that appropriate environmental management practices are followed during a project's construction and/or operation. Public Works Advisory would review the CEMP for this proposal, which should include the following elements, as described in the Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004):

Table 4 Construction Environmental Management Plan Structure

Background	Introduction Project Description EMP Context EMP Objectives Environmental Policy
Environmental Management	Environmental Management Structure and Responsibility Approval and Licensing Requirements Reporting Environmental Training Emergency Contacts and Response
Implementation	Risk Assessment Environmental Management Environmental Management Activities and Controls Environmental Management Plans and Maps Environmental Schedules
Monitor and Review	Environmental Monitoring Environmental Auditing Corrective Action EMP Review

6.2 Construction Mitigation Measures

The following compilation of mitigation measures is intended to assist in the preparation of the CEMP, to ensure that the relevant site specific safeguards are implemented for the aspects of the environment listed below. It should be noted that this list is not comprehensive, with the CEMP to incorporate any additional measures required as part of

determination of the project and conditions of any other approvals, permits or licenses required for the proposal. The CEMP should also provide details on monitoring and verification for all identified mitigation measures.

6.2.1 Land Use and Ownership

Objective(s)

- Minimise impacts to adjoining landuses and landowners during construction

Action(s)

Action/Phase	Responsibility
Pre-construction	
Prior to commencement of works, the required authorisation should be sought from DoI – Lands for the installation of pipelines within this land.	Cabonne Council
Consultation would be undertaken with landowners potentially affected by these works, including those potentially impacted by noise and interruptions to access to private property.	Cabonne Council/ Contractor
Best management construction impacts are to be documented in a project specific CEMP.	Contractor
Construction	
No construction activities (e.g. tree clearing, stockpiling etc.) would be undertaken on private property adjoining the alignment without prior approval. Appropriate security, supervision and access controls would be put in place and properly monitored to ensure no access by unauthorised personnel, either to the work area or via the work area to adjoining areas not under the ownership of Cabonne Council.	Contractor
During construction, ensure the necessary care and maintenance of property facilities and operations, including fences, gates and stock. However, if any damage did occur to property it would be restored to a condition equivalent to the original condition. Temporary fencing and gates would be installed where necessary to exclude animals (stock and ground dwelling native fauna) from the work sites. Any temporary fencing or gates no longer required would be removed at the completion of the construction works.	Contractor
Cabonne Council would provide a 24-hour telephone number so that any issues relating to the operation of the new infrastructure can be clarified and complaints dealt with by those able to respond.	Cabonne Council

6.2.2 Soils and Water

Objective(s)

- To effectively manage sediment and erosion control during construction

Action(s)

Action/Phase	Responsibility
Pre-construction & Construction	
A detailed Soil and Water Management Plan (SWMP) shall be prepared as part of the CEMP. The SWMP would describe the site-specific measures to be implemented for all works areas, in accordance with the guidelines outlined in the 2004 Landcom publication Managing Urban Stormwater: Soils and Construction, 4th edition ("The Blue Book") and Volume 2a Installation of Services. The SWMP would need to be site specific and would need to address the following issues to prevent erosion, sediment loss and water quality impacts: • Minimisation of disturbance to soil and water adjacent to, and within, all watercourses in the works area. • Identification of site specific sediment and erosion control measures wherever erosion is likely to occur. • Identification of any environmentally sensitive areas on or near construction sites to ensure runoff is diverted away from sensitive areas. • Requirements for vegetation clearing to be kept to a minimum. • Retention of all surface runoff on-site. • Where possible, diversion of off-site stormwater around the construction site. • Backfilling and stabilising of trenches once pipelines are installed. • Location of construction compounds (at least 50 m from any drainage lines). • Location and management of stockpiles, such as locating stockpiles away from any drainage lines near the works areas. • All erosion and sediment controls would be regularly inspected, especially when rain is expected and directly after any rain events. • All areas where ground disturbance has occurred would be stabilised following completion of works to ensure there is no erosion hazard and restored to their pre-construction condition. This would involve, where required, reshaping the ground surface, covering it with topsoil excavated from the site and re-establishing an appropriate vegetation cover. • Any excess spoil would either be spread across the ground in nearby areas in such a manner as to avoid creating an erosion hazard, or removed off site for disposal in accordance with relevant Cabonne Council	Contractor

Action/Phase	Responsibility
and OEH requirements.	
The pipeline alignment to be followed is most often located in the road shoulder and table drain adjacent the local carriageway. As these locations are regularly graded as part of road maintenance works, it would be imperative to: • Ensure that table drain runoff upstream of works does not enter and concentrate within the pipeline trench. • The table drain and shoulder should be backfilled and compacted according to Cabonne Council road maintenance requirements as these are considered trafficable areas of any road corridor. • All trenched areas should be progressively backfilled with suitable certified clean soil.	
Adequate procedures would be established and detailed in the CEMP, including notification requirements to the EPA, for incidents that cause material harm to the environment.	Contractor
Any disposal of wastewater or fluids generated as part of construction works, including for pipeline commissioning, would be undertaken in a manner that does not cause water pollution. The CEMP would document an appropriate offsite disposal facility for treatment and disposal.	Contractor
The contractor would develop a monitoring and flood response plan to detail procedures for monitoring rainfall and waterway flows and to identify subsequent response actions that would be taken to ensure the protection of personnel, equipment and water quality during the construction works.	Contractor
In the event of flooding, construction works in affected areas would cease and would not commence until floodwaters have receded. Weather forecasts would be checked regularly so that equipment and materials in flood areas can be secured prior to heavy rainfall events.	Contractor
A site-specific spill management plan would be prepared and include the following requirements: • Emergency spill kits are to be kept at the site (vehicle kits). • Refueling of machinery to be undertaken in a dedicated area within the construction compound appropriately protected as outlined in the spill management plan. • Any chemicals and fuels are to be stored in a bunded area at least 50 metres from any waterway or drainage line. • Any hazardous materials stored on site would be stored in the compounds and within impervious and bunded enclosures capable of storing 120% of the volume of material stored there. • Workers would be trained in the spill management plan and the use of the spill kits.	Contractor

Action/Phase	Responsibility
In the unlikely event that groundwater is encountered during construction, mitigation measures to manage groundwater would be incorporated into the CEMP, including: • Dewatering techniques during excavation; • Measures to ensure groundwater quality is not impacted during construction; • Techniques to settle, treat or filter groundwater encountered during excavation works i.e. diverting groundwater through baffle tanks or filter membranes; and • Appropriate treatment and monitoring regimes if groundwater flows come to the surface, including disposal of groundwater in such a way as to prevent adverse impacts (such as erosion and water pollution). Groundwater should not be discharged to a waterway during construction.	Contractor
Operation	
During operation of the pipeline, any water containing silt and sediment generated because of scouring pipelines would be treated (if required) and disposed of as appropriate. Depending on the resultant water quality, this may involve discharge to a waterway or land application. Any water discharged to a waterway or recycled must be consistent with the requirements of the Protection of the Environment Operations Act 1997.	Cabonne Council

6.2.3 Flora and Fauna

Objective(s)

- Avoidance/minimisation of impacts to flora and fauna
- Avoid weed invasion

Action(s)

Action/Phase	Responsibility
Pre-construction	
Appropriate flora and fauna management would be addressed in CEMP, including avoiding removal of all trees.	Contractor
Pre-clearing surveys would be undertaken by a licensed ecologist familiar with NSW Biodiversity Assessment Guidelines published by OEH and would include surveys for threatened birds and the presence of active nests in the proposal area.	Contractor
If clearing works are undertaken from winter to spring, pre-clearance surveys would be undertaken by an ecologist in all woodland areas for nesting threatened birds.	Contractor

Action/Phase	Responsibility
The Contractor would be aware of local WIRES and Council wildlife protection personnel before commencement. Details of WIRES/wildlife carer to be kept readily available in the case of fauna being discovered or injured during the work.	Contractor
Construction	
Topsoil would be carefully removed and stored appropriately, in particularly where works occur within native vegetation.	Contractor
Topsoil would not be mixed with subsoil.	Contractor
Topsoil would be returned to the area from which it was stripped and not be mixed with topsoil from other areas, only if not weed infested. Prior to the initial ground disturbance, an inspection would be undertaken for any burrows. These burrows would be marked in the field prior to work commencing.	Contractor
An ecologist would be present during ground disturbance work at burrows. If any fauna are found, works would stop and not recommence until the fauna have been relocated or have moved from the area. This may require work to be suspended in this location.	Contractor
Extra care would be necessary during ground disturbance work at burrows to avoid injury to fauna.	Contractor
Declared noxious weeds would be managed according to the requirements stipulated by the local control authority and recommendations made by the Noxious and Environmental Weed Handbook (DPI, 2014), which contains details as to the management of specific noxious weeds.	Contractor
Declared weeds found in Cabonne Local Control Area (LCAs), are listed on the NSW DPI website: http://weeds.dpi.nsw.gov.au/, with listed species shown after selecting the names of the two LCAs. The Contractor would be required to treat and remove declared weeds according to weed specific requirements. Topsoil from treated areas containing weed seed or other plant materials or weed suppression chemicals, would not be reused as part of alignment restoration.	Contractor
Construction machinery (bulldozers, excavators, trucks, loaders and graders) would be cleaned prior to entering the work site if the machinery is used off the hard stand or road areas and prior to leaving the site if operating in areas containing noxious weeds.	Contractor
All plant material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules, would be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth.	Contractor
Any imported topsoil is to be supplied from a local supplier stipulating it is	Contractor

Action/Phase	Responsibility
weed free and not contaminated with dangerous goods.	
All herbicides would be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation.	Contractor
Trenches and pits would be filled/closed progressively as works move along the alignment. If they are required to be left open, inspection and rescue measures would be undertaken to ensure fauna would not be trapped in the pits overnight. This may be achieved by placing escape ramps into pits or by covering the pit if practical. The trench/pit would be inspected each morning prior to the commencement of works for trapped fauna.	Contractor
Any fallen timber, dead wood and bush rock encountered in the impact area would be relocated to a suitable place nearby (a suitable place would be deemed as an area with similar characteristics as to where the log/dead wood/rock was originally located). These items would not be placed on top of existing habitat features.	Contractor
All workers would be made aware of potential threatened flora and fauna during works and understand the procedures if threatened fauna are detected.	Contractor

6.2.4 Historic Heritage

Objective(s)

- Minimise potential impact to items of historic heritage

Action(s)

Action/Phase	Responsibility
Construction	
As part of an induction, in the unlikely event that any historical relics or sites are identified workers should be aware of their responsibilities under the provisions of the *Heritage Act 1977*. In this event, all works must cease and the area be protected until a qualified archaeologist inspects the site and provides management advice in consultation with the Heritage Division, OEH.	Contractor

6.2.5 Cultural Heritage

Objective(s)

- Minimise potential to impact items and places of Aboriginal heritage

Action(s)

Action/Phase	Responsibility
Construction	

Action/Phase	Responsibility
It is generally recommended that, where possible, all works are contained to areas within previous disturbance footprints in the road reserves (i.e. in or within 2m of the established road surfaces).	Contractor/ Cabonne Council
Should works be undertaken outside the area of previous disturbance in section 3, 4, 5 and the northern section of Section 8 in the township of Yeoval, further archaeological assessment in the form of an Aboriginal Cultural Heritage Assessment would be required.	Contractor/ Cabonne Council
All contractors working on site should undergo a cultural heritage induction to educate and make them aware of the types of Aboriginal archaeological sites and objects which may be present within the study area.	Contractor
Aboriginal objects are protected under the NPW Act regardless if they are registered on AHIMS or not. If suspected Aboriginal objects, such as stone artefacts are located during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.	Contractor
In the extremely unlikely event that human remains are found, works should immediately cease and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.	Contractor

6.2.6 Noise and Vibration

Objective(s)

- Compliance with relevant recommendations specified in the Interim Construction Noise Guideline (DECC, 2009)
- Avoidance/minimisation of noise impacts on nearby sensitive noise receivers

Action(s)

Action/Phase	Responsibility
Pre-construction & Construction	
Construction noise would be managed by a detailed Construction Noise and Vibration Management Plan (CNVMP) and would be prepared by the successful construction contractor prior to commencement of works on site. This would utilise more detailed information in relation to the proposed construction methodology, activities, duration and equipment type and numbers. This would be reviewed by Cabonne Council prior to commencement of works. The CEMP would address site specific issues, including limited work hours and noise and vibration reduction practices, taking into consideration EPA's Interim Construction Noise Guideline	Contractor

Action/Phase	Responsibility
(particularly Tables 4 – 10) and Assessing Vibration: A Technical Guideline (particularly mitigation measures in Section 3). All reasonable practical steps shall be undertaken to reduce noise and vibration from the site. Mitigation measures to minimise noise and vibration impacts would include: • Optimum siting of work areas, vehicle and plant parking areas, materials stockpiles and equipment storage areas in locations where potential acoustic and vibration impacts would be minimised; • Regular maintenance of all plant and machinery used for the project; • Identify locations where construction noise and vibration is most intrusive and develop strategies to reduce impacts for these areas.	
Community notification would be undertaken where appropriate and where work is likely to cause vibration or offensive noise and impact the public and nearby residents.	Contractor
Works would be undertaken during normal work hours i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays; and no work would be undertaken on Sundays, Public Holidays or outside these work hours without notification to affected community and EPA. Notification would provide the following details: • The locations and types of surrounding receivers likely to be affected; • The nature of the proposed works; • The noise characteristics of any powered equipment likely to be used; • Measures to be taken to reduce noise emissions; and • Any other information EPA may request.	Contractor

6.2.7 Air Quality

Objective(s)

- Avoid/minimise off-site dust nuisance to neighbouring landholders and the community
- Minimise air quality impacts resulting from machinery and vehicle emissions

Action(s)

Action/Phase	Responsibility
Pre-construction	
Construction vehicles and equipment would be suitably serviced within the six-month period prior to commencement of construction activities and all necessary maintenance undertaken during the construction period to meet EPA air quality requirements.	Contractor
The excessive use of vehicles and powered construction equipment would be	Contractor

Action/Phase	Responsibility
avoided.	
All construction machinery would be turned off when not in use to minimise emissions.	Contractor
Construction contractors would monitor dust generation potential.	Contractor
Dust suppression methods (including the use of water carts if considered appropriate) would be applied where required, that is, on windy days when earthworks and vehicle movements are generating dust).	Contractor
All light vehicle and truck movement would be restricted to maximum speed of 50 km/hr near residential areas, especially when unfavourable wind conditions arise have the potential to create dust issues.	Contractor
Any stockpiled spoil/fill would be protected to minimise dust generation to avoid sediment moving offsite.	Contractor
Vehicles transporting spoil from the sites would be covered.	Contractor

6.2.8 Traffic and Access

Objective(s)

- Ensure that construction vehicles do not cause excessive inconvenience to the landowners
- Ensure the safety of road users and construction personnel for the duration of the works
- Minimise the pollution impacts resulting from the use of construction vehicles

Action(s)

Action/Phase	Responsibility
Construction	
The contractor would prepare a Traffic Management Plan as part of the CEMP, to be reviewed by Cabonne Council prior to commencement of works. The Traffic Management Plan would include measures to minimise traffic impacts ensure public safety and would be prepared in accordance with: • RTA's Traffic Control at Work Sites Manual, Issued June 2010, and • Australian Standard 1742.3 - 2009 Traffic Control for Works on Roads	Contractor

Action/Phase	Responsibility
Prior to the commencement of works, existing access tracks, road and culverts that would be used by heavy vehicles would be assessed for adequacy and upgraded where necessary. Road/carriageway surface repairs may need to be carried out progressively during construction, to ensure continued use by all road users. Strict conditions may need to be established for access to prevent damaged to existing roads such as King Street, Bell Street, Bathurst Street and Short Street. Appropriate drainage would be provided for any unsealed tracks utilised during the works to ensure that vehicle movements do not cause erosion and sedimentation of nearby waterways.	Contractor
Any disturbance to landowners because of vehicle movements and noise would be minimised by adhering to standard working hours (see Section 5.8.2). The contractor would avoid any inconvenience to residences/landowners, and all access gates would be in their original condition following completion of the works.	
Any temporary access tracks required for the works would be located to minimise disturbance to the existing environment. Following completion of the works the temporary tracks would be removed, topsoil provided and re-grassed. Existing tracks would be restored to their condition prior to works.	Contractor
Trucks would not access the sites in weather conditions that would cause damage to properties.	Contractor
All traffic would comply with all applicable traffic laws and regulations including speed limits. All construction vehicles would comply with the speed limits set for the roads accessing the site.	Contractor
The contractor would consult with affected landowners regarding any impacts on access to private property, and ensure alternative access to properties is established or maintained (if required) during works. Restoration of access driveways where required would be carried out using suitable materials and to a standard acceptable to Council and the landowner.	Contractor
Any temporary compounds and access roads required for the works would be located to minimise disturbance to the existing environment.	Contractor
The contractor would monitor weather conditions prior to and during the construction period.	Contractor
Vehicles and construction plant would not access the sites in weather conditions that would cause damage to road conditions.	Contractor

6.2.9 Waste Management

Objective(s)

- Comply with the provisions of the *Protection of the Environment Operations (Waste) Regulation 2014*
- Maximise reuse/recycling of waste material and minimise waste disposed to landfill

Action(s)

Action/Phase	Responsibility
Pre-construction & Construction	
Appropriate waste management procedures would be established and detailed in a Waste Management Plan to be incorporated into the CEMP. The contractor is to assume responsibility for the appropriate disposal of any waste generated. The WMP would follow the resource management hierarchy principles in the *Waste Avoidance and Resource Recovery Act 2001*, to: • avoid unnecessary resource consumption; • recover resources (reuse, reprocessing, recycling and energy recovery); • dispose (as a last resort). The WMP would include notification requirements to EPA for incidents that cause material harm to the environment.	Contractor
Onsite re-use of surplus spoil would be undertaken where appropriate. Spoil reuse as backfill material for drainage channels or gullies where erosion has occurred shall be compacted to minimise potential erosion.	Contractor
No batched concrete mixing plants would be established in the works areas. Any required concrete would be mixed off-site and transported to the construction areas.	Contractor
Following completion of the works, excess concrete would be removed off-site for recycling.	Contractor
All waste removed from the site would be classified and disposed of appropriately, and all non-recyclable waste would be disposed of at an appropriate licensed waste disposal facility.	Contractor
If any contaminated material is encountered during earthworks, work shall cease, the site secured and a safe work method statement(s) and appropriate practices shall be implemented. Any contaminated material would be classified first and then stored, transported and disposed of in accordance with EPA requirements at an EPA licensed waste facility.	Contractor
Cleared vegetation (devoid of weeds) would be mulched and re-used on site as part of site stabilisation and revegetation. Excess mulch would be removed off site and disposed of in accordance with EPA requirements.	Contractor
If practicable, surplus excavated materials/fill would be reused onsite as part of rehabilitation and restoration works. Any surplus spoil disposed of in this manner would be seeded to minimise the likelihood of it being transported offsite through wind or water action.	Contractor
Any disposal of wastewater or fluids generated as part of construction works, including for pipeline commissioning, would be undertaken in a manner that does not cause water pollution. The CEMP would document an appropriate offsite disposal facility for treatment and disposal.	Contractor

6.2.10 Visual Amenity

Objective(s)

- Protect the visual amenity of the locality for the Council and adjacent landowner(s).

Action(s)

Action/Phase	Responsibility
Construction	
The clearing of vegetation would be kept to the minimum required for the works	Contractor
Construction compounds and areas for the parking of vehicles and storing of equipment would be in cleared areas wherever possible.	Contractor

6.2.11 Utilities and Infrastructure

Objective(s)

- Avoidance/minimisation of impacts on utilities and infrastructure

Action(s)

Action/Phase	Responsibility
Pre-construction	
Utilities and services which may be impacted by the proposal would be accurately located prior to commencement of works.	Contractor
Utility and service providers would be consulted prior to the commencement of and during construction works if impacts on any utilities and services by the proposal are likely.	Contractor
Information from existing utilities providers would be used to plan detailed construction work in shared corridors. Any relocation of the pipeline due to existing services would be agreed by Cabonne Council and the relevant utilities providers.	Contractor
Any damage to any services infrastructure is to be rectified after contacting the responsible service provider.	Contractor

7 Conclusions

Cumnock and Yeoval have been identified as priority townships under the Restart NSW Water Security for Regions program. Installation of potable water pipelines would contribute to the overall sustainable management of water supply and the enhancement of the amenity and water security to these townships and their communities.

The proposal would potentially cause short term impacts such as increased noise and traffic and a reduction in community amenity for the residents and users of local streets during the construction phase. However, the works are temporary and can be managed to minimise impacts. Potential adverse impacts on water quality, through erosion and sedimentation, would be mitigate by the implementation and management of appropriate erosion and sediment controls.

A Due Diligence Assessment of the proposal has identified areas of potential Aboriginal significance along the proposed alignment. The areas outside of the disturbance footprint of the road within the road reserve at section 3, 4, 5 and the northern section of Section 8 in the township of Yeoval have the potential to contain subsurface archaeological deposits. This led to design amendments to install the pipeline within areas of previous disturbance, and therefore further assessment or an AHIP are not required. If works are undertaken outside the area of previous disturbance within these sections, further archaeological assessment would be required in the form of an Aboriginal Cultural Heritage Assessment.

Given that the works predominantly comprise an underground pipeline, adverse environmental impacts potentially associated with the operation phase of the proposal are considered to be minimal. Potential operational impacts have been (as part of the concept design) or generally would be (as part of the detailed design) mitigated as part of the design.

This REF has been prepared in accordance with Sections 111 and 112 of the *Environmental Planning and Assessment Act 1979* and Clause 228 of the *Environmental Planning and Assessment Regulation 2000.* It provides a true and fair assessment of the proposed activity in relation to its likely effects on the environment. Notwithstanding further heritage assessment that are required, it addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

On the basis of the information available at the time of preparation of this REF (noting that further assessment is required to confirm the significance of Aboriginal cultural and historic heritage impacts) it is concluded that:

(1) the proposed activity is not likely to have a significant impact on the environment and therefore an Environmental Impact Statement is not required.

(2) the proposed activity is not likely to significantly affect threatened species, populations, ecological communities, or critical habitat. Therefore, a Species Impact Statement (SIS) is not required

(3) the proposed activity is not likely to affect any Commonwealth land, is not being carried out on Commonwealth land, or significantly affect any Matters of National Environmental Significance.

The proposed activity is recommended for approval subject to implementation of the measures to avoid, minimise or manage environmental impacts listed in this REF.

8 References

Australian Standard *AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites*

DEC, 2006, *Assessing Vibration: A Technical Guide*

DECCW, 2009, *Interim Construction Noise Guideline*

DECCW, 2010 *The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*

DIPNR, 2004, *Guideline for the Preparation of Environmental Management Plans*

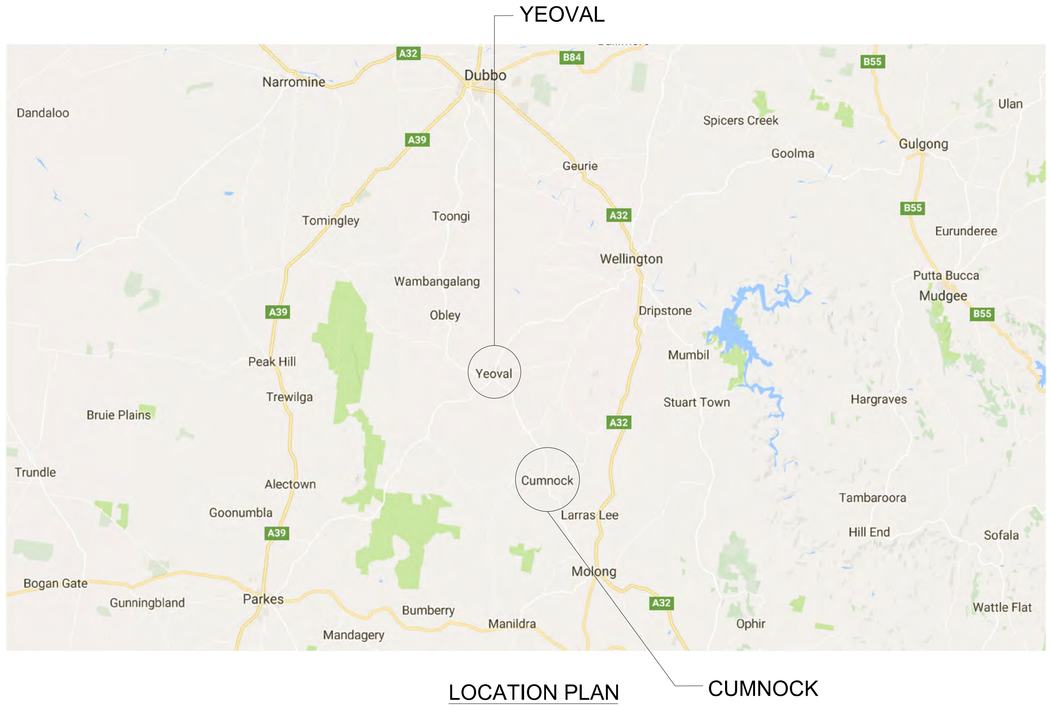
ELA, 2017, *Aboriginal Archaeological Due Diligence Assessment Water Reticulation Upgrades, Yeoval & Cumnock*

Appendix A – Alignment Plans

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

CONTRACT No. XXXXXX
VOLUME 2 - DRAWINGS
MARCH 2017

PROPOSED PIPELINE ROUTES AT YEOVAL



LOCATION PLAN

PROPOSED PIPELINE ROUTES AT CUMNOCK

DRAWING LIST

DRAWING NUMBER	TITLE
	GENERAL
	COVER PAGE
17/16033-G1	PROJECT LOCALITY PLAN AND LIST OF DRAWINGS
	YEOVAL
17/16033-P1	YEOVAL – LINE YSM ROUTE PLAN & LONGITUDINAL SECTION CH. 0.0 - CH. 664.5
17/16033-P2	YEOVAL – LINE YSM ROUTE PLAN & LONGITUDINAL SECTION CH. 664.5 - CH. 947.6
17/16033-P3	YEOVAL ROUTE PLAN – LINES 2A, 3A AND 4A
17/16033-P4	YEOVAL ROUTE PLAN – LINE 5A
17/16033-P5	YEOVAL ROUTE PLAN – LINES 6A AND part 8A
17/16033-P6	YEOVAL ROUTE PLAN – LINES 7A AND part 8A
17/16033-P7	CONNECTION DETAILS NEAR EXISTING YEOVAL RESERVOIR
	CUMNOCK
17/16033-P8	CUMNOCK ROUTE PLAN – LINES 3A AND 4A
17/16033-P9	CUMNOCK ROUTE PLAN – LINES 1A AND 2A
	OTHER DRAWINGS
17/16033-P10	THRUST BLOCKS DETAILS
17/16033-P11	PIPELINE TRENCH BACKFILL DETAILS
17/16033-P12	PROPOSED CONNECTION TO EXISTING LINE ENDING AT HYDRANT OR S.V.
17/16033-P13	PROPOSED TEE CONNECTION TO EXISTING LINE WITH AND WITHOUT HYDRANT

LIST OF DRAWINGS

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

PROJECT LOCALITY PLAN AND LIST OF DRAWINGS

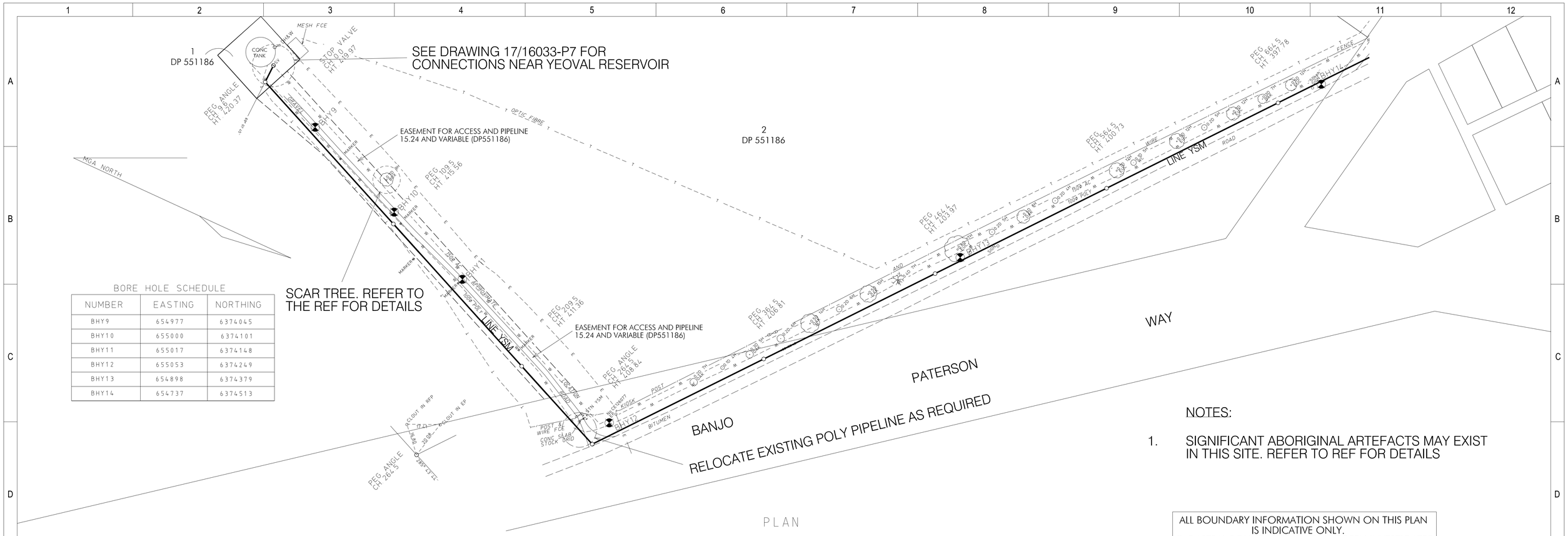
PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-G1 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

23/03/2017 11:42:25 AM \\Waterserv\Projects\Cabonne_SCR\etic-Cumnock\Yeoval\Des-2\4-Work_Drawings\17_16033_G1_LocalityPlan&ListofDrawings.dgn



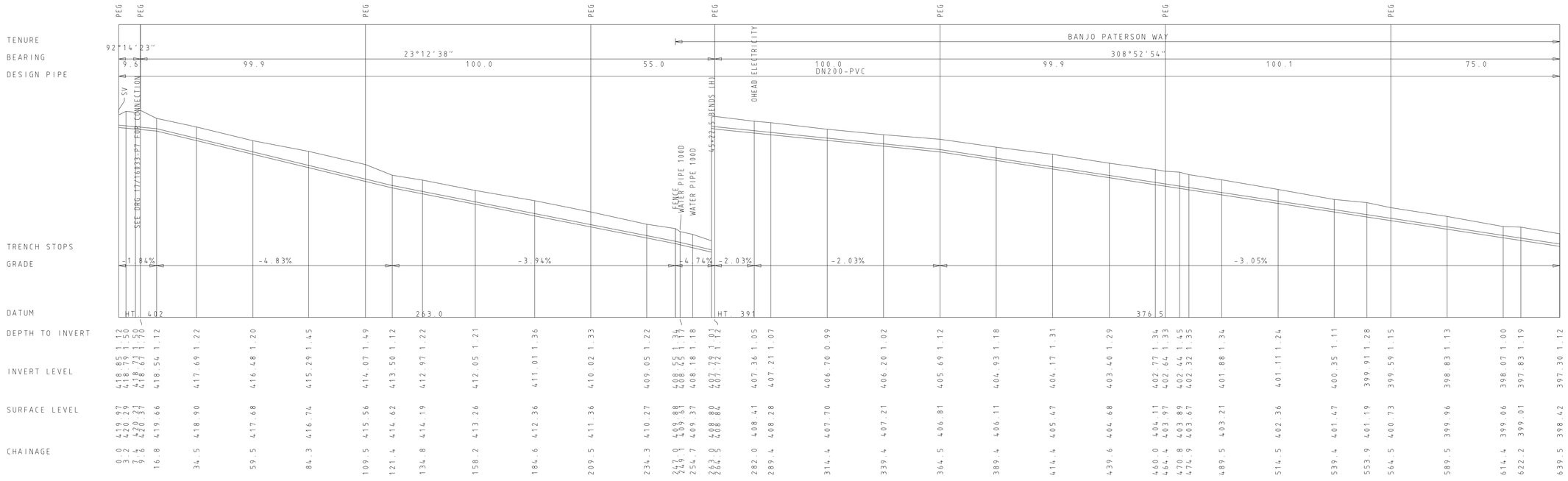
BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY9	654977	6374045
BHY10	655000	6374101
BHY11	655017	6374148
BHY12	655053	6374249
BHY13	654898	6374379
BHY14	654737	6374513

NOTES:

1. SIGNIFICANT ABORIGINAL ARTEFACTS MAY EXIST IN THIS SITE. REFER TO REF FOR DETAILS

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED



1:200 V 0 4 8 12 16 20m
4 2
1:1000 H 0 20 40 60 80 100m
20 10

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - LINE YSM
ROUTE PLAN & LONGITUDINAL SECTION
CH.0.0 - CH.664.5

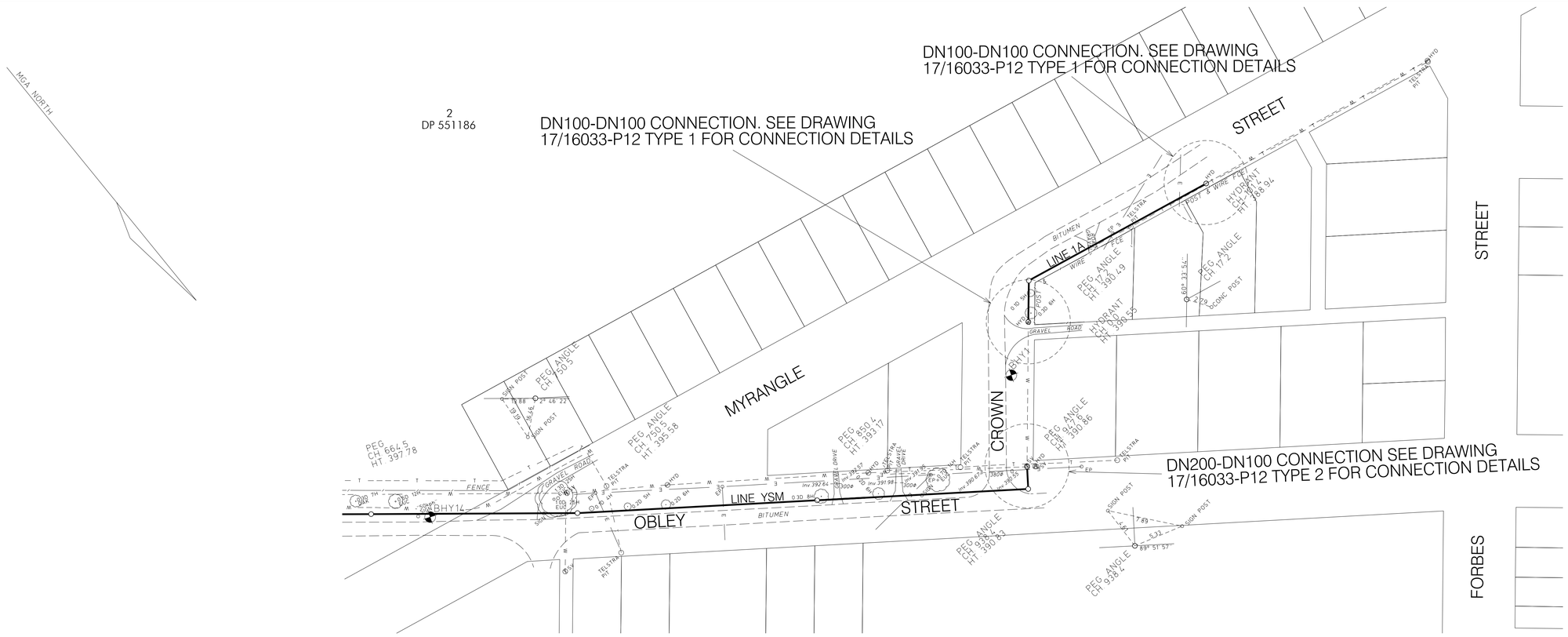
PROJECT/CONTRACT No.

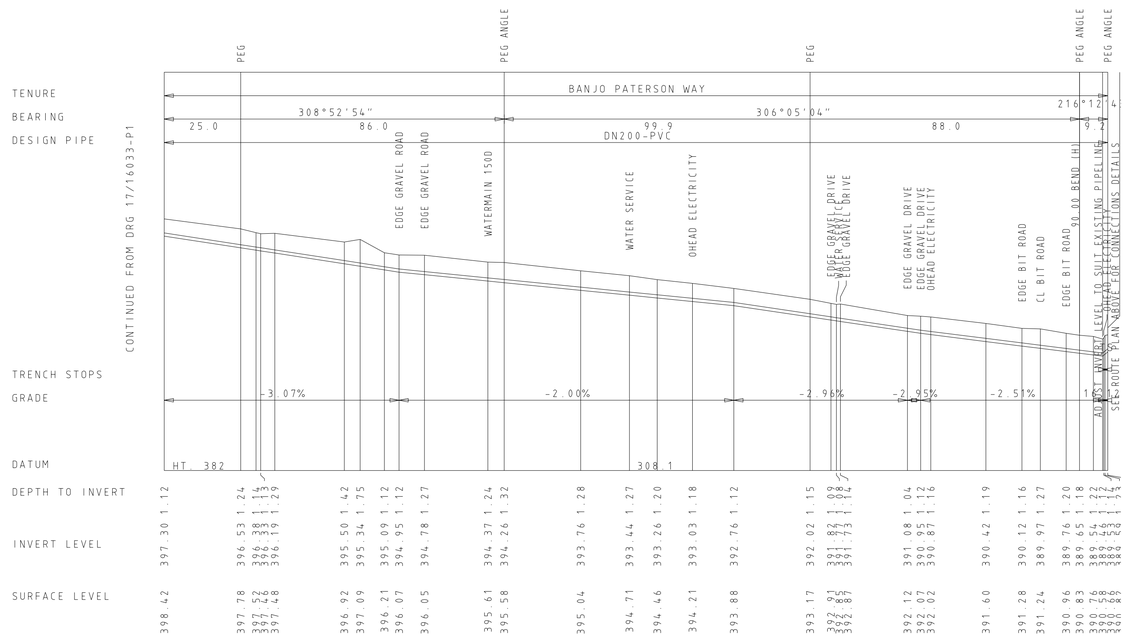
A1 SCALE @ A1

DRAWING No. 17/16033-P1

REV 0

CONFIRM SCALE 100mm ON A1 ORIGINAL





ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY1	654512	6374620
BHY14	654737	6374513

1:200 V 0 4 8 12 16 20m
4 2
1:1000 H 0 20 40 60 80 100m
20 10

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT PublicWorks Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - LINE YSM
ROUTE PLAN & LONGITUDINAL SECTION
CH.664.5 - CH.947.6

PROJECT/CONTRACT No.

A1 SCALE @ A1

DRAWING No. 17/16033-P2

REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

OBLEY STREET

LUCKNOW STREET

KING STREET

GANOO STREET

BELL STREET

BATHURST STREET

SHORT STREET

LINE 2A

LINE 3A

LINE 4A

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. CONNECTION POINT TO EXISTING PIPELINE EXTENDS BEYOND THAT SHOWN IN THE SURVEY. SEE DRAWING 17/16033-P13 TYPE 4 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

LOCALLY DEVIATE PIPELINE ALIGNMENT AS NECESSARY. SEE REF FOR DETAILS

MGA NORTH

1:1000 0 20 40 60 80 100m
20 10

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
	TOP OF BANK		
	BOTTOM OF BANK		

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY. CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY2	654269	6375000
BHY3	654093	6375222
BHY4	654058	6375274
BHY5	654106	6375344
BHY6	654126	6375376
BHY7	654122	6375568
BHY8	654159	6375615

SSM23625

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - ROUTE PLAN
LINES 2A, 3A AND 4A

PROJECT/CONTRACT No.

A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P3 REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

DN100-DN100 CONNECTION SEE DRAWING
17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING
17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY15	654528	6375715
BHY16	654454	6375884
BHY17	654480	6376095
BHY18	654499	6376245

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
~~	TOP OF BANK		
----	BOTTOM OF BANK		

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - ROUTE PLAN
LINE 5A

PROJECT/CONTRACT No.

A1 | SCALE @ A1 1:1000

DRAWING No. 17/16033-P4 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY19	655371	6376170
BHY20	655409	6376384
BHY24	655062	6376702
BHY25	654997	6376561

LEGEND

UNDERGROUND SERVICES / ABOVEGROUND SERVICES

W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
HYD	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
	TOP OF BANK		
	BOTTOM OF BANK		

LOCALLY BEND ALIGNMENT TO ACHIEVE TEE CONNECTION. DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN150-DN100 CONNECTION. CONNECTION POINT TO EXISTING PIPELINE IS AS SHOWN HERE. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

1:1000 0 20 40 60 80 100m
20 10

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

YEOVAL - ROUTE PLAN
LINES 6A AND PART 8A

PROJECT/CONTRACT No.

A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P5 REV 0

CONFIRM SCALE 100mm ON A1 ORIGINAL

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY21	655580	6376737
BHY22	655544	6376875
BHY23	655217	6376935

DN150-DN100 CONNECTION. CONNECTION POINT TO EXISTING PIPELINE EXTENDS BEYOND THAT SHOWN IN THE SURVEY. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

CONNECT NEW DN100 PIPELINE TO EXISTING DN40 PIPELINE USING A DN40 x DN100 TAPER

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
++++++	TOP OF BANK		
----	BOTTOM OF BANK		

1:1000 — 0 20 40 60 80 100m; 20 10

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

Public Works Advisory, a division of the Department of Finance, Services and Innovation shall not be liable or responsible for any loss or damage arising out of the conversion of any electronic document, data or program. The recipient or user of any electronic document, data or program is solely responsible for ascertaining its accuracy and its suitability for their purposes.

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

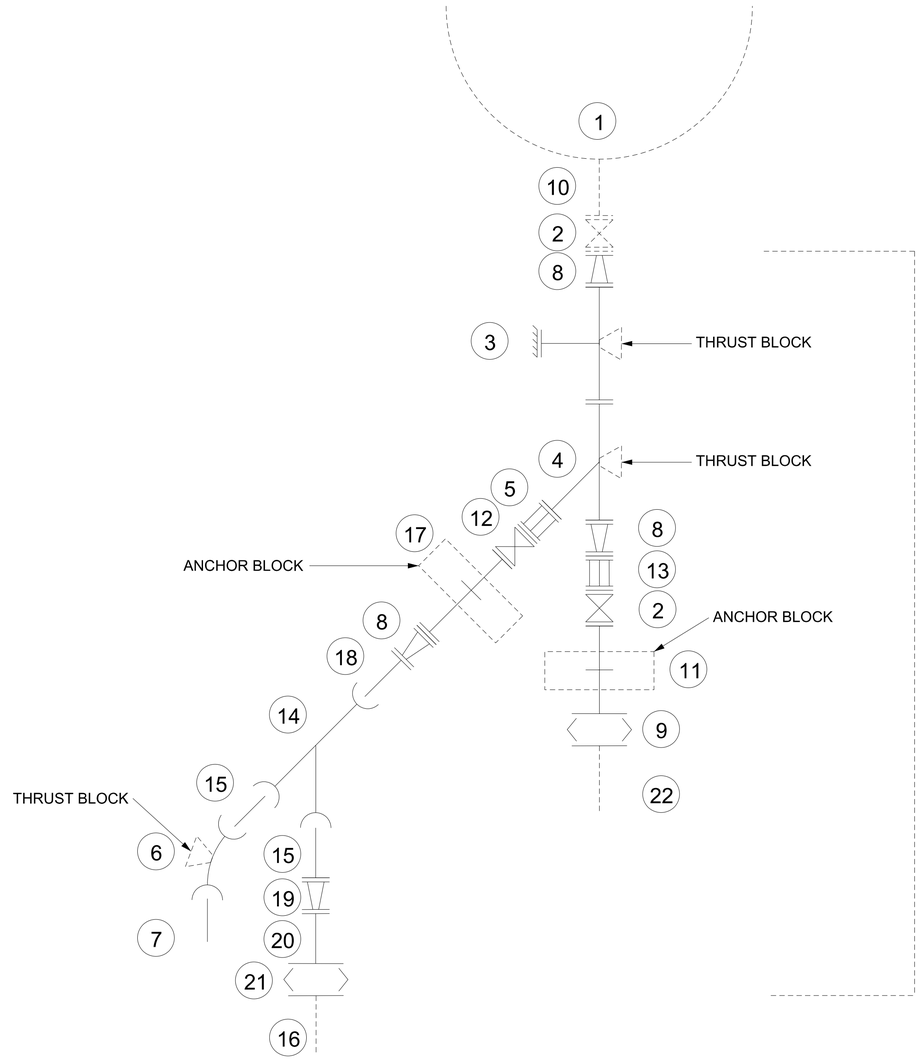
YEOVAL - ROUTE PLAN
LINES 7A AND PART 8A

PROJECT/CONTRACT No.

A1 | SCALE @ A1 1:1000

DRAWING No. 17/16033-P6 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL



PLAN
YEOVAL RESERVOIR CONNECTION DETAILS

PIPEWORK SCHEDULE

ITEM	DESCRIPTION
1	YEOVAL RESERVOIR
2	DN150 GATE VALVE (FL-FL)
3	DN200 DICL ALL FLANGED TEE WITH BLANK FLANGE
4	DN200 DICL ALL FLANGED 45 ANGLE BRANCH TEE
5	DN200 THRUST DISMANTLING JOINT (FL-FL)
6	DN200 45 DEG BEND SO-SO
7	NEW DN200 PIPELINE
8	DICL 150x200 FLANGED TAPER
9	DN150 V-G COUPLING
10	EXISTING DN150 PIPELINE
11	DICL DN150 2m LONG FL-SP PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
12	DN200 GATE VALVE (FL-FL)
13	DN150 THRUST DISMANTLING JOINT (FL-FL)
14	DN200 DICL ALL SOCKETED 45 ANGLE BRANCH TEE
15	DN200 DICL PIPE (SP-SP). LENGTH TO SUIT
16	EXISTING DN100 POLY PIPELINE
17	DICL 2m DN200 LONG FL-FL PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
18	DN150 DICL PIPE (FL-SP)
19	DICL 200x100 FLANGED TAPER
20	DN100 DICL PIPE (FL-SP)
21	DN100 V-G COUPLING
22	EXISTING DN150 AC PIPELINE

NOTES:

1. VERIFY SIZE/TYPE/ALIGNMENT OF EXISTING PIPELINES FOR COMPATIBILITY PRIOR TO ORDERING
2. OBTAIN APPROVAL OF THE PRINCIPAL PRIOR TO CUTTING ANY EXISTING PIPEWORK

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

CONNECTION DETAILS NEAR EXISTING YEOVAL RESERVOIR

PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-P7 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 111369
ORIENTATION OF GRID PM 111369 TO PM 111367 BEARING 89° 05' 59"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 111369	664110.763	6354624.016		510.456		STAR PICKET IN METAL BOX FD
PM 111367	664492.609	6355618.728		509.684		STAR PICKET IN METAL BOX FD
PM 111368	664594.292	6354943.957		517.178		STAR PICKET IN METAL BOX FD
PM 44572	664123.779	6355322.695		504.781		STEEL PIN IN METAL BOX FD
SSM 110017	664065.929	6355703.094		499.444		BRASS PLAQUE SET IN COR TELSTRA PIT FD
SSM 110018	663627.690	6355145.455		509.376		BRASS PLAQUE SET IN CONC PATH FD

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

⊖	STOP VALVE	⊖	AIR VALVE
⊕	HYDRANT	⊖	DOUBLE AIR VALVE
Ⓦ	WATER METER	Ⓔ	ELECTRICAL METER
WPIT	WATER PIT	Ⓖ	GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT	○	TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
++++++	TOP OF BANK		
----	BOTTOM OF BANK		

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 2 FOR CONNECTION DETAILS

83
DP 220176

1:1000 0 20 40 60 80 100m
20 10

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHC6	664227	6355335
BHC7	664253	6355474
BHC8	664278	6355643

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

Public Works Advisory, a division of the Department of Finance, Services and Innovation shall not be liable or responsible for any loss or damage arising out of the conversion of any electronic document, data or program. The recipient or user of any electronic document, data or program is solely responsible for ascertaining its accuracy and its suitability for their purposes.

ISSUED FOR REVIEW

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

CUMNOCK - ROUTE PLAN
LINES 3A AND 4A

PROJECT/CONTRACT No.

A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P8 REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P13 TYPE 3 FOR CONNECTION DETAILS

CONNECTION TO EXISTING DN100 LINE WITH NEW HYDRANT SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

DN100-DN100 CONNECTION. SEE DRAWING 17/16033-P12 TYPE 1 FOR CONNECTION DETAILS

MCLAUGHLAN STREET

OBLEY STREET

GOOGODERY STREET

HAIG STREET

BEATTY STREET

BURRAWONG ROAD

LINE 1A

LINE 2A

BHC1

BHC2

BHC3

BHC4

BHC5

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
HYD	HYDRANT		DOUBLE AIR VALVE
WM	WATER METER	EM	ELECTRICAL METER
WPIT	WATER PIT	GM	GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
++++++	TOP OF BANK		
----	BOTTOM OF BANK		

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHC1	663943	6354832
BHC2	663860	6355028
BHC3	664386	6354970
BHC4	664371	6354880
BHC5	664279	6354815

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY. CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 111369 ORIENTATION OF GRID PM 111369 TO PM 111367 BEARING 89° 05' 59"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 111369	664110.763	6354624.016		510.456		STAR PICKET IN METAL BOX FD
PM 111367	664492.609	6355618.728		509.684		STAR PICKET IN METAL BOX FD
PM 111368	664594.292	6354943.957		517.178		STAR PICKET IN METAL BOX FD
PM 44572	664123.779	6355322.695		504.781		STEEL PIN IN METAL BOX FD
SSM 110017	664065.929	6355703.094		499.444		BRASS PLAQUE SET IN COR TELSTRA PIT FD
SSM 110018	663627.690	6355145.455		509.376		BRASS PLAQUE SET IN CONC PATH FD

1:1000 0 20 40 60 80 100m 20 10

PM111368

MGA NORTH

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

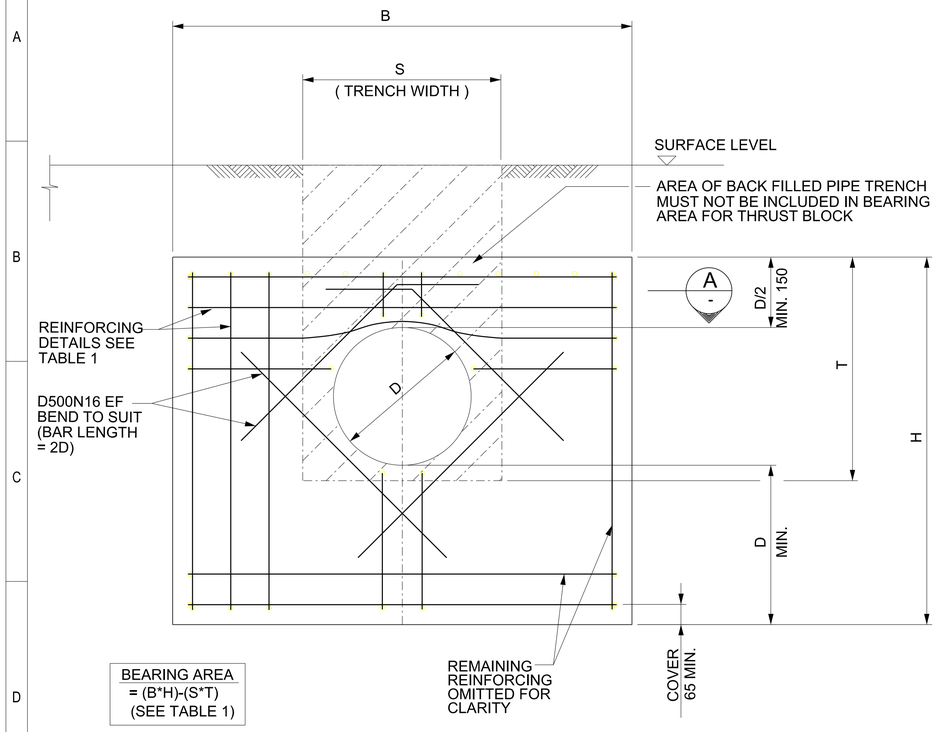
CUMNOCK - ROUTE PLAN
LINES 1A AND 2A

PROJECT/CONTRACT No.

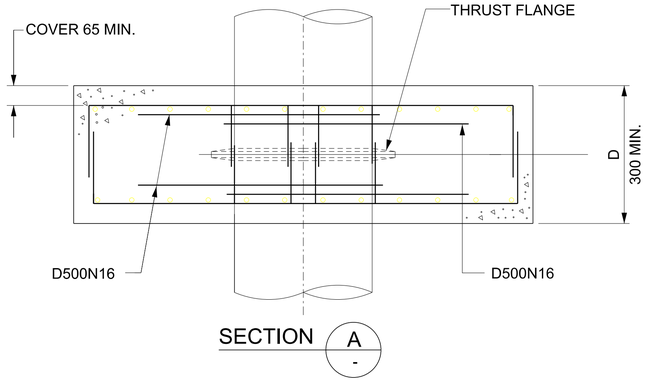
A1 SCALE @ A1 1:1000

DRAWING No. 17/16033-P9 REV 0

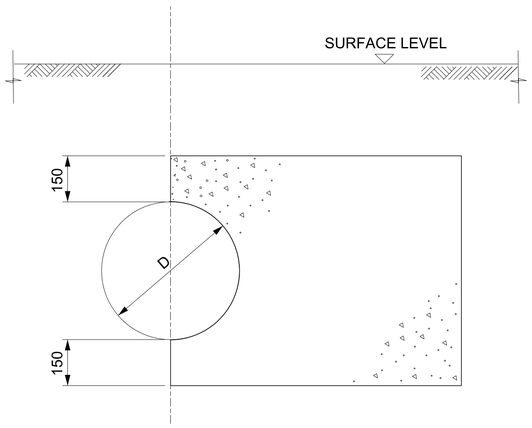
CONFIRM SCALE 100mm ON A1 ORIGINAL

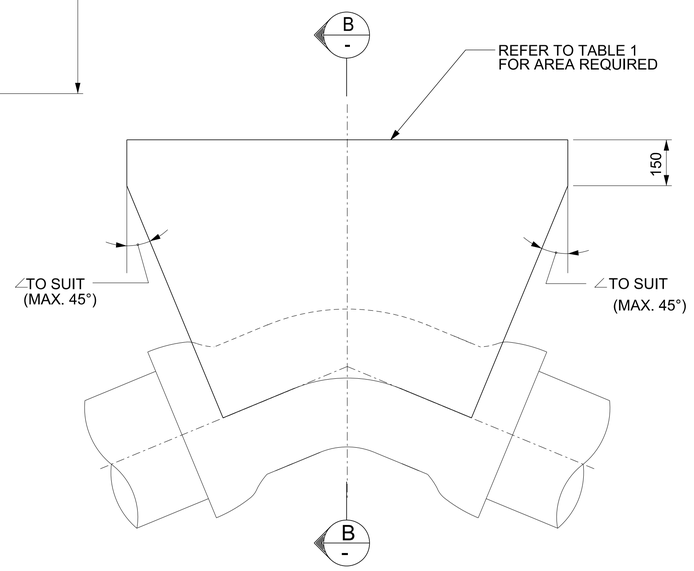


ELEVATION



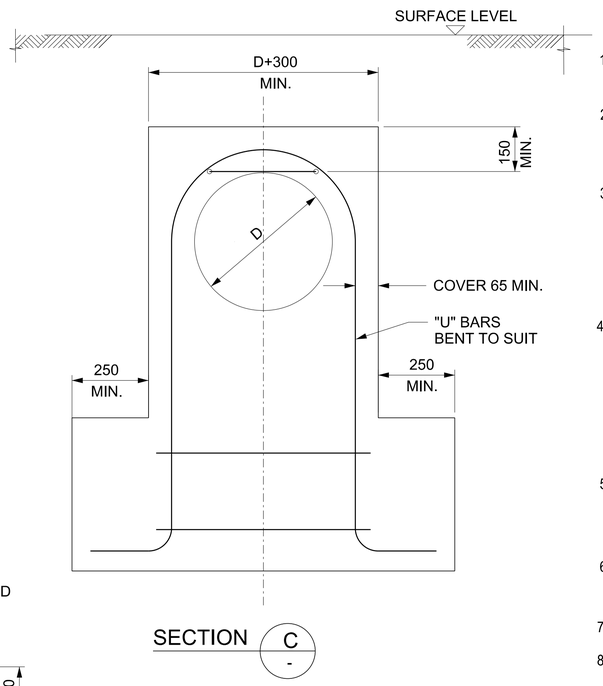
DETAILS OF THRUST BLOCK AT THRUST CONNECTOR





PLAN

DETAILS OF THRUST BLOCK AT HORIZONTAL BEND

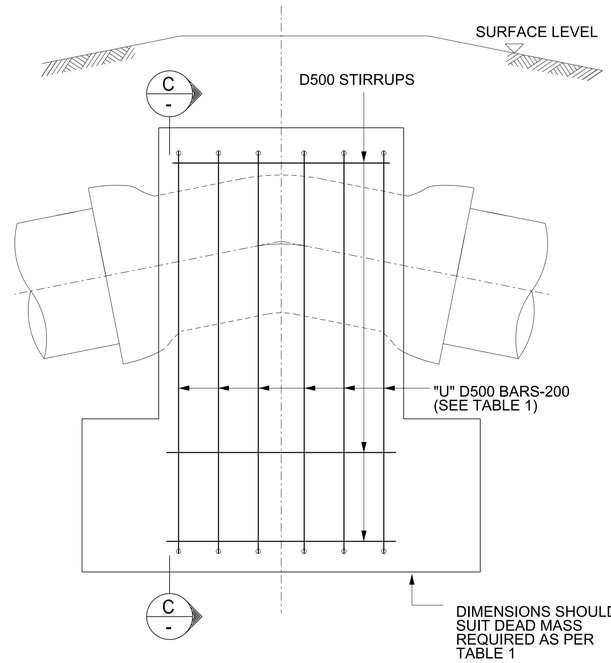


NOTES:

1. THRUST BLOCK FOR HORIZONTAL THRUST AND VERTICAL DOWNTHRUST SHALL BE CAST AGAINST UNDISTURBED MATERIAL.
2. THOSE AREAS OF THRUST BLOCKS LESS THAN 300 mm BELOW NATURAL SURFACE OR WITHIN BACK FILLED PIPE TRENCH SHALL NOT BE CONSIDERED IN HORIZONTAL BEARING CALCULATIONS.
3. TABLE 1 IS BASED ON AN ASSUMED SAFE BEARING CAPACITY OF 100 KPa ON THE UNDISTURBED SOIL. WHERE IT IS FOUND THAT THIS CAPACITY IS NOT OBTAINABLE THE CONTRACTOR SHALL EITHER PROPORTIONALLY INCREASE THE BEARING AREA OF THE THRUST BLOCK TO SUIT THE AVAILABLE SAFE BEARING CAPACITY OF THE SOIL.
4. FOR VERTICAL THRUST ACTING UPWARDS THE REQUIRED STABLE DEAD MASS ON EACH FITTING IS GIVEN IN TABLE 1.
   THE DEAD MASS MAY BE CONSIDERED AS THE COMBINED MASS OF THE CONCRETE AND THAT PROJECTED VOLUME OF PERMANENT STABLE FILL WHICH IS AFFECTED BY THE UPWARD THRUST OF THE CONCRETE MASS.
5. THE BEARING AREA REQUIREMENTS SHOWN IN TABLE 1 HAVE BEEN CALCULATED FOR NORMAL DRY CONDITIONS. FOR SATURATED SOILS THE BEARING AREAS MUST BE INCREASED.
6. THE BEARING AREAS GIVEN IN TABLE 1 MAY BE REDUCED FOR MATERIALS HAVING A HIGHER SAFE BEARING CAPACITY THAN THAT ASSUMED IN NOTE 3.
7. ASSUMED SAFETY FACTOR FOR HORIZONTAL THRUST CALCULATION IS 1.5
8. CONCRETE TO BE GRADE 25. COVER TO REINFORCEMENT TO BE 50mm

TABLE 1

PIPE SIZE D	PIPE INTERNAL DIAMETER	PIPE MATERIAL	TEST HEAD	THRUST BLOCKS FOR HORIZONTAL AND VERTICAL (DOWNTHRUST)) BENDS, TEES, END CAPS AND THRUST CONNECTORS								ANCHOR BLOCKS FOR VERTICAL BENDS (UPTHRUST)					
				THRUST CONNECTOR REINFORCEMENT		REQUIRED BEARING AREA FOR HORIZONTAL THRUST BLOCKS (m^2)						REQUIRED DEAD MASS (TONNES)			REINFORCEMENT - TOTAL NUMBER OF N12 U BARS		
DN	mm		m	HORIZONTAL (EF)	VERTICAL (EF)	11.25 BEND	22.5 BEND	45 BEND	90 BEND	TEE (BRANCH SIZE)	END CAP	11.25 BEND	22.5 BEND	45 BEND	11.25 BEND	22.5 BEND	45 BEND
100	110	PVC-M	120	N20-200	N20-200	0.03	0.07	0.13	0.24	0.17	0.17	0.23	0.45	0.89	4	4	4
150	160	PVC-M	120	N20-200	N20-200	0.07	0.14	0.28	0.51	0.36	0.36	0.48	0.96	1.88	4	4	4
200	210	PVC-M	120	N16-200	N16-200	0.12	0.24	0.48	0.88	0.62	0.62	0.83	1.65	3.24	4	4	4



DETAILS OF ANCHOR BLOCK FOR VERTICAL BEND

DRAWING NOT TO SCALE

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

Kittaltelles Food Basket
CABONNE COUNCIL

NSW GOVERNMENT PublicWorks Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

THRUST BLOCKS DETAILS

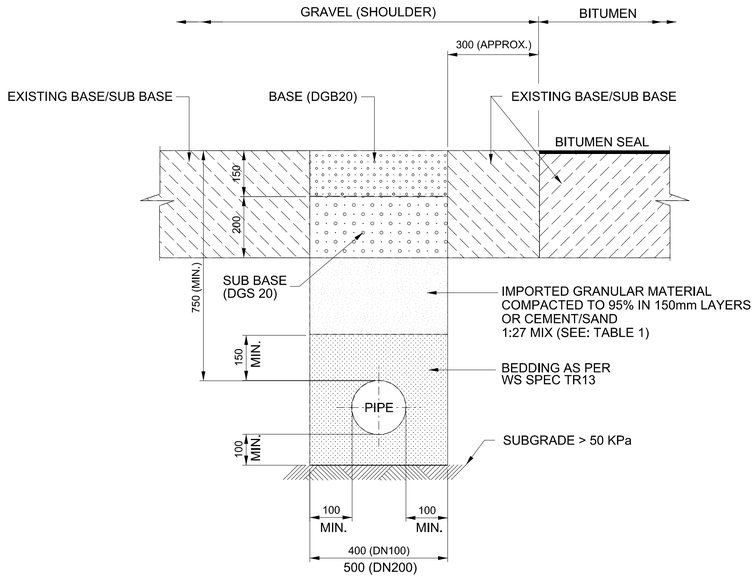
PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

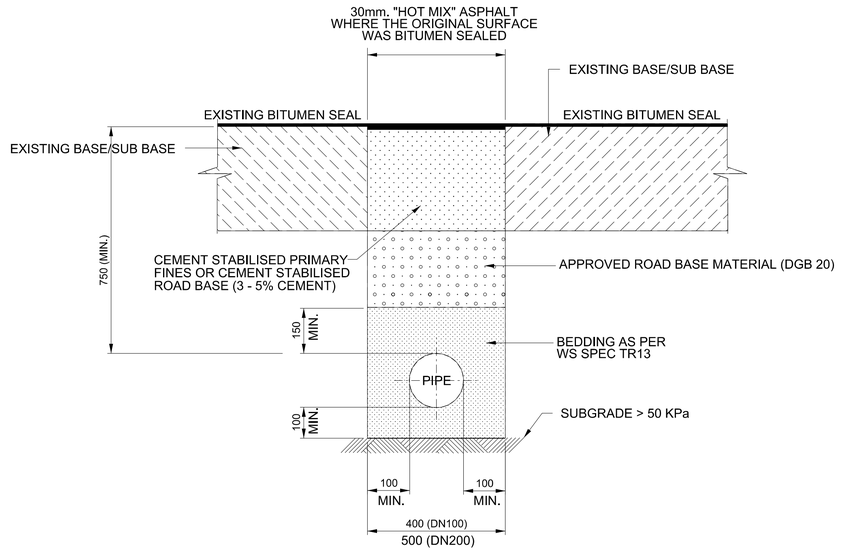
DRAWING No. 17/16033-P10 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

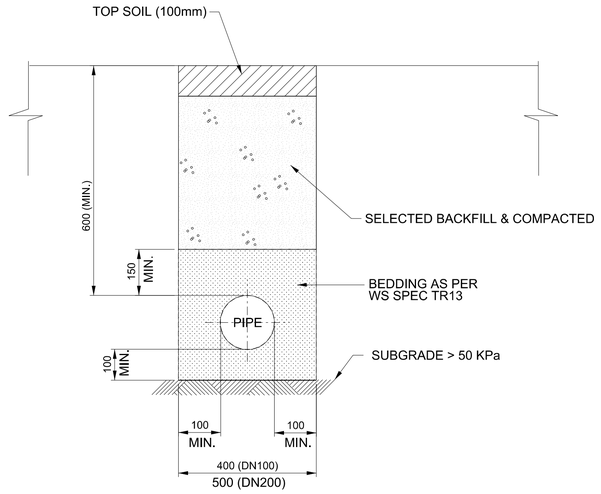
G:\Waterserv\Projects\Cabonne_SCI\Relic-Cumnock\Yeoval\Des-2\4-Work_Drawings\17_16033_P10_ThrustBlocksDetails.dgn
23/03/2017 11:28:34 AM



TRENCH DETAILS - TYPE 'A' (ON ROAD SHOULDER)



TRENCH DETAILS - TYPE 'B' (UNDER BITUMEN)



TRENCH DETAILS - TYPE 'C' (OUTSIDE ROAD PAVEMENT)

TABLE 1

SIEVE SIZE APERTURE WIDTH (AS1152)	EQUIVALENT BS SIEVE SIZE (BS410)	PERCENTAGE PASSING
9.5 mm	3/8 inch	100
6.7 mm	1/4 inch	90-100
425 µm	No. 36	40-90
150 µm	No.100	0-40

NOTE:

1. THE PIPE SHALL BE CONCRETE ENCASED IF THE MINIMUM COVER CANNOT BE PROVIDED.
2. DRAWING NOT TO SCALE

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

PIPELINE TRENCH BACKFILL DETAILS

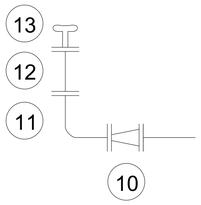
PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

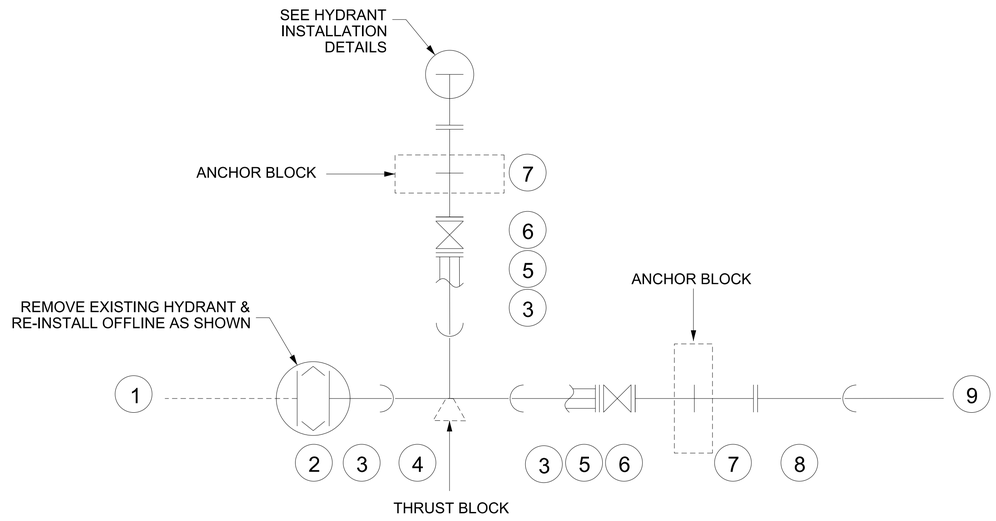
DRAWING No. 17/16033-P11 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

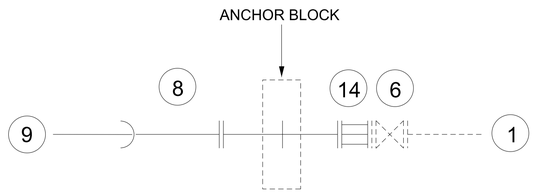
23/03/2017 11:29:19 AM G:\Watersen\Projects\Cabonne_SC\Reticu-CumnockYeovalDes-2\4-Work_Drawings\17_16033_P11_TrenchBackfillDetails.dgn



ELEVATION
HYDRANT INSTALLATION DETAILS



PLAN
TYPE 1 - PROPOSED CONNECTION TO EXISTING PIPELINE ENDING AT HYDRANT



PLAN
TYPE 2 - PROPOSED CONNECTION TO EXISTING LINE ENDING AT S.V.

PIPEWORK SCHEDULE

ITEM	DESCRIPTION
1	EXISTING PIPELINE
2	V-G COUPLING
3	DICL SP-SP PIPE. LENGTH TO SUIT
4	DICL SOCKETED TEE WITH DN100 BRANCH
5	NON-THRUST DISMANTLING JOINT
6	GATE VALVE (FL-FL)
7	DICL 2m LONG FL-FL PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
8	DICL FL-SO CONNECTOR
9	NEW PIPELINE
10	DICL DN100xDN80 FLANGED TAPER
11	DN80 90 DEG BEND FL-FL
12	DN80 DICL FL-FL HEIGHT TO SUIT
13	DN80 HYDRANT
14	THRUST-TYPE DISMANTLING JOINT

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT Public Works Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

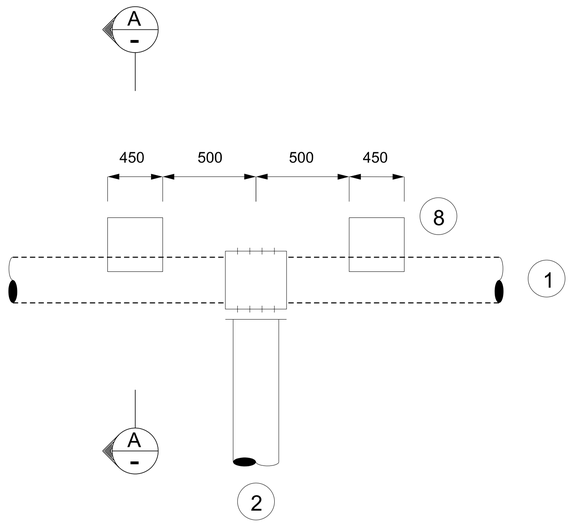
PROPOSED CONNECTION TO EXISTING LINE ENDING AT HYDRANT OR SLUICE VALVE

PROJECT/CONTRACT No.

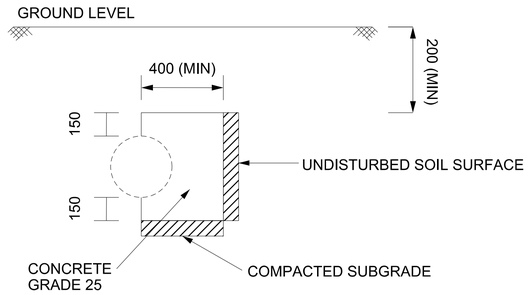
A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-P12 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL



PLAN

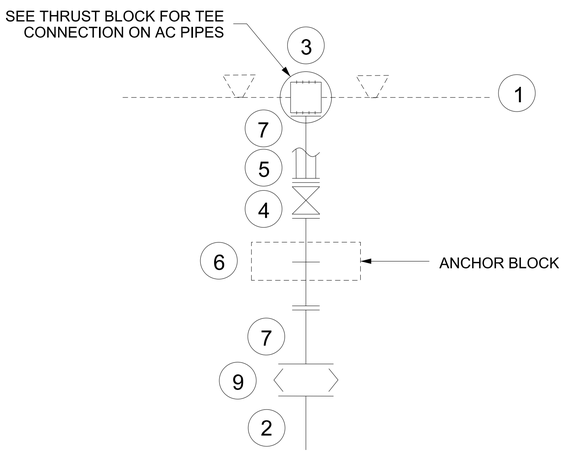


SECTION A -

THRUST BLOCK FOR TEE CONNECTION ON AC PIPES

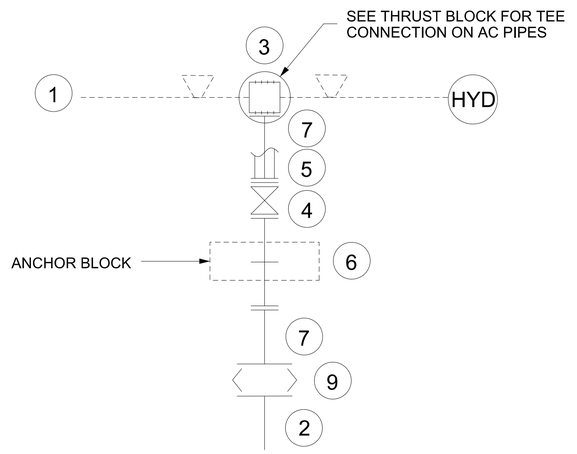
PIPEWORK SCHEDULE

ITEM	DESCRIPTION
1	EXISTING PIPELINE
2	NEW PIPELINE
3	STAINLESS STEEL FLANGED OFF-TAKE CLAMP
4	GATE VALVE (FL-FL)
5	NON-THRUST DISMANTLING JOINT
6	DICL 2m LONG FL-FL PIPE WITH THRUST FLANGE (WELDED OR MACHINE FITTED)
7	DICL FL-SP. LENGTH TO SUIT
8	THRUST BLOCK
9	V-G COUPLING



PLAN

TYPE 3 - PROPOSED PVC TO AC TEE CONNECTION



PLAN

TYPE 4 - PROPOSED PVC TO AC CONNECTION WITH EXISTING HYDRANT

REV	AMENDMENT DETAILS	APPROVED	DATE
0	ISSUED FOR REVIEW	D.G	11.04.17

ISSUED FOR REVIEW

CABONNE COUNCIL

NSW GOVERNMENT PublicWorks Advisory

DESIGNED	A.BARKHO
CHECKED	D.GUNASEKERA
DRAFTED	A.BARKHO
CHECKED	
PRINCIPAL ENGINEER	

CUMNOCK & YEOVAL WATER SUPPLY
CONSTRUCTION OF RETICULATION PIPELINES

PROPOSED TEE CONNECTION TO EXISTING PIPELINE WITH AND WITHOUT HYDRANT

PROJECT/CONTRACT No.

A1 | SCALE @ A1 N.T.S

DRAWING No. 17/16033-P13 | REV 0

CONFIRM SCALE — 100mm ON A1 ORIGINAL

Appendix B - Consideration of Clause 228

Clause 228 of the EP&A Regulation 2000 indicates, for purposes of Part 5 of the Act, the factors that must be taken into account when consideration is being given to the likely impact of an activity on the environment.

A determining authority is only required to consider the following matters where an EIS has been prepared for a Part 5 activity under the EP&A Act. However, the following information is provided to assist determining authorities in making determinations consistent with those made for an activity requiring preparation of an EIS.

The various factors and findings following the environmental assessment are presented below.

***(a) Any environmental impact on a* community,**

There is the potential for some minor noise, dust and access impacts during construction, however any impacts would be minor and would not affect the community permanently.

(b) Any transformation of a locality,

The proposed works are located within a Yeoval & Cumnock. Construction works would involve construction of new pipeline sections and associated valves, hydrants located below ground. The disturbed alignment would be restored to existing finished levels, without transformation of the area surrounding the infrastructure.

(c) Any environmental impact on the ecosystems of the locality,

No significant impact to threatened species or ecological communities is anticipated. Measures have been proposed to ensure that any impacts are minor and temporary.

(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality,

Construction works are within the already disturbed road corridor. The construction works would be temporary and would not preclude general use of the disturbed area post completion. The project would be carried out considering protection of local fauna, flora and heritage.

(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations,

None identified.

(f) Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974),

None identified.

(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air,

None identified.

(h) Any long-term effects on the environment,

The proposal would not result in a long-term effects on the environment.

(i) Any degradation of the quality of the environment,

Temporary degradation may occur during the works due to excavation and associated dust impacts.

(j) Any risk to the safety of the environment,

None identified.

(k) Any reduction in the range of beneficial uses of the environment,

None identified.

(l) Any pollution of the environment,

No discharges are anticipated.

(m) Any environmental problems associated with the disposal of waste,

None identified

(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply,

None identified. The proposal would meet human needs for potable water.

(o) Any cumulative environmental effect with other existing or likely future activities,

None identified.

(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions.

Not relevant to this proposal.

Appendix C – Consultation Responses

CABONNE COUNCIL

Phone: (02) 6392 3247
Fax: (02) 6392 3260
Contact: Heather Nicholls

THE GENERAL MANAGER
POST OFFICE BOX 17
MOLONG 2866
Website: www.cabonne.nsw.gov.au
Email: council@cabonne.nsw.gov.au

Our Ref:
Doc ID: 805193
ABN: 41992 919 200

23 January 2017

Rowan McKay
Rowan.mckay@finance.nsw.gov.au

Dear Sir,

CUMNOCK AND YEOVAL RETICULATED PIPELINE
PROPOSED UPGRADE TO WATER SUPPLY SERVICES
PREPARATION OF REVIEW OF ENVIRONMENTAL FACTORS

Council is in receipt of your correspondence dated 23 December 2016 and notes the contents. Cabonne Local Environmental Plan 2012 (the LEP) applies to the subject land and should be referenced in the Review of Environmental Factors. The mapping associated with the LEP may also provide a reference when identifying and assessing biodiversity, karst and flooding etc.

Please also note that the Cabonne Council area is subject to State Environmental Planning Policy 44 – Koala Habitat. In addition, certain lands within Cabonne have been mapped as having geological potential for the presence of Naturally Occurring Asbestos (NOA). Further information on NOA mapping can be sourced from the EPA or Safework web sites.

Should you have any further enquiries please contact Council's Environmental Services Department on 6392 3247 between 9am and 11am Monday to Friday.

Yours faithfully,

HJ Nicholls
DIRECTOR ENVIRONMENTAL SERVICES

Department of Primary Industries
Water

Contact Alice Buckley
Phone 02 6841 7469
Fax 02 6884 0104
Email alice.buckley@dpi.nsw.gov.au

Our ref 70ERM2016/1191

Mr Rowan McKay
Level 14, McKell Building
2-24 Rawson Place
SYDNEY NSW 2000

12 January 2017

Dear Mr McKay

Cumnock to Yeoval Reticulation Pipeline Upgrades – Review of Environmental Factors

I refer to your email and letter dated 23rd December 2016 requesting comments from DPI Water in relation to the preparation of a Review of Environmental Factors (REF) for the proposed Cumnock to Yeoval Reticulation Pipeline Ugrades.

The following key assessment requirements are requested to be addressed in the REF.

- An impact assessment of construction and operation of the pipeline within 40m of the banks of watercourses. Design and construction of works within waterfront land are recommended to be consistent with DPI Water *"Guidelines for Controlled Activities on Waterfront Land"*. These guidelines can be accessed at the DPI Water website (http://www.water.nsw.gov.au/water-licensing/approvals/controlled-activity).
- Potential impacts on groundwater should also be considered, an assessment framework for the NSW Aquifer Interference Policy can be found online at: http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference.
- Commitment to prepare a construction environmental management plan to identify and manage impacts during construction. It is requested erosion and sediment control is in accordance with the guideline, *"Managing Urban Stormwater: Soils and Construction (Landcom 2004)"*.

Should you require further information please contact Alice Buckley, Water Regulation Officer on 02 6841 7469.

Alice Buckley

Water Regulation Officer

Our Ref: DOC17/7616-1

Mr Rowan McKay
Environmental Planner
NSW Water Solutions
Level 14, 2-24 Rawson Place
SYDNEY NSW 2000
Rowan.mckay@finance.nsw.gov.au

Dear Mr McKay,

Request for Comment – Draft Review of Environmental Factors – Cumnock and Yeoval Reticulation Pipeline Upgrades

Thank you for your email dated 23 December 2016 seeking advice from the Office of Environment and Heritage (OEH) regarding our requirements for the preparation of a Review of Environmental Factors (REF) for the Cumnock and Yeoval Reticulation Pipeline Upgrades.

The background information provided indicates that the project is located near the townships of Cumnock and Yeoval in Central Western NSW. The project proposes approximately 3,052 metres and 999.7 metres of pipeline at various locations throughout the respective towns.

OEH Role

OEH has responsibilities under the:

- *National Parks and Wildlife Act 1974* (NP&W Act) - namely the protection and care of Aboriginal objects and places, the protection and care of native flora and fauna and the protection and management of reserves;
- *Threatened Species Conservation Act 1995* (TSC Act) which aims to conserve threatened species of flora and fauna, populations and ecological communities to promote their recovery and manage processes that threaten them; and
- *Native Vegetation Conservation Act 2003* – ensuring compliance with the requirements of this legislation.

OEH understands from the correspondence that the proposed activity is a Part 5 application pursuant to the *Environmental Planning and Assessment Act 1979* (EP&A Act). As such OEH only has a statutory role in assessing such an activity if the determining authority determines that:

a) the activity is likely to significantly affect a threatened species, population, ecological community, or its habitat, as listed under the TSC Act; and/or
b) An Aboriginal Heritage Impact Permit is required.

The EP&A Act requires that the REF should fully describe the proposal, the existing environment and impacts of the proposal. It is the responsibility of the proponent and

consent authority to adequately consider the requirements under the EP&A Act and the *Environmental Planning and Assessment Regulation 2000*.

OEH can provide advice on the REF where it deals with biodiversity and Aboriginal cultural heritage conservation issues. OEH may also comment on the legitimacy of the conclusions reached regarding the significance of impacts by the proposed development to these components of the environment.

This letter directs you primarily to our generic guidance material. However please note that it is up to the proponent (and later the consent/determining authority after appropriate consultation) to determine the detail and comprehensiveness of the surveys and level of assessment required to form legally defensible conclusions regarding the impact of the proposal. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data.

OEH Requirements

In summary, the OEH's key information requirements for the proposal include an adequate assessment of:

1. **Impacts to Aboriginal cultural heritage objects;** and
2. **Impacts on flora, fauna, threatened species, populations, communities and their habitats.**

This assessment should include consideration of direct and indirect impacts as a result of both construction and operation of the project. Assessment of any cumulative impacts of this and other developments in the area will be essential.

Flora, Fauna and Threatened Species

A copy of our generic Environmental Impact Assessment requirements for biodiversity are included in **Attachment A**. Associated guidance documents are referenced in **Attachment A** and **Attachment B**. These guidelines address requirements under the *EP&A Act* and OEH's areas of responsibility relating to flora, fauna and threatened species, populations and ecological communities and their habitats.

OEH is committed to the protection, appropriate management, and where necessary, rehabilitation of native vegetation. For these reasons, OEH considers that careful planning should precede any development that involves further vegetation clearance or other significant impact within areas of remnant vegetation.

Cultural Heritage

The importance of protecting Aboriginal Cultural Heritage is reflected in the provisions under Part 6 of the NP&W Act, as amended. That Act clearly establishes that Aboriginal objects and places are protected and may not be harmed, disturbed or desecrated without appropriate authorisation. Importantly, approvals under Parts 4 and 5 of the EP&A Act do not absolve the proponent of their obligations under the NP&W Act.

Under the NP&W Act, it is the responsibility of each individual proposing to conduct ground disturbance works to ensure that they have conducted a due diligence assessment to avoid harming Aboriginal objects by the proposed activity. OEH has produced a generic due diligence process, which is not mandatory to follow, however any alternative process followed must be able to demonstrate their process was reasonable and practicable in attempts to avoid harm to Aboriginal objects.

Consultation must also be in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010) as set by OEH if impact to cultural heritage is unavoidable.

Further advice regarding Aboriginal cultural heritage can be found on the OEH website at: http://www.environment.nsw.gov.au/licences/achregulation.htm and within guidance documents listed in **Attachment B**.

Should you require further information please contact myself on (02) 6883 5382 or via email on Steven.Cox@environment.nsw.goc.au.

Yours faithfully,

STEVEN COX
Senior Team Leader - Planning
North West Region

11 January 2017

Contact officer: STEVEN COX
(02) 6883 5382

ATTACHMENT A

EIA Requirements Review of Environmental Factors – Biodiversity

Introduction

These are introductory, generic specifications of the Office of Environment and Heritage (OEH) for an adequate assessment of the impacts of a development proposal on native flora and fauna (i.e. including protected and threatened species).

However, OEH recognises that the scale and complexity of the project will to some extent, dictate the level of information that is required to address the questions posed below. Consequently, flora and fauna assessments need to be tailored to suit the proposal. For example, a development which is proposed on land which has already been totally (or substantially) cleared should address the issues raised below but the amount of work required to address these issues may be substantially less than if the area comprised undisturbed bushland and, therefore, of more significant wildlife habitat value. A preliminary assessment, including a desktop investigation and a preliminary site inspection, may indicate the need for a detailed survey of the site.

It is up to the proponent (and later the consent and/or determining authorities) to determine the detail and comprehensiveness of assessment required to form legally defensible conclusions regarding the impact of the proposal. The scale and intensity of the proposed development should dictate the detail of investigation. It is important that all conclusions are supported by adequate data and that these data are clearly presented in EIA documentation.

OEH will consider the following issues when reviewing an EIA document:

1. **Concerns** - What are OEH's concerns regarding the conservation of natural and cultural heritage in accordance with the relevant legislation? Is the proposal likely to affect natural and cultural heritage? How?
2. **Provision of Information** - Is adequate information provided for a valid assessment of the impacts?
3. **Validity of Conclusions** - Has the proponent arrived at valid conclusions as a result of the assessment of impacts?
4. **Recommended Conditions of Consent/Approval** (where appropriate) - Should Consent or Approval be granted, what conditions (if any) are required to ensure that the project is developed, and thereafter managed in accordance with natural and cultural heritage conservation and the provisions of legislation administered by OEH?

Thus the EIA document should fully describe the existing environment including flora and fauna, so that future impacts can be properly assessed and then reviewed (e.g. during the public participation phase).

1. Flora

Background

Although the proposed site may be disturbed by various land uses, any remnants of native vegetation are of significant natural heritage value, including riparian and wetland areas. The area of vegetation and habitat at the proposed site may provide an area of high biological diversity, high conservation value may or may not be well represented or protected elsewhere. It may also act as a corridor or migratory route for wildlife, drought refuge habitat or have other important values.

OEH is committed to the protection, appropriate management, and where necessary, rehabilitation of native vegetation. For these reasons, OEH considers that careful planning should precede any development that involves further vegetation clearance or other significant impact within areas of remnant vegetation.

Negative impacts to native vegetation (e.g. clearing) should be avoided where possible. Where impacts cannot be avoided, mitigation measures must be implemented. Where residual impacts remain the EIA should detail how a "maintain or improve" outcome for biodiversity will be achieved via compensatory measures such as offsets - the provision of sites of similar type of vegetation to that impacted that will be managed in perpetuity for conservation. BioBanking provides a voluntary mechanism through which this can be achieved.

The BioBanking Assessment Methodology allows quantification of impacts and assessment of the value of offset areas and associated management regimes for those areas. The BioBanking scheme provides an alternative path for proponents to the current threatened species assessment of significance process. Information about BioBanking is located on OEH's website at http://www.environment.nsw.gov.au/biobanking/.

Where an offset package will not be determined using the BioBanking Assessment Methodology then the package should:

a) Meet OEH's *Principles for the use of biodiversity offsets in NSW1*, which are available at: http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip.htm;
b) Identify the conservation mechanisms to be used to ensure the long term protection and management of the offset sites; and
c) Include an appropriate Management Plan (such as vegetation or habitat) that has been developed as a key amelioration measure to ensure any proposed compensatory offsets, retained habitat enhancement features within the development footprint and/or impact mitigation measures (including proposed rehabilitation and/or monitoring programs) are appropriately managed and funded.

Report Requirements

The EIA documentation should include a report on the flora that includes the following:

- detailed location map and identification of the area surveyed (including the location of photographs, transects, areas of significance etc.),
- at least one of the following: a land satellite image, vegetation communities map, aerial photograph, or a remnant vegetation map,
- A map identifying the vegetation communities located in the study area and the areas of each vegetation community to be impacted.
- a complete plant list (including scientific names of those plants) of all tree, shrub, ground cover and aquatic species, categorised according to country of origin (i.e., native versus exotic),
- a detailed description of vegetation structure (in terms of a scientifically accepted classification system) and spatial distribution (i.e. plant densities and patterning) on the site, including a vegetation map,
- describe the condition and integrity of the vegetation including a description of any past disturbance,
- an account of the likely original vegetation communities (pre-, or at early settlement), and an assessment of the likely regional distribution of the original communities,
- an assessment of whether the plant communities are adequately represented in conservation reserves or otherwise protected,
- an account of the hydrology of the area and how this relates to the dynamics of the vegetation communities,
- a list of **known** and **likely** threatened species as listed under Schedules 1 & 2 (TSC Act) which might occur at the site. The OEH database needs to be accessed and the likelihood of occurrence of threatened flora species determined,
- an assessment of the impacts of the proposal on flora, on-site and off-site (e.g. siltation, water availability or drainage changes) and measures to mitigate these impacts,
- an assessment of the significance of the impact of the development at both the site and at the regional scale,
- a detailed rehabilitation/management plan including a list of the plant species to be used during rehabilitation (if required),

- detail methodologies used and a list of the reference literature cited, and
- any other issues that may be considered relevant.

The above guidance will provide some of the information necessary to conduct an Assessment of Significance required for threatened flora and fauna under Section 5A of the EP&A Act, should threatened species be likely or known to occur in the locality of the subject development proposal.

Similarly, it will provide some of the information required if an application is found to be necessary under the *Native Vegetation Act (2003)*. However the above relates mostly to the specific environmental assessment processes under the EP&A Act and does not constitute an Assessment of Significance.

Similarly, the above guidance will provide some of the information required for BioBanking, but may not be sufficient for BioBanking offset calculations. Please refer to the BioBanking website or contact OEH for specific information relating to BioBanking assessment requirements. The BioBanking scheme provides an alternative path for proponents to the current threatened species assessment of significance process.

2. Fauna

Background

The present high rate of biodiversity decline is associated with clearing and reduced condition of habitats. Native vegetation including wetland, riparian and remnant environments are very significant areas of fauna habitat. Therefore any development in such areas should fully consider the impact on fauna and its habitat.

Report Requirements

The EIA document should include a report on the fauna (including protected and threatened species), that includes the following:

- detailed location map and identification of the area surveyed (including the location of photographs, transects, areas of significance etc.),
- at least one of the following: a land satellite image, vegetation communities map, aerial photograph, or a remnant vegetation map,
- a complete list of all **known** and **likely** terrestrial and aquatic species (e.g. birds, mammals, reptiles and amphibians including scientific names). It is suggested that invertebrates also be considered as they form part of the food chain for many fauna species,
- those species which are protected, threatened or listed under any international agreements, as well as introduced species,
- those species known or likely to breed in the area,
- any species which have specific habitat requirements found within the project area,
- those species or populations which may be near the limit of their geographic range or are a disjunct/isolated population,
- assessment of the importance or otherwise of the location as a corridor, migratory route or drought refuge, in relation to other remnant vegetation, riparian and wetland areas or habitat in the region,
- assessment of the impacts of the proposal on all fauna and its habitat, at both the site and at the regional scale,
- identification of any mitigation measures proposed to limit or ameliorate the impact of the proposal,
- detailed methodologies used and a list of the reference literature cited, and,
- any other issues that may be considered relevant.

Again, the above guidance will provide some of the information necessary to conduct an Assessment of Significance required for threatened flora and fauna under Section 5A of the EP&A Act, should threatened species be likely or known to occur in the locality of the subject development proposal. However the above relates mostly to the specific environmental

assessment processes under the EP&A Act and does not constitute an Assessment of Significance. Similarly, the above guidelines will provide some of the information required for the Threatened Species component of BioBanking, but may not be sufficient for BioBanking offset calculations.

Please refer to the BioBanking website or contact OEH for specific information relating to BioBanking assessment requirements.

3. Threatened Species of Fauna and Flora

Background

The proponent will need to address the requirements of legislation that currently governs threatened species protection and impact assessment in NSW.

The TSC Act protects all threatened flora and fauna native to NSW (excluding fish and marine plants). The proponent will need to consider the provisions of this Act.

The TSC Act contains lists of threatened species, which are divided into a number of categories – those presumed extinct, endangered species, critically endangered species and vulnerable species. It also contains lists of endangered populations and endangered ecological communities. This Act also allows for the declaration of critical habitat, key threatening processes and the preparation of both Recovery Plans and Threat Abatement Plans. These listings and plans must be considered as part of the EIA process.

If an activity or development is proposed in a locality **likely** or **known** to be occupied by a threatened species, population, ecological community or critical habitat, any potential impact to that threatened species must be taken into account during the development assessment process. However under the EP&A Act, some types of development are not required to go through approval processes. Please note that a licence may still be required under the TSC Act if such a development/activity is likely to harm a threatened species, population or ecological community.

Proponents can voluntarily use BioBanking to minimise and offset their impacts on biodiversity. The scheme provides an alternative path for proponents to the current threatened species assessment of significance process.

Assessment of Significance & Species Impact Statements

If during the flora or fauna assessment or survey, threatened species are **found** or are **likely** to occur in the area, the proponents must undertake an Assessment of Significance as outlined in section 5A of the EP&A Act to determine whether or not the development would be likely to have a significant impact upon threatened species.

The Assessment of Significance is a statutory mechanism which allows decision makers to assess whether a proposed development or activity is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats.

The Assessment of Significance is contained within section 5A of the EP&A Act and consists of seven factors which need to be addressed for informed decisions to be made regarding the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats. A copy of OEH's *Threatened species assessment guidelines: The assessment of significance* can be obtained from the OEH website at: http://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf

Following threatened species assessment via the Assessment of Significance, it may be necessary to prepare a Species Impact Statement (SIS). The proponent will need to prepare a SIS in the following circumstances:

- If (after having addressed Section 5A) the flora/fauna assessment concludes that there is likely to be a significant impact to threatened species, or
- The proposed development is likely to affect critical habitat declared under the TSC Act.

If a SIS is required, the proponent (not the consultant) must write to OEH for any formal requirements for the SIS that OEH might deem appropriate. The SIS must then be prepared in accordance with these requirements and provided to OEH. In some instances the Minister for the Environment will also need to be consulted for approval.

Methods to reduce the impact on the protected and threatened species should be considered fully, and are considered an integral requirement within any SIS document.

OEH advises that conducting an Assessment of Significance or an SIS according to the provisions of the EP&A Act and the TSC Act is a complex task and should be undertaken by suitably qualified person(s).

Available Biodiversity Data

The following information sources are recommended:

Data Source	Web Address
Atlas of NSW Wildlife - A general search for flora and fauna records can be conducted. Please note that not all the information associated with the individual records is available on this website. You can apply to the Office of Environment and Heritage for more detailed information about individual sightings (terms and conditions apply). Contact the Wildlife Data Unit for more information on (02) 9995 5000.	http://www.bionet.nsw.gov.au/
OEH Threatened Species website – detailed information relating to threatened species, populations, ecological communities and their habitats can be obtained.	http://www.environment.nsw.gov.au/threatenedspecies
BioBanking Threatened Species Database	http://www.environment.nsw.gov.au/threatenedspecies
Vegetation Types databases	http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm
Other data sources (e.g. PlantNET, Online Zoological Collections of Australian Museums, previous or nearby surveys etc.) may also be used to compile the list.	http://www.ozcam.org.au/

ATTACHMENT B

Guidance Material

Title	Web Address
Relevant Legislation	
Environment Protection and Biodiversity Conservation Act (C'wlth) 1999	https://www.legislation.gov.au/Details/C2016C00777
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Fisheries Management Act 1994	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
Threatened Species Conservation Act 1995	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Wilderness Act 1987	http://www.legislation.nsw.gov.au/viewtop/inforce/act+196+1987+FIRST+0+N
Biodiversity	
BioBanking Assessment Methodology (OEH, 2014)	http://www.environment.nsw.gov.au/resources/biobanking/140661BBAM.pdf
BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW, 2008)	http://www.environment.nsw.gov.au/biobanking/calculator.htm
Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW, 2009)	http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)	http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
OEH Threatened Species website	http://www.environment.nsw.gov.au/threatenedspecies/
Atlas of NSW Wildlife	http://www.environment.nsw.gov.au/wildlifeatlas/about.htm
BioBanking Threatened Species Database	http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx
Vegetation Types databases	http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm
PlantNET	PlantNET http://plantnet.rbgsyd.nsw.gov.au/
Online Zoological Collections of Australian Museums	http://www.ozcam.org.au/

Title	Web Address
Threatened Species Assessment Guideline - The Assessment of Significance (DECCW, 2007)	http://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf
Principles for the use of biodiversity offsets in NSW	http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip.htm
Aboriginal Cultural Heritage	
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/10783FinalArchCoP.pdf
Due Diligence Code for the Protection of Aboriginal Objects in NSW (DECCW 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf
Aboriginal Site Recording Form	http://www.environment.nsw.gov.au/resources/parks/SiteCardMainV1_1.pdf
Aboriginal Site Impact Recording Form	http://www.environment.nsw.gov.au/resources/cultureheritage/120558asirf.pdf
Aboriginal Heritage Information Management System (AHIMS) Registrar	http://www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm

Appendix D – Aboriginal Heritage Due Diligence Assessment

ECO LOGICAL AUSTRALIA PTY LTD
ABN 87 096 512 088
www.ecoaus.com.au

Ms Lara Hess
Senior Environmental Scientist, NSW Water Solutions
Public Works Advisory
Department of Finance, Services and Innovation
Level 13, Mckell Building, 2-24 Rawson Place,
Sydney NSW 2000

REF/Job No: 17NEW 6322

7 March 2017

Dear Ms Hess,

RE: Aboriginal Archaeological Due Diligence Assessment – Water Reticulation Upgrades, Yeoval and Cumnock, NSW.

Eco Logical Australia (ELA) has been engaged by the NSW Public Works Advisory on behalf of Cabonne Council, to conduct an Aboriginal Archaeological Due Diligence Assessment for proposed water reticulation upgrade works at Cumnock and Yeoval NSW, NSW (**Figure 1** and **Figure 2**).

This assessment follows the due diligence Code of Practice as set out in the Office of Environment and Heritage's (OEH) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (hereafter referred to as 'CoP') (DECCW 2010).

This due diligence process aims to determine whether Aboriginal objects will be harmed by the proposed works, as required under Part 6 of the NSW *National Parks and Wildlife Act 1974* (NSW). The CoP sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

1. Identify whether or not Aboriginal objects are, or are likely to be, present in an area;
2. Determine whether or not their activities are likely to harm Aboriginal objects (if present); and
3. Determine whether an Aboriginal Heritage Impact Permit (AHIP) from the OEH or further assessment is required.

Location

The proposed works are located in the towns of Yeoval and Cumnock, in the Central Western district of New South Wales. The proposed works will be conducted at 11 separate locations; eight within the town of Yeoval, and three within the town of Cumnock NSW (**Figure 1** and **Figure 2**).

The proposed works include the provision of new water infrastructure to the towns, and is to be contained within established road reserves.

Based on the archaeological constraints identified in the draft report, Cabonne Council has made the following design amendments:

1. Section 3 (Yeoval) will be installed between the edge of carriageway and existing Telstra cables in an area of previous disturbance.
2. Sections 4 and 5 (Yeoval) has been relocated from previously undisturbed land, to nearby man made drainage channels adjacent a previously disturbed carriageway.
3. Section 8 (Yeoval) of the proposed works will be conducted between the edge of the existing disturbed carriage way and the existing water pipeline.

Figure 1: Study area location Yeoval

Figure 2: Study area location Cumnock

Legislative framework for due diligence

Aboriginal objects and places in NSW are afforded protection under the *National Parks and Wildlife Act 1974* (NSW) regardless of whether they are included on the Aboriginal Heritage Information Management System (AHIMS) register. Strict penalties apply for harm to an Aboriginal object or place without a defence under the Act. Under Section 87 of the Act there are five defences to causing harm to an Aboriginal object:

- The harm was authorised under an AHIP.
- By exercising due diligence, and being able to demonstrate this.
- The actions compiled with a code of practice as described in the National Parks and Wildlife Regulation 2009, for example, undertaking test excavation in accordance with the 'Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW'.
- It was a low-impact activity or omission under the regulation and it was not known that an Aboriginal object was already present.
- It was an exemption under Section 87A, for example emergency fire-fighting or bush fire hazard reduction work within the meaning of the *Rural Fires Act 1997*.

If an AHIP application is required, the OEH require that it is supported by an Aboriginal Cultural Heritage Assessment (ACHA) prepared in line with the 'Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2010)', and a copy of an approval for the development or infrastructure under Part 4 or Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW).

Purpose and aim of the due diligence

The aims of this Aboriginal archaeological due diligence assessment are to:

- Undertake a search of the Aboriginal Heritage Information Management System (AHIMS) register maintained by the OEH, to establish if there are any previously recorded Aboriginal objects or places within the study area.
- Undertake a search of the NSW State Heritage Register, the Australian Heritage Database, The Cabonne LEP Schedule 5, and DCP, to determine if there are any places of Aboriginal significance within the study area;
- Undertake a desktop review of relevant previous archaeological assessments to understand the local archaeological context and assist in predicting the likely occurrence of unrecorded archaeological sites or objects.
- Prepare a letter style Aboriginal due diligence assessment determining if known objects or additional unrecorded objects are present within the study area, as well as indicating whether further assessment and/or an AHIP is required.

Historic Heritage

This assessment does not examine potential impacts upon historical archaeology.

Consultation

No consultation has been undertaken with representatives of the Aboriginal community or other interested stakeholders as part of this due diligence.

Authorship and Acknowledgements

This assessment has been prepared by Taryn Gooley[1], Archaeologist with ELA and reviewed by Alistair Grinbergs[2], Senior Archaeologist with ELA.

Previously Recorded Aboriginal Sites

Heritage Database Searches

Searches of the Australian Heritage Database and the State Heritage Inventory (SHI) utilising the terms "Yeoval, NSW", and "Cabonne, NSW" were conducted on 3 February 2017, in order to determine if any places of Aboriginal significance are located within proximity to the study area.

No items of Aboriginal significance were identified.

The Cabonne Local Environmental Plan 2012 Schedule 5 was also consulted on 6 February 2017 in order to determine if any areas of Aboriginal heritage significance have been identified within proximity to the study area.

No areas of Aboriginal significance have been identified within Cabonne LEP 2012.

AHIMS Search

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted by Public Works on 13 December 2016. The searches covered Lat, Long from: -32.9254, 148.7549 - Lat, Long to:-32.9253, 148.755 with a buffer of 1000 m for the area of works in Cumnock, and Lat, Long from: -32.7508, 148.6482 - Lat, Long to:-32.7507, 148.6517 with a buffer of 1000 m for the area of works in Yeoval (**Attachment A**)

A total of five AHIMS sites and zero Aboriginal Places were identified during the searches. All AHIMS sites were identified within the Yeoval search area (**Figure 3** and **Table 1**). No AHIMS sites are located within the area of works however two AHIMS sites (36-4-0106, and 36-4-0129) are located within 50 m of the proposed works.

Table 1: AHIMS sites recorded within approximately 1 km of the AHIMS search area

AHIMS #	Site Type
36-1-0150	Scarred Tree
36-4-0059	Scarred Tree
36-4-0106	Scarred Tree
36-4-0127	Scarred Tree
36-4-0129	Isolated artefact

[1] Bachelor of Arts and Science (Honours). Archaeology. University of Sydney)
[2] Bachelor of Arts (Honours) Australian National University. Graduate Diploma of Applied Science, University of Canberra.

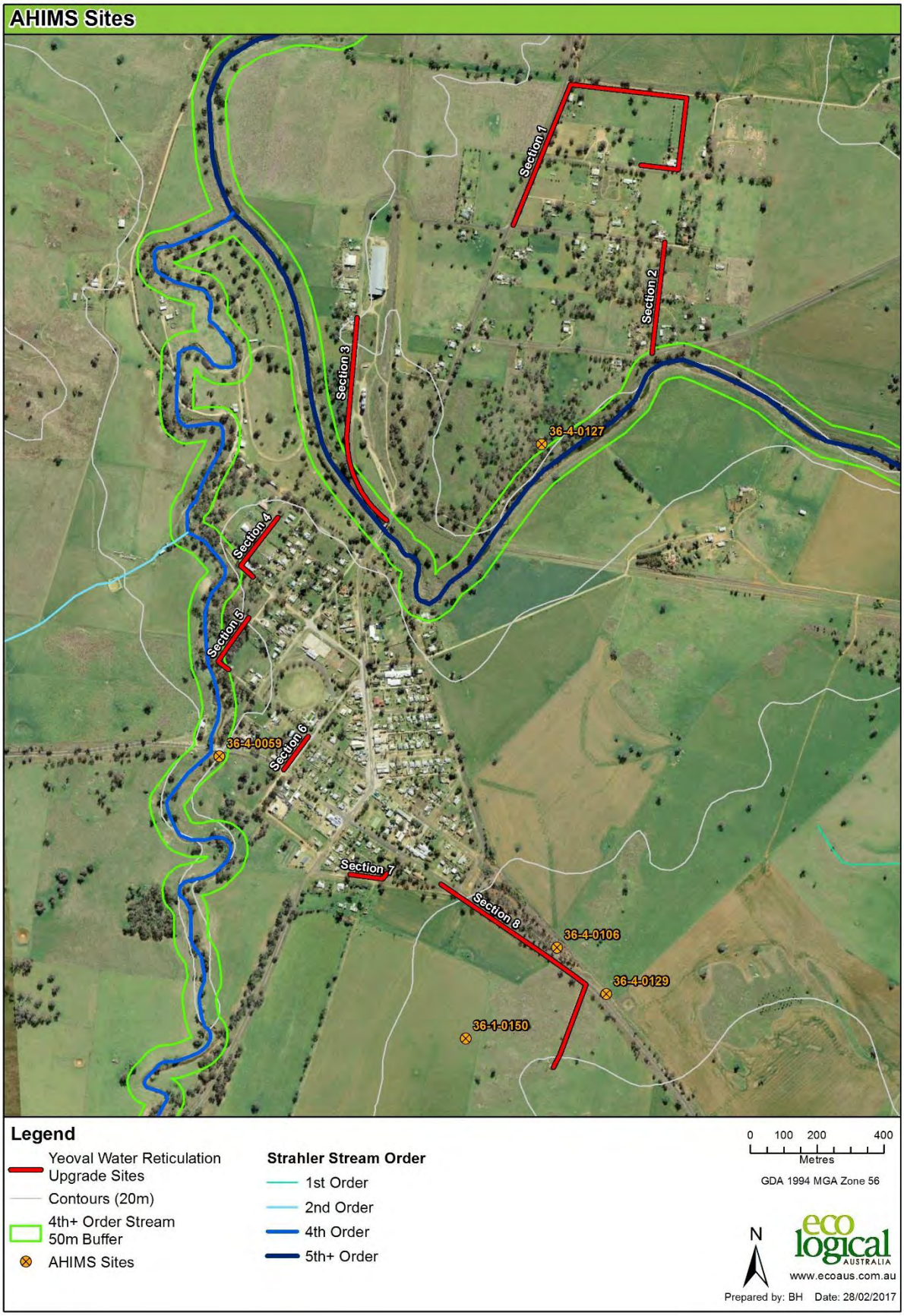


Figure 3: AHIMS sites and Strahler stream order

Previous Aboriginal Archaeological Studies

Regional Aboriginal Archaeological Context

The study area falls within the traditional lands of the *Wiradjuri* people. Although several large scale archaeological studies have been undertaken in the broader central NSW region (Pearson: 1981; White: 1986 and Pardoe: 2010), the most comprehensive of these was conducted by Pearson.

Pearson found that:

- sites could be found anywhere between 10m to 500m from water sources;
- that sites typically increased in both size and frequency with proximity to water sources;
- approximately 75% of sites identified were found on rolling hills rather than flats or river terraces;
- areas with good drainage, and good vantage points within proximity to water sources, were likely to contain camp sites; and
- burial sites were often located near camp sites.

Local Archaeological Context

A number of Aboriginal archaeological assessments have been conducted within close proximity to the study area.

Bell, D. 1980. Aboriginal Carved Trees in New South Wales: A Survey Report: Part 1. Report to NSW National Parks and Wildlife Service.

This study documents the wide ranging field survey which was undertaken by the NPWS between 1979-1980 in order to relocate and verify carved trees within NSW. The study had three main aims: locating and recording carved trees within NSW, making recommendations to the NPWS for the protection and preservation of carved trees, and to compile a register of sites for inclusion into the Register of the National Estate for the Australian Heritage Commission.

The 1979 survey covered much of the central west and part of northern NSW and took eleven weeks to complete. A total of 110 carved tree sites were investigated however only 76 sites could be relocated during the 1979 survey. The 1980 survey involved an inspection of 95 carved tree sites. A total of 44 trees were relocated and recorded during the survey. Approximately 28% of the carved trees recorded during the survey were previously unknown.

The report made various recommendations for the preservation and protection of the carved trees identified during the survey, including fencing and developing a tagging system in order to make identification easier. The report identified that scarred and carved trees can be culturally significant given their associations with burial and initiation practices (Etheridge, 1918: 6-7; and Bell. 1980: 139).

Haglund, L. 1984. Survey for Aboriginal Sites in the Area of Molong Water Supply Augmentation NSW. Report to the Public Works Department of NSW.

Haglund conducted an Aboriginal archaeological survey for a proposed dam and storage area and associated water pipelines near the banks of the Molong Creek. The survey identified four archaeological sites consisting of two artefact scatters, one quarry and one artefact scatter with potential archaeological deposit (PAD). One of the

sites identified contained a retouched flake along with a grinding flat and top stone suggesting the site was used for more than a transitory campsite.

Davies, S.J. 1993. An Archaeological Assessment of the Proposed Telecom Optic Fibre Cable Route Between Orange and Narromine, Central Region NSW. Report to Telecom Australia.

An archaeological assessment was undertaken by the University of Queensland Archaeological Services Unit (UQASU) for the proposed optic fibre cable route between Orange and Narromine, NSW. The assessment included an archaeological survey as well as mitigation recommendations for the avoidance of impacts to archaeological sites and objects.

The study area covered a 6m wide corridor extending approximately 192km in length. The assessment included a background study on the regional archaeological context of the Orange Plateau, the Bell River Valley, and the Dubbo Slopes which was largely based on the study conducted by Pearson (1981).

The survey was undertaken over three days and was carried out over sections of the proposed route which were considered to have high archaeological potential including terrain along and adjacent to all watercourses and ridge and spur chests. A number of constraints impacted the effectiveness of the survey including surface visibility which was poor (0-10% throughout the study area), ground surface disturbance, and the aggrading land surface along the route.

Approximately 60% of the study area was covered during the survey. A total of nine archaeological sites were located including one artefact scatter with two scarred trees, four artefact scatters, three isolated artefacts, and one scarred tree.

Navin Officer Heritage Consultants Pty Ltd 2003. Molong to Manildra 132kV Transmission Line, Stage 2. Cultural Heritage Assessment. Report to URS Australia Pty Ltd.

A cultural heritage assessment was undertaken by Navin Officer Heritage Consultants Pty Ltd for the Molong to Manildra 132kV transmission line. The study included a survey of approximately 16km (100%) of the proposed transmission line and a desktop assessment of the study area. The survey identified 13 previously unrecorded archaeological sites consisting of seven artefact scatters and six isolated artefacts. Four of the artefact scatters have associated potential archaeological deposit (PAD). All but one of the sites identified during the survey are within the impact footprint.

The Yuranigh Aboriginal burial site which is listed on the AHIMS register and the state heritage register, was also located 400m to the north of the study area.

Predictive Model

Regionally, archaeological studies suggest that site distribution is characterised by proximity to permanent water sources. Archaeological evidence in the vicinity of low order tributaries may comprise sparse and transitory activities, such as one-off camps or single knapping (stone tool manufacturing or curation) events and elevated areas adjacent to creek lines and spurs/crests can be archaeologically sensitive landforms.

The most common site types regionally are artefact sites (one or multiple artefact occurrences) and scarred trees.

The survival of archaeological materials depends on past land use and environmental factors. Archaeological material is more likely to survive intact within remnant soil profiles in areas where the ground has not been disturbed by historical activity or processes such as erosion.

A wide range of Aboriginal site types can be encountered during archaeological investigations and these reflect the range of activities carried out by Aboriginal people in the past. This summary is based on previous archaeological research and predictive models, as well as the assessment of landforms and environment within the study area.

Archaeological implications for the study area based on previously recorded sites, archaeological investigations in the region, predictive models, and the site's environmental characteristics are as follows:

- From the AHIMS search results and previous reporting for the area, scarred trees and open sites containing artefacts are by far the most recorded in the region.
- Areas of potential archaeological deposit (PAD) are also frequently found throughout the wider region. Larger artefact sites are predicted to occur in less disturbed areas with proximity to water courses, 3rd order and above.
- Human burials would be unlikely in the area of proposed works however they are known to occur in the region. Five recorded Aboriginal burials are located between Yeoval and Molong to the south.
- Areas which retain intact soil deposits close to creek lines or confluences have a higher likelihood of containing subsurface deposits than other areas.

Due Diligence Assessment Process

Due diligence is defined in the CoP as "taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm". The following section relates to the generic due diligence process as applied to the study area.

Step 1 – Will the activity disturb the ground surface or any culturally modified trees?

Yes. The proposed works involve vegetation clearing and excavation and trenching works which will result in ground disturbance.

There are no recorded culturally modified trees within the study area however one culturally modified tree is located approximately 50m to the north of the area of proposed works (section 8 within the township of Yeoval).

Step 2 – Are there any a) relevant confirmed site records on AHIMS, other sources of information, or b) landscape features that are likely to indicate presence of Aboriginal objects?

Consequently, if your proposed activity is:

- **Within 200m of waters, or**
- **located within a sand dune system, or**
- **located on a ridge top, ridge line or headland, or**
- **located within 200m below or above a cliff face, or**
- **within 20m of or in a cave, rock shelter, or a cave mouth;**
- **and is on land that is not disturbed land then you must go to step 3.**

"Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable.

*Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks."(*DECCW 2010).

A search of the AHIMS register identified five AHIMS sites within ~1km of the study area. All five AHIMS sites are located within the township of Yeoval. No AHIMS sites were identified within the township of Cumnock.

No AHIMS sites are located within the area of works, however two AHIMS sites (36-4-0106, and 36-4-0129) are located within 50m of section 8 of the proposed works within the township of Yeoval. AHIMS site 36-4-0106 is a scarred tree located within the road corridor on Banjo Patterson Way. AHIMS site 36-4-0129 is an isolated artefact consisting of a single platform core, located within the road corridor approximately 50m to the north east of the area of proposed works.

The proposed works will not impact on either AHIMS Site 36-4-0106, or 36-4-0129. The works will be conducted on the opposite side of the road in an area disturbed by previous construction and maintenance of Banjo Patterson Way.

A number of creek lines are located within 200m of the area of proposed works. Sections 2 and 3 of the proposed works in Yeoval are located within 50m of a fifth order creek line (Buckinbah Creek) while section 4 and 5 of the proposed works in Yeoval are located within 50m of a fourth order creek line (Sandy Creek) (**Figure 3**).

A study of available historic aerial imagery shows that much of the areas of proposed works had been subject to vegetation clearance and disturbance through the construction of services, utilities and other infrastructure within the towns of Yeoval and Cumnock prior to 1964 (**Figure 4 - Figure 5**).

The proposed works are contained to previously established road reserves. A site survey was undertaken by ELA archaeologist Taryn Gooley on 6 February 2017. All sections of the proposed works were surveyed. Surface visibility along all sections of the proposed works with the exception of sections 4 and 5 within the township of Yeoval was good (~50-70%). The surface visibility of the areas immediately adjacent to the road was low within sections 4 and 5, due to large amounts of vegetation including introduced grasses and native trees and shrubs.

All sections were noted to have been subject to previous ground disturbance through the establishment and maintenance of the access roads. The sections of proposed works within the township of Cumnock have been highly disturbed by vegetation clearance and works associated with building roads (excavation, and stripping of soils).

The road surfaces and the area within approximately 2m of the road surfaces (hereafter referred to as the disturbance footprint) in each section of proposed works can be classified as disturbed under the CoP. These areas showed clear evidence of disturbance from the construction of the roads, such as levelling of the ground surface, top soil stripping, installation of curbing and drains, and associated excavation.

The road reserves in sections 1, 3, 4, 5, and 8 within the township of Yeoval were noted to have much lower levels of disturbance in areas outside of the disturbance footprint. Aboriginal sites or objects may be present within the wider road reserves in these areas due to the following:

- The presence of previously recorded Aboriginal sites within proximity to the area of works;
- Low levels of disturbance outside of the disturbance footprint within sections 1, 3, 4, 5, and 8;
- Close proximity to both a fifth and fourth order creek line, and

- Presence of remnant vegetation.

A summary of the levels of disturbance for each section of the proposed works are listed below:

- The sections of proposed works within the township of Cumnock have been highly disturbed by vegetation clearance, and works associated with building roads (excavation, and stripping of soils). The site inspection did not identify any areas of archaeological potential in this area.
- Section 1 of the proposed works within the township of Yeoval has not been upgraded to an asphalt road. No Aboriginal objects were noted in this area. There was very little A horizon soil remaining in this area, with clay observed throughout the survey area. No areas of archaeological potential were noted for this section.
- Sections 2, 6, and 7 within the township of Yeoval display high levels of disturbance from works associated with the construction of roads, and domestic dwellings. The site inspection did not identify any areas of archaeological potential in this area.
- Section 3, in the township of Yeoval is located within a sensitive landform unit (area of higher ground within close proximity (50m) of a higher (5th) order creek line. The formal road surface and the surrounding 2m has been heavily disturbed by the construction of the roads. The areas outside of the disturbance footprint of the road within the road reserve in this section have the potential to contain subsurface archaeological deposits.
- Sections 4 and 5 in the township of Yeoval are located within sensitive landform units (areas of higher ground within close proximity (50m) of a higher (4th) order creek line. These areas displayed lower levels of ground disturbance as they had not been upgraded to asphalt roads. The gravel roads have been graded in the past and showed evidence of surface wash with very little A horizon soils remaining. The road surface and the surrounding 2m has been heavily disturbed by the construction of the roads. The areas outside of the disturbance footprint of the road within the road reserve in these sections have the potential to contain subsurface archaeological deposits.

A selection of photographs taken during the site inspection are included in **Plates 1 -13** below.

Step 3 – Can harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or can the carrying out of the activity at the relevant landscape features be avoided?

The proposed works will not impact on any known Aboriginal archaeological sites.

The areas of proposed impact were thoroughly inspected for Aboriginal sites and objects however none were identified. An assessment of the potential for subsurface archaeological deposits being located in or within close proximity to the areas of proposed works was undertaken as part of the survey. Sections 3, 4, and 5 within the township of Yeoval were assessed as having subsurface archaeological potential due to the proximity of a fourth and fifth order creek line, and generally low levels of previous ground disturbance within the road corridor outside of the formalised road surface.

The northern portion of the road reserve at section 8 of the proposed works was assessed as having subsurface archaeological potential due to the generally low levels of previous ground disturbance, and previously recorded AHIMS sites being located within 50 m of the area of proposed works.

The proposed works are expected to be undertaken within ~2m of the formalised road surface in each section. The formalised road surface and areas within ~2m of the formalised road surface in each section has been assessed as meeting the definition of disturbed as per the CoP.

Provided the proposed works are contained to within ~ 2m of the formalised road surface in each section, the works are not expected to impact on any Aboriginal sites or Objects.

Step 4 – Does the desktop and visual assessment confirm that there are Aboriginal objects or that they are likely?

The evidence collected during the desktop and visual assessment demonstrates that the disturbance footprint (the existing road surface and 2m either side of road surface) within all sections of the proposed area of works can be classified as disturbed under the definition established in the due diligence CoP.

The road reserve beyond the disturbance footprint within sections 3, 4, 5, and the northern side of the road reserve in section 8 within the township of Yeoval cannot be classified as disturbed under the CoP. The historic aerial imagery available shows aside from the construction and maintenance of the formalised road surface, very little ground disturbance has occurred within the road reserves at sections 3, 4, 5, and the northern side of the road reserve in section 8 within the township of Yeoval (**Figure 4** to **Figure 6**).

The proximity of a fourth and fifth order creek line to these sections along with the low levels of disturbance displayed, and presence of previously recorded AHIMS sites in the local area indicates that Aboriginal objects or sites may be present outside the footprint of previous disturbance in these sections.

Figure 4: Historic aerial imagery 1964 (Source: Land & Property Information NSW)

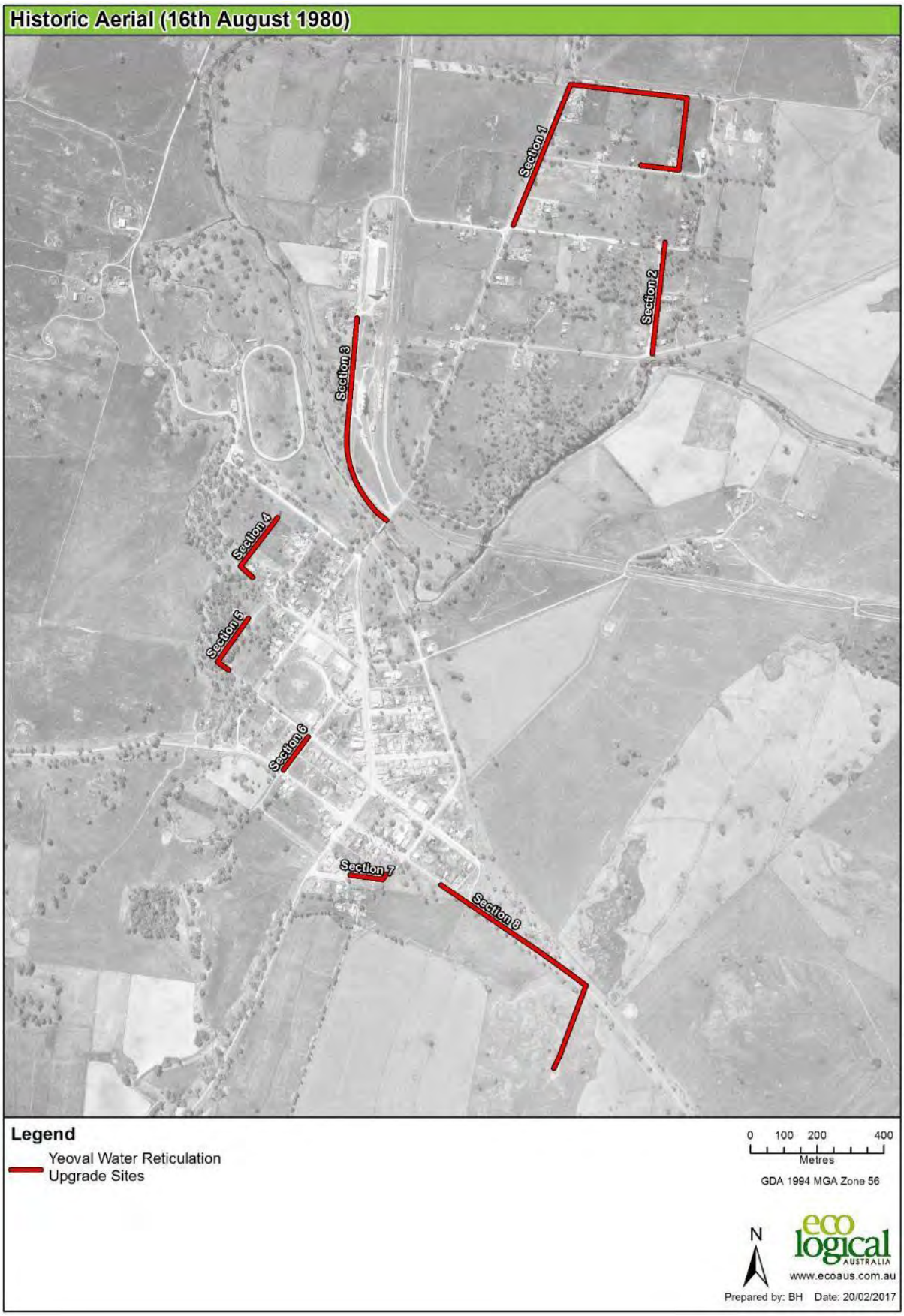


Figure 5: Historic aerial imagery 1980 (Source: Land & Property Information NSW)

Figure 6: Historic aerial imagery 1995 (Source: Land & Property Information NSW)

Figure 7: Historic aerial imagery 1980 (Source: Land & Property Information NSW)

Figure 8: Historic aerial imagery 1995 (Source: Land & Property Information NSW)

Conclusions

The purpose of the Aboriginal heritage due diligence is to identify if there are registered Aboriginal sites and/or sensitive landforms which may indicate the presence of Aboriginal sites and may therefore require further assessment and approval under Part 6 of the *National Parks and Wildlife Act 1974*.

ELA has undertaken an extensive search of the Aboriginal Heritage Information Management System (AHIMS) database maintained by the Office of Environment & Heritage (OEH), and a review of available background reports and historic aerial imagery.

No AHIMS sites are located within the area of works, however two AHIMS sites (36-4-0106, and 36-4-0129) are located within 50m of the proposed works. The area of proposed works displayed varying levels of previous ground disturbance. The road surface and the surrounding 2m within each section of proposed works was assessed as disturbed as defined by the CoP.

The road reserves at sections 3, 4, 5, and the northern side of section 8 within the township of Yeoval were assessed as having low levels of previous disturbance outside the footprint of disturbance, caused by the construction of the road (i.e. the road surface and the surrounding 2m).

The proximity of Buckinbah Creek and Sandy Creek which are major creek lines, as well as low levels of previous disturbance, and previous AHIMS sites being recorded in the local area, indicates that sections 3, 4, and 5 and the northern side of the road reserve of section 8 within the township of Yeoval have the potential to contain subsurface archaeological deposits outside the footprint of disturbance caused by the construction of the road (i.e. the road surface and the surrounding 2m).

The likelihood of further Aboriginal sites occurring within the road reserve outside of the areas of previous disturbance in sections 3, 4, 5, and the northern side of the section 8 road reserve within the township of Yeoval is therefore moderate to high.

Based on the archaeological constraints identified in the draft report, Cabonne Council has made the following design amendments:

- Section 3 (Yeoval) will be installed between the edge of the existing carriageway and existing Telstra cables in an area of previous disturbance.
- Sections 4 and 5 (Yeoval) has been relocated from previously undisturbed land, to nearby man made drainage channels adjacent a previously disturbed carriageway.
- Section 8 (Yeoval) of the proposed works will be conducted between the edge of the existing disturbed carriage way and the existing water pipeline.

Recommendations

Based on the findings of this due diligence and the requirement of the NPW Act the following is recommended:

- It is generally recommended all works are contained to areas within previous disturbance footprints in the road reserves (i.e. in or within 2m of the established road surfaces).
- The sections of proposed works within the township of Cumnock have been highly disturbed by vegetation clearance, and works associated with building roads (excavation, and stripping of soils). No further Aboriginal archaeological assessment is therefore recommended in these areas. Works can proceed in this area without the need for further archaeological investigations or an AHIP.

- Section 1 of the proposed works within the township of Yeoval has not been upgraded to an asphalt road. No Aboriginal objects were noted in this area. There was very little A horizon soil remaining in this area, with clay observed throughout the survey area. No areas of archaeological potential were noted for this section. No further Aboriginal archaeological assessment is therefore recommended in these areas. Works can proceed in this area without the need for further archaeological investigations or an AHIP.

- Sections 2, 6, and 7 within the township of Yeoval display high levels of disturbance from works associated with the construction of roads, and domestic dwellings. No further Aboriginal archaeological assessment is therefore recommended in these areas. Works can proceed in this area without the need for further archaeological investigations or an AHIP.

- Section 3, 4, and 5 in the township of Yeoval are located within sensitive landform units (areas of higher ground within close proximity (50m) of higher order (4^{th} and above) creek lines. The formal road surface and the surrounding 2m has been heavily disturbed by the construction of the road. The areas outside of the disturbance footprint of the road within the road reserve at section 3, 4, and 5 in the township of Yeoval have the potential to contain subsurface archaeological deposits. Should works be required outside the area of previous disturbance within these sections, further archaeological assessment in the form of an Aboriginal Cultural Heritage Assessment will be required.

- Section 3 (Yeoval) will be installed between the edge of carriageway and existing Telstra cables in an area of previous disturbance. No further Aboriginal archaeological assessment is therefore recommended in these areas. Works can proceed in this area without the need for further archaeological investigations or an AHIP.

- Sections 4 and 5 (Yeoval) will be constructed within man made drainage channels adjacent a previously disturbed carriageway. No further Aboriginal archaeological assessment is therefore recommended in these areas. Works can proceed in this area without the need for further archaeological investigations or an AHIP.

- Section 8 (Yeoval) of the proposed works will be conducted between the edge of the existing disturbed carriage way and the existing water pipeline. . The southern section of the road reserve in section 8 has been subject to previous disturbance associated with the construction and maintenance of banjo Patterson Way. No further Aboriginal archaeological assessment is therefore recommended in this area. Works can proceed in this area without the need for further archaeological investigations or an AHIP.

- The northern portion of the road reserve at section 8 of the proposed works within the township of Yeoval displays lower levels of previous ground disturbance, previous AHIMS sites are also located within 50m of this area. Should works be required outside the area of previous disturbance within this section, further archaeological assessment in the form of an Aboriginal Cultural Heritage Assessment will be required.

- It is recommended that all contractors working on site should undergo a cultural heritage induction in order to educate and make them aware of the types of Aboriginal archaeological sites and objects which may be present within the study area.

- Aboriginal objects are protected under the NPW Act regardless if they are registered on AHIMS or not. If suspected Aboriginal objects, such as stone artefacts are located during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are

found to be Aboriginal objects, the OEH must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.

- In the extremely unlikely event that human remains are found, works should immediately cease and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted at this time to assist in determining appropriate management.

Please contact ELA if you require any further information in relation to the project.

Yours sincerely,

Taryn Gooley
Archaeologist

Photographic Record

Plate 1 Site 1 (Yeoval) Facing East

Plate 2 Site 2 (Yeoval) Facing south

Plate 3 Site 3 (Yeoval) Facing north west

Plate 4 Site 4 (Yeoval) Facing South

Plate 5 Section 5 (Yeoval) facing north west

Plate 6 Section 6 (Yeoval) facing north

Plate 7 Section 7 (Yeoval) facing south west

Plate 8: Site 8 (Yeoval) Facing East

Plate 9 Site 8 (Yeoval) Facing West

Plate 10: Surface Visibility on farm track at Site 8 (Yeoval)

Plate 11 Section 1 (Cumnock) Facing West

Plate 12: Section 2 (Cumnock) facing north

Plate 13 Section 3 (Cumnock) facing north

References

Bell, D. 1980. *Aboriginal Carved Trees in New South Wales: A Survey Report: Part 1*. Report to NSW National Parks and Wildlife Service.

Davies, S.J. 1993. *An Archaeological Assessment of the Proposed Telecom Optic Fibre Cable Route Between Orange and Narromine, Central Region NSW*. Report to Telecom Australia.

DECCW 2010. Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales

Haglund, L. 1984. *Survey for Aboriginal Sites in the Area of Molong Water Supply Augmentation NSW*. Report to the Public Works Department of NSW.

Navin Officer Heritage Consultants Pty Ltd 2003. *Molong to Manildra 132kV Transmission Line, Stage 2. Cultural Heritage Assessment*. Report to URS Australia Pty Ltd.

Pardoe, C. 2010. *Young to Wellington Gas Pipeline Cultural Heritage Assessment and Consultation*. Unpublished Report to ERM Power Pty Ltd.

Pearson, M. 1981. *Through Different Eyes: Changing land Use and Settlement in the Upper Macquarie River Region of NSW*. Unpublished PhD Thesis, ANU. Canberra.

White, I. 1986. *Dimensions of Wiradjuri*. Unpublished Thesis. Department of Prehistory and Anthropology, ANU, Canberra.

Attachment A – Basic and Extensive AHIMS searches on 31 January 2017

Office of Environment & Heritage

NSW GOVERNMENT

AHIMS Web Services (AWS)

Search Result

Purchase Order/Reference : Cumnock

Client Service ID : 258591

Public Works Advisory

Date: 13 December 2016

McKell Building 2-24 Rawson Place
Haymarket New South Wales 2000

Attention: Rowan Mckay

Email: rowan.mckay@finance.nsw.gov.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.9254, 148.7549 - Lat, Long To : -32.9253, 148.755 with a Buffer of 1000 meters, conducted by Rowan Mckay on 13 December 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)

Search Result

Purchase Order/Reference : Yeoval

Client Service ID : 258602

Public Works Advisory

Date: 13 December 2016

McKell Building 2-24 Rawson Place
Haymarket New South Wales 2000

Attention: Rowan Mckay

Email: rowan.mckay@finance.nsw.gov.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.7508, 148.6482 - Lat, Long To : -32.7507, 148.6517 with a Buffer of 1000 meters, conducted by Rowan Mckay on 13 December 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

5	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Yeoval

Client Service ID : 258602

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
36-1-0150	Yiovcel;	GDA	55	654700	6374100	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Warren Bluff					Permits		
36-4-0059	Yeoval;	AGD	55	653900	6374800	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1333
	Contact	Recorders	Warren Bluff					Permits		
36-4-0106	Cumnock - Yeoval Road 6	GDA	55	654988	6374356	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact Searle	Recorders	Peter Peckham					Permits		
36-4-0127	Buchinbah Creek Reserve ST1	GDA	55	655028	6375860	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Mr.John Riley					Permits		
36-4-0129	Yeoval IF	GDA	55	655127	6374209	Open site	Valid	Artefact : 1		
	Contact	Recorders	Eco Logical Australia - Hunter Region.Ms.Taryn Gooley					Permits		

Report generated by AHIMS Web Service on 13/12/2016 for Rowan Mckay for the following area at Lat, Long From : -32.7508, 148.6482 - Lat, Long To : -32.7507, 148.6517 with a Buffer of 1000 meters. Additional Info : Due diligence. Number of Aboriginal sites and Aboriginal objects found is 5

Page 1 of 1

McKell Building
2-24 Rawson Place
SYDNEY NSW 2000

www.publicworksadvisory.nsw.gov.au

CONTRACT 957221

CONSTRUCTION OF WATER RETICULATION SYSTEM CABONNE COUNCIL

SECTION 8 – GEOTECHNICAL INVESTIGATION REPORTS

NSW GOVERNMENT | Public Works Advisory

Cumnock Water Supply Reticulation Mains

Geotechnical Investigation

Report Number: 17-GT27A

February 2017

Prepared for:

Cabonne Council

Australia's Food Basket

CABONNE COUNCIL

Cumnock Water Supply
Reticulation Mains

Geotechnical Investigation

Report Number: 17-GT27A

February 2017

Document Control

Issue / Revision	Author	Reviewer	Approved for Issue	
			Name	Date
Final	C.Karwaj	P.Anderson	C.Karwaj	22.2.2017

File path: G:\Watertec\Geotech\!PROJECTS\Cumnock Water Supply (GT27A)\Reporting\GT27A-Cumnock WS Report.docx

Contact name

Conrad Karwaj

Senior Geotechnical Engineer

McKell Building 2-24 Rawson Place Sydney NSW 2000

T: 02 9372 7879 M: 0427 898 800

E: conrad.karwaj@finance.nsw.gov.au W: www.publicworksadvisory.nsw.gov.au

Table of contents

Plates

Figures

Appendices

1 Introduction

1.1 General

Cabonne Council plans to upgrade the existing water supply for the villages of Cumnock and Yeoval by providing potable water from the Molong Water Treatment Plant, via a new trunk main from Molong to the villages. It is understood that potable water will be pumped from Molong to a new reservoir on a topographic high to the east of Cumnock. From this reservoir, water will gravitate to the villages. The trunk main from the new reservoir will feed the existing reticulation network in Cumnock and the existing reservoir in Yeoval, from where it will gravitate to a reticulation network in Yeoval.

The proposed upgrading also includes additional reticulation mains in the two systems to inter-connect the dead end of the existing pipes.

It is understood that within the Cumnock reticulation area the proposed works include the following:

- **Line 1A** - approximately 300m long; located in the eastern road reserve of Haig Street;
- **Line 2A** - approximately 306m long; located in the road reserves of Beatty Street and Burrawong Street;
- **Line 3A** – approximately 363m long; located in the road reserve of Keay Street;
- **Line 4A** – approximately 29m long; a minor spur off Line 3A, located in the road reserve of Bishop Street.

In early December, Cabonne Council commissioned Public Works Advisory (Specialist Services) to undertake a geotechnical investigation for the proposed reticulation mains. Initially, the scope of work was outlined in discussions held between C.Karwaj (Specialist Services) and D.Gunasekera (Public Works Advisory, Water Solutions). However, at the time of the site inspection, the scope of work was amended with some of the reticulation lines deleted from the total program.

This report presents the data from field investigations and laboratory testing carried out for the connection pipelines within the Cumnock reticulation area.

1.2 Location

Cumnock, a small town, is located within the Cabonne Shire Local Government Area in the Central West Region of New South Wales. Cumnock is approximately 25km north-west of Molong and 320km north-west of Sydney. The proposed reticulation mains are located in the south-western (Line 1A), south-eastern (Line 2A), and north-eastern (Lines 3A and 4A) parts of the town's built up area (see **Figure 1**).

1.3 Aims of the Investigation

The main objectives of the investigation were to report on:

- Subsurface conditions, including groundwater levels, within the target depth range;
- Foundation conditions;
- Chemical aggressiveness properties of in-situ sediments; and,
- Excavation characteristics of in-situ strata.

1.4 Terminology

The methods used in this report to describe soil profiles, including visual classification of material types encountered, are in accordance with AS1726-1993 Geotechnical Site Investigations. The Geotechnical Terminology and Technical Aids are presented in **Appendix A**.

1.5 Limitations

The Specialist Services Section has conducted an investigation and prepared this report in response to specific instructions from the client to whom this report is addressed. This report is intended for the sole use of the client, and only for the purpose which it was prepared. Any third party who relies on the report or any representation contained in it does so at their own risk.

2 Regional Geology

The Wellington 1:100,000 Geological Series Sheet 8632, First Edition (2000), indicates that the Cumnock reticulation area is located within thick deposits of Quaternary sediments comprising alluvial silt, clay and sand with variable humic content and sporadic pebble- to cobble-sized unconsolidated conglomeratic lenses. To the west, the Quaternary deposits are flanked by a suite of rocks of the Kabadah Formation (Cabonne Group). The formation is Ordovician in age and comprises mafic volcaniclastic sandstone, siltstone, banded cherty siltstone and minor limestone.

The drilling investigations confirmed that the proposed pipeline alignments are located within thick deposits of Quaternary alluvium.

3 Fieldwork

Fieldwork was carried out on 16th January, 2017 and comprised the drilling of eight (8) boreholes, each to a depth of 1.5m.

The drilling was undertaken by Macquarie Geotech P/L, using a light-weight MG44 drill rig, mounted on the back of a 4WD utility. The boreholes were advanced using continuous, spiral flight augers fitted with a spiral Tungsten Carbide (TC) bit. All boreholes were terminated upon reaching their nominal target depth of 1.5m. Disturbed soil samples, taken off the auger flights, were recovered from selected boreholes. A summary of borehole data is presented in the following **Table 1**.

Table 1: Summary of Borehole Data

Borehole	Easting	Northing	Line	Depth (m)	Ground water (m)	Soil Profile
BH C1	663943	6354832	Line 1A	1.5	-	Silty clay (CI/CH).
BH C2	663860	6355028	Line 1A	1.5	-	Silty and sandy clays (CI/CH).
BH C3	664386	6354970	Line 2A	1.5	-	Sandy and silty clays (CI/CH).
BH C4	664371	6354880	Line 2A	1.5	-	Sandy and silty clays (CI/CH).
BH C5	664279	6354815	Line 2A	1.5	-	Roadbase over silty clay (CH).

Borehole	Easting	Northing	Line	Depth (m)	Ground water (m)	Soil Profile
BH C6	664227	6355335	Line 3A	1.5	-	Roadbase over sandy silty clay (CI/CH) and silty clay (CH).
BH C7	664253	6355474	Line 3A	1.5	-	Roadbase over sandy silty clay (CI) and silty clay (CH).
BH C8	664278	6355643	Line 3A	1.5	-	Roadbase over gravelly silt (CL/CI) and silty clay (CH).

The fieldwork was supervised full-time by a senior technical officer from our Section, who positioned and logged the boreholes and sampled in-situ strata.

Detailed borehole logs are presented in **Appendix B**. Borehole locations are shown on the detail survey plans, **Plan Room Number 57446**, **Sheets 7** and **8**, prepared by the Public Works Advisory, Surveying & Spatial Information Services section.

4 Corrosion and Scaling Assessment

Three (3) samples, representative of alluvial clays encountered along the pipelines alignments, were selected for corrosion and scaling assessment.

The samples were analysed for the following:

- pH 1:5 extract ratio;
- Electrical Conductivity (EC) 1:5 extract ratio;
- Soluble Sulphate (SO_4); and,
- Soluble Chloride (Cl).

The testing was carried out by Sydney Environmental and Soil Laboratory Pty Ltd (SESL) for the purposes of assessment of soil aggressivity towards concrete and steel, in accordance with Australian Standard AS2159-2009 (Piling Design and Installation).

Detailed test results and comments by SESL are presented in **Appendix C**. Generally, the clays are neutral to moderately alkaline, with pH levels ranging from 7.1 to 8.2. The sulphate and chloride levels are low. Overall, the laboratory's assessment is that the likelihood of aggressive corrosion is low.

5 Reticulation Line 1A

5.1 Site Description

The proposed Line 1A is approximately 300m in length, and generally, it is located within the eastern road reserve of Haig Street, between the western end of Beatty Street (Ch.0.0m) and its termination point in McLaughlan Street at Ch.299.7m (see **Sheet 8**, **Plan Room Number 57446**).

The topography is relatively flat, sloping at a very gentle gradient to the north-west from RL508.92m at Ch.0.0m to RL505.00m at Ch.299.7m. The road reserve is relatively wide and grassed, with occasional mature trees in the near vicinity of the alignment (see **Plate 1**).

5.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 1A may be extrapolated from data presented in the logs of boreholes BHC1 and BHC2 (refer to **Appendix B**). Generally, the alignment is located within thick deposits of Quaternary alluvium which persists for the full depths of drilling of 1.5m.

At discrete borehole locations, the subsurface profiles were found to be uniform, apart from the topsoil horizon. In borehole BHC1, the topsoil is 0.3m thick and consists of grey brown, firm, gravelly sandy clayey silt. The topsoil, due to the presence of gravel, may possibly be filling. In borehole BHC2, the topsoil is 0.2m thick and comprises grey brown, firm, sandy silty clay.

In both boreholes, the topsoil is underlain by dark reddish brown, very stiff silty clay with traces of fine ironstone gravel. Visually, the clays are assessed as being of medium to high plasticity (CI/CH). In borehole BHC1, the silty clay persists to the borehole termination depth of 1.5m; while in borehole BHC2, it extends to a depth of 1m and is underlain by similarly coloured, sandy silty clay (CI/CH) with traces of sub-angular gravel to 10mm in size.

Groundwater was not encountered in either of the boreholes within the depths of drilling.

6 Reticulation Line 2A

6.1 Site Description

The proposed Line 2A is approximately 306m in length. The alignment commences in Beatty Street (Ch.0.0m) and follows the northern road reserve of that street to its junction with Burrawong Street (Ch.113.4m). At this point it takes a right-angled bend, follows the western road reserve of the Burrawong Street, and then crosses the Googodery Road to the connection point at Ch.305.8m (see **Sheet 8**, **Plan Room Number 57446).**

Initially, the topography rises at a very gentle gradient to the west, from RL509.00m at Ch.0.0m to RL511.24m at Ch.113.4m, and then becomes relatively flat (RL511m to RL510.5m).

The road reserves are relatively wide and grassed, with occasional mature trees in Beatty Street (see **Plate 2**) and a line of trees in Burrawong Street (see **Plate 3**).

6.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 2A may be extrapolated from data presented in the logs of boreholes BHC3 to BHC5 (refer to **Appendix B**). Generally, the alignment is located within thick deposits of Quaternary alluvium which persists for the full depths of drilling of 1.5m.

At discrete borehole locations, the subsurface profiles were found to be fairly uniform comprising topsoil or fill, followed by silty and sandy clays. In boreholes BHC3 and BHC4, the topsoil is 0.2m and 0.3m thick and consists of red grey brown, firm, sandy silty clay. At the time of fieldwork, the clay was fissured due to surface desiccation. In borehole BHC5, roadbase fill was encountered to a depth of 0.3m, followed by firm clayey sandy silt to a depth of 0.5m.

In all boreholes, these surficial horizons are underlain by sandy silty clays and silty clays of medium to high plasticity (CI/CH or CH). The clays contain traces of embedded fine ironstone gravel; and, in borehole BHC3 below 0.7m depth, very thin interbeds of ironstone gravel. The clays are typically of stiff to very stiff consistency.

Groundwater was not encountered in either of the boreholes within the depths of drilling.

7 Reticulation Lines 3A and 4A

7.1 Site Description

The proposed Line 3A is approximately 363m in length. The alignment commences at the western end of Black Street (Ch.0.0m) and follows the western road reserve of Keay Street, to its junction with Eurimbla Street; it then crosses Eurimbla Street to the connection point at Ch.362.7m. Line 4A is a minor (28.6m in length) off-shoot from Line 3A, located in the northern road reserve of Bishop Street (see **Sheet 7**, **Plan Room Number 57446)**.

The topography along the Line 3A alignment slopes at gentle gradient to the north, from RL509.44m at Ch.0.0m to RL502.59m at Ch.362.7m (connection point). The road reserve is relatively narrow and typically has occasional mature trees (see **Plate 4**).

7.2 Subsurface Conditions

The subsurface conditions along the alignments of Lines 3A and 4A may be extrapolated from data presented in the logs of boreholes BHC6 to BHC8 (refer to **Appendix B**). Please note that all boreholes were drilled in close proximity to the edge of the bitumen. As for the other areas, the alignments are located within thick deposits of Quaternary alluvium, which are mantled by roadbase fill.

At discrete borehole locations, roadbase fill was encountered to depths varying from 0.3m to 0.4m. The roadbase consists of firm, sandy silty gravel (shaley gravel).

In boreholes BHC6 and BHC7, the roadbase is underlain by variably coloured sandy silty clays and silty clays with traces of embedded, fine ironstone gravel to the termination depth of 1.5m. The clays are of medium to high plasticity (CI/CH or CH) and of very stiff consistency.

In borehole BHC8, the roadbase is underlain by stiff, gravelly clayey sandy silt (CL/CI) to a depth of 0.8m and then very stiff, silty clay with traces of ironstone gravel (CH) to the termination depth of 1.5m.

Groundwater was not encountered in either of the boreholes within the depths of drilling

8 Summary and Discussion

The investigation revealed that the Cumnock reticulation area is underlain by cohesive sediments comprising silty clays with varying concentrations of sand and traces of embedded, fine ironstone gravel.

The clays are typically of very stiff consistency, locally of stiff consistency. Consequently, bearing capacity is more than adequate while settlement is of no concern.

Construction difficulties associated with permanent groundwater are not envisaged.

The mains are expected to be founded at shallow depths. The trench walls are expected to be self-supporting during a short term construction period.

Excavations to design invert levels should be readily achievable using conventional earth moving equipment such as a backhoe.

9 General Remarks

It should be noted that this report is based on extrapolation of data from discrete boreholes and may not represent actual conditions between them. Should different conditions be encountered at the time of construction then advice should be sought from a geotechnical consultant.

PLATES

PLATE 1: View along the road reserve of Haig Street, looking north-west from the vicinity of Council's Depot.

PLATE 2: View along the road reserve of Beatty Street, looking east towards Burrawong Street.

PLATE 3: View along road reserve of Burrawong Street, looking south from its intersection with Googodery Road.

PLATE 4: View along the road reserve of Keay Street, looking north from its intersection with Black Street.

FIGURES

NSW GOVERNMENT Public Works Advisory

LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE , SYDNEY 2000
PHONE: (02) 9372 7879

CUMNOCK WATER RETICULATION UPGRADE

Line 1A, Line 2A, Line 3A and Line 4A

Locality Plan

GT27A

FIGURE 1

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 111369
ORIENTATION OF GRID PM 111369 TO PM 111367 BEARING 89° 05' 59"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 111369	664110.763	6354624.016		510.456		STAR PICKET IN METAL BOX FD
PM 111367	664492.609	6355618.728		509.684		STAR PICKET IN METAL BOX FD
PM 111368	664594.292	6354943.957		517.178		STAR PICKET IN METAL BOX FD
PM 44572	664123.779	6355322.695		504.781		STEEL PIN IN METAL BOX FD
SSM 110017	664065.929	6355703.094		499.444		BRASS PLAQUE SET IN COR TELSTRA PIT FD
SSM 110018	663627.690	6355145.455		509.376		BRASS PLAQUE SET IN CONC PATH FD

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
▾▾▾▾▾▾	TOP OF BANK		
----	BOTTOM OF BANK		

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHC6	664227	6355335
BHC7	664253	6355474
BHC8	664278	6355643

83
DP 220176

MGA NORTH

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION
THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:1,000 FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
REDUCTION RATIO 1:1,000 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM111369 HT 510.456
FIXED BY GNSS STATIC SURVEY
AZIMUTH MGA ZONE 55 BASED ON PM111369
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 10-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017

VALIDATED S.SAUNDERS 21/02/2017

APPROVED MANAGER S.SAUNDERS 21/02/2017

Public Works Advisory

CUMNOCK WATER RETICULATION UPGRADE LINE 3A AND 4A

DETAIL SURVEY

PLAN RM NO 57446 | NO IN SET 08
SCALES 1:1000 | SHEET NO 07
DESIGNED | DATE
DRAFTED | VERIFIED

1:000 M / mm I:\Surveys\Proj\Cumnock and Yeoval Water Retic Surveys 4423\B6055\CADD\57446h7.dgn
piccolod
3:14:22 PM 21/02/2017

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

⊖	STOP VALVE	⊖	AIR VALVE
⊕	HYDRANT	⊖	DOUBLE AIR VALVE
Ⓦ	WATER METER	Ⓔ	ELECTRICAL METER
WPIT	WATER PIT	Ⓖ	GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT	○	TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
++++++	TOP OF BANK		
----	BOTTOM OF BANK		

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHC1	663943	6354832
BHC2	663860	6355028
BHC3	664386	6354970
BHC4	664371	6354880
BHC5	664279	6354815

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 111369
ORIENTATION OF GRID PM 111369 TO PM 111367 BEARING 89° 05' 59"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 111369	664110.763	6354624.016		510.456		STAR PICKET IN METAL BOX FD
PM 111367	664492.609	6355618.728		509.684		STAR PICKET IN METAL BOX FD
PM 111368	664594.292	6354943.957		517.178		STAR PICKET IN METAL BOX FD
PM 44572	664123.779	6355322.695		504.781		STEEL PIN IN METAL BOX FD
SSM 110017	664065.929	6355703.094		499.444		BRASS PLAQUE SET IN COR TELSTRA PIT FD
SSM 110018	663627.690	6355145.455		509.376		BRASS PLAQUE SET IN CONC PATH FD

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION
THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:1,000 FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
REDUCTION RATIO 1:1,000 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM111369 HT 510.456
FIXED BY GNSS STATIC SURVEY
AZIMUTH MGA ZONE 55 BASED ON PM111369
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 10-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017

VALIDATED S.SAUNDERS 21/02/2017

APPROVED MANAGER S.SAUNDERS 21/02/2017

NSW GOVERNMENT Public Works Advisory

CUMNOCK WATER RETICULATION UPGRADE LINE 1A AND 2A

DETAIL SURVEY

PLAN RM NO 57446 | NO IN SET 08
SCALES 1:1000 | SHEET NO 08
DESIGNED | DATE
DRAFTED | VERIFIED

piccolod 1.000 M / mm I:\Survey\Proj\Cumnock and Yeoval Water Retic Surveys 4423\B6055\CAD\57446sh8.dgn 3:15:26 PM 21/02/2017

APPENDIX A

Geotechnical Terminology and Technical Aids

CHARACTERISATION OF GEOTECHNICAL DATA

Geotechnical data generally fall into the categories of fact, interpretation and opinion, as defined by the Institution of Engineers, Australia, 1987 - Guidelines for the Provision of Geotechnical Information in Construction Contracts.

Facts are defined as the materials, statistics and properties which may be seen, measured or identified by means of accepted and preferably standardised criteria, classifications and tests. Examples of facts include: exploration locations, outcrop locations, samples and drill core, lithological names/descriptions of soils and rocks, measured water levels, laboratory test results and seismic time/distance plots.

Interpretative data is defined as information derived from competently made interpretation of facts using accepted and proven techniques, or reasonable judgement exercised in the knowledge of geological conditions or processes evident at the site. Examples of interpretative data are: borehole and test pit logs, inferred stratigraphy and correlations between boreholes or test pits, material and rock mass properties used in analysis (e.g. permeability), and seismic interpretation (yielding velocity and layer depths).

Opinion is derived from consideration of relevant available facts, interpretations and analysis and/or the exercise of judgement. Examples of opinions based on geotechnical/geological interpretations include bearing capacity and foundation suitability, need for foundation treatment, settlements, potential for grouting, excavation stability, ease of excavation, and suitability of construction materials.

SOIL DESCRIPTION

The methods of description and classification of soils are based on Australian Standard 1726, the SAA Site Investigation Code. The description of a soil is based on particle size distribution and plasticity as shown in the "GUIDE TO THE DESCRIPTION, IDENTIFICATION AND CLASSIFICATION OF SOILS".

SOIL CLASSIFICATION

The basic soil types and their subdivisions are defined by their particle sizes:

MAJOR SOIL CATEGORIES

Soil Classification	Particle Size
Boulders	Greater than 200mm
Cobbles	63 - 200mm
Gravel	2.36 - 63mm
Sand	0.075 - 2.36mm
Silt	0.002 - 0.075mm
Clay	Less than 0.002mm

MINOR SOIL CONSTITUENTS

As most natural soils are combinations of various constituents, the primary soil is further described and modified by its minor components:

Coarse grained soils			**Fine grained soils**		
% Fines		**Modifier**	**% Coarse**		**Modifier**
	≤ 5	Omit, or use 'trace'		≤ 15	Omit, or use 'trace'
> 5	≤ 12	Describe as 'with clay/silt', as applicable	> 15	≤ 30	Describe as 'with sand/gravel', as applicable
> 12		Prefix soil as 'silty/clayey', as applicable	> 30		Prefix soil as 'sand/gravelly', as applicable

COHESIVE SOILS

Clay and silt may be described according to their plasticity:

Descriptive Term	**Range of liquid limit (percent)**
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50

MOISTURE CONDITION

Term	Description
Dry (D)	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist (M)	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet (W)	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere.

CONSISTENCY - NON-COHESIVE SOILS

Term	Density index %		SPT "N" value
Very loose		≤ 15	< 5
Loose	> 15	≤ 35	5 - 10
Medium dense	> 35	≤ 65	10 - 30
Dense	> 65	≤ 85	30 - 50
Very dense	> 85		> 50

CONSISTENCY - COHESIVE SOILS

Term	Undrained shear strength (kPa)		Field guide to consistency	SPT "N" value
Very soft		≤ 12	Exudes between the fingers when squeezed in hand.	< 2
Soft	> 12	≤ 25	Can be moulded by light finger pressure.	2 - 4
Firm	> 25	≤ 50	Can be moulded by strong finger pressure.	4 - 8
Stiff	> 50	≤ 100	Cannot be moulded by fingers; can be indented by thumb	8 - 16
Very stiff	> 100	≤ 200	Can be indented by thumb nail.	16 - 32
Hard	> 200		Can be indented with difficulty by thumb nail.	> 32

GRAPHICAL SYMBOLS USED FOR GEOTECHNICAL BOREHOLE AND TEST PIT LOGS

SOIL - COARSE GRAINED


GW


GP


GM


GC

SW


SP


SM


SC

SOIL - FINE GRAINED


CH


CI

CL


MH


ML


OH


OL


Pt

ROCK


Sedimentary rock


Igneous rock


Metamorphic rock

FILL MATERIAL


Fill

GROUNDWATER


Level


Inflow

NGE No Groundwater Encountered

SOIL HORIZON BOUNDARIES

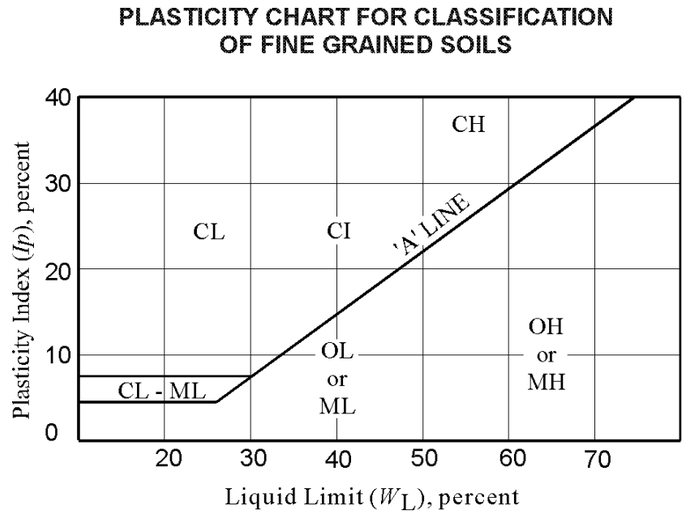
Boundary measured or determined from drilling conditions

Diffuse or uncertain boundary

GUIDE TO THE DESCRIPTION IDENTIFICATION AND CLASSIFICATION OF SOILS

Major Divisions		Particle Size (mm)	Group Symbol	Typical Names	Field Identification Sand and Gravels	Laboratory Classification				
							% < 0.06mm (see note 2)	Plasticity of Fine Fraction	$C_u = \frac{D_{50}}{D_{10}}$	$C_c = \frac{(D_{30})^2}{D_{10}D_{60}}$	Notes
COARSE GRAINED SOILS (more than half of material less than 63 mm is larger than 0.075 mm)	**BOULDERS**	200				Use the gradation curve of material passing 63mm for classification of fractions according to the criteria given in "Major Divisions"	—	—	—	—	
	COBBLES	63					—	—	—	—	
	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	coarse 20	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		0-5	—	> 4	between 1 and 3	1. Identify lines by the method given for fine grained soils.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		0-5	—	Fails to comply with above	—	
		medium 6	GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength		12-50	Below 'A' line or $I_p < 4$	—	—	2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.06mm size) is greater than 5% and less than 12%.
		fine 2.36	GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength		12-50	Above 'A' line or $I_p > 7$	—	—	Borderline classifications require the use of dual symbols e.g. SP-SM, GW-GC
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	coarse 0.6	SW	Well graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		0-5	—	> 6	between 1 and 3	3. I_p = Plasticity Index
			SP	Poorly graded sands and gravelly sands; little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		0-5	—	Fails to comply with above	Fails to comply with above	
		medium 0.2	SM	Silty sands, sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength		12-50	Below ‘A’ line or $I_p < 4$	—	—	
		fine 0.075	SC	Clayey sands, sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength		12-50	Above ‘A’ line or $I_p > 7$	—	—	

GUIDE TO THE DESCRIPTION, IDENTIFICATION AND CLASSIFICATION OF SOILS (CONT.)

Major Divisions		Particle Size (mm)	Group Symbol	Typical Names	Field Identification			Laboratory Classification			Notes
					Dry* Strength	Dilatancy†	Toughness ‡			Plasticity of Fine Fraction	
FINE GRAINED SOILS (more than half of material less than 63 mm is smaller than 0.075 mm)	**SILTS & CLAYS** (liquid limit < 50%)	<0.075	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	None to low	Quick to slow	None	Use the gradation curve of material passing 63mm for classification of fractions according to the criteria given in "Major Divisions"	More than 50% passing 0.06 mm	Below 'A' line	
			CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium			Above 'A' line	
			OL ⌖	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low			Below 'A' line	
	SILTS & CLAYS (liquid limit > 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, clastic silts	Low to medium	Slow to none	Low to medium			Below 'A' line	
			CH	Inorganic clays of high plasticity, fat clays	High to very high	None	High			Above 'A' line	
			OH ⌖	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Low to medium			Below 'A' line	
	HIGHLY ORGANIC SOILS		Pt ⌖	Peat and other highly organic soils	Identified by colour, odour, spongy feel and generally by fibrous texture					—	⌖ Effervesces with H_2O_2

PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS

FIELD IDENTIFICATION PROCEDURE FOR FINE GRAINED SOILS OR FRACTIONS

THESE PROCEDURES ARE TO BE PERFORMED ON THE MINUS 0.2MM SIZE PARTICLES. FOR FIELD CLASSIFICATION PURPOSES, SCREENING IS NOT INTENDED, SIMPLY REMOVE BY HAND THE COARSE PARTICLES THAT INTERFERE WITH THE TESTS.

*** Dry strength (Crushing characteristics)**

After removing particles larger than 0.2mm size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity. High dry strength is characteristic for clays of the CH group.

A typical inorganic silt possesses only very slight dry strength.

Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

† Dilatancy (Reaction to shaking)

After removing particles larger than 0.2mm size, prepare a pat of moist soil with a volume of 10 cm³. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles.

The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, shows a moderately quick reaction.

‡ Toughness (Consistency near plastic limit)

After removing particles larger than 0.2mm size, a specimen of soil about 10cm³ in size is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. The specimen is then rolled out by hand on a smooth surface or between the palms into a thread about 3mm in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together with a slight kneading action continued until the lump crumbles. The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil.

Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line. Highly organic clays have a very weak and spongy feel at the plastic limit.

APPENDIX B

Borehole Logs

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC1

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - HAIG STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 663943.0 m
NORTHING: 6354832.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			Cl (v)	TOPSOIL - Gravelly Sandy Clayey Silt; grey brown; firm; dry.			
				0.30			
				SILTY CLAY, trace of sand and fine ironstone gravel dark reddish brown; very stiff; just moist to moist depth.			
0.5					D		
			CI/CH (v)			Not Encountered	SPIRAL TC
1.0							
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC2

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - HAIG STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 663860.0 m
NORTHING: 6355028.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI (v)	TOPSOIL - Sandy Silty Clay; grey brown; firm; dry.		Not Encountered	SPIRAL TC
				0.20			
			CI/CH (v)	SILTY CLAY, trace of sand and fine ironstone gravel dark reddish brown; very stiff; just moist.			
0.5							
				1.00			
1.0			CI/CH (v)	SANDY SILTY CLAY includes trace of sub-angular gravel up to 10mm in size; dark red brown; stiff; moist.	D		
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC3

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - BURRAWONG STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 664386.0 m
NORTHING: 6354970.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI (v)	TOPSOIL - Sandy Silty Clay fissured; red grey brown, grey; firm; dry.		Not Encountered	SPIRAL TC
				0.20			
			CI/CH (v)	SANDY SILTY CLAY, trace of fine ironstone gravel red brown with yellow brown and grey; stiff to very stiff; moist.			
0.5							
				0.70			
			CI/CH (v)	SILTY CLAY, trace of sand includes thin lenses of ironstone gravel; yellow brown and grey; stiff to very stiff; moist.	D		
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC4

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - BURRAWONG STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 664371.0 m
NORTHING: 6354880.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI (v)	TOPSOIL - Sandy Silty Clay fissured; red grey brown; firm; dry.		Not Encountered	SPIRAL TC
				0.30			
0.5			CI/CH (v)	SANDY SILTY CLAY, trace of fine ironstone gravel red brown, yellow brown and grey; very stiff; dry to just moist.			
				0.80			
1.0			CH (v)	SILTY CLAY, trace of sand yellow brown and grey; stiff; moist.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC5

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - BEATTY STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 664279.0 m
NORTHING: 6354815.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Silty Gravel (Shale) grey; firm; dry.		Not Encountered	SPIRAL TC
				0.30			
			CL/CI (v)	CLAYEY SANDY SILT grey brown; firm; dry.			
0.5				0.50			
			CH (v)	SILTY CLAY, trace of sand and ironstone gravel yellow brown and grey mottled; very stiff; moist.			
1.0				1.00			
			CH (v)	SILTY CLAY TO CLAYEY SILT, trace of fine ironstone gravel mottled yellow brown and grey; stiff; moist to very moist.	D		
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC6

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - KEAY STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 664227.0 m
NORTHING: 6355335.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Sandy Silty Gravel brown grey; firm; dry.		Not Encountered	SPIRAL TC
				0.40			
0.5			CI/CH (v)	SANDY SILTY CLAY, trace of fine ironstone gravel dark red brown and grey; very stiff; just moist.			
				0.80			
			CH (v)	SILTY CLAY yellow brown, red brown and grey; very stiff; just moist.	D		
1.0				1.20			
			CH (v)	SILTY CLAY with weathered shale fragments; yellow brown, red brown and pinkish grey; very stiff; moist.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC7

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - KEAY STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 664253.0 m
NORTHING: 6355474.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Silty Sandy Gravel (Shale) brown grey; firm; dry.		Not Encountered	SPIRAL TC
				0.30			
0.5			CI (v)	SANDY SILTY CLAY, trace of fine ironstone gravel dark red brown with grey; very stiff; moist.			
				0.70			
1.0			CH (v)	SILTY CLAY TO CLAYEY SILT, trace of sand and gravel dark red brown, trace of yellow; very stiff; moist.	D		
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHC8

PROJECT: CUMNOCK WATER SUPPLY
LOCATION: RETICULATION MAIN - KEAY STREET
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 16/01/2017
SURFACE RL: AHD
EASTING: 664278.0 m
NORTHING: 6355643.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Silty Sandy Gravel brown grey; firm; dry.		Not Encountered	SPIRAL TC
				0.40			
0.5			CL/CI (v)	GRAVELLY CLAYEY SANDY SILT dark red brown and grey; stiff; just moist.			
				0.80			
1.0			CH (v)	SILTY CLAY, trace of ironstone gravel mottled yellow, red and grey brown; very stiff; moist.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT27A

SHEET: 1 OF 1

APPENDIX C

Corrosion and Scaling Assessment Test Results

Corrosion & Scaling Assessment:
Soil Reporting Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42098 **Sample N°: 1** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Cumnock Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHC1 (0.5-1.0m)**
Client Order N°:	**GT27A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.6	Slight alkalinity
EC mS/cm (1:5)		0.04	Very low
Texture Class		Clay Loam	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	<5.0	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	90	Low (non-aggressive)
* Resistivity Ω.	m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows slight alkalinity, very low salinity, low sulphate and low chloride levels.

According to AS2159:2009 the pH is considered non-aggressive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered mildly-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42098 **Sample N°: 2** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Cumnock Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHC3 (0.7-1.2m)**
Client Order N°:	**GT27A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		8.2	Moderate alkalinity
EC mS/cm (1:5)		0.25	Moderate
Texture Class		Light Clay	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	30	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	110	Low (non-aggressive)
* Resistivity Ω.	m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows moderate alkalinity, moderate salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42098 **Sample N°: 3** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Cumnock Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHC6 (0.8-1.2m)**
Client Order N°:	**GT27A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.1	Neutral
EC mS/cm (1:5)		0.41	Moderate
Texture Class		Light Medium Clay	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	390	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	310	Low (non-aggressive)
* Resistivity Ω. m		-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows neutral pH, moderate salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

NSW GOVERNMENT | Public Works Advisory

Yeoval Water Supply
Distribution Main and Reticulation Pipelines

Geotechnical Investigation

Report Number: 17-GT28A

March 2017

Prepared for:

Cabonne Council

Australia's Food Basket
CABONNE COUNCIL

Yeoval Water Supply
Distribution Main and Reticulation Pipelines

Geotechnical Investigation

Report Number: 17-GT28A

March 2017

Document Control

Issue / Revision	Author	Reviewer	Approved for Issue	
			Name	Date
Final	C.Karwaj	P.Anderson	C.Karwaj	07.03.2017

File path: G:\Watertec\Geotech\!PROJECTS\Yeoval Water Supply (GT28A)\Reporting\GT28A-Yeoval WS Report.docx

Contact name

Conrad Karwaj

Senior Geotechnical Engineer

McKell Building 2-24 Rawson Place Sydney NSW 2000

T: 02 9372 7879 M: 0427 898 800

E: conrad.karwaj@finance.nsw.gov.au W: www.publicworksadvisory.nsw.gov.au

Table of contents

Plates

Figures

Appendices

1 Introduction

1.1 General

Cabonne Council plans to upgrade the existing water supply for the villages of Cumnock and Yeoval by providing potable water from the Molong Water Treatment Plant, via a new trunk main from Molong to the villages. It is understood that potable water will be pumped from Molong to a new reservoir on a topographic high to the east of Cumnock. From this reservoir, water will gravitate to the villages. The trunk main from the new reservoir will feed the existing reticulation network in Cumnock and the existing reservoir in Yeoval, from where it will gravitate to a reticulation network in Yeoval.

The proposed upgrading includes a distribution main from the existing reservoir in Yeoval to the town; and, a number of additional reticulation pipelines in the two systems to inter-connect the dead ends of the existing pipes.

It is understood that within the Yeoval reticulation area the proposed works include the following:

- **Line YSM** (Distribution main) - approximately 948m long; from the existing Yeoval reservoir to the intersection of Obley Street and Crown Street; initially located within an easement in private property and then in the southern road reserve of Banjo Paterson Way;
- **Line 1A** - approximately 101m long; located in the road reserve of Crown Street;
- **Line 2A** - approximately 114m long; located in the road reserve of Lucknow Street;
- **Line 3A** - approximately 206m long; located in the road reserve of Bell Street;
- **Line 4A** - approximately 182m long; located in the road reserves of Bathurst Street and Short Street;
- **Line 5A** - approximately 641m long; located in the road reserve of Railway Parade;
- **Line 6A** - approximately 324m long; located in the road reserve of Avon Road;
- **Line 7A** - approximately 610m long; located in the road reserves of Tremain Drive and Tobins Road;
- **Line 8A** - approximately 423m long; located in the road reserve of Renshaw McGirr Way;

In early December, Cabonne Council commissioned Public Works Advisory (Specialist Services) to undertake a geotechnical investigation for the proposed reticulation mains. The scope of work was outlined in discussions held between C.Karwaj (Specialist Services) and D.Gunasekera (Public Works Advisory, Water Solutions).

This report presents the data from field investigations and laboratory testing carried out for the distribution main and the connection pipelines within the Yeoval reticulation area.

1.2 Location

Yeoval, a small town, is located in the Central West Region of New South Wales and within the Cabonne Council Local Government Area n, apart from a small part which lies over the Buckinbah Creek (referred to as North Yeoval), which lies within the Dubbo Regional Council Local Government Area. Yeoval is located approximately 40km south-west of Wellington and 340km north-west of Sydney. The proposed reticulation pipelines are generally located on the peripheries of the built up areas of the town (see **Figure 1**).

1.3 Aims of the Investigation

The main objectives of the investigation were to report on:

- Subsurface conditions, including groundwater levels, within the target depth range;
- Foundation conditions;
- Chemical aggressiveness properties of in-situ sediments; and,
- Excavation characteristics of in-situ strata.

1.4 Terminology

The methods used in this report to describe soil profiles, including visual classification of material types encountered, are in accordance with AS1726-1993 Geotechnical Site Investigations. The Geotechnical Terminology and Technical Aids are presented in **Appendix A**.

1.5 Limitations

The Specialist Services section has conducted an investigation and prepared this report in response to specific instructions from the client to whom this report is addressed. This report is intended for the sole use of the client, and only for the purpose which it was prepared. Any third party who relies on the report or any representation contained in it does so at their own risk.

2 Regional Geology

The Wellington 1:100,000 Geological Series Sheet 8632 (First Edition, 2000), indicates that Yeoval and surrounding areas are located within the Nariangla Granodiorite (Yeoval Complex). The formation is Devonian in age and comprises granodiorite-gabbro phase igneous rocks. Generally, the bedrock may be mantled by thin to thick residual deposits.

3 Fieldwork

Fieldwork was carried out on 17th and 18th January, 2017 and comprised the drilling of twenty five (25) boreholes, each to a depth of 1.5m.

The drilling was undertaken by Macquarie Geotech P/L, using a light-weight MG44 drill rig, mounted on the back of a 4WD utility. The boreholes were advanced using continuous, solid, spiral flight augers fitted with a spiral Tungsten Carbide (TC) bit. All boreholes were terminated upon reaching their nominal target depth of 1.5m; apart from borehole BHY6, which was terminated at 1.1m depth, upon reaching TC bit refusal. Disturbed soil samples, taken off the auger flights, were recovered from selected boreholes.

The fieldwork was supervised full-time by a senior technical officer from our Section, who positioned and logged the boreholes and sampled in-situ strata.

Detailed borehole logs are presented in **Appendix B**. Borehole locations are shown on the detail survey plans, **Plan Room Number 57446**, **Sheets 1** to **6**, prepared by the Public Works Advisory, Surveying & Spatial Information Services section.

A summary of borehole data, including GPS co-ordinates and depth to bedrock is presented in the following **Table 1**.

Table 1: Summary of Borehole Data

Borehole	Easting	Northing	Line	Depth (m)	Depth to bedrock (m)	Soil Profile
BHY1	654512	6374620	Line 1A	1.5	-	Sandy silty clay (CI).
BHY2	654269	6375000	Line 2A	1.5	-	Silty clay (CH).
BHY3	654093	6375222	Line 3A	1.5	-	Silty clay (CH).
BHY4	654058	6375274	Line 3A	1.5	-	Silty clay (CH) and sandy clay (CI/CH).
BHY5	654106	6375344	Line 3A	1.5	-	Silty sand and gravel to 0.6m over sandy silty clay (CI/CH).
BHY6	654126	6375376	Line 3A	1.1	0.5	Gravelly sandy silt to 0.5m over meta-sandstone. TC bit refusal at 1.1m.
BHY7	654122	6375568	Line 4A	1.5	0.7	Silty clay over extremely weathered granodiorite.
BHY8	654159	6375615	Line 4A	1.5	-	Silty clay (CI/CH) and sandy clay (CI).
BHY9	654977	6374045	Line YSM	1.5	0.7	Sandy silty clay over extremely weathered granodiorite.
BHY10	655000	6374101	Line YSM	1.5	0.6	Sandy silty clay over extremely weathered granodiorite.
BHY11	655017	6374148	Line YSM	1.5	0.5	Clayey sand over extremely weathered granodiorite.
BHY12	655053	6374249	Line YSM	1.5	0.4	Clayey sand over extremely weathered granodiorite.
BHY13	654898	6374379	Line YSM	1.5	0.8	Sandy silty clay over extremely weathered granodiorite.
BHY14	654737	6374513	Line YSM	1.5	-	Sandy silty clay (CI/CH).
BHY15	654528	6375715	Line 5A	1.5	-	Alluvial sandy clayey silt (CI).
BHY16	654454	6375884	Line 5A	1.5	-	Sandy silty clay (CI/CH) over silty sand (SM/SC).
BHY17	654480	6376095	Line 5A	1.5	-	Sand fill (0.5m), silty clay (CI/CH) over clayey silty sand (SC).

Borehole	Easting	Northing	Line	Depth (m)	Depth to bedrock (m)	Soil Profile
BHY18	654499	6376245	Line 5A	1.5	0.6	Sandy silty clay over extremely weathered granodiorite.
BHY19	655371	6376170	Line 6A	1.5	0.5	Silty sand (SM) over extremely weathered granodiorite.
BHY20	655409	6376384	Line 6A	1.5	0.8	Silty clay over extremely to highly weathered granodiorite.
BHY21	655580	6376737	Line 7A	1.5	1.0	Sandy silty clay over extremely weathered granodiorite.
BHY22	655544	6376875	Line 7A	1.5	-	Sandy silty clay (CI/CH) over clayey silt (CI/CH).
BHY23	655217	6376935	Line 7A	1.5	-	Sandy clayey silt (ML/CL) over silty clay (CI/CH).
BHY24	655062	6376702	Line 8A	1.5	0.9	Silty clay (CH) over extremely weathered granodiorite.
BHY25	654997	6376561	Line 8A	1.5	-	Silty clay (CH).

4 Corrosion and Scaling Assessment

Nine (9) samples, representative of materials encountered along the pipelines alignments, were selected for corrosion and scaling assessment.

The samples were analysed for the following:

- pH 1:5 extract ratio;
- Electrical Conductivity (EC) 1:5 extract ratio;
- Soluble Sulphate (SO_4); and,
- Soluble Chloride (Cl).

The testing was carried out by Sydney Environmental and Soil Laboratory Pty Ltd (SESL) for the purposes of assessment of soil aggressivity towards concrete and steel, in accordance with Australian Standard AS2159-2009 (Piling Design and Installation).

Detailed test results and comments by SESL are presented in **Appendix C**. Generally, the tested materials are neutral to moderately alkaline, with pH levels ranging from 7 to 7.6, apart from the samples from boreholes BHY19 and BHY20, which were slightly acidic with pH levels of 5.9 and 6.7, respectively. The sulphate and chloride levels are low, indicating the materials are non-aggressive towards concrete and non-corrosive towards steel. Overall, the laboratory's assessment is that the likelihood of aggressive corrosion is low.

5 Distribution Main – Line YSM

5.1 Site Description

The proposed Line YSM is approximately 948m in length. The initial 247m of the alignment is located within an access easement to the existing reservoir; and the remainder, within the road reserves of Banjo Patterson Way and Obley Street (see **Sheets 1** and **2**, **Plan Room Number 57446**).

From the reservoir site, the topography slopes at a gentle gradient to the north-east with a cross-fall of some 10m, from RL419.97m (Ch.0m) to RL409.88m (Ch.247m). The alignment traverses a grassed paddock (see **Plate 1**) with some scattered and stacked igneous boulders (see **Plate 2**) in the near vicinity.

At Ch.264.5m, the alignment takes a near right-angle bend and follows the road reserve of Banjo Patterson Way. The topography continues to descend at a very gentle gradient to the north-west, from RL408.84m at the bend to RL390.86m at the terminating point of the alignment (Ch.947.6m). The road reserve is wide and grassed, with occasional mature trees (see **Plate 3**).

5.2 Subsurface Conditions

The subsurface conditions along the alignment of Line YSM may be extrapolated from data presented in the logs of boreholes BHY9 to BHY13 (refer to **Appendix B**). Generally, the alignment is located within granodiorite of the Nariangla Granodiorite.

At discrete borehole locations, the subsurface profiles were found to be uniform. Bedrock was encountered at shallow depths ranging from 0.4m (BHY12) to 0.8m (BHY13).

The residual deposits overlying the bedrock are dominantly dark red brown and white speckled, very stiff, sandy silty clays of medium to high plasticity (CI/CH), apart from BHY12 where the residual horizon is medium dense clayey silty sand (SC).

The bedrock, within the depths of drilling, is deeply weathered with drilling conditions for a TC bit being easy to firm. The bedrock is extremely weathered, displaying soil-like characteristics but with evident rock fabric/structure. It behaves as medium dense silty sand with traces of clay and fine gravel (SM).

Moderately weathered tors, which appear scattered or stacked in the paddock, were not intercepted in any of the boreholes within the depths of drilling. However, the possibility of encountering near-surface tors should not be totally discounted.

Groundwater was not encountered in any of the boreholes within the depth of drilling.

6 Reticulation Line 1A

6.1 Site Description

The proposed Line 1A is approximately 101m in length, and generally, it is located within the northern road reserve of Myrangle Street, between the south-western end of Crown Street (Ch.0.0m) and its termination point in Myrangle Street (see **Sheet 2**, **Plan Room Number 57446**).

The topography is relatively flat. The road reserve is wide and grassed (see **Plate 4**).

6.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 1A may be extrapolated from data presented in the log of borehole BHY1 (refer to **Appendix B**). It should be noted that the borehole was drilled in Crown Street and not on the as-surveyed alignment; however, the subsurface conditions along the alignment are not expected to markedly differ from those reported on the borehole log. Generally, the alignment is located within granodiorite of the Nariangla Granodiorite; however, the bedrock is mantled by thick residual deposits.

At the discrete borehole location, the subsurface profile comprises a shallow cover (0.3m thick) of gravelly roadbase fill followed by residual, very stiff, sandy silty clay of medium plasticity (CI) to the borehole termination depth of 1.5m.

Groundwater was not encountered within the depths of drilling.

7 Reticulation Line 2A

7.1 Site Description

The proposed Line 2A is approximately 114m in length. The alignment is located in the north-western road reserve of Lucknow Street, between its intersections with Obley Street and King Street (see **Sheet 3**, **Plan Room Number 57446).**

The topography is relatively flat with surface levels in the order of RL380m to RL381m. The reserve is wide and grassed, with occasional mature trees (see **Plate 5**).

7.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 2A may be extrapolated from data presented in the log of borehole BHY2 (refer to **Appendix B**). As for Line 1A, the alignment is located within granodiorite of the Nariangla Granodiorite; however, the bedrock is mantled by thick residual deposits.

At the discrete borehole location, the subsurface profile comprises a shallow cover (0.3m thick) of sandy roadbase fill followed by residual, stiff, silty clay of high plasticity (CH) to the borehole termination depth of 1.5m.

Groundwater was not encountered within the depths of drilling.

8 Reticulation Line 3A

8.1 Site Description

The proposed Line 3A is approximately 206m in length. The alignment commences at the western end of King Street (Ch.0.0m) and then is located within the road reserve of Bell Street (dirt track); generally following the property fence line to its termination point at Ch.205.5m (see **Sheet 3**, **Plan Room Number 57446**).

The topography is relatively flat (RL377.5m to RL378m) up to approximate Ch.160m and then rises at a moderate gradient to RL383.3m at the terminating point. The northern side of the gravel track is overgrown with native grasses with occasional mature trees (see **Plate 6**).

Meta-sandstone bedrock crops out in the track on top of the hill, in the general vicinity of borehole BHY6 (see **Plate 7**).

8.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 3A may be extrapolated from data presented in the logs of boreholes BHY3 to BHY6 (refer to **Appendix B**). Please note that the boreholes were drilled in close proximity to the edge of the dirt track and not on the actual alignment.

At discrete borehole locations, there was some variation in subsurface conditions, especially in the upper part of the profile.

In boreholes BHY3 and BHY4, drilled near the commencement of the line, the subsurface profiles below a veneer (0.25m and 0.1m thick) of silty and sandy topsoil consist of stiff, silty clays and sandy silty clays of high plasticity (CH) and medium plasticity (CI/CH). In borehole BHY5, drilled at the base of the slope, the surficial deposits comprise a sequence of loose silty sand (SM) to a depth of 0.4m, followed by sub-angular gravel (GM) to 0.6m depth; and then, stiff sandy silty clay to the borehole termination depth of 1.5m.

In the remaining borehole BHY6, drilled on elevated ground, meta-sandstone/siltstone was encountered at 0.5m depth. Within the depths of drilling, the bedrock is highly weathered with very weak rock substance strength. The drilling conditions for a TC bit were firm to hard with TC bit refusal at 1.1m depth.

Groundwater was not encountered in any of the boreholes within the depths of drilling

9 Reticulation Line 4A

9.1 Site Description

The proposed Line 4A is approximately 182m in length. The alignment commences at the western end of Bathurst Street (Ch.0.0m); at Ch.46.5m it takes a right-angle bend and then is located within the eastern road reserve of Short Street (unformed road) to its termination point at Ch.181.6m (see **Sheet 3**, **Plan Room Number 57446)**.

The topography along the Line 4A alignment initially slopes at a very gentle gradient to the north-west, from RL382.75m at Ch.0.0m to RL380.38m at the bend and then rises to the north-east to RL382.74m at Ch.181.6m (connection point). The road reserve is overgrown with native grasses and occasional mature trees (see **Plate 8**). Some small tors and embedded boulders were noted near the end of the alignment (see **Plate 9**).

9.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 4A may be extrapolated from data presented in the logs of boreholes BHY7 and BHY8 (refer to **Appendix B**). Generally, the alignment is located within granodiorite of the Nariangla Granodiorite.

In borehole BHY7, the subsurface profile consists of a 0.8m cover of very stiff silty clay (CH) followed by granodiorite bedrock to the termination depth of 1.5m. The bedrock is extremely weathered, displaying soil-like characteristics but with evident rock fabric/structure. It behaves as medium dense clayey silty sand (SC). In borehole BHY8, silty clay (CI/CH) and sandy silty clay (CI) were encountered to a depth of 1.5m.

Groundwater was not encountered in either of the boreholes within the depths of drilling.

10 Reticulation Line 5A

10.1 Site Description

The proposed Line 5A is approximately 641m in length. The alignment commences at the junction of Renshaw McGirr Way and Railway Parade (Ch.0.0m) and follows the western road reserve of Railway Parade to its termination point (see **Sheet 4**, **Plan Room Number 57446)**.

Initially, the topography is relatively flat (RL374.5m-RL375m) up to approximate Ch.250m and then it rises at a very gentle gradient to the north to RL379.45m at the termination point (Ch.640.5m). The road reserve is typically grassed (see **Plates 10** and **11**).

10.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 5A may be extrapolated from data presented in the logs of boreholes BHY15 to BHY18 (refer to **Appendix B**). The alignment is partially located within alluvial sediments associated with Buckinbah Creek and partially within granodiorite of the Nariangla Granodiorite, which is obscured by colluvial/residual deposits.

At discrete borehole locations, the subsurface conditions were found to be variable.

In borehole BHY15, alluvial, stiff, dark grey sandy clayey silt (CI) was encountered below a shallow (0.3m thick) cover of sandy topsoil. The alluvium extends for the full depth of drilling of 1.5m.

In boreholes BHY16 and BHY17, the subsurface profiles were found to be consistent, apart from the surficial horizons. In borehole BHY16, the upper 0.4m consists of loose silty sand with traces of clay and gravel. In borehole BHY17, the surficial horizon to a depth of 0.5m consists of loose gravelly sand (inferred to be filling). In both boreholes, these surficial deposits are underlain by a sequence of stiff to very stiff, sandy silty clay (CI/CH) to depths of 1.2m, and then medium dense silty sand with varying clay contents to the termination depth of 1.5m.

In the remaining borehole BHY18, granodiorite bedrock was encountered at a depth of 0.6m. The bedrock is mantled by a 0.3m thick cover of loose gravelly sand (inferred to be filling) followed by very stiff, residual sandy silty clay to 0.6m depth. The underlying bedrock, to the termination depth of 1.5m, is extremely weathered, displaying soil-like characteristics but with evident rock fabric/structure. It behaves as medium dense to dense clayey silty sand (SC).

Groundwater was not encountered in any of the boreholes within the depths of drilling

11 Reticulation Line 6A

11.1 Site Description

The proposed Line 6A is 323.5m in length. The alignment commences at the intersection of Somerset Drive and Avon Road (Ch.0.0m). After crossing Somerset Drive, it then follows the western road reserve of Avon Road, to its intersection with Bournewood Road at Ch.323.5m (see **Sheet 5**, **Plan Room Number 57446)**.

The topography along the Line 6A alignment slopes at a gentle gradient to the south, with a cross-fall of some 10m, from RL390.2m at Ch.0.0m to RL380.4m at Ch.323.5m (connection point). The road reserve is generally grassed with some stands of mature trees along the property fence line (see **Plate 12**).

11.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 6A may be extrapolated from data presented in the logs of boreholes BHY19 and BHY20 (refer to **Appendix B**). Generally, the alignment is located within granodiorite of the Nariangla Granodiorite.

At discrete borehole locations, the subsurface profiles were found to be uniform. Bedrock was encountered at shallow depths of 0.5m (BHY19) and 0.8m (BHY20). In BHY19, the bedrock is mantled by loose silty sand with traces of clay and gravel (SM). In BHY20, the surficial deposits comprise a 0.2m cover of roadbase fill overlying very stiff silty clay with sand (CI/CH).

In borehole BHY19, the bedrock is extremely weathered, displaying soil-like characteristics but with evident rock fabric/structure. It behaves as medium dense silty sand with traces of clay and fine gravel (SM). In BHY20, hard drilling conditions for a TC bit were recorded below 1m depth and the quality of the bedrock is assessed as extremely weathered to highly weathered with very weak rock substance strength.

Groundwater was not encountered in either of the boreholes within the depths of drilling.

12 Reticulation Line 7A

12.1 Site Description

The proposed Line 7A is approximately 610m in length. The alignment commences in Tremain Drive (Ch.0.0m) and follows the western reserve of that road to its junction with Tobins Road (Ch.113.8m); at that point, it takes a right-angle bend and follows the southern reserve of the Tobins Road to its intersection with Renshaw McGirr Way (Ch.547.8m), where it takes another right-angle bend and traverses the eastern reserve of the latter road to its termination point at Ch.609.6m (see **Sheet 6**, **Plan Room Number 57446)**.

The topography along the Tremain Drive section of the alignment is relatively flat with surface levels in the order of RL390m. The road reserve is grassed with the occasional mature tree (see **Plate 13**). Along Tobins Road section, the topography descends at very gentle gradient to the west, with a cross-fall of some 7m, from RL389.86m at Tremain Drive intersection to RL382.9m at Renshaw McGirr Way intersection. This reserve is also grassed with the occasional mature tree (see **Plate 14**).

Near the end of the line, in the Renshaw McGirr Way road reserve, there is bouldery rock outcrop in the vicinity of a mature tree (see **Plate 16**).

12.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 7A may be extrapolated from data presented in the logs of boreholes BHY21 to BHY23 (refer to **Appendix B**). Generally, the alignment is located within residual deposits and associated granodiorite of the Nariangla Granodiorite.

At discrete borehole locations, the subsurface profiles were found to be uniform, with some minor variations, especially in the upper part of the profile. The surficial horizons to depths of 0.2m to 0.3m consist of roadbase (BHY21), sandy clayey silt (BHY22) and loose silty sand (BHY23).

The above deposits are underlain by stiff to very stiff cohesive sediments comprising sandy silty clay, clayey silt and silty clay of medium to high plasticity (CI/CH). In boreholes BHY22 and BHY23, the sediments persist for the full depth of drilling of 1.5m. In BHY21, the sandy clay extends to a depth of 1.0m and is underlain by extremely weathered granodiorite to 1.5m depth. The weathered bedrock displays soil-like characteristics but with evident rock fabric/structure.

Groundwater was not encountered in any of the boreholes within the depths of drilling.

13 Reticulation Line 8A

13.1 Site Description

The proposed Line 8A is approximately 423m in length. The alignment follows the eastern road reserve of Renshaw McGirr Way, up to its intersection with Somerset Drive (see **Sheets 5** and **6**, **Plan Room Number 57446)**.

The topography along the alignment rises at a gentle gradient, from RL383.3m at Ch.0m to RL387.9m at Ch.423.4m. The road reserve is grassed with occasional mature trees along the property fence lines (see **Plate 15**).

13.2 Subsurface Conditions

The subsurface conditions along the alignment of Line 8A may be extrapolated from data presented in the logs of boreholes BHY24 and BHY25 (refer to **Appendix B**). Generally, the alignment is located within residual deposits and associated granodiorite of the Nariangla Granodiorite.

In both boreholes, the surficial horizons comprise a veneer (0.1m/0.2m thick) of loose gravelly silty sand. In BHY25, the sand is underlain by very stiff silty clay (CH) to the termination depth of 1.5m. In BHY24, the silty clay extends to a depth of 0.9m, and is underlain by extremely weathered granodiorite to 1.5m depth. As for the other locations, the bedrock is deeply weathered, displaying soil-like characteristics.

Groundwater was not encountered in either of the boreholes within the depths of drilling.

14 Summary and Discussion

The investigation revealed that the distribution main alignment and the Yeoval reticulation areas are underlain by granodiorite and associated residual deposits comprising silty clays with varying concentrations of sand. The residual, medium to high plasticity clays are typically of very stiff consistency, locally of stiff consistency.

Granodiorite tors are stacked or strewn in the paddock containing the easement for the access to the existing reservoir. Minor bouldery outcrop was noted in parts of Line 4A and in the vicinity of junction of Lines 7A and 8A. Meta-sandstone bedrock also crops out in part of Line 3A.

Minor alluvial sediments occur in part of Line 5A, which is located in close proximity to Buckinbah Creek.

The proposed pipelines will be founded within residual clays or extremely weathered granodiorite; consequently, bearing capacity is more than adequate while settlement is of no concern.

Construction difficulties associated with permanent groundwater are not envisaged. However, it should be noted that presence of seepage is subject to prevailing weather conditions at the time of construction.

The proposed pipelines are expected to be founded at shallow depths, typically not exceeding 1m. The trench walls are expected to be self-supporting during a short term construction period; however, some minor battering back may be required where loose sands were encountered in the upper part of the profile.

Excavations to design invert levels will encounter fill, residual deposits and weathered granodiorite bedrock. The bedrock is typically extremely weathered and displays soil-like characteristics and should be excavatable using conventional earth moving equipment. Locally, embedded boulders may be encountered in the upper part of the soil profile. More competent bedrock was generally not encountered at discrete borehole locations, apart from near BHY6 (Line 3A) where highly weathered meta-sandstone is exposed in the track. At BHY6 location TC bit refusal was recorded at 1.1m depth. Hard digging conditions for a backhoe may be expected to a depth of 1m.

15 General Remarks

It should be noted that this report is based on extrapolation of data from discrete boreholes and may not represent actual conditions between them. Should different conditions be encountered at the time of construction then advice should be sought from a geotechnical consultant.

PLATES

PLATE 1: Line YSM – View of the alignment, looking north-east from the vicinity of the existing reservoir.

PLATE 2: Line YSM – View of the stacked granodiorite tors to the west of the alignment.

PLATE 3: Line YSM – View of the alignment in Banjo Patterson Way road reserve, looking north-west from the vicinity of the peg at Ch.264.5m.

PLATE 4: Line 1A – View of the alignment in Myrangle Street, looking west from near its intersection with Crown Street.

PLATE 5: Line 2A – View of the alignment looking north-east from the vicinity of the intersection of Lucknow Street and Obley Street.

PLATE 6: Line 3A – General view of Bell Street road reserve, looking south-west from the top of the hill. The alignment follows the fence line (right-hand side).

PLATE 7: Line 3A – Close up view of meta-sandstone outcrop in Bell Street, in close proximity to borehole BHY6.

PLATE 8: Line 4A – General view of Short Street (unformed road) reserve, looking north-east from the vicinity of its intersection with Bathurst Street.

PLATE 9: Line 4A – Close up view of the surface boulders and bouldery outcrop in the near vicinity of the alignment, to the north of borehole BHY8.

PLATE 10: Line 5A – View of the alignment, looking north-west, from the vicinity of the intersection of Railway Parade and Renshaw McGirr Way.

PLATE 11: Line 5A – View of the alignment, looking south from the vicinity of borehole BHY18.

PLATE 12: Line 6A – View of the alignment, looking north from the vicinity of the intersection of Avon Road and Bournewood Road.

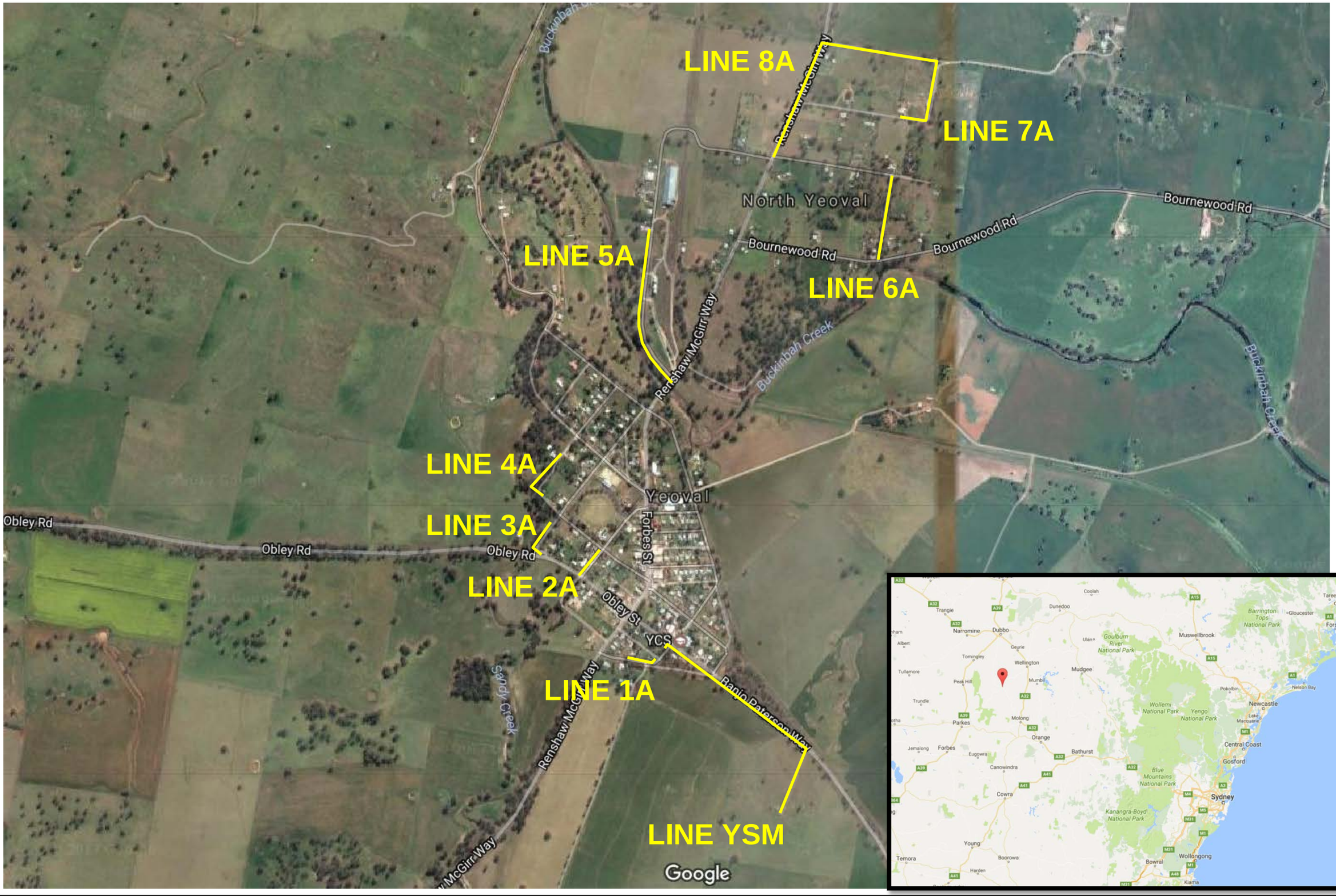
PLATE 13: Line 7A – View of the alignment located within the road reserve of Tremain Drive, looking south from the near vicinity of its intersection with Tobins Road.

PLATE 14: Line 7A – View of the alignment, looking west along Tobins Road reserve, from the vicinity of borehole BHY22.

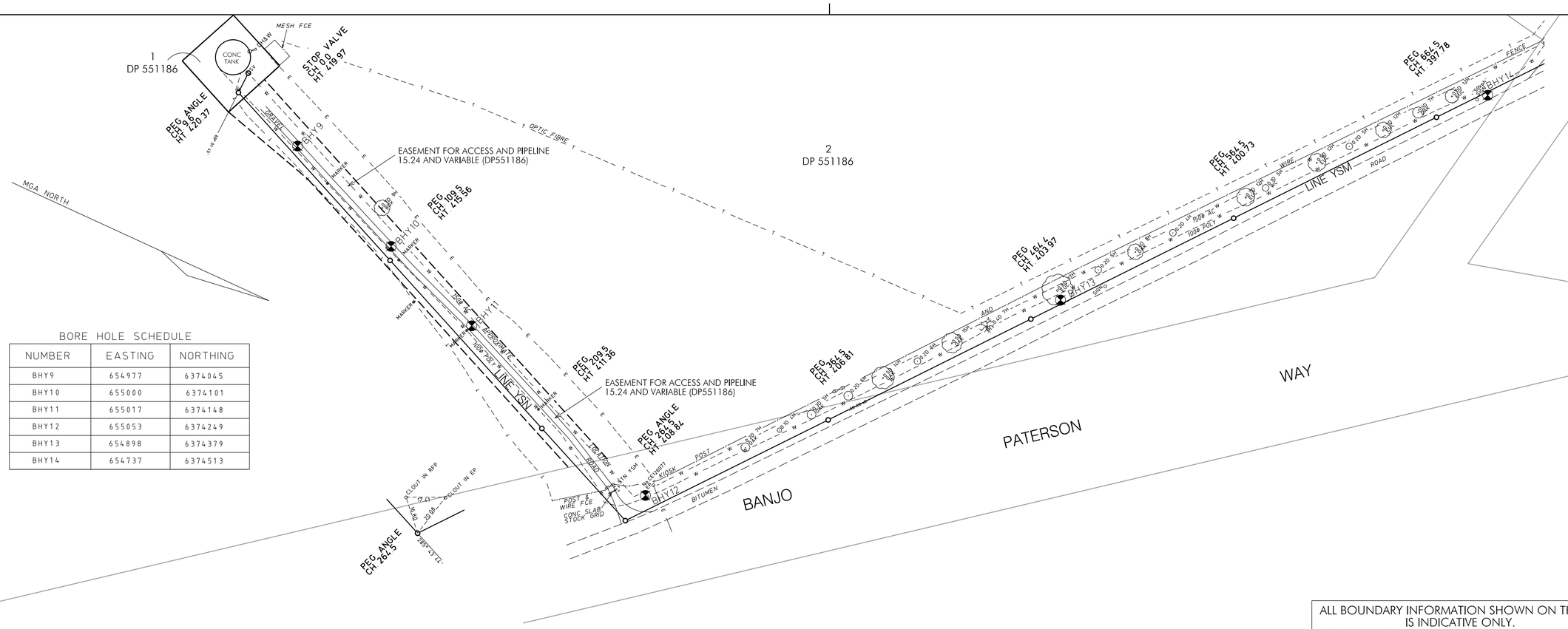
PLATE 15: Line 8A – View of the alignment, looking south from the vicinity of the peg at Ch. 0.0m (hydrant).

PLATE 16: Line 7A – Close up of bouldery rock outcrop in close proximity to the junction of Line 7A and Line 8A.

FIGURES

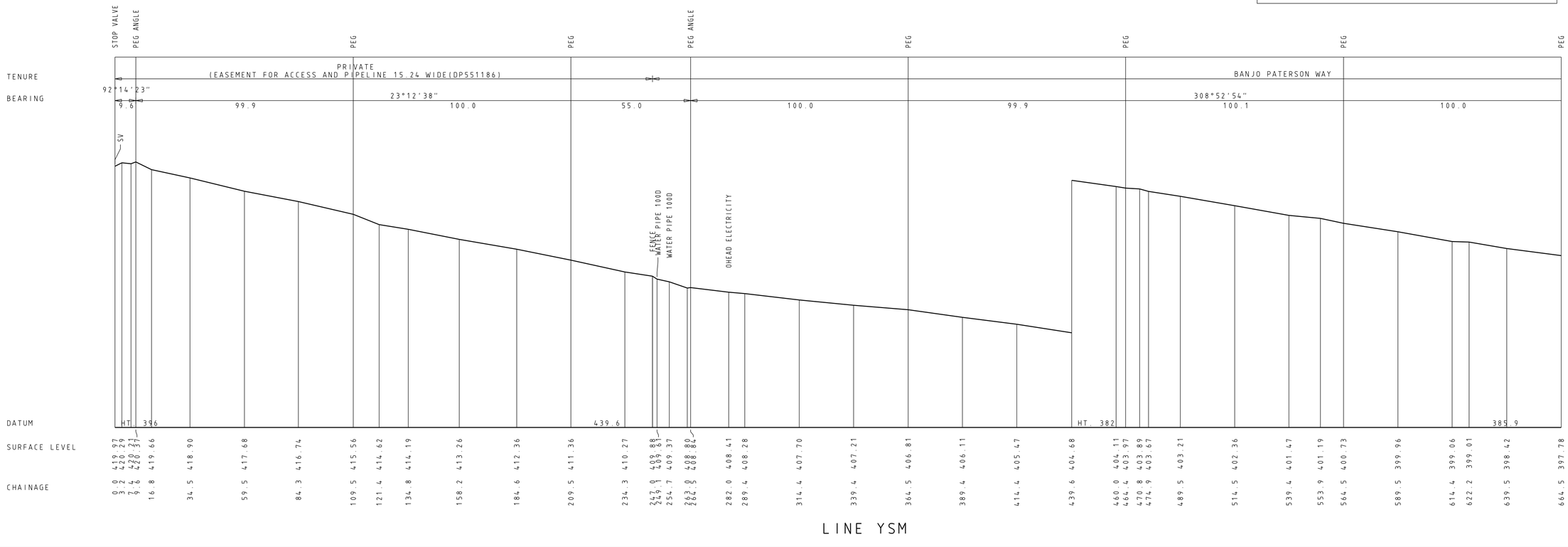


NSW GOVERNMENT Public Works Advisory LEVEL 13, McKELL BUILDING 2-24 RAWSON PLACE , SYDNEY 2000 PHONE: (02) 9372 7879	YEOVAL WATER RETICULATION UPGRADE Line YSM and Line 1A to Line 8A Locality Plan	GT28A FIGURE 1



BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY9	654977	6374045
BHY10	655000	6374101
BHY11	655017	6374148
BHY12	655053	6374249
BHY13	654898	6374379
BHY14	654737	6374513



LINE YSM

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION
THIS SURVEY WAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:H1000,V200FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
HORIZONTAL REDUCTION RATIO 1:1000 METRES
0 2 4 8 12 16 20
VERTICAL REDUCTION RATIO 1:200 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM104737 HT 395.051
AZIMUTH MGA ZONE 55 BASED ON PM104737
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 16-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

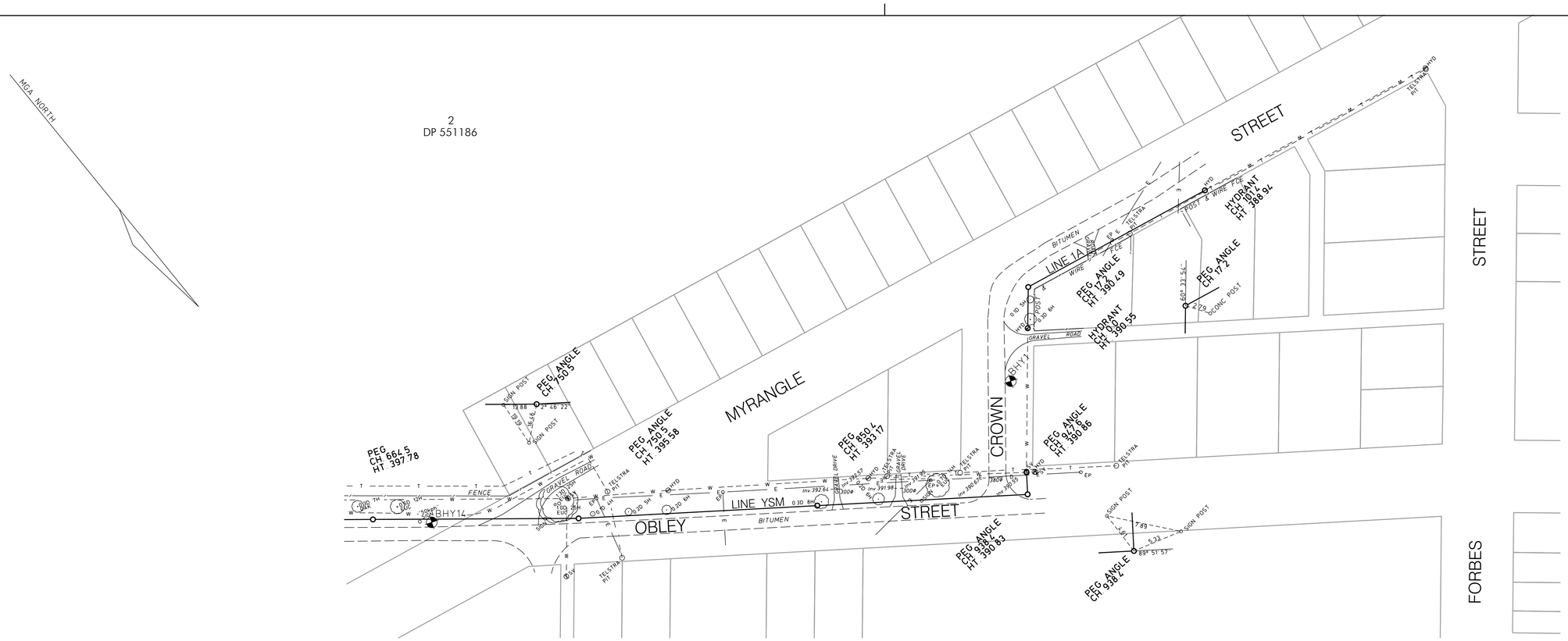
VERIFIED D.BURNETT 20/02/2017
VALIDATED S.SAUNDERS 21/02/2017
APPROVED MANAGER S.SAUNDERS 21/02/2017

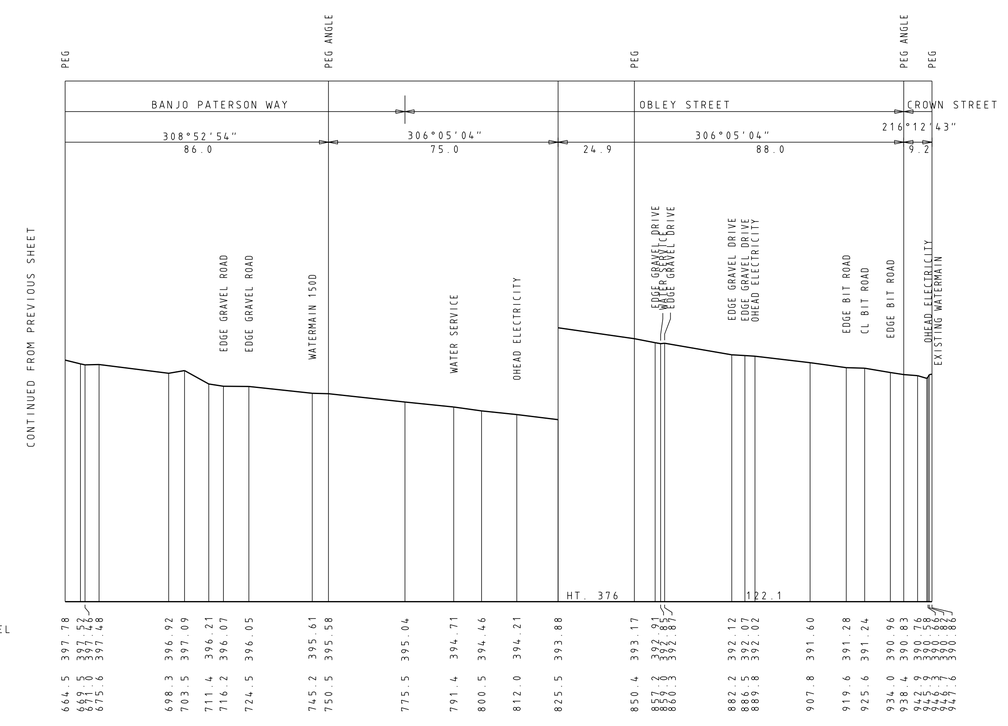
NSW GOVERNMENT Public Works Advisory

YEOVAL WATER RETICULATION UPGRADE

ROUTE PLAN & LONGITUDINAL SECTION
CH.0.0 - CH.664.5

PLAN RM NO 57446
NO IN SET 08
SCALES HOR 1:1000 VER 1:200
SHEET NO 01
DESIGNED DATE
DRAFTED VERIFIED





ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY1	654512	6374620
BHY14	654737	6374513

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION
THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:H1000,V200FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
HORIZONTAL REDUCTION RATIO 1:1000 METRES
0 2 4 8 12 16 20
VERTICAL REDUCTION RATIO 1:200 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM104737 HT.395.051
AZIMUTH MGA ZONE 55 BASED ON PM104737
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 16-JAN-2017 FILE
CADD C.T.ROSE

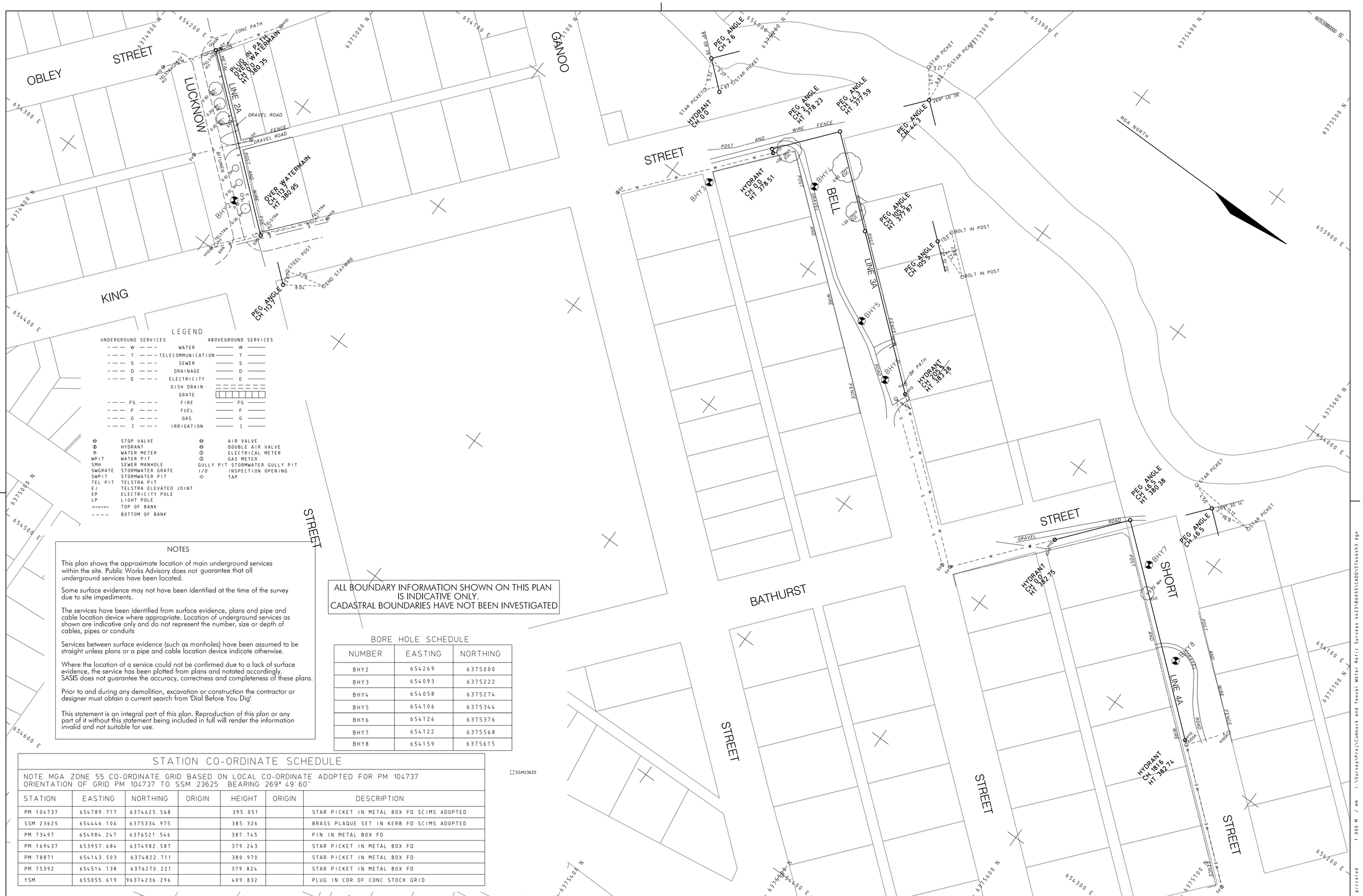
SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017
VALIDATED S.SAUNDERS 21/02/2017
APPROVED MANAGER S.SAUNDERS 21/02/2017

NSW GOVERNMENT Public Works Advisory

YEOVAL WATER RETICULATION UPGRADE
LINE YSM AND LINE A
ROUTE PLAN & LONGITUDINAL SECTION
CH.664.5 - CH.947.6

PLAN RM NO 57446
NO IN SET 08
SCALES HOR 1:1000 VER 1:200
SHEET NO 02
DESIGNED DATE
DRAFTED VERIFIED



LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
	TOP OF BANK		
	BOTTOM OF BANK		

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY. CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY2	654269	6375000
BHY3	654093	6375222
BHY4	654058	6375274
BHY5	654106	6375344
BHY6	654126	6375376
BHY7	654122	6375568
BHY8	654159	6375615

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737 ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

SSM23625

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION

THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:1,000 FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100

REDUCTION RATIO 1:1,000 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM104737 HT 395.051

AZIMUTH MGA ZONE 55 BASED ON PM104737
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 16-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017
VALIDATED S.SAUNDERS 21/02/2017
APPROVED MANAGER S.SAUNDERS 21/02/2017

NSW GOVERNMENT Public Works Advisory

YEOVAL WATER RETICULATION UPGRADE
LINES 2A ,3A AND 4A

DETAIL SURVEY

PLAN RM NO 57446
NO IN SET 08
SCALES 1:1000
SHEET NO 03
DESIGNED DATE
DRAFTED VERIFIED

3.09.33 PM 21/02/2017 plcolod 1:000 M / mm I:\Survey\Proj\Cunnock and Yeoval Water Retic Surveys 4423\B6055\CADD\57446sh3.dgn

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY15	654528	6375715
BHY16	654454	6375884
BHY17	654480	6376095
BHY18	654499	6376245

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	I
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE		AIR VALVE
	HYDRANT		DOUBLE AIR VALVE
	WATER METER		ELECTRICAL METER
WPIT	WATER PIT		GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT		TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
^^^^^^	TOP OF BANK		
-----	BOTTOM OF BANK		

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION
THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:1,000 FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
REDUCTION RATIO 1:1,000 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM104737 HT 395.051
AZIMUTH MGA ZONE 55 BASED ON PM104737
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 16-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017
VALIDATED S.SAUNDERS 21/02/2017
APPROVED MANAGER S.SAUNDERS 21/02/2017

NSW GOVERNMENT Public Works Advisory

YEOVAL WATER RETICULATION UPGRADE
LINE 5A
DETAIL SURVEY

PLAN RM NO 57446
NO IN SET 08
SCALES 1:1000
SHEET NO 04
DESIGNED DATE
DRAFTED VERIFIED

3:10:46 PM 21/02/2017 piccaload 1 000 M / mm I:\Survey\Proj\Cunnock and Yeoval Water Retic Surveys 4223\B6055\CADD\57446sht.dgn

STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY19	655371	6376170
BHY20	655409	6376384
BHY24	655062	6376702
BHY25	654997	6376561

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

	STOP VALVE
HYD	HYDRANT
	WATER METER
WPIT	WATER PIT
SMH	SEWER MANHOLE
SWGRATE	STORMWATER GRATE
SWPIT	STORMWATER PIT
TEL PIT	TELSTRA PIT
EJ	TELSTRA ELEVATED JOINT
EP	ELECTRICITY POLE
LP	LIGHT POLE
^^^^^^	TOP OF BANK
----	BOTTOM OF BANK
	AIR VALVE
	DOUBLE AIR VALVE
	ELECTRICAL METER
	GAS METER
GULLY PIT	STORMWATER GULLY PIT
I/O	INSPECTION OPENING
	TAP

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly. SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION

THIS SURVEY WAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:1,000 FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
REDUCTION RATIO 1:1,000 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM104737 HT 395.051

AZIMUTH MGA ZONE 55 BASED ON PM104737
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 16-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017
VALIDATED S.SAUNDERS 21/02/2017
APPROVED MANAGER S.SAUNDERS 21/02/2017

NSW GOVERNMENT Public Works Advisory

YEOVAL WATER RETICULATION UPGRADE
LINES 6A AND PART 8A

DETAIL SURVEY

PLAN RM NO 57446 | NO IN SET 08
SCALES 1:1000 | SHEET NO 5
DESIGNED | DATE
DRAFTED | VERIFIED

piccolod 3.12.25 PM 21/02/2017 I:\Survey\Proj\Cumnock and Yeoval Water Relic Surveys 4x23\B6055\CADD\57446s5.dgn 1 000 M / mm

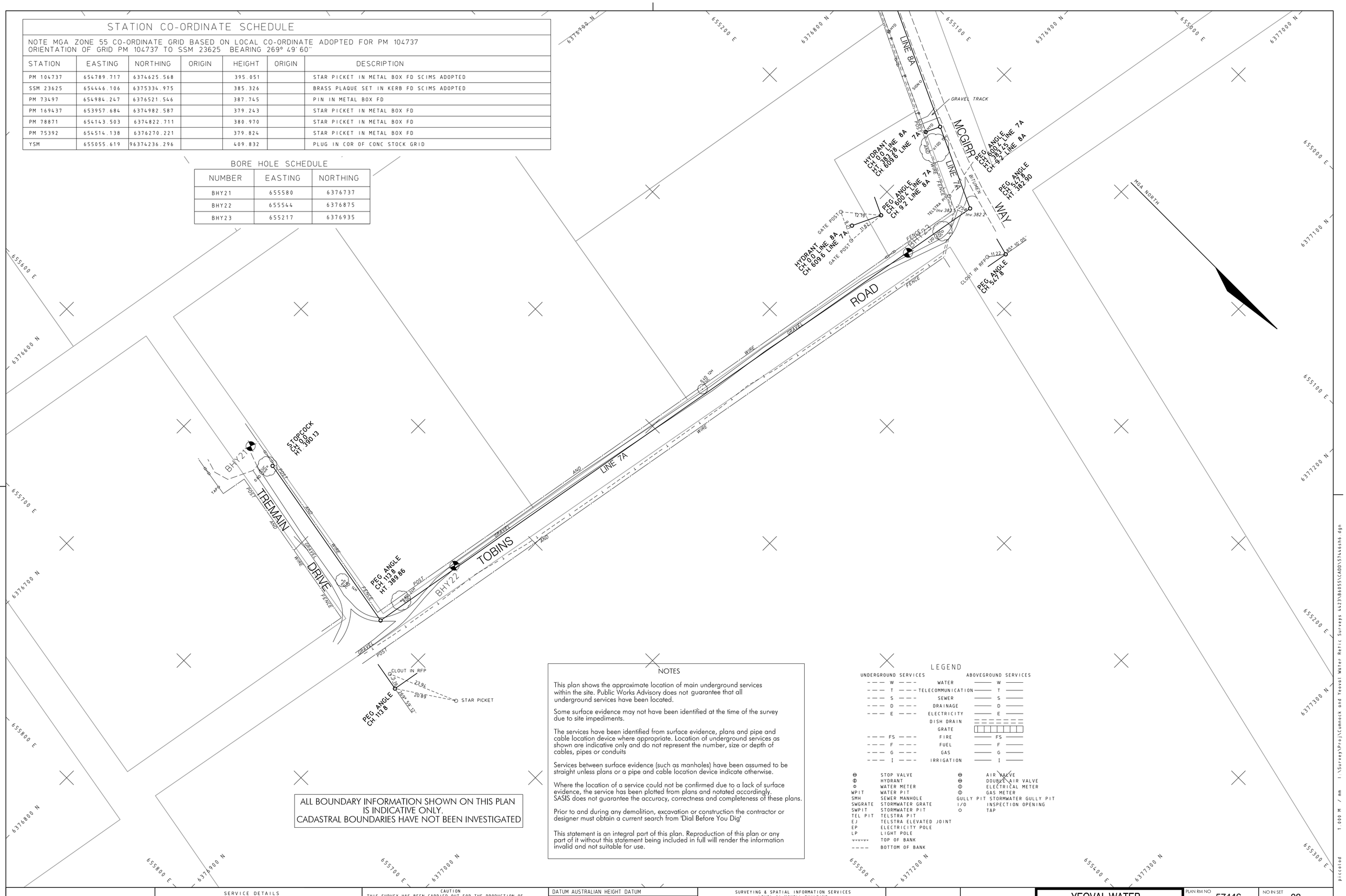
STATION CO-ORDINATE SCHEDULE

NOTE MGA ZONE 55 CO-ORDINATE GRID BASED ON LOCAL CO-ORDINATE ADOPTED FOR PM 104737
ORIENTATION OF GRID PM 104737 TO SSM 23625 BEARING 269° 49' 60"

STATION	EASTING	NORTHING	ORIGIN	HEIGHT	ORIGIN	DESCRIPTION
PM 104737	654789.717	6374625.568		395.051		STAR PICKET IN METAL BOX FD SCIMS ADOPTED
SSM 23625	654446.106	6375334.975		385.326		BRASS PLAQUE SET IN KERB FD SCIMS ADOPTED
PM 73497	654984.247	6376521.546		387.745		PIN IN METAL BOX FD
PM 169437	653957.684	6374982.587		379.243		STAR PICKET IN METAL BOX FD
PM 78871	654143.503	6374822.711		380.970		STAR PICKET IN METAL BOX FD
PM 75392	654514.138	6376270.221		379.824		STAR PICKET IN METAL BOX FD
YSM	655055.619	96374236.296		409.832		PLUG IN COR OF CONC STOCK GRID

BORE HOLE SCHEDULE

NUMBER	EASTING	NORTHING
BHY21	655580	6376737
BHY22	655544	6376875
BHY23	655217	6376935



ALL BOUNDARY INFORMATION SHOWN ON THIS PLAN IS INDICATIVE ONLY.
CADASTRAL BOUNDARIES HAVE NOT BEEN INVESTIGATED

NOTES

This plan shows the approximate location of main underground services within the site. Public Works Advisory does not guarantee that all underground services have been located.

Some surface evidence may not have been identified at the time of the survey due to site impediments.

The services have been identified from surface evidence, plans and pipe and cable location device where appropriate. Location of underground services as shown are indicative only and do not represent the number, size or depth of cables, pipes or conduits

Services between surface evidence (such as manholes) have been assumed to be straight unless plans or a pipe and cable location device indicate otherwise.

Where the location of a service could not be confirmed due to a lack of surface evidence, the service has been plotted from plans and notated accordingly.
SASIS does not guarantee the accuracy, correctness and completeness of these plans.

Prior to and during any demolition, excavation or construction the contractor or designer must obtain a current search from 'Dial Before You Dig'

This statement is an integral part of this plan. Reproduction of this plan or any part of it without this statement being included in full will render the information invalid and not suitable for use.

LEGEND

UNDERGROUND SERVICES		ABOVEGROUND SERVICES
W	WATER	W
T	TELECOMMUNICATION	T
S	SEWER	S
D	DRAINAGE	D
E	ELECTRICITY	E
	DISH DRAIN	
	GRATE	
FS	FIRE	FS
F	FUEL	F
G	GAS	G
I	IRRIGATION	I

⊖	STOP VALVE	⊖	AIR VALVE
Φ	HYDRANT	⊖	DOUBLE AIR VALVE
Φ	WATER METER	Ⓔ	ELECTRICAL METER
WPIT	WATER PIT	Ⓖ	GAS METER
SMH	SEWER MANHOLE	GULLY PIT	STORMWATER GULLY PIT
SWGRATE	STORMWATER GRATE	I/O	INSPECTION OPENING
SWPIT	STORMWATER PIT	O	TAP
TEL PIT	TELSTRA PIT		
EJ	TELSTRA ELEVATED JOINT		
EP	ELECTRICITY POLE		
LP	LIGHT POLE		
▽▽▽▽▽	TOP OF BANK		
----	BOTTOM OF BANK		

SERVICE DETAILS

A) visual evidence is shown to survey accuracy
B) inverts & diameters are shown where reasonable access was obtained
C) direction of services shown have been derived from visual evidence and when in agreement with Service Authority WAE drawings
D) direction of services NOT SHOWN is due to an uncertainty when comparing visual location with service diagrams
E) service details should be confirmed with the relevant Service Authorities during design and prior to construction

CAUTION
THIS SURVEY WAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO OF 1:1,000 FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE

0 10 20 40 60 80 100
REDUCTION RATIO 1:1,000 METRES

DATUM AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS PM104737 HT 395.051

AZIMUTH MGA ZONE 55 BASED ON PM104737
FOLDER B6055 LB FB
L.G.A. CABONNE COUNCIL
SURVEYOR D.BURNETT
SURVEY DATE 16-JAN-2017 FILE
CADD C.T.ROSE

SURVEYING & SPATIAL INFORMATION SERVICES
LEVEL 14 MCKELL BUILDING
2 - 24 RAWSON PLACE, SYDNEY NSW 2000
TEL: (02) 9372 7980 FAX: (02) 9372 7922

VERIFIED D.BURNETT 20/02/2017

VALIDATED S.SAUNDERS 21/02/2017

APPROVED MANAGER S.SAUNDERS 21/02/2017

NSW GOVERNMENT Public Works Advisory

YEOVAL WATER RETICULATION UPGRADE
LINES 7A AND PART 8A

DETAIL SURVEY

PLAN RM NO 57446
NO IN SET 08
SCALES 1:1000
SHEET NO 06
DESIGNED DATE
DRAFTED VERIFIED

3.13.26 PM 21/02/2017 piccolod 1 000 M / mm I:\Survey\Proj\Cumnock and Yeoval Water Relic Surveys 4x23\B6055\CADD\57446sh6.dgn

APPENDIX A

Geotechnical Terminology and Technical Aids

CHARACTERISATION OF GEOTECHNICAL DATA

Geotechnical data generally fall into the categories of fact, interpretation and opinion, as defined by the Institution of Engineers, Australia, 1987 - Guidelines for the Provision of Geotechnical Information in Construction Contracts.

Facts are defined as the materials, statistics and properties which may be seen, measured or identified by means of accepted and preferably standardised criteria, classifications and tests. Examples of facts include: exploration locations, outcrop locations, samples and drill core, lithological names/descriptions of soils and rocks, measured water levels, laboratory test results and seismic time/distance plots.

Interpretative data is defined as information derived from competently made interpretation of facts using accepted and proven techniques, or reasonable judgement exercised in the knowledge of geological conditions or processes evident at the site. Examples of interpretative data are: borehole and test pit logs, inferred stratigraphy and correlations between boreholes or test pits, material and rock mass properties used in analysis (e.g. permeability), and seismic interpretation (yielding velocity and layer depths).

Opinion is derived from consideration of relevant available facts, interpretations and analysis and/or the exercise of judgement. Examples of opinions based on geotechnical/geological interpretations include bearing capacity and foundation suitability, need for foundation treatment, settlements, potential for grouting, excavation stability, ease of excavation, and suitability of construction materials.

SOIL DESCRIPTION

The methods of description and classification of soils are based on Australian Standard 1726, the SAA Site Investigation Code. The description of a soil is based on particle size distribution and plasticity as shown in the "GUIDE TO THE DESCRIPTION, IDENTIFICATION AND CLASSIFICATION OF SOILS".

SOIL CLASSIFICATION

The basic soil types and their subdivisions are defined by their particle sizes:

MAJOR SOIL CATEGORIES

Soil Classification	Particle Size
Boulders	Greater than 200mm
Cobbles	63 - 200mm
Gravel	2.36 - 63mm
Sand	0.075 - 2.36mm
Silt	0.002 - 0.075mm
Clay	Less than 0.002mm

MINOR SOIL CONSTITUENTS

As most natural soils are combinations of various constituents, the primary soil is further described and modified by its minor components:

Coarse grained soils			**Fine grained soils**		
% Fines		**Modifier**	**% Coarse**		**Modifier**
	≤ 5	Omit, or use 'trace'		≤ 15	Omit, or use 'trace'
> 5	≤ 12	Describe as 'with clay/silt', as applicable	> 15	≤ 30	Describe as 'with sand/gravel', as applicable
> 12		Prefix soil as 'silty/clayey', as applicable	> 30		Prefix soil as 'sand/gravelly', as applicable

COHESIVE SOILS

Clay and silt may be described according to their plasticity:

Descriptive Term	**Range of liquid limit (percent)**
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50

MOISTURE CONDITION

Term	Description
Dry (D)	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist (M)	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet (W)	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere.

CONSISTENCY - NON-COHESIVE SOILS

Term	Density index %		SPT "N" value
Very loose		≤ 15	< 5
Loose	> 15	≤ 35	5 - 10
Medium dense	> 35	≤ 65	10 - 30
Dense	> 65	≤ 85	30 - 50
Very dense	> 85		> 50

CONSISTENCY - COHESIVE SOILS

Term	Undrained shear strength (kPa)		Field guide to consistency	SPT "N" value
Very soft		≤ 12	Exudes between the fingers when squeezed in hand.	< 2
Soft	> 12	≤ 25	Can be moulded by light finger pressure.	2 - 4
Firm	> 25	≤ 50	Can be moulded by strong finger pressure.	4 - 8
Stiff	> 50	≤ 100	Cannot be moulded by fingers; can be indented by thumb	8 - 16
Very stiff	> 100	≤ 200	Can be indented by thumb nail.	16 - 32
Hard	> 200		Can be indented with difficulty by thumb nail.	> 32

GRAPHICAL SYMBOLS USED FOR GEOTECHNICAL BOREHOLE AND TEST PIT LOGS

SOIL - COARSE GRAINED


GW


GP


GM


GC

SW


SP


SM


SC

SOIL - FINE GRAINED


CH


CI

CL


MH


ML


OH


OL


Pt

ROCK


Sedimentary rock


Igneous rock


Metamorphic rock

FILL MATERIAL


Fill

GROUNDWATER


Level


Inflow

NGE No Groundwater Encountered

SOIL HORIZON BOUNDARIES

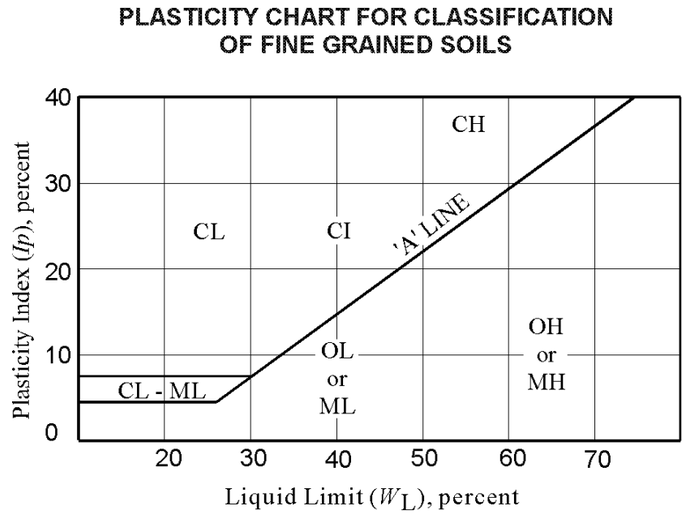
Boundary measured or determined from drilling conditions

Diffuse or uncertain boundary

GUIDE TO THE DESCRIPTION IDENTIFICATION AND CLASSIFICATION OF SOILS

Major Divisions		Particle Size (mm)	Group Symbol	Typical Names	Field Identification Sand and Gravels	Laboratory Classification				
							% < 0.06mm (see note 2)	Plasticity of Fine Fraction	$C_u = \frac{D_{50}}{D_{10}}$	$C_c = \frac{(D_{30})^2}{D_{10}D_{60}}$	Notes
COARSE GRAINED SOILS (more than half of material less than 63 mm is larger than 0.075 mm)	**BOULDERS**	200				Use the gradation curve of material passing 63mm for classification of fractions according to the criteria given in "Major Divisions"	—	—	—	—	
	COBBLES	63					—	—	—	—	
	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	coarse 20	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		0-5	—	> 4	between 1 and 3	1. Identify lines by the method given for fine grained soils.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		0-5	—	Fails to comply with above	—	
		medium 6	GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength		12-50	Below 'A' line or $I_p < 4$	—	—	2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.06mm size) is greater than 5% and less than 12%.
		fine 2.36	GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength		12-50	Above 'A' line or $I_p > 7$	—	—	Borderline classifications require the use of dual symbols e.g. SP-SM, GW-GC
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	coarse 0.6	SW	Well graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		0-5	—	> 6	between 1 and 3	3. I_p = Plasticity Index
			SP	Poorly graded sands and gravelly sands; little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		0-5	—	Fails to comply with above	Fails to comply with above	
		medium 0.2	SM	Silty sands, sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength		12-50	Below ‘A’ line or $I_p < 4$	—	—	
		fine 0.075	SC	Clayey sands, sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength		12-50	Above ‘A’ line or $I_p > 7$	—	—	

GUIDE TO THE DESCRIPTION, IDENTIFICATION AND CLASSIFICATION OF SOILS (CONT.)

Major Divisions		Particle Size (mm)	Group Symbol	Typical Names	Field Identification			Laboratory Classification			Notes
					Dry* Strength	Dilatancy†	Toughness ‡			Plasticity of Fine Fraction	
FINE GRAINED SOILS (more than half of material less than 63 mm is smaller than 0.075 mm)	**SILTS & CLAYS** (liquid limit < 50%)	<0.075	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	None to low	Quick to slow	None	Use the gradation curve of material passing 63mm for classification of fractions according to the criteria given in "Major Divisions"	More than 50% passing 0.06 mm	Below 'A' line	
			CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium			Above 'A' line	
			OL ⌖	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low			Below 'A' line	
	SILTS & CLAYS (liquid limit > 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, clastic silts	Low to medium	Slow to none	Low to medium			Below 'A' line	
			CH	Inorganic clays of high plasticity, fat clays	High to very high	None	High			Above 'A' line	
			OH ⌖	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Low to medium			Below 'A' line	
	HIGHLY ORGANIC SOILS		Pt ⌖	Peat and other highly organic soils	Identified by colour, odour, spongy feel and generally by fibrous texture					—	⌖ Effervesces with H_2O_2

PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS

FIELD IDENTIFICATION PROCEDURE FOR FINE GRAINED SOILS OR FRACTIONS

THESE PROCEDURES ARE TO BE PERFORMED ON THE MINUS 0.2MM SIZE PARTICLES. FOR FIELD CLASSIFICATION PURPOSES, SCREENING IS NOT INTENDED, SIMPLY REMOVE BY HAND THE COARSE PARTICLES THAT INTERFERE WITH THE TESTS.

*** Dry strength (Crushing characteristics)**

After removing particles larger than 0.2mm size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity. High dry strength is characteristic for clays of the CH group.

A typical inorganic silt possesses only very slight dry strength.

Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

† Dilatancy (Reaction to shaking)

After removing particles larger than 0.2mm size, prepare a pat of moist soil with a volume of 10 cm³. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles.

The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, shows a moderately quick reaction.

‡ Toughness (Consistency near plastic limit)

After removing particles larger than 0.2mm size, a specimen of soil about 10cm³ in size is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. The specimen is then rolled out by hand on a smooth surface or between the palms into a thread about 3mm in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together with a slight kneading action continued until the lump crumbles. The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil.

Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line. Highly organic clays have a very weak and spongy feel at the plastic limit.

EXPLANATION OF LOGGING TERMS FOR ENGINEERING GEOLOGY BOREHOLE LOGGING

ROCK SUBSTANCE WEATHERING CLASSIFICATION

RS	Residual soil
EW	Extremely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
F(s)	Fresh (stained defects)
F	Fresh

ESTIMATED STRENGTH CLASSIFICATION

EW	Extremely weak
VW	Very weak
W	Weak
MS	Medium strong
S	Strong
VS	Very strong
ES	Extremely strong

DEFECTS

Defects include all joints, bedding planes, fracture zones, seams, veins and cleavage partings.

RQD

Rock quality designation:

$$RQD = \frac{\text{length of core in pieces 100mm or longer}}{\text{length of run}} \times 100\%$$

WATER

Water table, with date

Water inflow

Partial drilling water loss

Complete drilling water loss

Angles of joint inclination (and other geological features and drill holes) are angles between the feature and a horizontal plane. In core, angles of joints (and other geological structures) are angles between the structure and the plane normal to the axis of the core. In vertical holes these angles are then the true inclination (dip) of the structure.

DEFINITIONS OF ENGINEERING GEOLOGICAL TERMS

This classification system provides a standard terminology for the engineering description of rock.

DEGREE OF WEATHERING [1]

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Rock is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance, and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock, usually as a result of iron bleaching or deposition. The colour and strength of the original substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance, and the original colour of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh (stained)	F_S	Rock substance unaffected by weathering. Weathering is limited to the surface of major discontinuities, for example an iron-stained joint.
Fresh	F	Rock substance unaffected by weathering.

ROCK STRENGTH [2]

Rock strength is defined by the Point Load Strength Index (Is (50)), and refers to the strength of the rock substance in the direction normal to the bedding.

TERM	Is (50)	FIELD GUIDE	APPROX. qu MPa *
Extremely Weak (EW)		Easily remoulded by hand to a material with soil properties.	
	0.03		0.7
Very weak (VW)		May be crumbled in the hand. Sandstone is "sugary" and friable.	
	0.1		2.4
Weak (W)		A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	
	0.3		7
Medium Strong (MS)		A piece of core 150mm long x 50mm dia. may be broken by hand with considerable difficulty. Readily scored with a knife.	
	1		24
Strong (S)		A piece of core 150mm long x 50mm dia. cannot be broken by unaided hands, may be slightly scratched or scored with knife.	
	3		70
Very Strong (VS)		A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	
	10		240
Extremely Strong (ES)		A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with hammer.	

* The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely and should be calibrated on site.

STRATIFICATION SPACING [2]

TERM	SEPARATION OF STRATIFICATION PLANES
Thinly laminated	< 6mm
Laminated	6mm - 20mm
Very thinly bedded	20mm - 60mm
Thinly bedded	60mm - 200mm
Medium bedded	200mm - 600mm
Thickly bedded	600mm - 2m
Very thickly bedded	> 2m

DISCONTINUITY SPACING [3]

TERM	SPACING
Very widely spaced	> 2m
Widely spaced	600mm - 2m
Moderately widely spaced	200mm 600mm
Closely spaced	60mm - 200mm
Very closely spaced	20mm - 60mm
Extremely closely spaced	< 20mm

APERTURE OF DISCONTINUITY SURFACES [4]

The degree to which a discontinuity is open, or to which the faces of the discontinuity have been separated and the space subsequently infilled (such as in a vein, fault or joint).

TERM	APERTURE THICKNESS (Discontinuities, veins, faults, joints)
Wide	> 200mm
Moderately wide	60mm - 200mm
Moderately narrow	20mm - 60mm
Narrow	6mm - 20mm
Very narrow	2mm - 6mm
Extremely narrow	> 0 - 2 mm
Tight	Zero

BLOCK SHAPE AND SIZE [4]

The following descriptive terms define shape:

Blocky	- approximately equidimensional.
Tabular	- one dimension considerably shorter than the other two.
Columnar	- one dimension considerably larger than the other two.

Block sizes are defined by the following descriptive terms:

TERM	BLOCK SIZE	EQUIVALENT DISCONTINUITY SPACINGS IN BLOCKY ROCK
Very large	$> 8m^3$	Extremely wide
Large	$> 0.2m^3$ - $8m^3$	Very wide
Medium	$> 0.008m^3$ - $0.2m^3$	Wide
Small	$> 0.0002m^3$ - $0.008m^3$	Moderately wide
Very small	$\leq 0.0002m^3$	Less than moderately wide

REFERENCES

1. Modifications of:
   (a) McMahon, B.K., Douglas, D.J., & Burgess, P.J., 1975. Engineering classification of sedimentary rocks in the Sydney area. Australian Geomechanics Journal, G5 (1), 51-53.
   (b) Geological Society Engineering Group Working Party, 1977. The description of rock masses for engineering purposes. Quarterly Jour. Engg. Geology, 10 (4), 355-388.

2. McMahon, B.K., Douglas , D.J., & Burgess, P. J., 1975. Engineering classification of sedimentary rocks in the Sydney area. Australian Geomechanics Journal, G5 (1), 51 -53.

3. ISRM Commission on Standardisation of Laboratory and Field Tests, 1978. Suggested methods for the quantitative description of discontinuities in rock masses. J1. Rock Mechanics Min. Sci. and Geomech. Abstra., 15, 319-368.

4. Geological Society Engineering Group Working Party, 1977. The description of rock masses for engineering purposes. Quarterly Journ. Engg Geology, 10 (4), 355-388.

APPENDIX B

Borehole Logs

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY1

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 1A - Crown Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654512.0 m
NORTHING: 6374620.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Silty Sandy Gravel light brown grey; firm; dry.		Not Encountered	SPIRAL TC
				0.30			
				SANDY SILTY CLAY, trace of fine ironstone gravel dark red brown; very stiff; just moist.			
0.5					D		
			Cl (v)				
1.0							
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY2

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 2A - Lucknow Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654269.0 m
NORTHING: 6375000.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Gravelly Silty Sand grey brown; firm; dry.		Not Encountered	SPIRAL TC
				0.30			
				SILTY CLAY, trace of sand and fine gravel red brown, trace of yellow brown; stiff; moist.			
0.5							
			CH (v)		D		
1.0							
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY3

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 3A - King Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654093.0 m
NORTHING: 6375222.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			ML (v)	TOPSOIL - Sandy Silt, trace of clay grey; firm; dry.		Not Encountered	SPIRAL TC
				0.25			
				SILTY CLAY, trace of sand grey with yellow brown mottle; stiff; moist.			
0.5			CH (v)				
1.0					D		
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY4

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 3A - Bell Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654058.0 m
NORTHING: 6375274.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	SILTY SAND light brown; loose; dry.		Not Encountered	SPIRAL TC
				0.10			
				SILTY CLAY, trace of sand dark red brown and grey; very stiff; moist.			
			CH (v)				
0.5							
				0.80			
				SANDY SILTY CLAY with angular gravel up to 15mm in size; grey, red brown and yellow brown; stiff; moist.			
			CI/CH (v)				
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY5

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 3A - Bell Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654106.0 m
NORTHING: 6375344.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	SILTY SAND with fine gravel brown grey; loose; dry.		Not Encountered	SPIRAL TC
				0.40			
0.5			GM (v)	GRAVEL, trace of silt and sand sub angular up to 50mm in size; grey brown; medium dense; dry.			
				0.60			
			CI/CH (v)	SANDY SILTY CLAY, trace of gravel dark red brown with white speckles; stiff; moist.	D		
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY6

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 3A - Bell Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654126.0 m
NORTHING: 6375376.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			ML/SM (v)	GRAVELLY SANDY SILT, trace of roots yellow brown and grey; medium dense; dry to just moist.		Not Encountered	SPIRAL TC
0.5				0.50			
			ROCK (v)	META SANDSTONE / SILTSTONE highly weathered; very weak; brown, yellow, red brown and grey.	D		
1.0				1.10			
1.5				NOTE: TC bit refusal. Hole Terminated at 1.10 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY7

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 4A - Short Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654122.0 m
NORTHING: 6375568.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI/CH (v)	SILTY CLAY with sand mantled by veneer (50mm layer) of topsoil; dark red brown with white speckles; very stiff; moist.		Not Encountered	SPIRAL TC
0.5							
				0.70			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense clayey silty sand (SC); grey brown with white speckles.	D		
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY8

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 4A - Short Street
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654159.0 m
NORTHING: 6375615.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
0.5			CI/CH (v)	SILTY CLAY with sand mantled by a thin veneer of topsoil; dark red brown with white speckles; very stiff; moist.		Not Encountered	SPIRAL TC
1.0							
				1.10			
			CI (v)	SANDY SILTY CLAY mixture of dark red, grey, yellow and dark grey; stiff; moist.	D		
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY9

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE YSM - Reservoir to town
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654977.0 m
NORTHING: 6374045.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI/CH (v)	SANDY SILTY CLAY dark red brown with white speckles; very stiff; just moist.		Not Encountered	SPIRAL TC
0.5							
				0.70			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense silty sand, trace of clay (SM); grey, orange brown with white speckles.	D		
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY10

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE YSM - Reservoir to town
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 655000.0 m
NORTHING: 6374101.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI/CH (v)	SANDY SILTY CLAY dark red brown with white speckles; very stiff; moist.		Not Encountered	SPIRAL TC
0.5				0.60			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense silty sand, trace of clay and fine gravel (SM); grey, brown with white speckles and trace of orange.			
1.0							
1.5				1.50 Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY11

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE YSM - Reservoir to town
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 655017.0 m
NORTHING: 6374148.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SC (v)	CLAYEY SILTY SAND (possibly residual granodiorite); grey, brown, red brown with white speckles; medium dense; dry;		Not Encountered	SPIRAL TC
0.5				0.50			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense silty sand, trace of clay and fine gravel (SM); grey, brown with white speckles.			
1.0							
1.5				1.50 Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY12

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE YSM - Banjo Paterson Way
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 655053.0 m
NORTHING: 6374249.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SC (v)	CLAYEY SILTY SAND dark red brown, dark grey, brown with white speckles; medium dense; dry;		Not Encountered	SPIRAL TC
				0.40			
0.5			ROCK (v)	GRANODIORITE extremely weathered; behaves as a dense silty sand, trace of clay and fine gravel (SM); grey, brown, dark grey with white speckles.			
1.0							
1.5				1.50 Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY13

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE YSM - Banjo Paterson Way
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654898.0 m
NORTHING: 6374379.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI/CH (v)	SANDY SILTY CLAY dark red brown with fine white speckles; very stiff; moist.			
0.5				- Thin gravelly layer 0.7m - 0.8m.	D	Not Encountered	SPIRAL TC
				0.80			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense silty sand, trace of clay and fine gravel (SC/SM); grey, brown with white speckles and trace of yellow brown.			
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY14

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE YSM - Banjo Paterson Way
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 17/01/2017
SURFACE RL: AHD
EASTING: 654737.0 m
NORTHING: 6374513.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			GM (v)	SANDY SILTY GRAVEL grey brown; loose; dry.		Not Encountered	SPIRAL TC
				0.15			
				GRANODIORITE extremely weathered; behaves as a very stiff sandy silty clay, trace of gravel (CI/CH); dark red brown and white speckles.			
0.5			ROCK (v)				
1.0				- Some dark grey appearing below 1.0m.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY15

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 5A - Railway Parade
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 654528.0 m
NORTHING: 6375715.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	SILTY SAND, trace of clay brown and grey; loose/medium dense; dry.			
				0.30			
				SANDY CLAYEY SILT dark grey; stiff; moist.			
0.5					D		
			CI (v)			Not Encountered	SPIRAL TC
1.0							
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY16

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 5A - Railway Parade
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 654454.0 m
NORTHING: 6375884.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM/ML (v)	SILTY SAND, trace of clay includes trace of gravel up to 40mm in size; brown grey; loose; dry.		Not Encountered	SPIRAL TC
				0.40			
0.5			CI/CH (v)	SANDY SILTY CLAY red brown; stiff to very stiff; just moist.	D		
1.0				1.20			
			SM/SC (v)	SILTY SAND, trace of clay red brown; medium dense; moist.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY17

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 5A - Railway Parade
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 654480.0 m
NORTHING: 6376095.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SP/SM (v)	GRAVELLY SAND, trace of silt sub-rounded gravel up to 20mm in size; (possibly fill); medium to coarse grained sand; brown grey; loose; dry.		Not Encountered	SPIRAL TC
0.5				0.50			
			CI/CH (v)	SILTY CLAY with sand dark red brown, trace of white speckles; stiff to very stiff; moist.			
1.0				1.20			
			CI/SC (v)	CLAYEY SILTY SAND medium grained; red brown; medium dense; moist.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY18

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 5A - Railway Parade
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 654499.0 m
NORTHING: 6376245.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	GRAVELLY SAND, trace of silt brown grey; loose; dry.		Not Encountered	SPIRAL TC
				0.30			
			CI (v)	SANDY SILTY CLAY dark red brown with white speckles; very stiff; just moist.			
0.5				0.60			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense to dense clayey silty sand (SC); grey, brown, orange brown and white speckled.	D		
1.0							
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY19

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 6A - Avon Road
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 655371.0 m
NORTHING: 6376170.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	SILTY SAND, trace of clay and gravel medium to coarse grained; brown grey; loose; dry.		Not Encountered	SPIRAL TC
0.5				0.50			
			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense silty clayey sand (CI/SC); dark reddish brown with grey and orange brown with white speckles;	D		
1.0							
1.5				1.50 Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY20

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 6A - Avon Road
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 655409.0 m
NORTHING: 6376384.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			FILL (v)	ROADBASE - Silty Gravelly Sand grey brown; firm; dry.		Not Encountered	SPIRAL TC
				0.20			
				SILTY CLAY with sand dark red brown, dark grey and white speckles; very stiff; moist.			
0.5			CI/CH (v)		D		
				0.80			
				GRANODIORITE extremely weathered to highly weathered; light grey, orange brown, white speckles and dark grey.			
1.0			ROCK (v)				
1.5				1.50			
				NOTE: Hard drilling for a ute rig. Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY21

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 7A - Tremain Drive
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER
EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ
DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 655580.0 m
NORTHING: 6376737.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			GM (v)	ROADBASE - Silty Sandy Gravel grey brown; firm; dry.		Not Encountered	SPIRAL TC
				0.20			
			CI (v)	SANDY SILTY CLAY dark red brown with fine white speckles; very stiff; just moist.			
0.5							
				1.00			
1.0			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense clayey silty sand (SC); orange brown, red brown and white speckles.			
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY22

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 7A - Tobins Road
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 655544.0 m
NORTHING: 6376875.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			CI (v)	SANDY CLAYEY SILT dark red brown; very stiff; dry.			
				0.20			
				SANDY SILTY CLAY dark red brown with fine white speckles; very stiff; moist.			
0.5			CI/CH (v)		D		
				0.80			
				CLAYEY SILT, trace of sand dark red brown; stiff to very stiff; just moist.		Not Encountered	SPIRAL TC
1.0			CI/CH (v)				
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY23

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 7A - Tobins Road
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 655217.0 m
NORTHING: 6376935.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			ML/SM (v)	SILTY SAND, trace of clay grey; loose; dry.		Not Encountered	SPIRAL TC
				0.30			
			ML/CL (v)	SANDY CLAYEY SILT dark grey brown; firm; moist.			
0.5				0.50			
			CI/CH (v)	SILTY CLAY with sand mottled yellow brown and grey; firm to stiff; moist.	D		
1.0				- Becomes very stiff below 1.0m.			
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY24

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 8A - Renshaw McGirr Way
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 655062.0 m
NORTHING: 6376702.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	GRAVELLY SILTY SAND grey; loose; dry.		Not Encountered	SPIRAL TC
				0.20			
0.5			CH (v)	SILTY CLAY with sand mottled dark grey and dark brown, trace of white speckles; very stiff; moist.	D		
				0.90			
1.0			ROCK (v)	GRANODIORITE extremely weathered; behaves as a medium dense clayey silty sand with fine gravel (SC); grey, orange brown, dark grey, white speckles.			
1.5				1.50			
				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

Public Works
NSW Water Solutions

GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE No.

BHY25

PROJECT: YEOVAL WATER SUPPLY
LOCATION: LINE 8A - Renshaw McGirr Way
CONTRACTOR: Macquarie Geotech
SITE SUPERVISOR: M.ASHOVER

EQUIPMENT: MG 44
PROJECT COORDINATOR: C. KARWAJ

DATE: 18/01/2017
SURFACE RL: AHD
EASTING: 654997.0 m
NORTHING: 6376561.0 m

DEPTH (m)	RL (m)	GRAPHIC LOG	SOIL GROUP	MATERIAL DESCRIPTION Soil type, colour, consistency, grainsize, moisture, remarks	SAMPLE or TEST	WATER	METHOD
			SM (v)	TOPSOIL - Gravelly Silty Sand grey; loose; dry.		Not Encountered	SPIRAL TC
				0.10			
				SILTY CLAY, trace of sand dark red brown; very stiff; moist.			
0.5			CH (v)				
				1.00			
1.0				SILTY CLAY, trace of sand yellow brown and grey mottled; very stiff; moist.			
			CH (v)				
				1.50			
1.5				Hole Terminated at 1.50 m			

v : visual
l : laboratory

SAMPLE OR TEST
Undisturbed: U
Disturbed: D
Bulk: B
Standard Penetration Test: SPT

GROUNDWATER
Water Table
Water Inflow

PROJECT No.: GT28A

SHEET: 1 OF 1

APPENDIX C

Corrosion and Scaling Assessment Test Results

Corrosion & Scaling Assessment:
Soil Reporting Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 1** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY1 (0.5-1.0m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.2	Neutral
EC mS/cm (1:5)		0.03	Very low
Texture Class		Clay Loam	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	20	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	110	Low (non-aggressive)
* Resistivity Ω. m		-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows neutral pH, very low salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 2** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY9 (0.7-1.1m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.3	Slight alkalinity
EC mS/cm (1:5)		0.07	Very low
Texture Class		Loamy Sand	
Soil Condition Class (Permeability)		High	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	<5.0	Low (mildly aggressive)
Chloride (1:5)	mgCl / kg	70	Low (non-aggressive)
* Resistivity Ω.	m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows slight alkalinity, very low salinity, low sulphate and low chloride levels.

According to AS2159:2009 the pH is considered mildly-aggressive towards concrete (due to high permeability) and non-corrosive towards steel. The low sulphate and low chloride levels are considered mildly-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is mild.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 3** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY13 (0.5-0.8m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.6	Slight alkalinity
EC mS/cm (1:5)		0.05	Very low
Texture Class		Sandy Clay Loam	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	$mgSO_4$ / kg	<5.0	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	150	Low (non-aggressive)
* Resistivity Ω. m		-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows slight alkalinity, very low salinity, low sulphate and low chloride levels.

According to AS2159:2009 the pH is considered non-aggressive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 4** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY15 (0.5-1.0m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building** **2-24 Rawson Place** **SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.5	Slight alkalinity
EC mS/cm (1:5)		0.04	Very low
Texture Class		Sandy Clay Loam	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	<5.0	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	80	Low (non-aggressive)
* Resistivity Ω.	m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows slight alkalinity, very low salinity, low sulphate and low chloride levels.

According to AS2159:2009 the pH is considered non-aggressive towards concrete (and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 5** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY16 (0.5-1.0m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST	RESULT	COMMENTS
pH in water (1:5)	7.1	Neutral
EC mS/cm (1:5)	0.03	Very low
Texture Class	Sandy Clay	
Soil Condition Class (Permeability)	Low	
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) mgSO_4 / kg	10	Low (non-aggressive)
Chloride (1:5) mgCl / kg	210	Low (non-aggressive)
* Resistivity Ω. m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows neutral pH, very low salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 6** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY19 (0.6-1.0m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building** **2-24 Rawson Place** **SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		5.9	Medium acidity
EC mS/cm (1:5)		0.1	Very low
Texture Class		Sandy Clay Loam	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	10	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	140	Low (non-aggressive)
* Resistivity Ω. m		-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows medium acidity, very low salinity, low sulphate and low chloride levels.

According to AS2159:2009 the pH is considered non-aggressive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 7** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY20 (0.4-0.8m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST	RESULT	COMMENTS
pH in water (1:5)	6.7	Very slight acidity
EC mS/cm (1:5)	0.03	Very low
Texture Class	Light Medium Clay	
Soil Condition Class (Permeability)	Low	
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) mgSO_4 / kg	10	Low (non-aggressive)
Chloride (1:5) mgCl / kg	80	Low (non-aggressive)
* Resistivity Ω. m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows very slight acidity, very low salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Corrosion & Scaling Assessment:
Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 42099 **Sample N°: 8** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name:	**Office of Finance & Services**	Project Name:	**Yeoval Water Supply - Pipeline**
Client Contact:	**Conrad Karwaj**	SESL Quote N°:	
Client Job N°:		Sample Name:	**BHY22 (0.3-0.8m)**
Client Order N°:	**GT28A**	Description:	**Soil**
Address:	**Level 13, McKell Building 2-24 Rawson Place SYDNEY NSW 2000**	Test Type:	**CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7	Neutral
EC mS/cm (1:5)		0.06	Very low
Texture Class		Clay Loam	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	$mgSO_4$ / kg	<5.0	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	60	Low (non-aggressive)
* Resistivity Ω. m		-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows neutral pH, very low salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid

Authorised Signatory: Kelly Lee

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Corrosion & Scaling Assessment:
Soil Reporting Profile

Batch N°: 42099 **Sample N°: 9** **Date Received: 1/2/17** **Report Status:** ○ Draft ◉ Final

Client Name: **Office of Finance & Services**
Client Contact: **Conrad Karwaj**
Client Job N°:
Client Order N°: **GT28A**
Address: **Level 13, McKell Building, 2-24 Rawson Place, SYDNEY NSW 2000**

Project Name: **Yeoval Water Supply - Pipeline**
SESL Quote N°:
Sample Name: **BHY24 (0.4-0.9m)**
Description: **Soil**
Test Type: **CSCSSNR**

TEST		RESULT	COMMENTS
pH in water (1:5)		7.1	Neutral
EC mS/cm (1:5)		0.16	Low
Texture Class		Light Medium Clay	
Soil Condition Class (Permeability)		Low	
SOLUBLE ANION ANALYSIS			
Sulphate (1:5)	mgSO_4 / kg	40	Low (non-aggressive)
Chloride (1:5)	mgCl / kg	280	Low (non-aggressive)
* Resistivity Ω.	m	-	Did not test

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

For the purpose of corrosion and scaling assessment of soils towards concrete structures with steel reinforcement, concrete and steel piles, this soil shows neutral pH, low salinity, low sulphate, low chloride levels.

According to AS2159-2009, the pH is considered non-corrosive towards concrete and non-corrosive towards steel. The low sulphate and low chloride levels are considered non-aggressive towards concrete and non-corrosive towards steel.

Factors affecting concrete scaling are: (a) elevated sulphate, becoming mildly aggressive at >5000mg/kg SO4; and (b) low pH, becoming mildly aggressive at pH of <5.5.

Factors affecting steel corrosivity are: (a) elevated chloride, becoming mildly aggressive at >5,000mg/kg Cl; and (b) low pH, becoming mildly aggressive at pH of <5 and (d) low resistivity, becoming mildly aggressive with resistivity values less than 50Ω.m.

Overall, based on the limited results and according to AS2159:2009 the likelihood of aggressive corrosion is low.

Please note not all analysis was conducted and may not necessarily depict the actual corrosion risk.

pH, EC, Soluble SO_4: Bradley et al., (1983); **Cl,** (4500-Cl- E; APHA, 1998);
Resistivity, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

Date Report Generated
9/02/2017

Consultant: Adam Reid
Authorised Signatory: Kelly Lee

Molong Pipeline - Geotechnical Investigation

Job no: B16565

Submitted to:
Cabonne Shire Council
101 Bank Street Molong, NSW 2866

Geotechnical Investigation Report

Report No: B16565

Molong Pipeline – Geotechnical Investigation

REVISION CONTROL

Revision	Date	Details	Prepared By	Reviewed By
00	23/12/2016	Issue 1	John Boyle	Robert Cox

Contents

List of Tables

Appendices

1 INTRODUCTION

At the request of Surendra Sapkota from Cabonne Shire Council, Macquarie Geotechnical has carried out a Geotechnical Investigation for the proposed Molong pipeline.

The objective of the investigation is to confirm the geological conditions at the site and provide a geotechnical investigation report.

2 SCOPE OF INVESTIGATION

2.1 Fieldwork

Twelve boreholes were drilled and logged on the 12th of November 2016 by an Engineering Geologist from our Bathurst Office. The fieldwork was undertaken in accordance with AS1726 Geotechnical Site Investigation and our correspondence dated 18th October 2016.

Twelve Boreholes were drilled to depths of up to 2.00m across different locations of the proposed pipe line.

A 4wd mounted Innovative Sampla 24LT drill rig was used to drill the boreholes using 125mm diameter solid flight augers, Dynamic Cone Penetration Testing (DCP) was carried out in all twelve boreholes as well as a pocket penetrometer test in selected boreholes.

2.2 Laboratory Testing

The soil samples were returned to Macquarie Geotechnical NATA accredited laboratory at Bathurst for further assessment and testing.

Table 1: Summary of Laboratory Testing

Test Pit	Depth (m)	Laboratory Test
BH02	0.4-0.5	Sulphate Content – AS1289 4.2.1
		pH – AS1289 4.3.1
		Electrical Conductivity – APHA 2520
		Chloride – RMS T1010
	1.4-1.5	Atterberg Limits AS1289 3.1.2, 3.2.1, 3.3.1
		Linear Shrinkage– AS1289 3.4.1
BH04	0.4-0.5	Atterberg Limits AS1289 3.1.2, 3.2.1, 3.3.1
		Linear Shrinkage– AS1289 3.4.1
	1.4-1.5	Sulphate Content – AS1289 4.2.1
		pH – AS1289 4.3.1
		Electrical Conductivity – APHA 2520
		Chloride – RMS T1010
BH06	0.4-0.5	Atterberg Limits AS1289 3.1.2, 3.2.1, 3.3.1
		Linear Shrinkage– AS1289 3.4.1

	1.4-1.5	Sulphate Content – AS1289 4.2.1
		pH – AS1289 4.3.1
		Electrical Conductivity – APHA 2520
		Chloride – RMS T1010
BH07	0.9-1.0	Sulphate Content – AS1289 4.2.1
		pH – AS1289 4.3.1
		Electrical Conductivity – APHA 2520
		Chloride – RMS T1010
BH09	0.8-0.9	Atterberg Limits AS1289 3.1.2, 3.2.1, 3.3.1
		Linear Shrinkage– AS1289 3.4.1
BH10	0.4-0.5	Sulphate Content – AS1289 4.2.1
		pH – AS1289 4.3.1
		Electrical Conductivity – APHA 2520
		Chloride – RMS T1010
	1.4-1.5	Atterberg Limits AS1289 3.1.2, 3.2.1, 3.3.1
		Linear Shrinkage– AS1289 3.4.1
BH12	0.9-1.0	Atterberg Limits AS1289 3.1.2, 3.2.1, 3.3.1
		Linear Shrinkage– AS1289 3.4.1
	1.9-2.0	Sulphate Content – AS1289 4.2.1
		pH – AS1289 4.3.1
		Electrical Conductivity – APHA 2520
		Chloride – RMS T1010

3 SITE DESCRIPTION

The site is situated in the town of Molong and comprises of a general flat to sloping surface with some borehole locations situated in residential areas and leading towards grass/ scrub areas outside of the town.

3.1 Regional Geology

Reference to the Geological map Bathurst 250k, 1998 indicates that the geology underlying the site consists of, but is not limited to;

"Occ: Basaltic andesite, mafic and quartz latite, siltstone, sandstone, breccia, conglomerate"

"Smo: Massive to bedded, poorly to highly-fossiliferous limestone"

3.2 Topography

All boreholes were located in relatively sloping areas, with minor sloping grounds consisting of an approximate elevation of 10m.

4 EXISTING SUB-SURFACE CONDITION

The subsurface conditions encountered in the boreholes are broadly summarised in the following table.

Table 2: Summary of Boreholes

Test Location	BH02	BH03	BH04	BH05	BH06
Material Description	Depth Range (m)				
Sandy/Silty CLAY	0.0-0.5	-	-	0-0.5	-
Silty CLAY	0.5-2.0	0.0-2.0	0.0-1.5	0.5-1.6	-
Silty CLAY: with trace gravel	-	-	1.5-2.0	1.6-2.0	0.0-1.6
Silty CLAY: with trace sand	-	-	-	-	-
Termination Depth (m)	2.00 (LOI)	2.00 (LOI)	2.00 (LOI)	2.00 (LOI)	1.60 (R)
Free Groundwater Observation (m)	NFGWO	NFGWO	NFGWO	NFGWO	NFGWO

Note: NFGWO – No Free Ground Water Observed;
LOI – Limit of Investigation
R – Refusal

Table 2 cont.: Summary of Boreholes

Test Location	BH07	BH08	BH09	BH010	BH11
Material Description	**Depth Range (m)**				
Sandy/Silty CLAY	-	-	-	-	-
Silty CLAY	0.0-2.0	0.0-2.0	-	0.0-2.0	-
Silty CLAY:with trace gravel	-		0.0-0.9	-	0.0-2.0
Silty CLAY:with trace sand	-		-	-	-
Termination Depth (m)	2.00 (LOI)	2.00 (LOI)	0.90 (R)	2.00 (LOI)	2.00 (LOI)
Free Groundwater Observation (m)	NFGWO	NFGWO	NFGWO	NFGWO	NFGWO

Table 2 cont.: Summary of Boreholes

Test Location	BH12	BH13
Material Description	**Depth Range (m)**	
Silty CLAY	0.0-2.0	-
Silty CLAY: with trace gravel	-	0.0-2.0
Silty CLAY with trace sand	-	-
Silty CLAY: with trace sand	-	-
Termination Depth (m)	2.00 (LOI)	2.00 (LOI)
Free Groundwater Observation (m)	NFGWO	NFGWO

5 LABORATORY TEST RESULTS

The summary of laboratory test results is shown in Tables 3 to seven inclusive.

Table 3: Laboratory Test Results – Plasticity Index & Linear Shrinkage

Borehole	Depth (m)	Sample Description	Liquid Limit	Plastic Limit	Plasticity Index	Linear Shrinkage
BH02	1.4-1.5	**Silty CLAY**	**34**	**8**	**26**	**6.5**
BH04	0.4-0.5	**Silty CLAY**	**34**	**11**	**23**	**9.0**
BH06	0.4-0.5	**Silty CLAY: with trace gravel**	**45**	**13**	**32**	**13.0**
BH09	0.8-0.9	**Silty CLAY: with gravel**	**36**	**17**	**19**	**11.0**
BH10	1.4-1.5	**Silty CLAY: with gravel**	**42**	**11**	**31**	**11.5**
BH12	0.9-1.0	**Silty CLAY**	**23**	**12**	**11**	**6.0**

Table 4: Laboratory Test Results – Soil Chemical Properties

Borehole Number	Depth (m)	Sample Description	pH	Sulphate (ppm)	Chloride (ppm)	Electrical Conductivity (uS/cm)
BH02	0.4-0.5	**Sandy CLAY**	**6.8**	**14.4**	**63.2**	**86.7**
BH04	1.4-1.5	**Sandy CLAY**	**8**	**35.0**	**240.4**	**388.9**
BH06	1.4-1.5	**Sandy CLAY**	**7.6**	**16.5**	**96.4**	**155.2**
BH07	0.9-1.0	**Sandy CLAY**	**6.8**	**20.6**	**85.3**	**115.9**
BH10	0.4-0.5	**Sandy CLAY**	**6.8**	**26.8**	**121.9**	**189.5**
BH12	1.9-2.0	**Sandy CLAY**	**7.6**	**24.7**	**43.2**	**65.4**

6 FOUNDATIONS

6.1 Geotechnical Design Parameters

The investigation indicates that the site comprises of residual clays to a depth of 2.00m (Limit of Investigation. Refusal on rock was encountered at depths of 1.60m (BH06) and 0.90m (BH09). Rock outcrops were noted adjacent to these locations

The geotechnical properties of the underlying residual clays are as follows;

- Low permeability,
- Low to moderate reactivity,
- Low wet strength,
- Poor subgrade strength,
- Low to moderate erosion potential
- Soil aggressivity – non aggressive

6.2 Site Classification

The classification of a site involves a number of geotechnical factors such as depth of bedrock, the nature and extent of subsurface soils and any specific problems (slope stability, soft soils, filling, reactivity, etc).

In accordance with AS2870 2011 the proposed development site will have an anticipated surface movement (Ys) of **35 - 40mm** and is classified as **"Class M"**.

An appropriate footing system should be designed in accordance with the above code to accommodate these anticipated movements. The possibility of additional movements, due to abnormal moisture variations, should be minimised by proper "site management" procedures as provided on the attached sheet.

It should be noted that this assessment is based on site conditions being represented by the natural soil profile. Any change in conditions noted during development, including cut or fill should be referred to Macquarie Geotechnical for appropriate inspection and assessment.

6.2.1 Footing

Based on our investigation, and our experience in this region, we recommend the following geotechnical design parameters.

Table 5: Summary of Geotechnical Design Parameters (Allowable)

Layer Depth Range (m)	Material Description	Bearing Capacity (KPa)	Shaft Adhesion (KPa)
0.00 – 2.00	CLAY	150	7.5

6.3 Groundwater

Groundwater was not encountered during drilling works.

7 Aggressive Soils

We refer to Table 6.4.2 (c) Exposure Classification for Concrete Piles AS2159 – 2009 'Piling – Design and Installation'.

The test results indicate that the soils at this site are non-aggressive, however if water is encountered they will be classed as MILD.

We trust the foregoing is sufficient for your present purposes, and if you have any questions please contact the undersigned.

Yours Sincerely

John Boyle
Senior Engineering Geologist
BSc (Hons) Affil MIE Aust

Attached: Limitations of Geotechnical Site Investigation

LIMITATIONS OF GEOTECHNICAL SITE INVESTIGATION

Scope of Services

This report has been prepared for the Client in accordance with the Services Engagement Form (SEF), between the Client and Macquarie Geotechnical.

Reliance on Data

Macquarie Geotechnical has relied upon data and other information provided by the Client and other individuals. Macquarie Geotechnical has not verified the accuracy or completeness of the data, except as otherwise stated in the report. Recommendations in the report are based on the data.

Macquarie Geotechnical will not be liable in relation to incorrect recommendations should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed.

Geotechnical Investigation

Findings of Geotechnical Investigations are based extensively on judgment and experience. Geotechnical reports are prepared to meet the specific needs of individual clients. This report was prepared expressly for the Client and expressly for the Clients purposes.

This report is based on a subsurface investigation, which was designed for project-specific factors. Unless further geotechnical advice is obtained this report cannot be applied to an adjacent site nor can it be used when the nature of any proposed development is changed.

Limitations of Site investigation

As a result of the limited number of sub-surface excavations or boreholes there is the possibility that variations may occur between test locations. The investigation undertaken is an estimate of the general profile of the subsurface conditions. The data derived from the investigation and laboratory testing are extrapolated across the site to form a geological model. This geological model infers the subsurface conditions and their likely behavior with regard to the proposed development.

The actual conditions at the site might differ from those inferred to exist.

No subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

Time Dependence

This report is based on conditions, which existed at the time of subsurface exploration. Construction operations at or adjacent to the site, and natural events such as floods, or groundwater fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report.

Macquarie Geotechnical should be kept appraised of any such events, and should be consulted for further geotechnical advice if any changes are noted.

Avoid Misinterpretation

A geotechnical engineer or engineering geologist should be retained to work with other design professionals explaining relevant geotechnical findings and in reviewing the adequacy of their plans and specifications relative to geotechnical issues.

No part of this report should be separated from the Final Report.

Sub-surface Logs

Sub-surface logs are developed by geoscientific professionals based upon their interpretation of field logs and laboratory evaluation of field samples. These logs should not under any circumstances be redrawn for inclusion in any drawings.

Geotechnical Involvement During Construction

During construction, excavation frequently exposes subsurface conditions. Geotechnical consultants should be retained through the construction stage, to identify variations if they are exposed.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendations and should make their own enquiries and obtain independent advice in relation to such matters

Macquarie Geotechnical assumes no responsibility and will not be liable to any other person or organisations for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisations arising from matters dealt with or conclusions expressed in the report.

Other limitations

Macquarie Geotechnical will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

Other Information

For further information reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, 1987.

MACQUARIE GEOTECH

Appendix A – Geotechnical Explanatory Notes

MACQUARIE GEOTECH

Geotechnical Explanatory Notes

Soil Description

In engineering terms soil includes every type of uncemented or partially cemented inorganic material found in the ground. In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. The dominant feature is assessed from the Unified Soil Classification system and a soil symbol is used to define a soil layer as follows:

UNIFIED SOIL CLASSIFICATION

The appropriate symbols are selected on the result of visual examination, field tests and available laboratory tests, such as, sieve analysis, liquid limit and plasticity index.

USC Symbol	Description
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand
ML	Silt of low plasticity
CL	Clay of low plasticity
OL	Organic soil of low plasticity
MH	Silt of high plasticity
CH	Clay of high plasticity
OH	Organic soil of high plasticity
Pt	Peaty Soil

MOISTURE CONDITION

Dry – Cohesive soils are friable or powdery
Cohesionless soil grains are free-running

Moist – Soil feels cool, darkened in colour
Cohesive soils can be moulded
Cohesionless soil grains tend to adhere

Wet – Cohesive soils usually weakened
Free water forms on hands when handling

For cohesive soils the following codes may also be used:

MC>PL Moisture Content greater than the Plastic Limit.
MC~PL Moisture Content near the Plastic Limit.
MC<PL Moisture Content less than the Plastic Limit.

PLASTICITY

The potential for soil to undergo change in volume with moisture change is assessed from its degree of plasticity. The classification of the degree of plasticity in terms of the Liquid Limit (LL) is as follows:

Description of Plasticity	LL (%)
Low	<35
Medium	35 to 50
High	>50

COHESIVE SOILS – CONSISTENCY

The consistency of a cohesive soil is defined by descriptive terminology such as very soft, soft, firm, stiff, very stiff and hard. These terms are assessed by the shear strength of the soil as observed visually, by the pocket penetrometer values and by resistance to deformation to hand moulding.

A Pocket Penetrometer may be used in the field or the laboratory to provide approximate assessment of unconfined compressive strength of cohesive soils. The values are recorded in kPa, as follows:

Strength	Symbol	Pocket Penetrometer Reading (kPa)
Very Soft	VS	< 25
Soft	S	20 to 50
Firm	F	50 to 100
Stiff	St	100 to 200
Very Stiff	VSt	200 to 400
Hard	H	> 400

MACQUARIE GEOTECH

COHESIONLESS SOILS – RELATIVE DENSITY

Relative density terms such as very loose, loose, medium, dense and very dense are used to describe silty and sandy material, and these are usually based on resistance to drilling penetration or the Standard Penetration Test (SPT) 'N' values. Other condition terms, such as friable, powdery or crumbly may also be used.

The Standard Penetration Test (SPT) is carried out in accordance with AS 1289, 6.3.1. For completed tests the number of blows required to drive the split spoon sampler 300 mm are recorded as the N value. For incomplete tests the number of blows and the penetration beyond the seating depth of 150 mm are recorded. If the 150 mm seating penetration is not achieved the number of blows to achieve the measured penetration is recorded. SPT correlations may be subject to corrections for overburden pressure and equipment type.

Term	Symbol	Density Index	N Value (blows/0.3 m)
Very Loose	VL	0 to 15	0 to 4
Loose	L	15 to 35	4 to 10
Medium Dense	MD	35 to 65	10 to 30
Dense	D	65 to 85	30 to 50
Very Dense	VD	>85	>50

COHESIONLESS SOILS PARTICLE SIZE DESCRIPTIVE TERMS

Name	Subdivision	Size
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 μm to 2.36 mm
	medium	200 μm to 600 μm
	fine	75 μm to 200 μm

Rock Description

The rock is described with strength and weathering symbols as shown below. Other features such as bedding and dip angle are given.

ROCK QUALITY

The fracture spacing is shown where applicable and the Rock Quality Designation (RQD) or Total Core Recovery (TCR) is given where:

$$\text{RQD (\%)} = \frac{\text{Sum of Axial lengths of core > 100mm long}}{\text{total length considered}}$$

$$\text{TCR (\%)} = \frac{\text{length of core recovered}}{\text{length of core run}}$$

ROCK STRENGTH

Rock strength is described using AS1726 and ISRM – Commission on Standardisation of Laboratory and Field Tests, "Suggested method of determining the Uniaxial Compressive Strength of Rock materials and the Point Load Index", as follows:

Term	Symbol	Point Load Index $Is_{(50)}$ (MPa)
Extremely Low	EL	<0.03
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	>10

ROCK MATERIAL WEATHERING

Rock weathering is described using the following abbreviation and definitions used in AS1726:

Abbreviation	Term
RS	Residual soil
XW	Extremely weathered
DW	Distinctly weathered
SW	Slightly weathered
FR	Fresh

MACQUARIE GEOTECH

DEFECT SPACING/BEDDING THICKNESS

Measured at right angles to defects of same set or bedding.

Term	Defect Spacing	Bedding
Extremely closely spaced	<6 mm	Thinly Laminated
	6 to 20 mm	Laminated
Very closely spaced	20 to 60 mm	Very Thin
Closely spaced	0.06 to 0.2 m	Thin
Moderately widely spaced	0.2 to 0.6 m	Medium
Widely spaced	0.6 to 2 m	Thick
Very widely spaced	>2 m	Very Thick

DEFECT DESCRIPTION

Type:	Description
B	Bedding
F	Fault
C	Cleavage
J	Joint
S	Shear Zone
D	Drill break

Planarity/Roughness:

Class	Description
I	rough or irregular, stepped
II	smooth, stepped
III	slickensided, stepped
IV	rough or irregular, undulating
V	smooth, undulating
VI	slickensided, undulating
VII	rough or irregular, planar
VIII	smooth, planar
IX	slickensided, planar

The inclination if defects are measured from perpendicular to the core axis.

WATER


Water level at date shown


Partial water loss


Water inflow


Complete water loss

Groundwater not observed: The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

Groundwater not encountered: The borehole/test pit was dry soon after excavation, however groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

MACQUARIE GEOTECH

Graphic Symbols for Soils and Rocks

Typical symbols for soils and rocks are as follows. Combinations of these symbols may be used to indicated mixed materials such as clayey sand.

Soil Symbols

Main components


CLAY - CL


CLAY - CH


SAND


GRAVEL


BOULDERS / COBBLES


TOPSOIL


SILT

Minor Components


Clayey


Silty


Sandy


Gravelly

Other


FILL


BITUMEN


CONCRETE

Rock Symbols

Sedimentary Rocks


SANDSTONE


SILTSTONE


CLAYSTONE, MUDSTONE


SHALE


LAMINITE


ASPHALT


LIMESTONE


CONGLOMERATE

Igneous Rocks


GRANITE


BASALT


UNDIFFERENTIATED IGNEOUS

Metamorphic Rocks


SLATE, PHYLLITE, SCHIST


GNEISS

QUARTZITE

MACQUARIE GEOTECH

Engineering Classification of Shales and Sandstones in the Sydney Region – A Summary Guide

The Sydney Rock Class classification system is based on rock strength, defect spacing and allowable seams as set out below. All three factors must be satisfied.

CLASSIFICATION FOR SANDSTONE

Class	Uniaxial Compressive Strength (MPa)	Defect Spacing (mm)	Allowable Seams (%)
I	>24	>600	<1.5
II	>12	>600	<3
III	>7	>200	<5
IV	>2	>60	<10
V	>1	N.A.	N.A.

CLASSIFICATION FOR SHALE

Class	Uniaxial Compressive Strength (MPa)	Defect Spacing (mm)	Allowable Seams (%)
I	>16	>600	<2
II	>7	>200	<4
III	>2	>60	<8
IV	>1	>20	<25
V	>1	N.A.	N.A.

MACQUARIE GEOTECH

UNIAXIAL COMPRESSIVE STRENGTH (UCS)

For expedience in field/construction situations the uniaxial (unconfined) compressive strength of the rock is often inferred, or assessed using the point load strength index (Is_{50}) test (AS 4133.4.1 – 1993). For Sydney Basin sedimentary rocks the uniaxial compressive strength is typically about 20 x (Is_{50}) but the multiplier may range from about 10 to 30 depending on the rock type and characteristics. In the absence of UCS tests, the assigned Sydney Rock Class classification may therefore include rock strengths outside the nominated UCS range.

DEFECT SPACING

The terms relate to spacing of natural fractures in NMLC, NQ and HQ diamond drill cores and have the following definitions:

Defect Spacing (mm)	Terms Used to Describe Defect Spacing[1]
>2000	Very widely spaced
600 – 2000	Widely spaced
200 – 600	Moderately spaced
60 – 200	Closely spaced
20 – 60	Very closely spaced
<20	Extremely closely spaced

[1]After ISO/CD14689 and ISRM.

ALLOWABLE SEAMS

Seams include clay, fragmented, highly weathered or similar zones, usually sub-parallel to the loaded surface. The limits suggested in the tables relate to a defined zone of influence. For pad footings, the zone of influence is defined as 1.5 times the least footing dimension. For socketed footings, the zone includes the length of the socket plus a further depth equal to the width of the footing. For tunnel or excavation assessment purposes the defects are assessed over a length of core of similar characteristics.

Source: Based on Pells et al (1978), as revised by Pells et al (1998).
Pells, P.J.N, Mostyn, G. and Walker, B.F. – Foundations on Sandstone and Shale in the Sydney Region. Australian Geomechanics Journal, No 33 Part 3, December 1998.

MACQUARIE GEOTECH

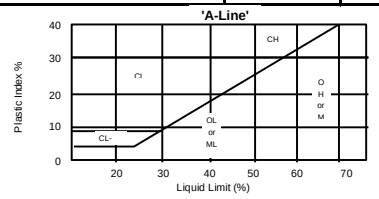
Summary of Soil Logging Procedures

Coarse Material: grain size - colour - particle shape - secondary components - minor constituents - moisture condition - relative density - origin - additional observations.

Fine Material: plasticity - colour - secondary components - minor constituents - moisture w.r.t. plasticity - consistency - origin - additional observations.

Guide to the Description, Identification and Classification of Soils

Major Divisions				SYMBOL	Typical Names
> 200mm	BOULDERS				
60 to 200mm	COBBLES				
COARSE GRAINED SOILS	More than 50% by dry mass less than 60mm is greater than 0.076mm	GRAVEL	More than 50% of coarse fraction > 2.36mm	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels.
		Gravelly Soils		GM	Silty gravels, gravel-sand-silt mixtures.
				GC	Clayey gravels, gravel-sand-clay mixtures
		SANDS	More than 50% of coarse fraction < 2.36mm	SW	Well-graded sands, gravelly sands, little or no fines.
				SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands.
		Sandy Soils		SM	Silty sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	More than 50% by dry mass less than 60mm is less than 0.076mm	Liquid Limit < 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
				OL	Organic silts and organic silty clays of low plasticity.
		Liquid Limit > 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS				Pt	Peat and other highly organic soils.



Grain sizes			
Gravel		Sand	
Coarse -	63 to 20mm	Coarse -	2.36 to 0.6mm
Medium -	20 to 6 mm	Medium -	0.6 to 0.2mm
Fine -	6 to 2.36mm	Fine -	0.2 to 0.075mm

GEOLOGICAL ORIGIN:-

Fill - artificial soils / deposits
Alluvial - soils deposited by the action of water
Aeolian - soils deposited by the action of wind
Topsoil - soils supporting plant life containing significant organic content
Residual - soils derived from insitu weathering of parent rock.
Colluvial - transported debris usually unsorted, loose and deposited

Field Identification of Fine Grained Soils - Silt or Clay?

Dry Strength - Allow the soil to dry completely and then test its strength by breaking and crumbling between the fingers.
High dry strength - Clays; Very slight dry strength - Silts.

Toughness Test - the soil is rolled by hand into a thread about 3mm in diameter. The thread is then folded and re-rolled repeatedly until it has dried sufficiently to break into lumps. In this condition inorganic clays are fairly stiff and tough while inorganic silts produce a weak and often soft thread which may be difficult to form and readily breaks and crumbles.

Dilatancy Test - Add sufficient water to the soil, held in the palm of the hand, to make it soft but not sticky. Shake horizontally, striking vigorously against the other hand several times. Dilatancy is indicated by the appearance of a shiny film on the surface of the soil. If the soil is then squeezed or pressed with the fingers, the surface becomes dull as the soil stiffens and eventually crumbles. These reactions are pronounced only for predominantly silt size material. Plastic clays give no reaction.

Descriptive Terms for Material Portions

COARSE GRAINED SOILS		FINE GRAINED SOILS	
% Fines	*Term/Modifier*	*% Coarse*	*Term/Modifier*
< 5	Omit, or use "trace"	< 15	Omit, or use "trace"
> 5, < 12	"with clay/silt" as applicable	> 15, < 30	"with sand/gravel" as applicable
> 12	Prefix soil as "silty/clayey"	> 30	Prefix as "sandy/gravelly"

Moisture Condition

for non-cohesive soils:

Dry -	runs freely through fingers.
Moist -	does not run freely but no free water visible on soil surface.
Wet -	free water visible on soil surface.

for cohesive soils:

MC > PL	Moisture content estimated to be greater than the plastic limit.
MC ~ PL	Moisture content estimated to be approximately equal to the plastic limit. The soil can be moulded
MC < PL	Moisture content estimated to be less than the plastic limit. The soil is hard and friable, or powdery.

The plastic limit (PL) is defined as the moisture content (percentage) at which the soil crumbles when rolled into threads of 3mm dia.

Consistency - For Clays & Silts

Description	*UCS(kPa)*	*Field guide to consistency*
Very soft	< 25	Exudes between the fingers when squeezed in hand
Soft	25 - 50	Can be moulded by light finger pressure
Firm	50 - 100	Can be moulded by strong finger pressure
Stiff	100 - 200	Cannot be moulded by fingers. Can be indented by thumb.
Very stiff	200 - 400	Can be indented by thumb nail
Hard	> 400	Can be indented with difficulty by thumb nail
Friable	-	Crumbles or powders when scraped by thumbnail

Relative Density for Gravels and Sands

Description	*SPT "N" Value*	*Density Index (ID) Range %*
Very loose	0 - 4	< 15
Loose	4 - 10	15 - 35
Medium dense	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very dense	> 50	> 85

MACQUARIE GEOTECH

Summary of Rock Logging Procedures

Description order: constituents - rock name - grain size - colour - weathering - strength - minor constituents - additional observations.
· minor constituents - moisture w.r.t. plasticity - consistency - origin - additional observations.

Definition - Sedimentary Rock

Conglomerate	more than 50% of the rock consists of gravel (>2mm) sized fragments
Sandstone	more than 50% of the rock consists of sand (0.06 to 2mm) sized grains
Siltstone	more than 50% of the rock consists of silt sized granular particles and the rock is not laminated
Claystone	more than 50% of the rock consists of clay or mica material and the rock is not laminated
Shale	more than 50% of the rock consists of clay or silt sized particles and the rock is laminated

Weathering

Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a change in volume but the soil has not significantly transported.
Extremely Weathered	EW	Rock is weathered to such an extent that it has 'soil' properties; ie. it either disintegrates or can be remoulded, in water
Distinctly Weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron-staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly Weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

Stratification

thinly laminated	<6mm	medium bedded	0.2 - 0.6m
laminated	6 - 20mm	thickly bedded	0.6 - 2m
very thinly bedded	20 - 60mm	very thickly bedded	>2m
thinly bedded	60mm - 0.2m		

Discontinuities

order of description: depth - type - orientation - spacing - roughness / planarity - thickness - coating

	Type	Class	Roughness/Planarity	Class	Roughness/Planarity
B	Bedding	I	rough or irregular, stepped	VI	slickensided, undulating
F	Fault	II	smooth, stepped	VII	rough or irregular, planar
C	Cleavage	III	slickensided, stepped	VIII	smooth, planar
J	Joint	IV	rough or irregular, undulating	IX	slickensided, planar
S	Shear Zone	V	smooth, undulating		
D	Drill break				

Rock Strength

Term		Is (50)	Field Guide
Extremely Low	EL		Easily remoulded by hand to a material with soil properties.
		0.03	
Very low	VL		May be crumbled in the hand. Sandstone is "sugary" and friable
		0.1	
Low	L		A piece of core 150 mm long x 50 mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
		0.3	
Medium	M		A piece of core 150 mm long x 50 mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.
		1	
High	H		A piece of core 150 mm long x 50 mm dia. core cannot be broken by unaided hands, can be slightly scratched or scored with knife.
		3	
Very High	VH		A piece of core 150 mm long x 50 mm dia. May be broken readily with hand held hammer. Cannot be scratched with pen knife.
		10	
Extremely High	EH		A piece of core 150 mm long x 50 mm dia. Is difficult to break with hand held hammer. Rings when struck with a hammer.

* - rock strength defined by point load strength (Is 50) in direction normal to bedding

Degree of fracturing

fragmented	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter
highly fractured	Core lengths are generally less than 20mm - 40mm with occasional fragments.
fractured	Core lengths are mainly 30mm - 100mm with occasional shorter and longer lengths
slightly fractured	Core lengths are generally 300mm - 1000mm with occasional longer sections and shorter sections of 100mm -- 300mm.
unbroken	The core does not contain any fracture.

- spacing of all types of natural fractures, but not artificial breaks, in cored bores.

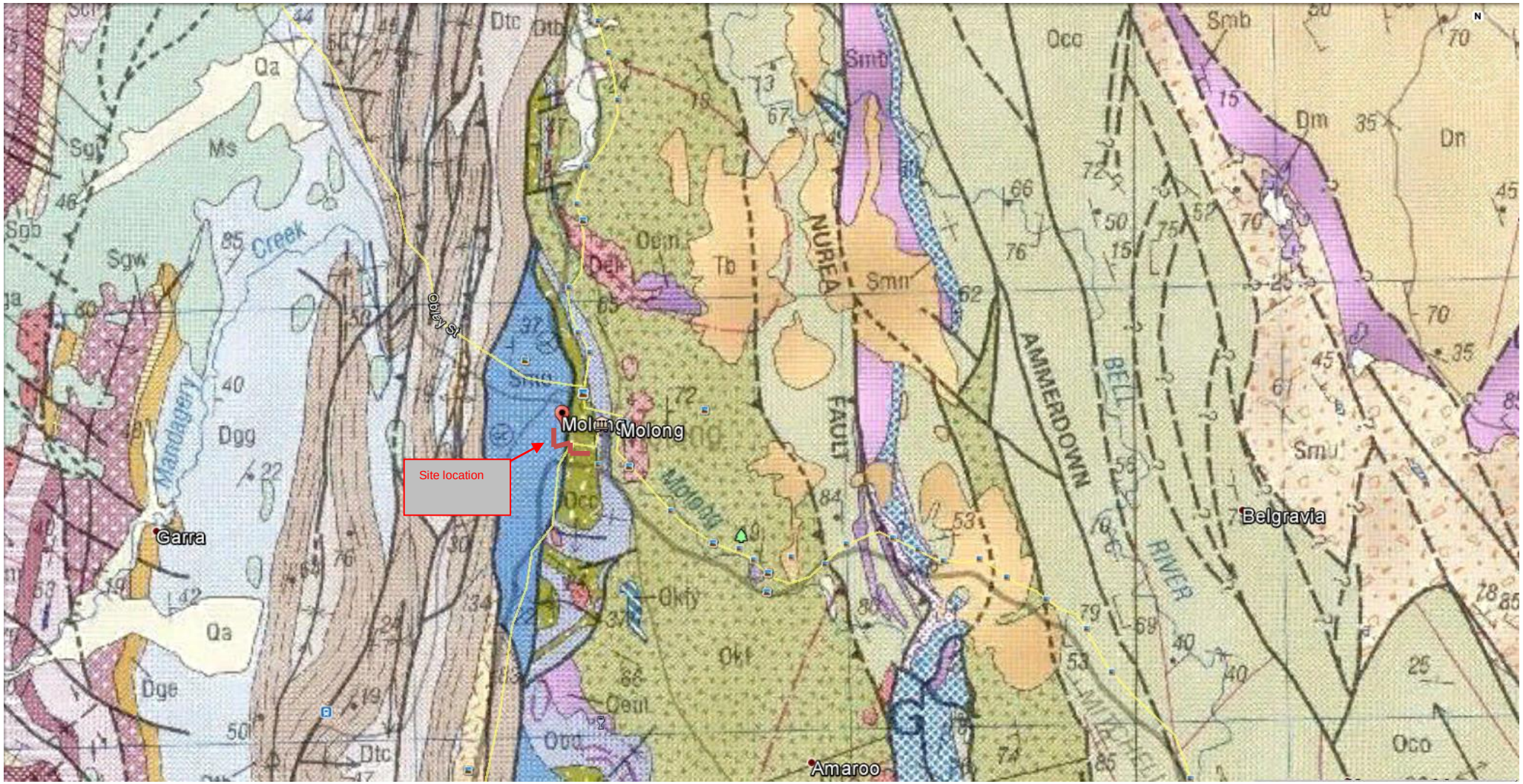
The fracture spacing is shown where applicable and the Rock Quality Designation is given by: RQD (%) = sum of unbroken core pieces 100 mm or longer

Appendix B – Site Plan & Test Locations


Trimble
BH10
BH11
BH12
BH13
Wellington St
Lee St
Philip St
Gidley St
Smith St
Edward St
Park St
McArdle St
© 2016 Google
Image © 2016 CNES / Astrium
Google Earth
Tour Guide
2007
Imagery Date: 10/14/2016 55 H 674032.81 m E 6336321.55 m S elev 567 m eye alt 1.09 km


Trimble
Wellington St
King St
Bridge St
Peabody Rd
Smith St
BH08
BH09
© 2016 Google
Image © 2016 CNES / Astrium
Google Earth
Tour Guide
2007
Imagery Date: 10/14/2016 55 H 673529.42 m E 6336446.65 m S elev 552 m eye alt 1.09 km


BH02
BH03
BH04
BH05
BH06
BH07
McGroder St
Wellington St
Trimble
© 2016 Google
Image © 2016 CNES / Astrium
Google Earth
Tour Guide
2007
Imagery Date: 10/14/2016 55 H 673237.82 m E 6336532.08 m S elev 547 m eye alt 1.09 km



Occ: Basaltic andesite, mafic and quartz latite, siltstone, sandstone, breccia, conglomerate
Smo: Massive to bedded, poorly to highly-fossiliferous limestone

Appendix C – Borehole Logs

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH02

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		ML	Clayey SILT: light brown, low plasticity, dry, stiff to very stiff			
			1		CL	Silty CLAY: orange/brown, low to medium plasticity, dry to slightly moist, very stiff			
			2			BH02 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

DCP (blows/100mm): 0 5 10 15 20 25

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH03

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		CL	Silty CLAY: grey/brown, low plasticity, dry, firm to stiff		0 5 10 15 20 25	
			1		CL	Silty CLAY: light brown/orange, low to medium plasticity, dry to slightly moist, stiff to very stiff			
			2		CL	Silty CLAY: orange/brown, medium plasticity, slightly moist, very stiff			
						BH03 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH04

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** --- **DATUM** ---

DRILLING CONTRACTOR --- **SLOPE** 90° **BEARING** ---

EQUIPMENT --- **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY** ---

NOTES --- **EASTING (m)** --- **NORTHING (m)** ---

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		CL	Silty CLAY: grey, low plasticity, dry, stiff		0 5 10 15 20 25	
					CL	Silty CLAY: orange/brown, low to medium plasticity, dry to slightly moist, stiff			
			1		CL	Silty CLAY: orange/brown, medium plasticity, slightly moist, firm			
			2		CL	Silty CLAY with trace gravels: orange, low to medium plasticity, fine sub-angular gravels, slightly moist, stiff			
						BH04 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH05

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR _____ **SLOPE** 90° **BEARING** ---

EQUIPMENT _____ **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY** _____

NOTES _____ **EASTING (m)** _____ **NORTHING (m)** _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm) 0 5 10 15 20 25	Additional Observations
					CL	Sandy/Silty CLAY with trace gravels: brown, low plasticity, fine sands, fine to medium sub-angular gravels, dry, very stiff			
			1		CL	Silty CLAY: orange/brown, low to medium plasticity, dry to slightly moist, very stiff			
					CL	Silty CLAY: orange/brown, medium plasticity, slightly moist, very stiff			
			2		CL	Silty CLAY with trace gravels: orange, low to medium plasticity, fine to medium sub-angular gravels, slightly moist, very stiff			
						BH05 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH06

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR _____ **SLOPE** 90° **BEARING** ---

EQUIPMENT _____ **HOLE LOCATION** Molong

HOLE SIZE 1.6 **LOGGED BY** SM **CHECKED BY** _____

NOTES _____ **EASTING (m)** _____ **NORTHING (m)** _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			1		CL	Silty CLAY with trace gravels: brown, low plasticity clay, fine to large sub-angluar gravels, dry, very stiff		0 5 10 15 20 25	
					CL	Silty CLAY with traces of gravels: red/brown, low to medium plasticity clay, fine to medium sub-angular gravels, dry to slighty moist, very stiff			
			2			Refusal, hard rock material BH06 terminated at 1.6m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH07

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm) 0 5 10 15 20 25	Additional Observations
			0		CL	Silty CLAY: light brown/orange, low plasticity, dry, very stiff			
					CL	Silty CLAY: orange/brown, medium plasticity, dry, very stiff			
			1		CL	Silty CLAY: red/brown, medium plasticity, dry to slightly moist, very stiff			
			2			BH07 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH08

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR _____ **SLOPE** 90° **BEARING** ---

EQUIPMENT _____ **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY** _____

NOTES _____ **EASTING (m)** _____ **NORTHING (m)** _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		CL	Silty CLAY with trace gravels: brown, low plasticity clay, fine sub-angular gravels, dry, stiff			
			1		CL	Silty CLAY with trace sand: dark brown, low to medium plasticity clay, fine to medium sands, slightly moist, firm to stiff			
			2		CL	Silty CLAY: dark brown, medium to high plasticity clay, slightly moist to moist, soft to firm			
						BH08 terminated at 2m			

DCP (blows/100mm): 0 5 10 15 20 25

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH09

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 0.9m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
					CL	Silty CLAY with trace gravel: dark brown, low plasticity clay, fine to large sub-angular gravels, dry, very stiff			
					CL	Silty CLAY with trace gravels: brown, low plasticity clay, fine to large sub-angluar gravels, dry to slightly moist, very stiff			
			1			Refusal, Large gravel material. BH09 terminated at 0.9m			

DCP (blows/100mm): 0 5 10 15 20 25

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH10

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		CL	Silty CLAY with trace gravels: orange/brown, low plasticity clay, fine to medium sub-angular gravel, dry to slightly moist, very stiff		0 5 10 15 20 25	
			1						
			2			BH10 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH11

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		CL	Silty CLAY with trace gravels: brown, low plasticity clay, fine to large sub-angular gravels, dry, very stiff		0 5 10 15 20 25	
			1		CL	Silty CLAY with trace gravels: brown, low to medium plasticity clay, fine sub-angluar gravels, slightly moist, stiff to very stiff			
			2			BH11 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH12

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR _____ **SLOPE** 90° **BEARING** ---

EQUIPMENT _____ **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY** _____

NOTES _____ **EASTING (m)** _____ **NORTHING (m)** _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm) 0 5 10 15 20 25	Additional Observations
			1		CL	Silty CLAY: red/brown, low plasticity clay, dry, stiff to very stiff			
			2		CL	Silty CLAY: brown/yellow, medium plasticity, slightly moist, stiff to very stiff			
			3			BH12 terminated at 2m			
			4						
			5						
			6						
			7						
			8						
			9						
			10						

MACQUARIE GEOTECH
Macquarie Geotech
3 Watt Drive
BATHURST NSW 2795
Telephone: (02) 6332 2011

BOREHOLE NUMBER BH13

CLIENT Cabonne Shire Council **PROJECT NAME** Molong Pipeline

PROJECT NUMBER B16565 **PROJECT LOCATION** Molong

DATE STARTED 12/12/16 **COMPLETED** 12/12/16 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---

EQUIPMENT **HOLE LOCATION** Molong

HOLE SIZE 2m **LOGGED BY** SM **CHECKED BY**

NOTES **EASTING (m)** **NORTHING (m)**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	DCP (blows/100mm)	Additional Observations
			0		CL	Silty CLAY with trace gravels: brown, low plasticity clay, fine to medium sub-angular gravels, dry, very stiff		0 5 10 15 20 25 >>	
			1		CL	Silty CLAY with trace gravels: orange, low to medium plasticity clay, fine to medium sub-angular gravels, slightly moist, very stiff			
			2			BH13 terminated at 2m			
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						

Appendix D – Laboratory Test Results

SOIL CHEMICAL PROPERTIES REPORT

Client:	Cabonne Shire Council	**Source:**	BH02 0.4-0.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Sandy CLAY
Project:	Molong Pipeline	**Report No:**	B34674-SCP
Job No:	B16565	**Lab No:**	B34674

Test Procedure:			
	☑	AS1289 4.2.1	Soil Chemical Tests - Determination of a sulfate content of a natural soil and the sulfate content of the groundwater - Normal Method
	☑	AS1289 4.3.1	Soil Chemical Tests - Determination of the pH value of a soil - Electrometric method
	☐	AS 1289 4.4.1	Soil Chemical Tests - Determination of the electrical resistivity of a soil - Method for sands and granular material
	☐	AS 1012.20	Chloride and sulphate
	☐	RMS T123	pH value of a soil (electrometric method)
	☐	RMS T185	Resistivity of sands and granular road construction materials
	☐	RMS T200	Chloride content of roadbase
	☑	RMS T1010	Quantitative determination of chlorides in soil
	☐	RMS T1011	Quantitative determination of sulphates in soil
	☐	BS1377(1990 pt.3)	Water soluble sulphate content
	☐	APHA 4500 H+B	pH
	☐	APHA 4500 SO4 2-B	Sulphate
	☐	APHA 4500 Cl-B	Chloride
	☑	APHA 2510 & 2520-B	Electrical Conductivity
	☐	TAI B117	Sulphides Present (This service Not Covered by NATA Accreditation)

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Sulphides Present	-
Sulphur Peroxide (%)	-
Sulphate content (ppm)	14.4
Sulphate content (%)	0.00
Chloride ion content (ppm)	63.2
Chloride ion content (%)	0.01
pH	6.8
Electrical Conductivity (uS/cm)	86.7
Mean Resistivity Ω.m	-
(Resisitivity) Density ratio (R_D)	-
(Resisitivity) Density index (I_D)	-

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Brad Morris

16/12/2016

Date:

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CLASSIFICATION REPORT

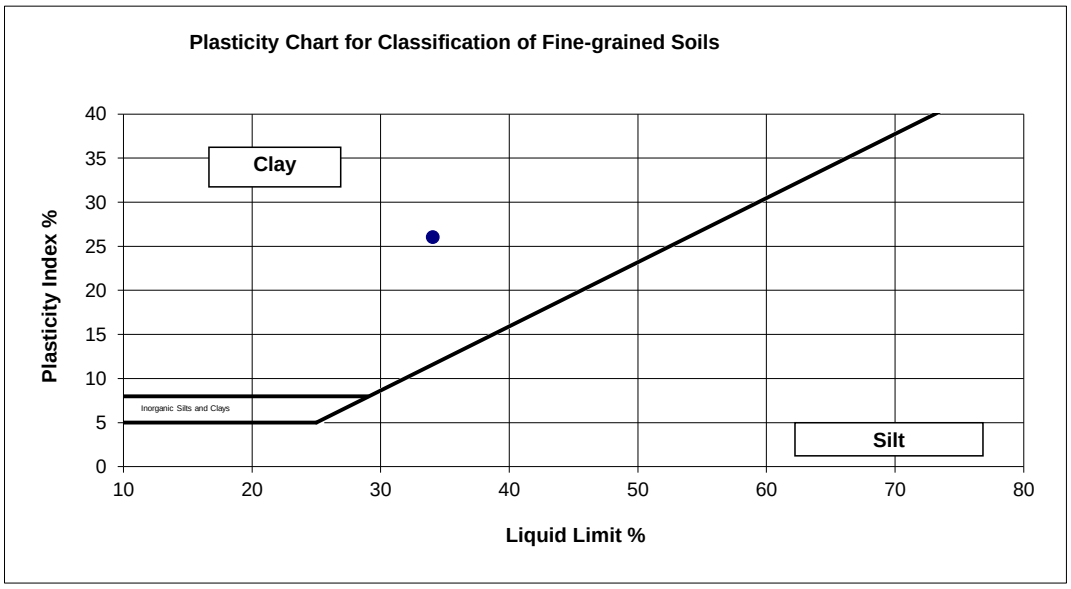
Client:	Cabonne Shire Council	**Source:**	BH02 1.4-1.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Silty CLAY
Project:	Molong Pipeline	**Report No:**	B34675-PI
Job No:	B16565	**Lab No:**	B34675

Test Procedure:

☐	AS1289 2.1.1	Soil moisture content tests (Oven drying method)
☑	AS1289 3.1.1	Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
☐	AS1289 3.1.2	Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
☑	AS1289 3.2.1	Soil classification tests - Determination of the plastic limit of a soil - Standard method
☑	AS1289 3.3.1	Soil classification tests - Calculation of the plasticity Index of a soil
☑	AS1289 3.4.1	Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Liquid Limit (%):	34	**Linear Shrinkage (%):**	6.5
Plastic Limit (%):	8	**Field Moisture Content (%):**	-
Plastic Index:	26		



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: NA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

John Boyle

23/12/2016

Date:

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CLASSIFICATION REPORT

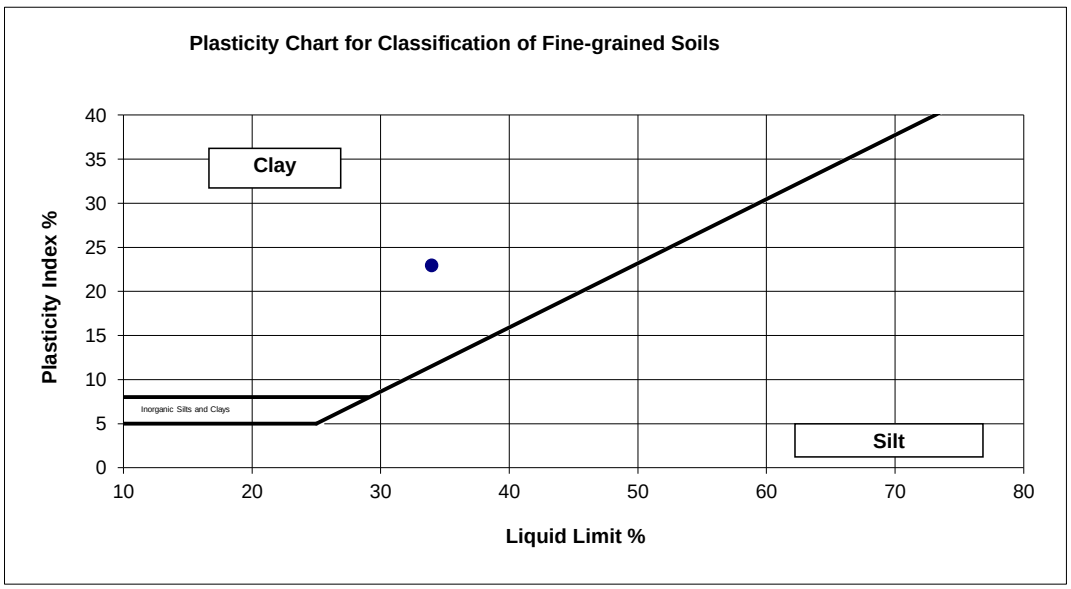
Client:	Cabonne Shire Council	**Source:**	BH04 0.4-0.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Silty CLAY
Project:	Molong Pipeline	**Report No:**	B34676-PI
Job No:	B16565	**Lab No:**	B34676

Test Procedure:

☐	AS1289 2.1.1	Soil moisture content tests (Oven drying method)
☑	AS1289 3.1.1	Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
☐	AS1289 3.1.2	Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
☑	AS1289 3.2.1	Soil classification tests - Determination of the plastic limit of a soil - Standard method
☑	AS1289 3.3.1	Soil classification tests - Calculation of the plasticity Index of a soil
☑	AS1289 3.4.1	Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Liquid Limit (%):	34	**Linear Shrinkage (%):**	9.0
Plastic Limit (%):	11	**Field Moisture Content (%):**	-
Plastic Index:	23		



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Curling Occuring

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

John Boyle

23/12/2016

Date:

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CHEMICAL PROPERTIES REPORT

Client:	Cabonne Shire Council	**Source:**	BH04 1.4-1.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Sandy CLAY
Project:	Molong Pipeline	**Report No:**	B34677-SCP
Job No:	B16565	**Lab No:**	B34677

Test Procedure:			
	☑	AS1289 4.2.1	Soil Chemical Tests - Determination of a sulfate content of a natural soil and the sulfate content of the groundwater - Normal Method
	☑	AS1289 4.3.1	Soil Chemical Tests - Determination of the pH value of a soil - Electrometric method
	☐	AS 1289 4.4.1	Soil Chemical Tests - Determination of the electrical resistivity of a soil - Method for sands and granular material
	☐	AS 1012.20	Chloride and sulphate
	☐	RMS T123	pH value of a soil (electrometric method)
	☐	RMS T185	Resistivity of sands and granular road construction materials
	☐	RMS T200	Chloride content of roadbase
	☑	RMS T1010	Quantitative determination of chlorides in soil
	☐	RMS T1011	Quantitative determination of sulphates in soil
	☐	BS1377(1990 pt.3)	Water soluble sulphate content
	☐	APHA 4500 H+B	pH
	☐	APHA 4500 SO4 2-B	Sulphate
	☐	APHA 4500 Cl-B	Chloride
	☑	APHA 2510 & 2520-B	Electrical Conductivity
	☐	TAI B117	Sulphides Present (This service Not Covered by NATA Accreditation)

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Sulphides Present	-
Sulphur Peroxide (%)	-
Sulphate content (ppm)	35.0
Sulphate content (%)	0.00
Chloride ion content (ppm)	240.4
Chloride ion content (%)	0.02
pH	8.0
Electrical Conductivity (uS/cm)	388.9
Mean Resistivity Ω.m	-
(Resisitivity) Density ratio (R_D)	-
(Resisitivity) Density index (I_D)	-

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Brad Morris

16/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CLASSIFICATION REPORT

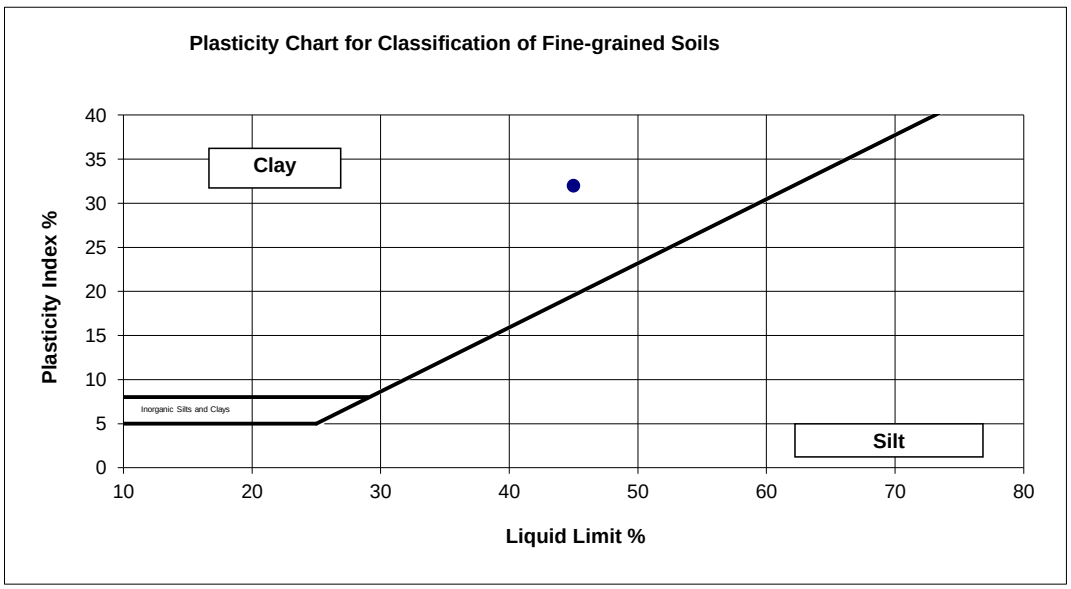
Client:	Cabonne Shire Council	**Source:**	BH06 0.4-0.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Silty CLAY: with trace gravel
Project:	Molong Pipeline	**Report No:**	B34678-PI
Job No:	B16565	**Lab No:**	B34678

Test Procedure:

☐	AS1289 2.1.1	Soil moisture content tests (Oven drying method)
☑	AS1289 3.1.1	Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
☐	AS1289 3.1.2	Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
☑	AS1289 3.2.1	Soil classification tests - Determination of the plastic limit of a soil - Standard method
☑	AS1289 3.3.1	Soil classification tests - Calculation of the plasticity Index of a soil
☑	AS1289 3.4.1	Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Liquid Limit (%):	45	**Linear Shrinkage (%):**	13.0
Plastic Limit (%):	13	**Field Moisture Content (%):**	-
Plastic Index:	32		



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Curling Occuring

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

John Boyle

23/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CHEMICAL PROPERTIES REPORT

Client:	Cabonne Shire Council	**Source:**	BH06 1.4-1.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Sandy CLAY
Project:	Molong Pipeline	**Report No:**	B34679-SCP
Job No:	B16565	**Lab No:**	B34679

Test Procedure:

☑	AS1289 4.2.1	Soil Chemical Tests - Determination of a sulfate content of a natural soil and the sulfate content of the groundwater - Normal Method
☑	AS1289 4.3.1	Soil Chemical Tests - Determination of the pH value of a soil - Electrometric method
☐	AS 1289 4.4.1	Soil Chemical Tests - Determination of the electrical resistivity of a soil - Method for sands and granular material
☐	AS 1012.20	Chloride and sulphate
☐	RMS T123	pH value of a soil (electrometric method)
☐	RMS T185	Resistivity of sands and granular road construction materials
☐	RMS T200	Chloride content of roadbase
☑	RMS T1010	Quantitative determination of chlorides in soil
☐	RMS T1011	Quantitative determination of sulphates in soil
☐	BS1377(1990 pt.3)	Water soluble sulphate content
☐	APHA 4500 H+B	pH
☐	APHA 4500 SO4 2-B	Sulphate
☐	APHA 4500 Cl-B	Chloride
☑	APHA 2510 & 2520-B	Electrical Conductivity
☐	TAI B117	Sulphides Present (This service Not Covered by NATA Accreditation)

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Sulphides Present	-
Sulphur Peroxide (%)	-
Sulphate content (ppm)	16.5
Sulphate content (%)	0.00
Chloride ion content (ppm)	96.4
Chloride ion content (%)	0.01
pH	7.6
Electrical Conductivity (uS/cm)	155.2
Mean Resistivity Ω.m	-
(Resisitivity) Density ratio (R_D)	-
(Resisitivity) Density index (I_D)	-

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Brad Morris

16/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CHEMICAL PROPERTIES REPORT

Client:	Cabonne Shire Council	**Source:**	BH07 0.9-1.0m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Sandy CLAY
Project:	Molong Pipeline	**Report No:**	B34680-SCP
Job No:	B16565	**Lab No:**	B34680

Test Procedure:

☑	AS1289 4.2.1	Soil Chemical Tests - Determination of a sulfate content of a natural soil and the sulfate content of the groundwater - Normal Method
☑	AS1289 4.3.1	Soil Chemical Tests - Determination of the pH value of a soil - Electrometric method
☐	AS 1289 4.4.1	Soil Chemical Tests - Determination of the electrical resistivity of a soil - Method for sands and granular material
☐	AS 1012.20	Chloride and sulphate
☐	RMS T123	pH value of a soil (electrometric method)
☐	RMS T185	Resistivity of sands and granular road construction materials
☐	RMS T200	Chloride content of roadbase
☑	RMS T1010	Quantitative determination of chlorides in soil
☐	RMS T1011	Quantitative determination of sulphates in soil
☐	BS1377(1990 pt.3)	Water soluble sulphate content
☐	APHA 4500 H+B	pH
☐	APHA 4500 SO4 2-B	Sulphate
☐	APHA 4500 Cl-B	Chloride
☑	APHA 2510 & 2520-B	Electrical Conductivity
☐	TAI B117	Sulphides Present (This service Not Covered by NATA Accreditation)

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Sulphides Present	-
Sulphur Peroxide (%)	-
Sulphate content (ppm)	20.6
Sulphate content (%)	0.00
Chloride ion content (ppm)	85.3
Chloride ion content (%)	0.01
pH	6.8
Electrical Conductivity (uS/cm)	115.9
Mean Resistivity Ω.m	-
(Resisitivity) Density ratio (R_D)	-
(Resisitivity) Density index (I_D)	-

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

JABoye

John Boye

23/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CLASSIFICATION REPORT

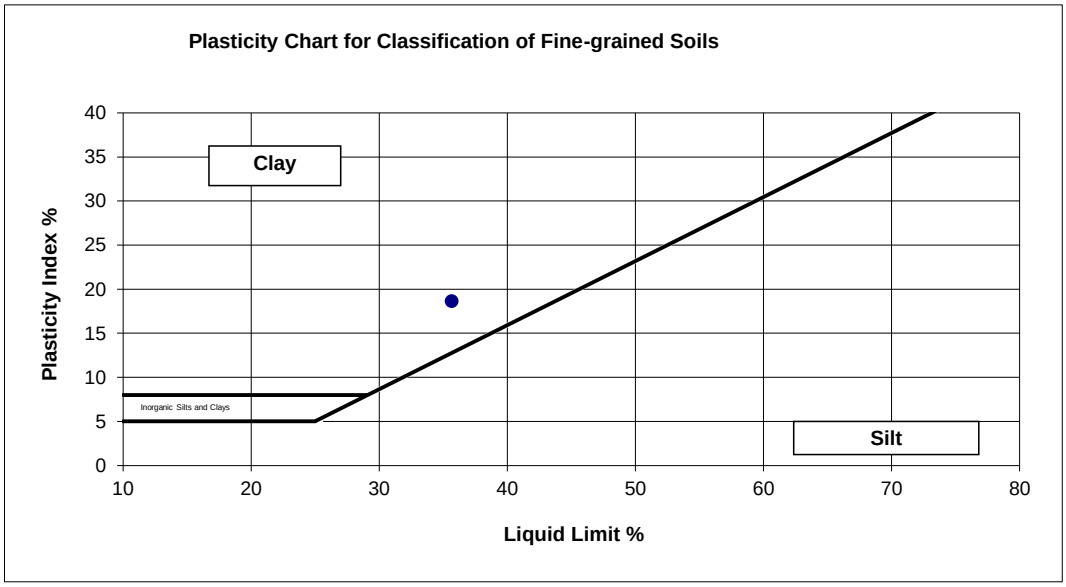
Client:	Cabonne Shire Council	**Source:**	BH09 0.8-0.9m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Silty CLAY: with gravel
Project:	Molong Pipeline	**Report No:**	B34681-PI
Job No:	B16565	**Lab No:**	B34681

Test Procedure:

- ☐ AS1289 2.1.1 Soil moisture content tests (Oven drying method)
- ☑ AS1289 3.1.1 Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
- ☐ AS1289 3.1.2 Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
- ☑ AS1289 3.2.1 Soil classification tests - Determination of the plastic limit of a soil - Standard method
- ☑ AS1289 3.3.1 Soil classification tests - Calculation of the plasticity Index of a soil
- ☑ AS1289 3.4.1 Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Liquid Limit (%):	36	**Linear Shrinkage (%):**	11.0
Plastic Limit (%):	17	**Field Moisture Content (%):**	-
Plastic Index:	19		



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Curling Occuring

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

John Boyle

Date: 23/12/2016

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CHEMICAL PROPERTIES REPORT

Client:	Cabonne Shire Council	**Source:**	BH10 0.4-0.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Sandy CLAY
Project:	Molong Pipeline	**Report No:**	B34682-SCP
Job No:	B16565	**Lab No:**	B34682

Test Procedure:

☑	AS1289 4.2.1	Soil Chemical Tests - Determination of a sulfate content of a natural soil and the sulfate content of the groundwater - Normal Method
☑	AS1289 4.3.1	Soil Chemical Tests - Determination of the pH value of a soil - Electrometric method
☐	AS 1289 4.4.1	Soil Chemical Tests - Determination of the electrical resistivity of a soil - Method for sands and granular material
☐	AS 1012.20	Chloride and sulphate
☐	RMS T123	pH value of a soil (electrometric method)
☐	RMS T185	Resistivity of sands and granular road construction materials
☐	RMS T200	Chloride content of roadbase
☑	RMS T1010	Quantitative determination of chlorides in soil
☐	RMS T1011	Quantitative determination of sulphates in soil
☐	BS1377(1990 pt.3)	Water soluble sulphate content
☐	APHA 4500 H+B	pH
☐	APHA 4500 SO4 2-B	Sulphate
☐	APHA 4500 Cl-B	Chloride
☑	APHA 2510 & 2520-B	Electrical Conductivity
☐	TAI B117	Sulphides Present (This service Not Covered by NATA Accreditation)

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Sulphides Present	-
Sulphur Peroxide (%)	-
Sulphate content (ppm)	26.8
Sulphate content (%)	0.00
Chloride ion content (ppm)	121.9
Chloride ion content (%)	0.01
pH	6.8
Electrical Conductivity (uS/cm)	189.5
Mean Resistivity Ω.m	-
(Resisitivity) Density ratio (R_D)	-
(Resisitivity) Density index (I_D)	-

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Brad Morris

16/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CLASSIFICATION REPORT

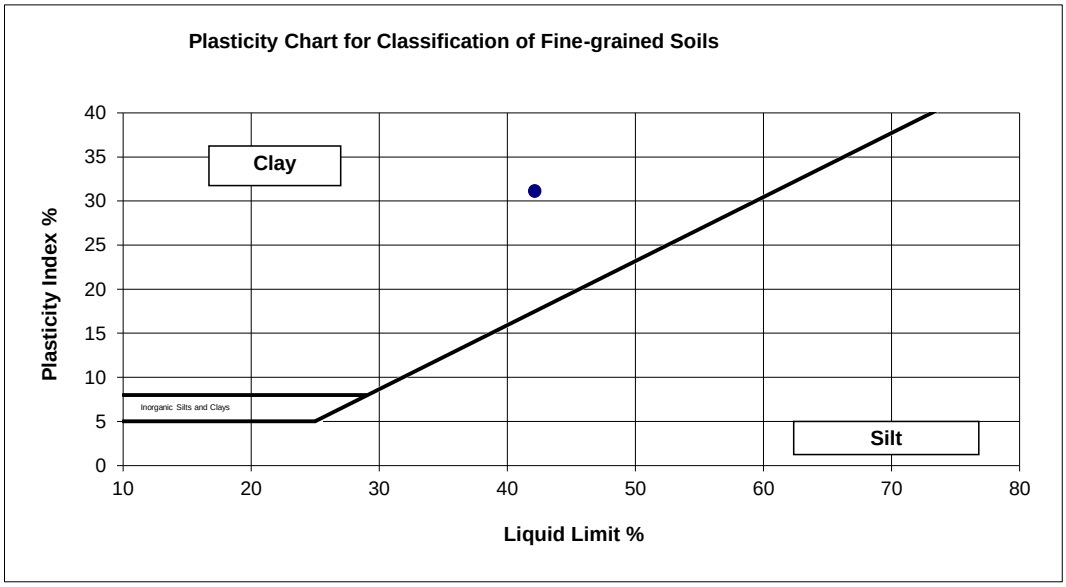
Client:	Cabonne Shire Council	**Source:**	BH10 1.4-1.5m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Silty CLAY: with gravel
Project:	Molong Pipeline	**Report No:**	B34683-PI
Job No:	B16565	**Lab No:**	B34683

Test Procedure:

- ☐ AS1289 2.1.1 Soil moisture content tests (Oven drying method)
- ☑ AS1289 3.1.1 Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
- ☐ AS1289 3.1.2 Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
- ☑ AS1289 3.2.1 Soil classification tests - Determination of the plastic limit of a soil - Standard method
- ☑ AS1289 3.3.1 Soil classification tests - Calculation of the plasticity Index of a soil
- ☑ AS1289 3.4.1 Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Liquid Limit (%):	42	**Linear Shrinkage (%):**	11.5
Plastic Limit (%):	11	**Field Moisture Content (%):**	-
Plastic Index:	31		



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Curling Occuring

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

JABoyle

John Boyle

23/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CLASSIFICATION REPORT

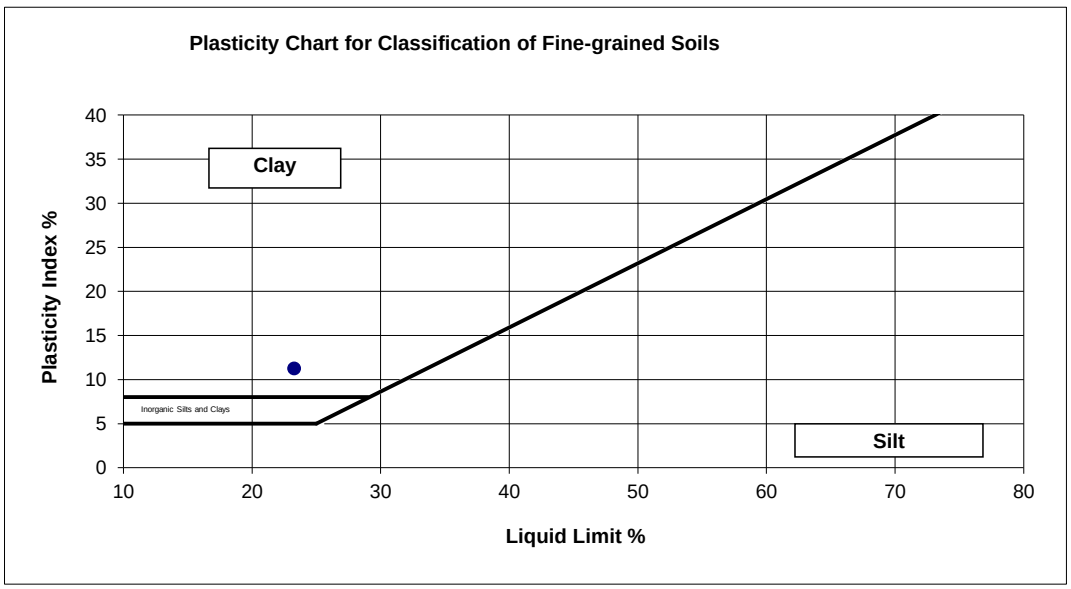
Client:	Cabonne Shire Council	**Source:**	BH12 0.9-1.0m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Silty CLAY
Project:	Molong Pipeline	**Report No:**	B34684-PI
Job No:	B16565	**Lab No:**	B34684

Test Procedure:

- ☐ AS1289 2.1.1 Soil moisture content tests (Oven drying method)
- ☑ AS1289 3.1.1 Soil classification tests - Determination of the liquid limit of a soil - Four point casagrande method
- ☐ AS1289 3.1.2 Soil classification tests - Determination of the liquid limit if a soil - One point Casagrande method (subsidiary method)
- ☑ AS1289 3.2.1 Soil classification tests - Determination of the plastic limit of a soil - Standard method
- ☑ AS1289 3.3.1 Soil classification tests - Calculation of the plasticity Index of a soil
- ☑ AS1289 3.4.1 Soil classification tests - Determination of the linear shrinkage of a soil - Standard method

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Liquid Limit (%):	23	**Linear Shrinkage (%):**	6.0
Plastic Limit (%):	12	**Field Moisture Content (%):**	-
Plastic Index:	11		



Soil Preparation Method: Dry Sieved
Soil History: Oven Dried
Soil Condition: Linear

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

JABoyle

John Boyle

23/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795

SOIL CHEMICAL PROPERTIES REPORT

Client:	Cabonne Shire Council	**Source:**	BH12 1.9-2.0m
Address:	PO Box 17 Molong NSW 2866	**Sample Description:**	Sandy CLAY
Project:	Molong Pipeline	**Report No:**	B34685-SCP
Job No:	B16565	**Lab No:**	B34685

Test Procedure:			
	☑	AS1289 4.2.1	Soil Chemical Tests - Determination of a sulfate content of a natural soil and the sulfate content of the groundwater - Normal Method
	☑	AS1289 4.3.1	Soil Chemical Tests - Determination of the pH value of a soil - Electrometric method
	☐	AS 1289 4.4.1	Soil Chemical Tests - Determination of the electrical resistivity of a soil - Method for sands and granular material
	☐	AS 1012.20	Chloride and sulphate
	☐	RMS T123	pH value of a soil (electrometric method)
	☐	RMS T185	Resistivity of sands and granular road construction materials
	☐	RMS T200	Chloride content of roadbase
	☑	RMS T1010	Quantitative determination of chlorides in soil
	☐	RMS T1011	Quantitative determination of sulphates in soil
	☐	BS1377(1990 pt.3)	Water soluble sulphate content
	☐	APHA 4500 H+B	pH
	☐	APHA 4500 SO4 2-B	Sulphate
	☐	APHA 4500 Cl-B	Chloride
	☑	APHA 2510 & 2520-B	Electrical Conductivity
	☐	TAI B117	Sulphides Present (This service Not Covered by NATA Accreditation)

Sampling:	Sampled by Macquarie Geotechnical Staff in accordance with AS1289 1.1	**Date Sampled:**	12/12/2016
Preparation:	Prepared in accordance with the test method		

Sulphides Present	-
Sulphur Peroxide (%)	-
Sulphate content (ppm)	24.7
Sulphate content (%)	0.00
Chloride ion content (ppm)	43.2
Chloride ion content (%)	0.00
pH	7.6
Electrical Conductivity (uS/cm)	65.4
Mean Resistivity Ω.m	-
(Resisitivity) Density ratio (R_D)	-
(Resisitivity) Density index (I_D)	-

NATA

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Brad Morris

16/12/2016

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
3 Watt Drive
Bathurst NSW 2795