R.W. CORKERY & CO.
PTY. LIMITED ABN 31 002 033 712
GEOLOGICAL & ENVIRONMENTAL CONSULTANTS

28 June 2013

General Manager
Penrith City Council
PO Box 60
PENRITH NSW 2751

Attention: Gurvinder Singh

Dear Sir/Madam

Re: Statement of Environmental Effects for the Erskine Park Landfill Gas Project

Please find enclosed:

1. a copy of the original Application form, including landowners' consents and a cost report;
2. six complete copies of the Statement of Environmental Effects including a CD on the inside front cover of each report; and
3. a cheque covering the fees relevant to the Application.

I trust the documentation provided fully meets Council's requirements and that the application can be processed expeditiously. In this regard, I would appreciate it if you could please provide an indication to the timing of Council's review and determination.

Should you have any questions about the documentation enclosed, please don't hesitate to contact either Rob Corkery or myself in our Brooklyn office.

Yours sincerely

David Schumacher
Environmental Consultant

Encls: 1. 2. and 3. above

Copy: The Austral Brick Company Pty Limited

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THE AUSTRAL BRICK COMPANY PTY LIMITED

ABN: 52 000 005 550

Statement of Environmental Effects

for the

Erskine Park Landfill Gas Project

June 2013

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

The Austral Brick Company Pty Limited

ABN: 52 000 005 550

Statement of Environmental Effects

for the

Erskine Park Landfill Gas Project

Prepared for:

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Ref No. 863/02(F)

June 2013

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EXECUTIVE SUMMARY

Introduction

This *Statement of Environmental Effects* has been prepared for The Austral Brick Company Pty Limited (Austral) by R.W. Corkery & Co. Pty. Limited to accompany applications to Penrith City Council and Fairfield City Council for the Erskine Park Landfill Gas Project.

Specifically, Austral proposes to construct a pipeline to deliver landfill gas from the Erskine Park Waste Management Facility (EPWMF) to the nearby brick manufacturing plant (Plant 23) which is owned and operated by Austral.

The Applicant

Austral is one of the key companies within the Buildings Product Group of Brickworks Limited. Austral first commenced manufacturing bricks at the Plant 23 site in the early 1970s.

Background

The EPWMF is owned and operated by Transpacific Industries Pty Limited (Transpacific), which purchased the facility in 2007. The EPWMF is located within and adjacent to a former breccia quarry void which has been utilised as a landfill since 1994.

Landfill gas currently being collected is able to generate approximately 1365 gigajoules of energy per day, or approximately 498 terajoules per year, a level that can be used efficiently in Austral's Plant 23 located in nearby Horsley Park.

In recognition that sufficient landfill gas can be recovered from the EPWMF for use in Plant 23, both Transpacific and Austral have reached an agreement for the supply of the gas from the EPWMF to Plant 23. Hence, this document has been prepared and development applications lodged with Penrith City Council and Fairfield City Council.

Assessment of Environmental Effects

This *Statement of Environmental Effects* has assessed the following environmental issues that could be potentially affected by the Project.

- Soil and Water Resources.
- Noise.
- Visibility.
- Ecology.
- Groundwater.
- Air Quality.
- Existing Infrastructure.
- Landfill Gas Combustion.

Conclusions

The assessments of the environmental effects have concluded that the residual effects of the proposed installation of the pipeline would be negligible given the minor nature of the construction operations, and the operational safeguards Austral would adopt during the comparative short construction period. Once operational and delivering gas to Plant 23, operation of the pipeline would have no environmental effects along its length. The proposed pipeline would in fact reduce Austral's reliance on natural gas and reduce the carbon emissions

resulting from the EPWMF. These factors are in Austral's, Transpacific's and the public's interest. Following the assessment of the potential environmental effects of the Project, it is concluded that there is no evident environmental reason to prevent the Project from proceeding.

It is concluded, following the assessment of the potential effects of the Project on the environment, there is no evident environmental reason to prevent the Project from proceeding.

Section 1
Introduction

1.1 SCOPE

This Statement of Environmental Effects (SoEE) has been prepared to accompany development applications (see **Appendix 1**) by The Austral Brick Company Pty Limited ("Austral") to Penrith City Council and Fairfield City Council for the Erskine Park Landfill Gas Project ("the Project").

This document focuses upon the works necessary to allow landfill gas to be delivered from the Erskine Park Waste Management Facility (EPWMF) to the nearby brick manufacturing plant (Plant 23) owned and operated by Austral.

Figure 1.1 displays the location of the EPWMF, Horsley Park Plant 23 (hereafter "Plant 23"), and the alignment of the proposed gas pipeline.

1.2 THE APPLICANT

The Austral Brick Company Pty Limited is one of the key companies within the Buildings Product Group of Brickworks Limited. Austral first commenced manufacturing bricks at the Plant 23 site in the early 1970s.

1.3 BACKGROUND

1.3.1 Erskine Park Waste Management Facility

The EPWMF is owned and operated by Transpacific Industries Pty Limited (Transpacific), which purchased the facility in 2007. The EPWMF is located within and adjacent to a former breccia quarry void which has been utilised as a landfill since 1994. **Figure 1.2** shows the local setting of the EPWMF.

To date, approximately 13 million tonnes of non-putrescible waste has been placed into the quarry void at the EPWMF and the production of resultant landfill gas steadily increased.

Figure 1.3 displays the actual and projected landfill gas collected from the EPWMF. The quantity of gas collected represents a level which may be used as a substitute for natural gas to fire the kilns at Plant 23.

Figure 1.1
LOCALITY PLAN

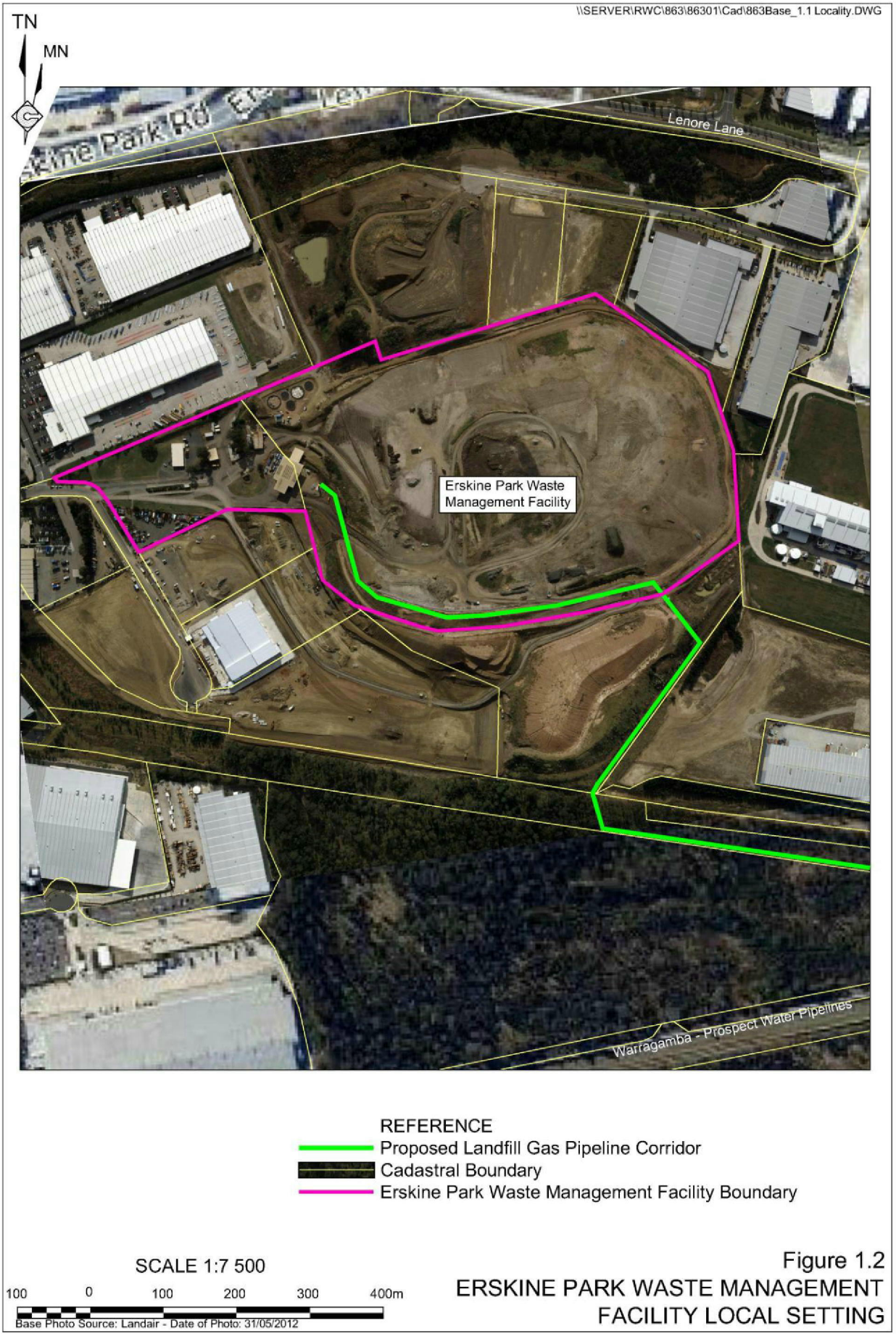
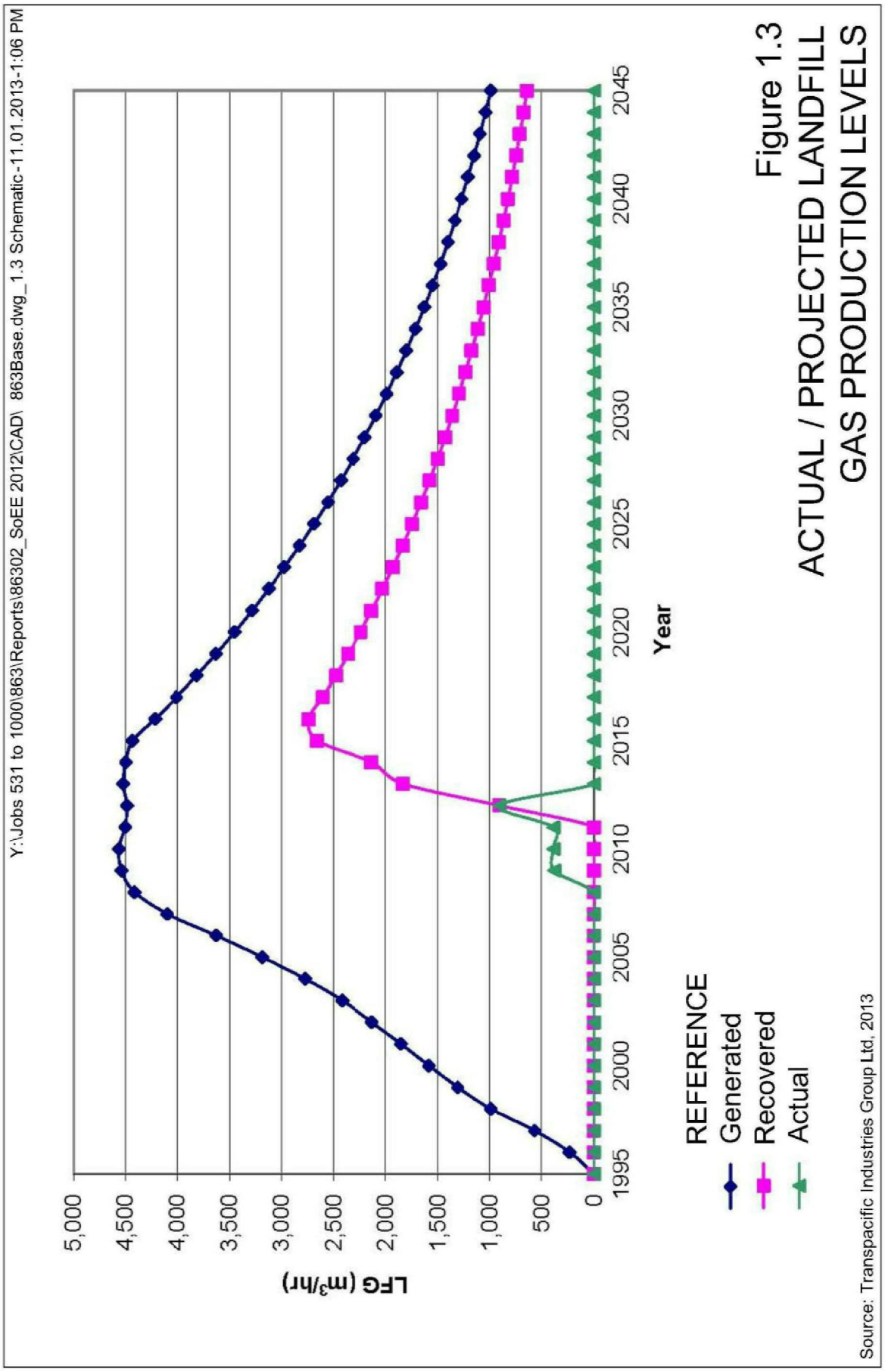


Figure 1.2
ERSKINE PARK WASTE MANAGEMENT FACILITY LOCAL SETTING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LFG (m³/hr)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
Year
REFERENCE
Generated
Recovered
Actual
Figure 1.3
ACTUAL / PROJECTED LANDFILL
GAS PRODUCTION LEVELS
Source: Transpacific Industries Group Ltd, 2013

The quantity of landfill gas currently being collected is able to generate approximately 1365 gigajoules of energy per day, or approximately 498 terajoules per year, a level that can be used efficiently in Plant 23.

In recognition that sufficient landfill gas can be recovered from the EPWMF for use in Plant 23, both Transpacific and Austral have reached an agreement for the supply of the gas from the EPWMF to Plant 23. Hence, this document has been prepared and development applications lodged with Penrith City Council and Fairfield City Council.

Transpacific Flare Unit

Transpacific has constructed a flare unit in a fenced compound adjacent to the northern boundary of the EPWMF. **Plates 1.1** and **1.2** show the flare unit and its 10m high exhaust stack. The flare unit has the capacity to combust up to 3 000m^3 of landfill gas per hour. **Plate 1.3** shows one of numerous existing landfill gas collection bores located on the EPWMF which is used around the landfill site.

1.3.2 Horsley Park Plant 23

Plant 23 has a capacity to produce up to approximately 130 million bricks per year.

The two tunnel kilns in Plant 23 are currently operating using approximately 15 million m^3 of natural gas per year. This quantity of gas generates approximately 580 terajoules of energy per year.

1.4 CONSULTATION

Pre-lodgement meetings for the Project have been held with the following officers of Penrith City Council and Fairfield City Council. The meeting with Penrith City Council was held on 31 July 2012 with the following Council officers.

- Mr Gurvinder Singh (Senior Planner).
- Mr Adrian Estridge (Environmental Officer).
- Ms Christine Martin (Administration Officer).

The meeting with Fairfield City Council was held on 25 July 2012 with the following Council officers.

- Mr Mark Stephenson (Senior Development planner).
- Mr Nelson Mu (Senior Development planner).).
- Ms Nicoleta Diacopoulos (Assistant Subdivision Engineer).
- Mr Wayne Pope (Subdivisions Inspector).
- Mr Trevor Winple (Environmental Health Officer).

Consultation has also been undertaken with all landowners whose land is proposed to be impacted by the proposed pipeline corridor.

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Plate 1.1: Existing Erskine Park Waste Management Facility flare and exhaust stack (Ref: E863B/001)

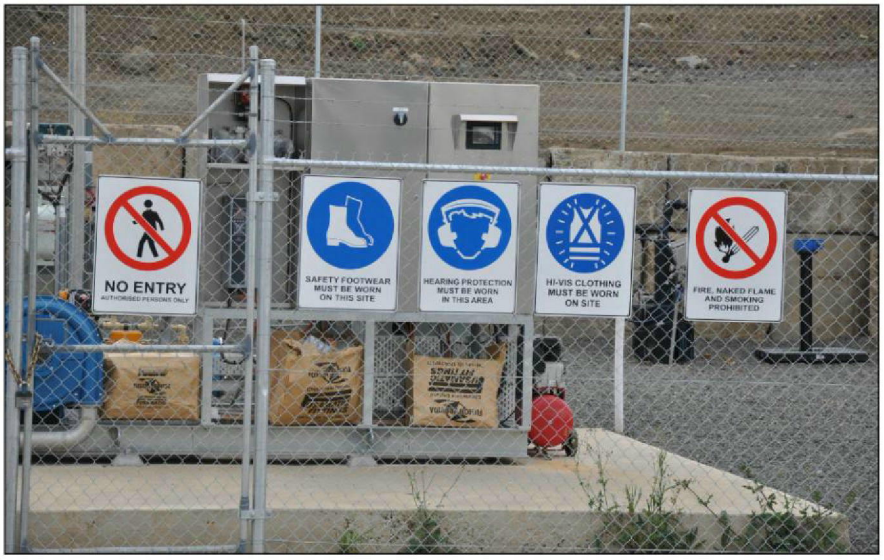


Plate 1.2: Components and instrumentation of the Erskine Park Waste Management Facility Flare unit (Ref: E863B/002)

Plate 1.3: Existing landfill gas collection bore (Ref: E863B/009)

1.5 MANAGEMENT OF INVESTIGATIONS

The preparation of this document has involved a study team managed by Mr Rob Corkery, M.Appl.Sc., B.Sc (Hons), Principal of R.W. Corkery & Co. Pty Limited, assisted by Mr David Schumacher, B.Soc.Sc (Hons), Environmental Consultant with the same company. Information about the Project has been provided by both Transpacific and Austral personnel. Key personnel involved in the supply of information have been.

- Mr Stephen Wall – NSW Manufacturing Manager (Austral).
- Mr Robert Zvirgzdins – Mining and Raw Materials Manager (Austral).
- Ms Cassandra Steppacher – Environmental Officer (Austral).
- Mr Eric Le Provost – State Manager - NSW Post Collections (TPI).

Section 2
Description of the Proposal

2.1 INTRODUCTION

The Erskine Park Landfill Gas Project is described in this section in sufficient detail to allow Penrith City Council and Fairfield City Council to approve the installation of a buried gas pipeline and associated components to enable landfill gas to be delivered from the EPWMF to Plant 23.

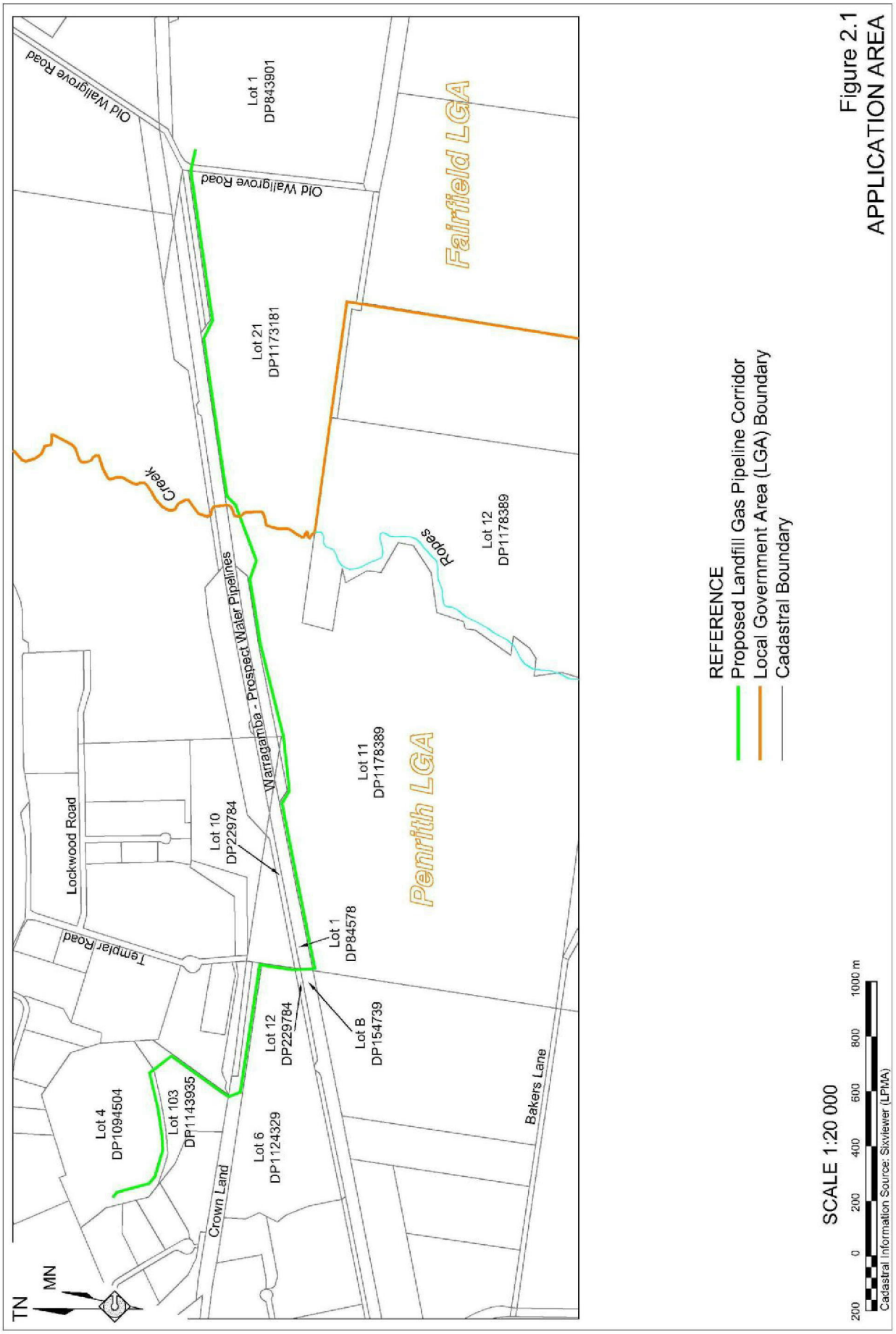
2.2 THE APPLICATION AREA

The area to which the development applications relate is shown in **Figure 2.1**. **Table 2.1** sets out the relevant land ownership details for those land parcels through which the pipeline corridor would pass, the locations of which are shown in **Figure 2.2**.

Table 2.1
Land Ownership – Landfill Gas Pipeline Corridor

Identifier	Landowner	Lot/DP*	Parish / County	Local Government Area	Land Zoning (SEPP WSEA 2009)
2	Enviroguard Pty Limited and CSR Limited	Lot 4 DP 1094504	Claremont / Cumberland	Penrith City	IN1 (General Industrial) / E2 (Environmental Conservation)
3	CSR Limited	Lot 103 DP 1143935	Claremont / Cumberland	Penrith City	E2
4	Minister Administering the Environmental Planning & Assessment Act 1979	Lot 6 DP 1124329	Claremont / Cumberland	Penrith City	E2
5	Sydney Catchment Authority	Lot 10 DP 229784 Lot 12 DP 229784, Lot B DP 154739, Lot 1 DP 84578	Claremont / Cumberland	Penrith City	N/A
6	The Austral Brick Company Pty Limited	Lot 11 DP 1178389	Claremont / Cumberland	Penrith City	IN1 / E2
7	BGAI 6 Pty Limited	Lot 21 DP 1173181	Melville / Cumberland	Fairfield City	IN1 / E2
8	The Austral Brick Company Pty Limited	Lot 1 DP 843901	Melville / Cumberland	Fairfield City	IN1

* See **Figure 2.1**


Old Wallgrove Road
Old Wallgrove Road
Lot 1
DP843901
Fairfield LGA
Lot 21
DP1173181
Creek
Lot 12
DP1178389
Popes
Warragamba - Prospect Water Pipelines
Lockwood Road
Lot 10
DP229784
Lot 11
DP1178389
Penrith LGA
Templar Road
Lot 1
DP84578
Lot 12
DP229784
Lot B
DP154739
Bakers Lane
Lot 4
DP1094504
Lot 103
DP1143935
Lot 6
DP1124329
Crown Land
TN
MN
REFERENCE
Proposed Landfill Gas Pipeline Corridor
Local Government Area (LGA) Boundary
Cadastral Boundary
SCALE 1:20 000
200 0 200 400 600 800 1000 m
Cadastral Information Source: Sixviewer (LPMA)
Figure 2.1
APPLICATION AREA

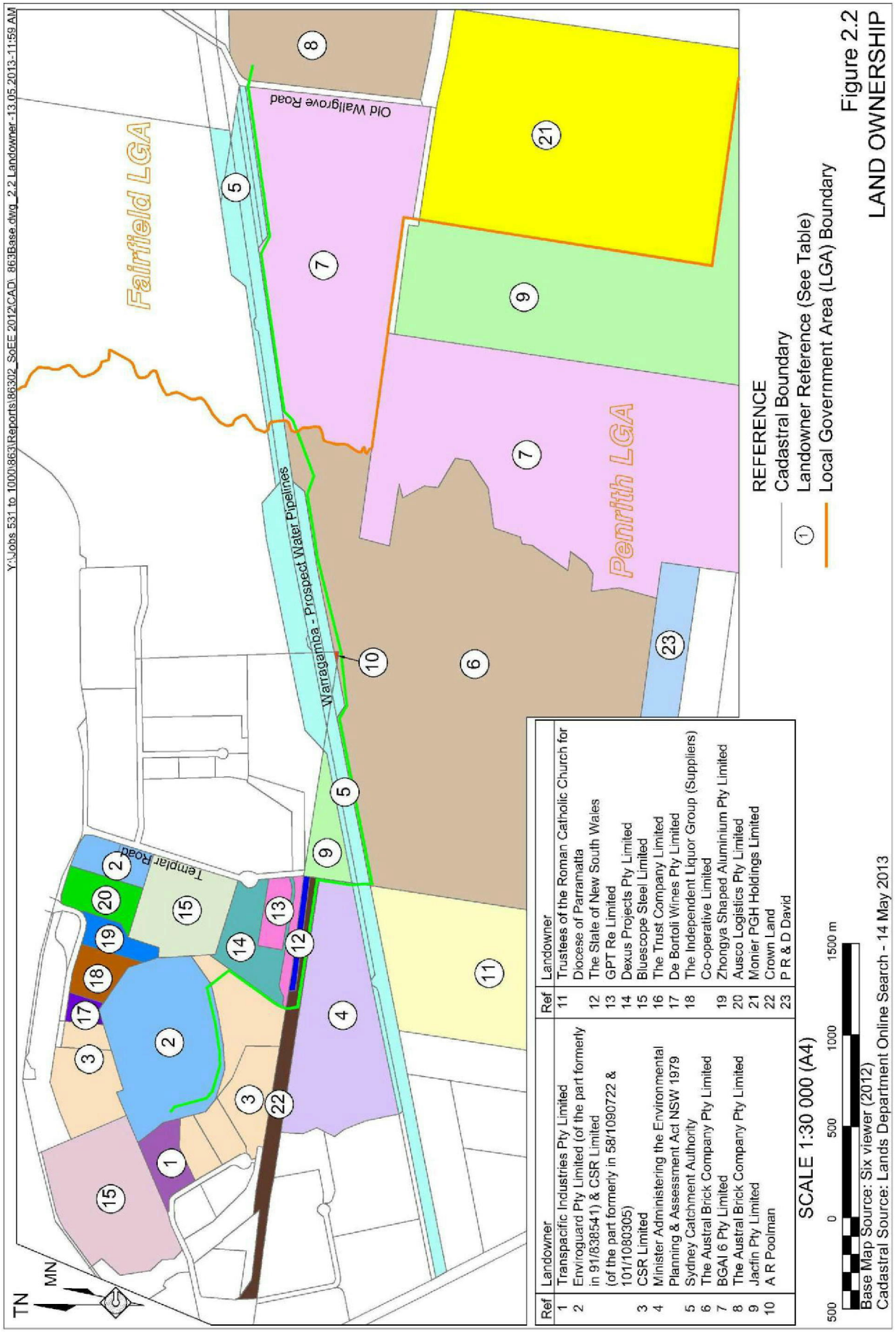


Figure 2.2
LAND OWNERSHIP

2.3 APPROVALS REQUIRED

In order for the Erskine Park Landfill Gas Project to proceed, the following two key approvals are required.

- Development Consent – Penrith City Council

  Development consent from Penrith City Council under Part 4 of the *Environmental Planning and Assessment Act 1979* is required by Austral for the construction and operation of the compression plant and installation of the proposed pipeline between the EPWMF and Ropes Creek, being the boundary of the Penrith Local Government Area. This *Statement of Environmental Effects* has been prepared in support of the development application.

- Development Consent – Fairfield City Council

  Development consent from Fairfield City Council under Part 4 of the *Environmental Planning and Assessment Act 1979* is required by Austral for the construction and operation of the proposed pipeline between Ropes Creek, being the boundary of the Fairfield Local Government Area and Plant 23. This *Statement of Environmental Effects* has been prepared in support of the development application.

The Project is an integrated development as it traverses two Local Government Areas and requires at least one additional approval issued by an approval body. The following additional approvals are required, all of which require the aforementioned development consents to be issued prior to their issue.

- A Controlled Activity Approval – NSW Office of Water

  A controlled activity approval would be required from the NSW Office of Water since the proposed pipeline corridor (see **Figure 2.3**) has been defined such that it passes under Ropes Creek and an unnamed tributary of Ropes Creek.

- A Section 138 Permit – Penrith City Council

  A permit under Section 138 of the *Roads Act 1993* would be required for works within the crown road reserve. This permit would be sought prior to the commencement of the proposed works.

- A Section 138 Permit – Fairfield City Council

  A permit under Section 138 of the *Roads Act 1993* would be required for works within Old Wallgrove Road road reserve. This permit would be sought prior to the commencement of the proposed works.

Austral also notes the following.

- The Project is not a designated development since it would not exceed the thresholds for designated development. Schedule 3(1) of the *EP&A Regulation 2000* does not nominate any development that applies to the Project.

- The Project is not State Significant Infrastructure since it would not exceed the thresholds established in *State Environmental Planning Policy (State and Regional Development) 2011* i.e. the pipeline would be less than 10km in length, a pre-requisite of the *Gas Pipelines Act 1967*.

2.4 STATUTORY PLANNING CONSIDERATIONS

2.4.1 Introduction

A number of State and local planning instruments apply to the Project. These planning instruments have been reviewed to identify any environmental aspects requiring consideration in the preparation of this document.

A brief summary of each relevant planning instrument is provided in the following subsections. The application and relevance of planning instruments related to specific environmental issues have been addressed in Section 5.2.

2.4.2 Penrith City Council

This subsection addresses the Project with respect to the relevant sections of the Penrith LEP (2010) and the Penrith Development Control Plan (DCP) 2006.

Penrith LEP 2010

The Penrith LEP 2010 is the current guiding planning instrument with the location of the Application Area located within an area in which zones have not been assigned. As such, the Project is unable to be assessed in accordance with the objectives of the Penrith DCP 2006.

Penrith Development Control Plan (DCP) 2006

Section 6.10 of the Penrith DCP 2006 relates to the Erskine Business Park, which includes all of the lands within the Penrith LGA to which the Project relates. Zoning within this area is directly drawn from the *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (SEPP WSEA) which provides for a mix of Industrial and Environmental Conservation zoned lands (see **Table 2.1**). The relevant sections of the SEPP WSEA addressed in Section 2.4.4 of this document.

Section 4.9 of the Penrith DCP 2006 relates directly to the EPWMF site, and requires that all development on the site be consistent with both the 2006 Biodiversity Management Plan and the Enviroguard Erskine Park Landfill Environment Management Plan. The proposed pipeline would be constructed in accordance with these documents, as required.

2.4.3 Fairfield City Council

This subsection addresses the Project with respect to the relevant sections of the current *Fairfield Local Environmental Plan (LEP) 1994*, the Draft Fairfield LEP (2011) and the *Fairfield City Wide Development Control Plan (DCP) 2006*.

Fairfield LEP 1994

The *Fairfield LEP 1994* is the current guiding planning instrument with the location of the Project located within an area entitled "Unzoned" as per Fairfield LEP 1994 – Map No.65. As such, the Project is unable to be assessed in accordance with the objectives of the *Fairfield LEP 1994*.

Draft Fairfield LEP 2011

Recommendations were put forward by Council's LEP Committee in relation to the Draft Fairfield LEP 2011 and passed by Council on 24 April 2012 with the LEP subsequently sent to the Department of Planning and Infrastructure to be placed on exhibition for public consultation. As of December 2012, the Draft LEP document is awaiting final approval from the Minister of Planning and Infrastructure. The Draft LEP Zoning Maps that are relevant to the Project (Sheets LZN-001 and L8N-002) nominate the Project is situated within an unzoned area but is surrounded by land nominated as *State Environmental Planning Policy (SEPP) – Western Sydney Employment Area*.

Fairfield City Wide DCP 2006

Section 1.4 of the *Fairfield City Wide DCP 2006* notes that the DCP 'supplements the statutory provisions contained in Fairfield Local Environmental Plan 1994' and as such, the LEP 1994 is the applicable legislative planning instrument until it is superseded by the future gazetted Draft Fairfield LEP 2011.

2.4.4 State Planning Instruments

State Environmental Planning Policy (Western Sydney Employment Area) 2009

The application area lies within the area covered by the *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (SEPP WSEA). Land zoning within the SEPP WSEA is set out within **Table 2.1**. While the SEPP WSEA over rides the Local Environment Plans for Penrith and Fairfield City Councils, it does not provide for the construction of infrastructure including gas pipelines. However, such infrastructure is required for employment generating projects within the nominated areas.

The proposed development is located within both the IN1 (General Industrial) and the E2 (Environmental Conservation) Zones of the SEPP WSEA.

The objectives of the IN1 Zone are set out as follows.

- *To facilitate a wide range of employment-generating development including industrial, manufacturing, warehousing, storage and research uses and ancillary office space.*
- *To encourage employment opportunities along motorway corridors, including the M7 and M4.*
- *To minimise any adverse effect of industry on other land uses.*
- *To facility road network links to the M7 and M4 motorways.*
- *To encourage a high standard of development that does not prejudice the sustainability of other enterprises on the environment.*

- *To provide for small-scale local services such as commercial, retail and community facilities (including child care facilities) that service or support the needs of employment-generating uses in the zone.*

The proposed development would provide for the utilisation of landfill gas at an existing industrial facility which provides ongoing employment for ongoing employment to a sizeable work force. The proposed pipeline would be buried to a sufficient depth so as to avoid any adverse effects on other land uses or the environment as outlined in the Section 4 of this document.

The objectives of the E2 Zone are set out as follows.

- *To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.*

- *To prevent development that could destroy, damage or otherwise have an adverse effect on those values.*

The proposed pipeline would be buried to a sufficient depth so as to avoid any adverse effects on any areas of high ecological value as outlined in the Section 4 of this document.

State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) provides for the development of gas pipelines on any land if the pipeline is subject to a licence under the *Pipelines Act 1967* or a licence or authorisation under the *Gas Supply Act 1996.* The proposed pipeline is not subject to a licence under either of these pieces of legislation and as such, the Project is not State significant infrastructure.

2.5 LANDFILL GAS

The key component gases of the landfill gas collected at the EPWMF are as follows.

Methane	-	55%
Carbon Dioxide	-	44.3%
Oxygen	-	<0.1%
Other Gases[1]	-	0.6%

A certificate of Analysis of a representative sample of the landfill gas is reproduced in **Appendix 3**.

2.6 PROJECT DESIGN

2.6.1 Overview

Figure 2.3 displays the alignment of the proposed pipeline corridor and the sections that would be installed using trenching or underboring methodologies.

[1] See **Appendix 3** for details of other gases.

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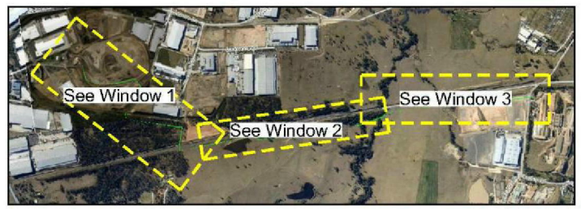
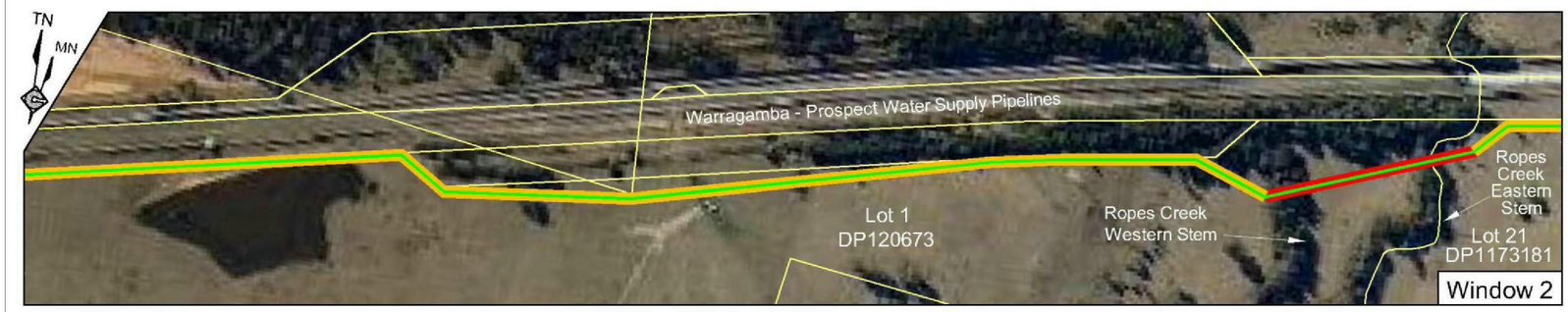




REFERENCE
- Proposed Landfill Gas Pipeline Corridor
- Proposed Trenching
- Proposed Underboring
- Cadastral Boundary

SCALE 1:6 000 (A3)

100 0 100 200 300 m

Base Photo Source: Landair - Date of Photo: 31/05/2012 & Google Earth (2012)

Figure 2.3
PROPOSED LANDFILL GAS
PIPELINE CORRIDOR

Figures 2.4, 2.5 and **2.6** display schematic sections of the proposed pipeline between the compression plant at the EPWMF and Plant 23. The pipeline would consist of a 315mm diameter High-Density Polyethylene (HDPE) pipe which would be laid in either 6m or 12m lengths along the corridor.

The pipeline would be fitted with flame arrestors and isolation valves at each end. A gas meter and calorimeter would be located at the entry end of the gas delivery line.

2.6.2 Compression Plant

The Project would utilise the existing flare unit located at the EPWMF (see **Plates 1.1** and **1.2**) as the compression plant which draws the landfill gas from a series of bores located throughout the EPWMF site. A compressor and chiller would be installed adjacent to the existing flare to provide pressure for the gas within the pipeline.

The compressor would pump the landfill gas through the chiller, which in turn would remove all condensate from the gas and return this condensate to the EPWMF. The gas would then be pumped into the pipeline for transfer to Plant 23.

2.6.3 Pipeline Corridor

The corridor for the gas pipeline, which is approximately 4.7km in length, is identified in full in **Figure 2.2** with cross sections and long sections shown in **Figures 2.4, 2.5** and **2.6**. This subsection describes the corridor outlined in these figures.

From the flare unit, the proposed pipeline corridor follows the western and southern edges of the EPWMF to a drainage easement that crosses land owned by CSR Limited (being Lot 103 DP 1143935) and currently used for stockpiling overburden material from the surrounding industrial area.

The proposed pipeline corridor then follows an unformed crown road reserve which runs east-west along the southern boundary of the industrial area. The pipeline and lay adjacent to an existing sewer pipe approximately 1m from the southern edge of the road reserve.

The pipeline corridor would then cross a biodiversity offset area managed by the DP&I (being Lot DP1124329) along its eastern boundary. This area was established in 2007 and contains a mix of native flora and fauna. All surface features within this lot would be underbored (see Section 2.7.2) with an entry pit located within the adjacent crown road reserve so as to ensure there is no surface disturbance or disturbance of any vegetation within the subject lot.

As shown in **Figure 2.3**, the underbored pipeline corridor would then cross Lot 12 DP 229784, Lot B DP 154739 and Lot 1 DP 84578, being land owned by the Sydney Catchment Authority and used for the Warragamba – Prospect water supply pipelines. All activities within these lots would be underbored with no surface disturbance or disturbance of any existing infrastructure. The proposed underboring would occur midway between the foundations of the both the northern and southern way supply pipelines. An exit pit for this phase of underboring would be located on adjoining land to the south owned by Austral. Lot 10 DP 229784 and Lot B DP 154739 have been included within the application area in the event that site conditions and/or the requirements of the Sydney Catchment Authority dictate the location of the corridor needs to be positioned in the area on or near the boundary of these land parcels.

From the southern side of the pipelines, the pipeline corridor runs eastwards through land owned by Austral (being Lot 1 DP 120763) and presently used for agricultural purposes to Ropes Creek. The installation of the pipeline in this area would be via trenching (see Section 2.7.2).

The pipeline would then be underbored under both the eastern and western stems of Ropes Creek (see **Figure 2.3**) to avoid any disturbance to the natural creek bed and riparian vegetation.

Trenching would continue through Lot 21 DP 1173181 to an unnamed tributary of Ropes Creek which would be underbored in accordance with the methodology (see Section 2.7.3) used for the two stems of Ropes Creek. Trenching would then continue to Old Wallgrove Road which would be underbored, with a minimum depth of 1.3m maintained between the top of the pipeline and the road carriageway.

The pipeline would then cross Lot 1 DP 843901, using trenching methods, to its end point at Plant 23.

2.6.4 Pipeline Design

The pipeline would consist of a 315mm diameter High-Density Polyethylene (HDPE) pipeline made up of a number of links each being either 6m or 12m in length.

At the flare end (within the EPWMF), a control system would ensure that gas drawn from the landfill and not directed to Plant 23, would be delivered to the flare unit for burning. This would prevent any fugitive emission of landfill gas. It is noted that the maximum quantity of landfill gas produced is below the maximum requirement of Plant 23. Consequently, the plant has the capacity to burn all the landfill gas generated. Further, should either site need to shut down for maintenance, the other just revert to the current arrangement at the flick of a switch.

All condensate would be removed from the pipeline would be transferred back to the EPWMF for disposal or treatment within the on-site wastewater treatment plant.

2.7 CONSTRUCTION ACTIVITIES

2.7.1 Introduction

As identified in **Figure 2.3**, the pipeline would be installed using either trenching or underboring methods, depending on the area through which the pipeline corridor passes. The following subsections set out the construction methodology of both methods.

2.7.2 Trenching

The majority of the pipeline corridor would be excavated using trenching methods given the nature of the land through which the corridor is to pass. The following equipment is required on site during the construction phase.

- 5-tonne excavator.
- 8-tonne tipper truck.

- 4-tonne service truck.
- Up to 3 light vehicles.

Figure 2.4 shows a cross section and long section of a standard trenched section of the pipeline corridor. The sequence of construction activities would be as follows.

1. The alignment of the pipeline corridor would be marked out on the ground.
2. A 1400mm(d) x 500mm(w) trench would then be dug in sections using the excavator, with all material placed to temporary stockpiles adjacent to the trench. The topsoil (top 150mm) would be separately stockpiled immediately beyond the bulk material and subsoil.
3. Once each section of the trench is excavated, 100mm of washed, pH neutral bedding sand would be laid along the base of the trench and the pipe laid on top of the sand.
4. Lengths of pipe would be butt-welded together at the surface and then lowered into the open trench.
5. The trench around the laid pipe would be packed with the same bedding sand and a further 100mm of this sand laid above the pipe.

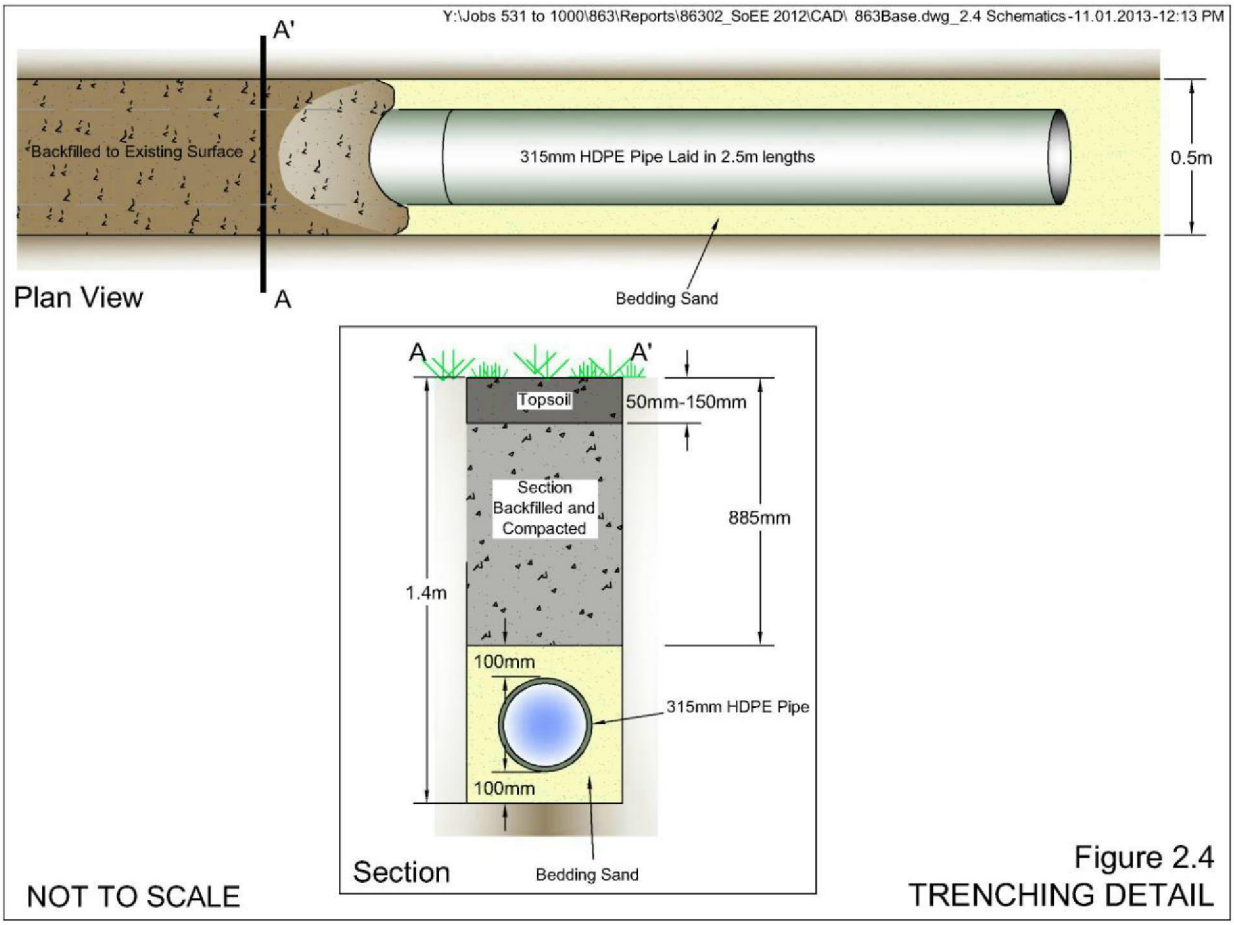


Figure 2.4
TRENCHING DETAIL

6. The bulk of the excavated materials would be returned to the trench and the backfilled materials compacted leaving approximately 150mm for the replacement of the topsoil.
7. Following the replacement of the topsoil (without compaction), the disturbed area would be seeded with a pasture mix and fertiliser.
8. Where appropriate, disturbed areas not to be used for access or any other operational purpose, would also be seeded with a pasture mix and fertilised.

Any excess materials from the trench north of the Warragamba - Prospect water supply pipelines would be transported for disposal at the EPWMF, whilst any excess materials from the trench south of the water supply pipelines would be transported to the raw material stockpile area adjacent to Plant 23. The material excavated south of the water supply considered as virgin excavated natural materials.

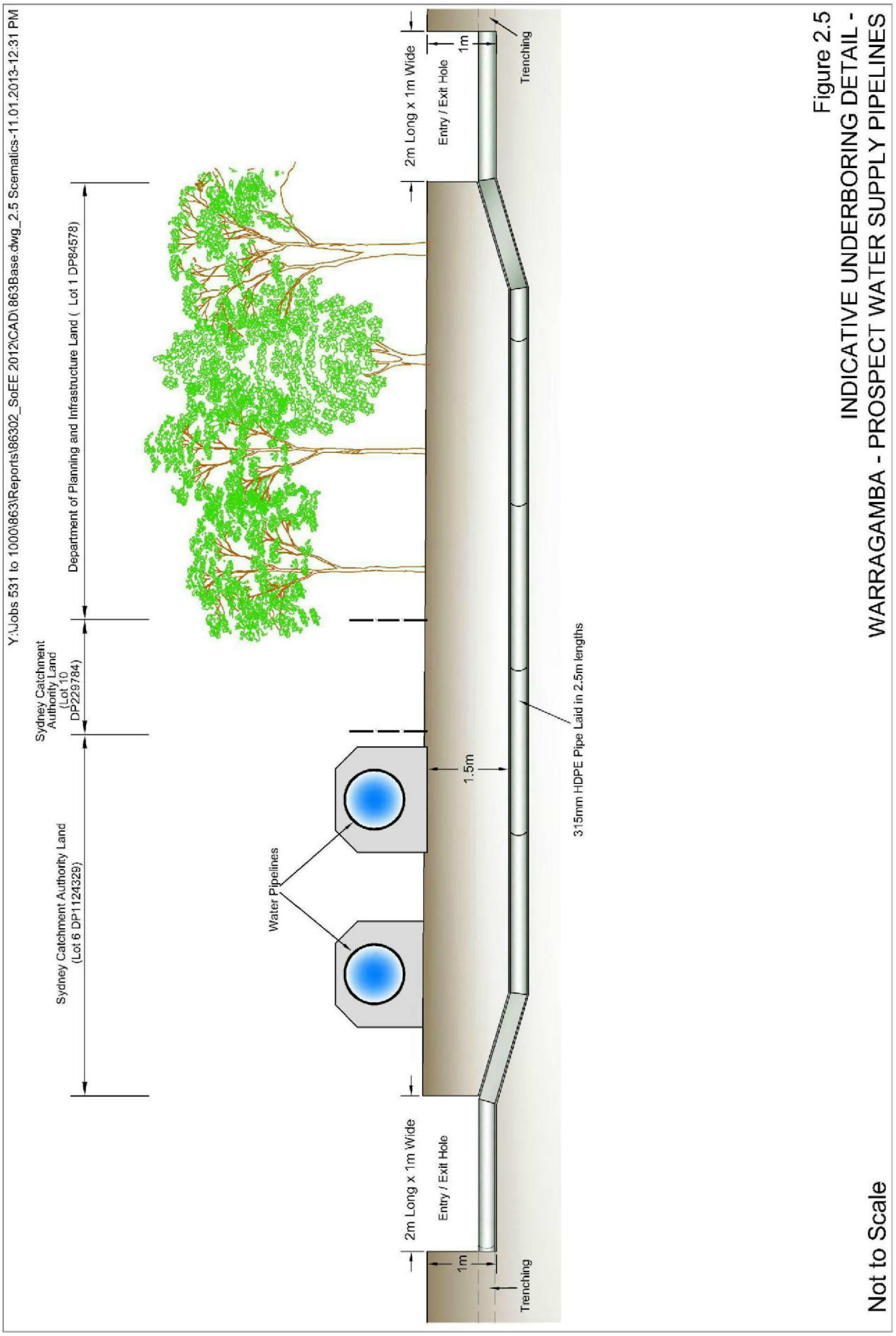
2.7.3 Underboring

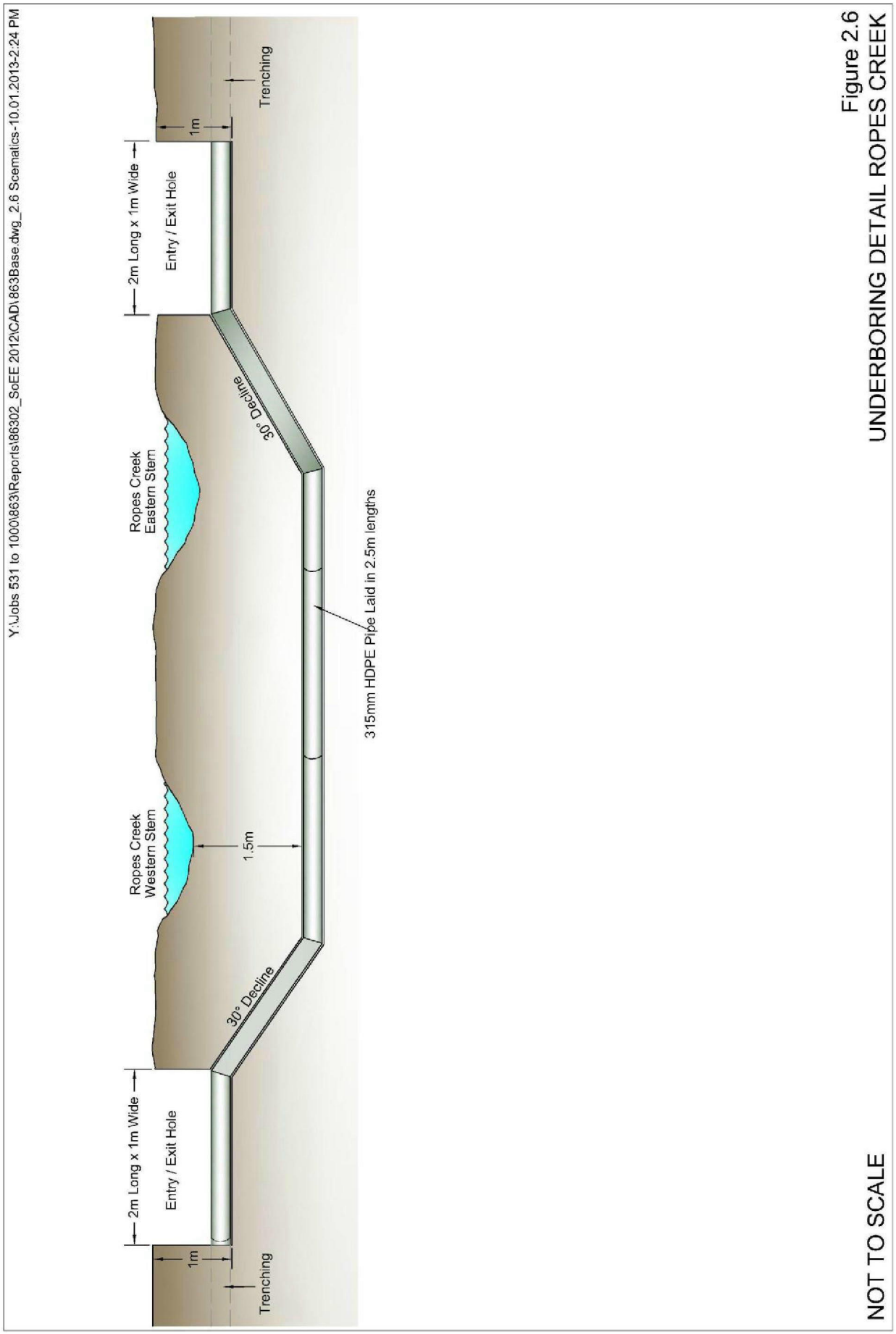
As identified in **Figure 2.3**, four sections of the pipeline would be installed using underboring equipment in order to limit the surface disturbance of construction activities. The following equipment would be required on site during the construction phase when underboring.

- A Ditch witch 4020 or similar for drilling the required bores.
- A sucker truck to remove excess liquid from the underboring process.
- 5-tonne excavator.
- 8-tonne tipper truck.
- 4-tonne service truck.
- Up to 3 light vehicles.

Figures 2.5 and **2.6** show long sections of the underbored sections of the pipeline corridor. The sequence of construction activities would be as follows.

1. The entry and exit points of the pipeline corridor would be marked out on the ground.
2. Entry and exit holes 2m(l) x 1m(w) x 1m(d) would be excavated at each end of the section to be underbored, with the topsoil and all remaining material placed in nearby temporary stockpiles, i.e. away from proposed activity areas. The entry and exit holes would be excavated with near – vertical sides as they would be open for only 1 to 2 days.
3. A 110mm pilot hole would be bored between the entry and exit holes using a Ditch witch 4020 or similar.
4. A 350mm diameter reamer would then be pulled back through the pilot hole. This reamer jets a liquid made up of water mixed with a cleaned natural clay product which assists in maintaining the integrity of the hole once boring is completed. All liquid is collected within the entry and exit holes and recycled using the sucker truck.


Y:\Jobs 531 to 1000\863\Reports\86302_SoEE 2012\CAD\ 863Base.dwg_2.5 Scematics-11.01.2013-12:31 PM
Department of Planning and Infrastructure Land (Lot 1 DP84578)
Sydney Catchment Authority Land (Lot 10 DP229784)
Sydney Catchment Authority Land (Lot 6 DP1124329)
2m Long x 1m Wide
Entry / Exit Hole
1m
Trenching
Water Pipelines
1.5m
315mm HDPE Pipe Laid in 2.5m lengths
Not to Scale
Figure 2.5
INDICATIVE UNDERBORING DETAIL -
WARRAGAMBA - PROSPECT WATER SUPPLY PIPELINES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Trenching
1m
2m Long x 1m Wide
Entry / Exit Hole
30° Decline
Ropes Creek
Eastern Stem
315mm HDPE Pipe Laid in 2.5m lengths
Ropes Creek
Western Stem
1.5m
30° Decline
2m Long x 1m Wide
Entry / Exit Hole
1m
Trenching
NOT TO SCALE
UNDERBORING DETAIL ROPES CREEK
Figure 2.6

5. The 315mm HDPE pipe is then inserted into the hole in 6m or 12m lengths which have been butt-welded together prior to insertion, no bedding material is required when underboring.
6. All excavated materials would be returned to the entry and exit holes and the subsurface compacted and covered with the topsoil (not compacted).
7. Where appropriate, disturbed areas not to be used for access or any other operational purpose, would be seeded with a pasture mix and fertilised.
8. All excess clay materials from the underboring would be returned to the clay stockpile area adjacent to Plant 23.

It is noted that the finished levels of the land within the pipeline corridor would be identical to existing levels.

Any excess materials resulting from underboring north of the Warragamba – Prospect water supply pipelines would be transported for disposal at the EPWMF, whilst any excess materials resulting from underboring south of the water supply pipelines would be transported to the raw material stockpile area adjacent to Plant 23. The bored material would be considered as virgin excavated natural material.

A geotechnical investigation was undertaken by Douglas Partners Pty Ltd. at the sites of the proposed underboring (**Appendix 4**). This investigation concluded that the underbores would have no effect on the stability or settlement of the surrounding ground profile.

2.7.4 Pipeline Testing

Prior to the final commissioning of the pipeline, it would be pressure tested to ensure no leaks are present in the system. Any issues found during this phase would be fully addressed prior to the pipeline being commissioned for operation.

2.7.5 Hours of Operation and Project Duration

2.7.5.1 Hours of Operation

All activities associated with the installation of the proposed pipeline would be undertaken between 7:00am and 6:00pm Monday to Friday and 8:00am to 1:00pm Saturday, public holidays excluded.

2.7.5.2 Project Duration

It is anticipated the pipeline would be installed within 4 weeks and the entire installation and connection between the flare unit and Plant 23 completed within 6 to 8 weeks.

2.8 GAS COMBUSTION

Austral would modify the burner system for the tunnel kilns within Plant 23 to accommodate the mixture of natural gas and landfill gas.

The delivery of landfill gas, with an energy level of 1368GJ/day, represents approximately 85% of the gas required to operate the kilns in Plant 23. From **Figure 1.3,** it can be seen that the bulk of the gas required for the kilns could be supplied from the flare unit after which the proportion of landfill gas will gradually diminish back to the 40% level by about 2035.

Overall, it is estimated that landfill gas from the EPWMF would be used at Plant 23 for up to 20 years saving the use of approximately 6.5 petajoules of natural gas.

The composition of the emissions from the combustion of the landfill gas has not been established although it is recognised that landfill gas as a fuel for brick manufacture is used internationally. Brick manufacturing plants in the USA have been approved by the USEPA to use landfill gas as a supplement to natural gas.

Three examples of similar plants that utilise landfill gas in the USA are discussed below.

- Jenkins Brick Jordan Plant Landfill Gas Energy Project

  This plant within the state of Alabama, has utilised methane from a nearby landfill as fuel since 1998 at a rate of 639 standard cubic feet per minute (scfm). This plant is a part of the Landfill Methane Outreach Program administered by the USEPA and has won awards for the clean capture and use of methane to fire kilns for the production of bricks in 2006 amongst other conservation awards awarded by the state of Alabama. Austral staff have visited this plant to investigate the use of methane.

- Jenkins Brick Montgomery Plant LFG Energy Project

  This Project is controlled by the same company as mentioned above but receives landfill gas at a larger rate, namely 910 scfm from a landfill site of 7 26 million tonnes of waste-in-place material.

- Jenkins Brick Moody Plant Landfill Gas Energy Project

  This project as of 2006, had constructed the largest brick plant in North America at Moody, Alabama that fires a kiln utilising landfill gas as fuel.

The three above brick plants save a combined total of the equivalent annual greenhouse gas emissions from 26 000 passenger vehicles, carbon sequestered 14 700 acres of forest and the equivalent of 62 000 metric tonnes of CO_2 per year. Apart from redirecting carbon emissions, the savings extended to reducing the power requirements of each plant and to utilise a fuel source that otherwise would be lost to the atmosphere.

Section 3
Environmental Setting

3.1 APPLICATION AREA

3.1.1 Introduction

The application area for the landfill gas project is shown in **Figure 3.1**. This section provides an outline of the environmental setting of the land through which the proposed pipeline corridor would pass.

3.1.2 Erskine Park Waste Management Facility

The existing flare unit is located to the northwest of the landfill void in a section away from the key activity and operational areas. The gas management system at the EPWMF was approved as part of Development Consent DA10/0429 by Penrith City Council on 23 December 2010.

The EPWMF is located on the site of a former breccia quarry prior to landfilling commencing in 1994. The landfill void, prior to filling was approximately 140m deep, while the final landform will form a hill to an elevation of approximately 92m AHD, and over time will settle to approximately 87m AHD.

While the EPWMF site is zoned E2 Environmental Conservation under the SEPP WSEA, the existing land use remains to be the disposal of general waste to the landfill with the entire length of the proposed pipeline corridor within the EPWMF being previously disturbed land which is yet to be revegetated (see **Plates 3.1** and **3.2**).

3.1.3 Pipeline Corridor

The pipeline corridor crosses land used for a number of uses as identified in **Figure 3.1**, each of the land parcels beyond the EPWMF has been set out in **Table 3.1**.

Plate 3.1: View looking southwest along proposed pipeline corridor within the Erskine Park Waste Management Facility
(Ref: E863B/010)

Plate 3.2: View looking southeast along proposed pipeline corridor within the Erskine Park Waste Management Facility.
(Ref: E863B/004)

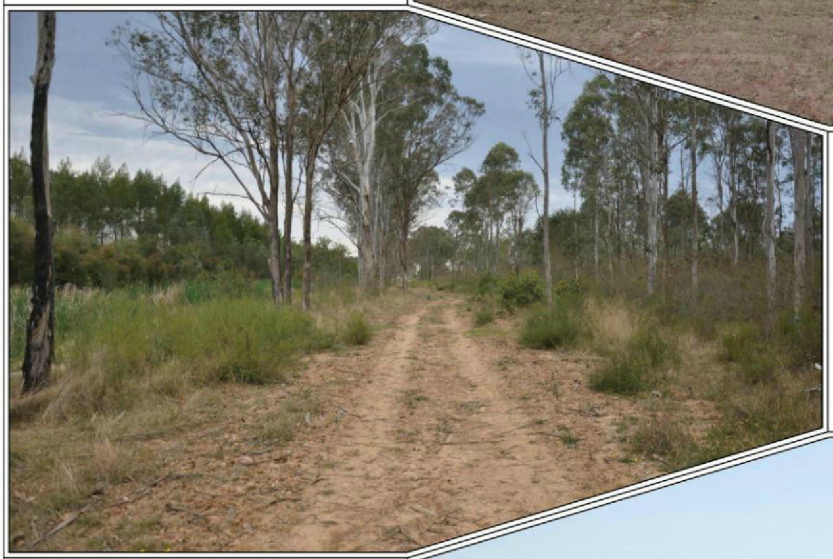
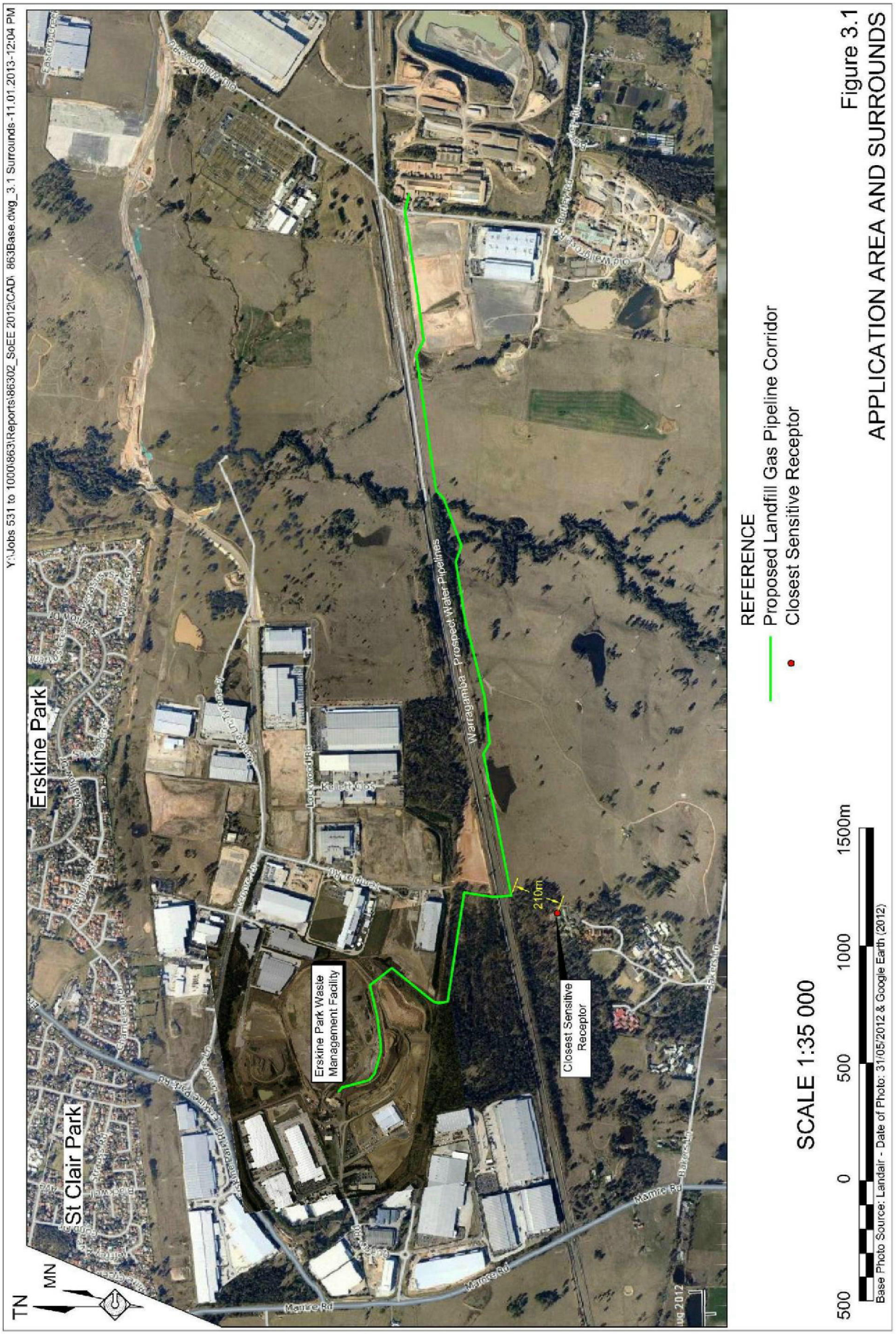


Plate 3.3: View looking east along crown road reserve
(Ref: E863B/021)

Plate 3.4: View looking west along the Warragamba - Prospect Water Supply pipelines near the point where the proposed pipeline would be installed beneath the pipelines.
(Ref: E863A/044)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Erskine Park
St Clair Park
Erskine Park Waste Management Facility
Closest Sensitive Receptor
210m
Wallgrove Rd
Mamre Rd
Old Wallgrove Rd
Wallgrove Pipeline
Warragamba – Prospect Water Pipelines
TN
MN
REFERENCE
Proposed Landfill Gas Pipeline Corridor
Closest Sensitive Receptor
SCALE 1:35 000
500 0 500 1000 1500m
Base Photo Source: Landair - Date of Photo: 31/05/2012 & Google Earth (2012)
Figure 3.1
APPLICATION AREA AND SURROUNDS

Table 3.1
Pipeline Corridor Environmental Setting

Identifier (See Figure 2.2)	Site/Area Description	Description of Existing Site
3	Lot 103 DP 1143935	This lot is owned by CSR Limited. It is currently used for stockpiling overburden material from the surrounding industrial development and is zoned E2 Environmental Conservation under the SEPP WSEA. The lot contains a drainage easement along its eastern boundary which the pipeline corridor would follow.
22	Crown Road Reserve	This crown road reserve is identified as a future extension to James Erskine Drive. The reserve lies between an industrial site and a biodiversity offset area. The site currently contains a dirt track with sparse vegetation (**Plate 3.3**) running east-west along the alignment of the reserve, manhole covers are evident which indicate that other services have been laid within the road reserve. Given the sparse vegetation, all works within the road reserve would be undertaken using the trenching method outlined in Section 2.7.2.
4	Lot 6 DP 1124329	This lot is owned by the Minister Administering the *Environmental Planning and Assessment Act 1979* and managed by the Department of Planning and Infrastructure as a biodiversity offset area. The lot contains a number of species of regenerating native vegetation (**Plate 3.3**). Works would be limited to a corridor adjacent to the eastern boundary of the site. All works within the lot would be undertaken using the underboring methodology outlined in Section 2.7.3 with no surface disturbance taking place within this lot. The entry and exist holes for this section of pipeline would be located outside of this land parcel on adjacent lots.
5	Lot 1 DP 229784 Lot 12 DP 229784, Lot B DP 154739, Lot 1 DP 84578	The lots are owned by the Sydney Catchment Authority and contain the Warragamba – Prospect water supply pipelines (**Plate 3.4**). All works within these lots would be undertaken using the underboring methodology outlined in Section 2.7.3 with no surface disturbance within these lots. Geotechnical investigations have been undertaken within this site to ensure that any underboring activities would not adversely affect the existing pipelines or the ability of the Sydney Catchment Authority to construct further infrastructure within the site.
6	Lot 11 DP 1178389	This lot is owned by Austral and is currently used for grazing cattle (**Plate 3.4**). The site is zoned IN1 (General Industrial) under SEPP WSEA.
6/7	Ropes Creek and tributaries	Ropes Creek forms a boundary between Lot 11 DP1178389 and Lot 21 DP 1173181 (**Plates 3.5** and **3.6**). A small unnamed tributary of Ropes Creek crosses Lot 2 DP 120673 in the eastern section of the site. Ropes Creek is approximately 23km long and flows in a northwesterly direction to where it joins South Creek 12km north of the proposed corridor. The pipeline corridor would cross a section of the main section of Ropes Creek where the creek has forked into two stems with a small island between these stems. As shown in **Figure 2.6**, all construction within the vicinity of Ropes Creek would be undertaken using the underboring methodology outlined in Section 2.7.3.

Plate 3.5: View looking west to the Eastern stem of Ropes Creek where it passes under the Warragamba - Prospect Pipelines
(Ref: E863A/020)

Plate 3.6: View looking west to the vegetation bordering the eastern stem of Ropes Creek
(Ref: E863A/021)

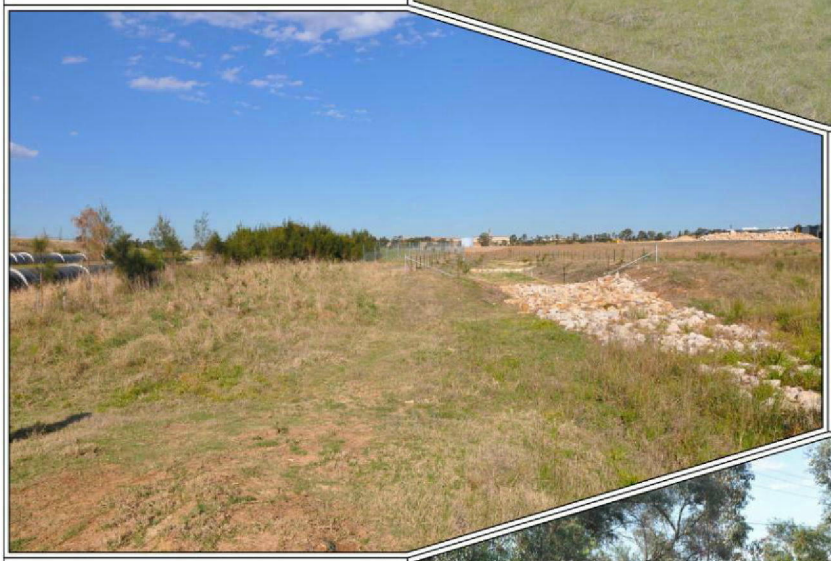


Plate 3.7: View looking east across Lot 2 DP120673 with Plant 23 in the background
(Ref: E863A/057)

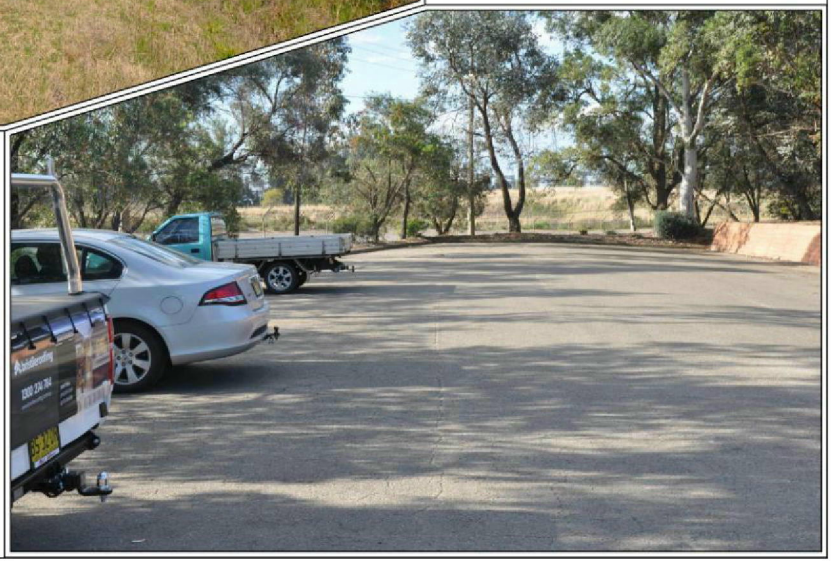


Plate 3.8: Existing carpark in front of Plant 23
(Ref: E863A/068)

Table 3.1 (Cont'd)
Pipeline Corridor Environmental Setting

Identifier (See Figure 2.2)	Site/Area Description	Description of Existing Site
7	Lot 21 DP 1173181	This lot is owned by BGAI 6 Pty Limited, a wholly owned subsidiary of Austral. It is currently used for grazing cattle. The site is zoned IN1 (General Industrial) under SEPP WSEA and earthworks have commenced on the western section of the site for future industrial development (**Plate 3.7**).
N/A	Old Wallgrove Road	Old Wallgrove Road is owned by Fairfield City Council and services the industrial area surrounding Plant 23. The pipeline corridor would be constructed under Old Wallgrove Road using the underboring methodology outlined in Section 2.7.3 with a minimum distance of 1.3m being maintained between the top of the pipeline and the road surface.
8	Lot DP (Plant 23)	Plant 23 is situated within a 23ha site on the eastern side of Old Wallgrove Road. The pipeline would be located within the western section of the site where it would cross beneath a car parking area (**Plate 3.8**) and internal roads before connecting to the Plant 23 gas system. The Plant 23 site is a highly developed industrial site and all areas affected by the proposed pipeline corridor have been previously disturbed through activities relating to the manufacture of bricks.

3.2 LOCAL GEOLOGICAL SETTING

Reference to the Sydney 1:100,000 Geological Series Sheet indicates that the watercourse underbore sites are underlain by Quaternary Fluvial Sediments comprising fine grained sand, silt and clay. These deposits are local to the creek alignments and are also underlain by Bringelly Shale, which generally consists of shale, carbonaceous claystone, claystone, laminite, fine to medium-grained lithic sandstone, rare coal and tuff. The weathered portion of this formation typically includes clays and silty clays of medium to high plasticity. The underbore below the water supply lines is underlain by Bringelly Shale.

A geotechnical assessment of the proposed sites of underboring has been undertaken by Douglas Partners Pty Ltd (**Appendix 4**). While investigations were only undertaken at two of the four underboring locations, these are considered to provide a sound representation of all locations where underboring would occur.

A summary of the typical sequence of subsurface conditions encountered during the geotechnical investigations is presented as follows.

Topsoil: Approximately 50mm thickness of light brown, silty clay with a trace of fine sand and with some grass rootlets. The topsoil was generally humid.

Clay Soils: Sandy clay, sandy silty clay and silty clay below the topsoil and extending to depths of between 1.6m and 5.1m. Generally brown orange-brown and light grey, mottled and sandy near the creek crossings, some fine grained ironstone gravels and tending to shaly clay at depth. The clays were generally firm to very stiff and moist to wet.

Weathered Rock: Intersected from depths of 1.6m to 5.1m and consisting of shale overlying siltstone in all boreholes except for one where sandstone was also intersected. The rock was initially highly to moderately weathered within the upper 2m to 3m then mostly slightly weathered to fresh at depths below 6 m. The rock was initially of typically very low to low strength (varies between extremely low and medium strength) to a depth of approximately 7m and then remained medium strength to the base of all boreholes.

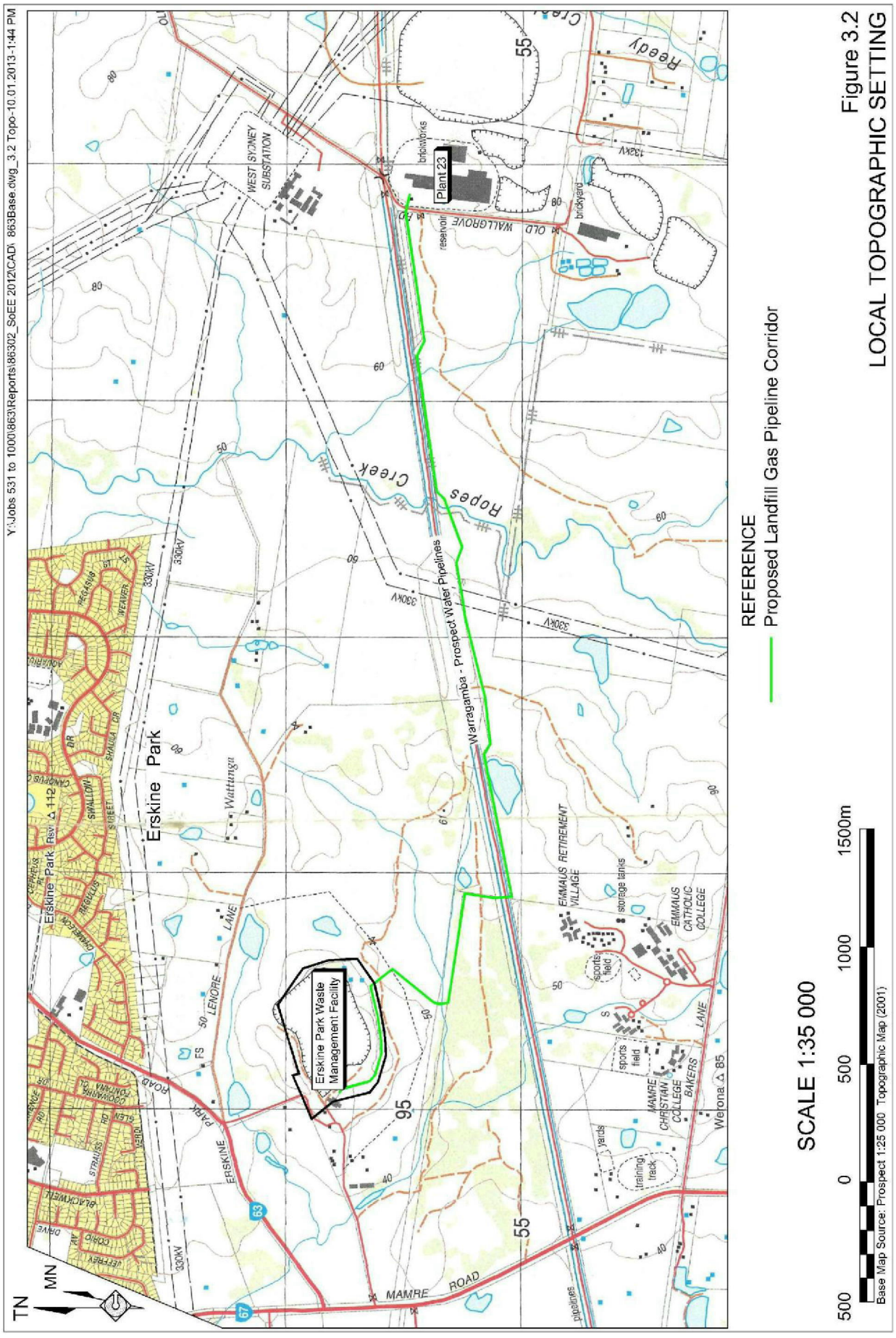
3.3 SURROUNDING LAND USES

Figure 3.1 displays the land uses surrounding the application area, while **Figure 3.2** displays the local topographic setting. The EPWMF is surrounded by industrial activities on all sides with a conservation area (being Lot 6 DP1124329) located to the south. It is noted that this lot was previously owned by a subsidiary company of Austral.

Plant 23 is also surrounded by industrial land uses, with industrial zoned agricultural land to the east. The majority of the proposed pipeline corridor lies within, or is surrounded by, industrial zoned land which is presently used for agricultural grazing purposes.

The closest sensitive receptor to the proposed pipeline corridor is a health care services facility (Emmaus Residential Aged Care facility) located approximately 210m from the closest point on the pipeline corridor and approximately 1.3km from the proposed compression plant. The background noise levels in vicinity of this facility are currently influenced by noise generated from Mamre Road traffic and within the industrial area developed around the EPWMF. This includes construction noise as a number of the lots within the industrial area are not yet fully developed.

The closest urban areas to the proposed pipeline corridor are St Clair Park and Erskine Park, i.e. approximately 1km to 2km north of the pipeline corridor.


Y:\Jobs 531 to 1000\863\Reports\86302_SoEE 2012\CAD\ 863Base.dwg_3.2 Topo-10.01.2013-1:44 PM
Figure 3.2
LOCAL TOPOGRAPHIC SETTING
REFERENCE
Proposed Landfill Gas Pipeline Corridor
SCALE 1:35 000
500 0 500 1000 1500m
Base Map Source: Prospect 1:25 000 Topographic Map (2001)
TN
MN
Erskine Park
Erskine Park Waste Management Facility
Warragamba - Prospect Water Pipelines
Plant 23
WEST SYDNEY SUBSTATION
OLD WALLGROVE RD
MAMRE ROAD
ERSKINE PARK ROAD
LENORE LANE
EMMAUS RETIREMENT VILLAGE
EMMAUS CATHOLIC COLLEGE
MAMRE CHRISTIAN COLLEGE
BAKERS LANE
Hopes Creek
Reedy Creek
Wattunga
Werona
brickworks
brickyard
reservoir
storage tanks
sports field
training track
yards
pipelines
330kV
132kV

Section 4
Environmental Management and Environmental Effects

4.1 INTRODUCTION

This section presents the design and operational safeguards that would be adopted throughout the installation of the proposed pipeline to Plant 23 together with the predicted environmental effects that would occur once the safeguards are adopted. The combustion of the landfill gas in Plant 23 is also addressed to the extent possible.

4.2 SOIL AND WATER RESOURCES

During installation of the pipeline, all efforts would be made to avoid pipeline installation activities during periods of excessive rainfall i.e. emphasis would be placed on careful assessment of the best available weather conditions. Notwithstanding this objective, the following safeguards would be adopted during installation of the pipeline.

1. All designated watercourses would be underbored to minimise the effects on each watercourse and their riparian margins.
2. Excavated materials would not be placed in drainage line. All excess materials would be transported to either the EPWMF or the clay stockpile area adjacent to Plant 23.
3. The open trench would be excavated in sections such that only a comparatively short length (approximately 200m) would be open at any one time, therefore limiting the area for potential interaction with surface runoff.
4. Any upslope runoff near the alignment of the trench and the entry and exit holes would be directed, as much as practicable, around any open section of the trench or excavated using the strategically placed topsoil and subsoil materials to prevent runoff flowing into the excavated area.
5. Silt-stop fencing would be held on site and placed on the downslope side of the disturbance area, as required.
6. The excavated subsoil materials would be placed in the backfilled trench and excavation pits and compacted to limit erosion following installation of the gas pipeline.
7. The retained topsoil would be placed within the upper 150mm section of the backfilled trench and seeded with a pasture mix and fertiliser.
8. If required, silt-stop fencing would be installed adjacent to disturbed areas until the surface has been stabilised, particularly around the entry and exit holes.

It is noted that access is currently available along the full length of the pipeline corridor including formed crossings across the eastern and western stems of Ropes Creek. Consequently, there would be no need for any track construction, particularly given the short duration of the Project.

With the adoption of the above safeguards, it is assessed the Project would not adversely affect the topsoil resources within the corridor, surface water quality in nearby watercourses or the agricultural productivity of the disturbed land.

4.3 NOISE

The excavation of the trench, underboring and the related activities would result in short term increases in noise levels. The contractor responsible for the Project would inform the operators of the Emmaus Residential Aged Care facility at least 1 week ahead of the proposed activities within 400m of the facility.

The loudest item of machinery that would be used during the construction phase of the proposed pipeline would be the drilling machine (Ditch witch 4020 or similar) which would have a sound power level of approximately 109dB(A). For the purposes of this assessment, a maximum sound power level of the combined equipment would be 112dB(A). During periods when this noise level is generated, the noise level at the Emmaus Residential Aged Care facility would be approximately 58dB(A). This level is 17dB(A) below the 75dB(A) maximum noise level specified in the Interim Construction Noise Guideline (DECC 2009) and then it would only occur for less than three days.

4.4 VISIBILITY

The pipeline would not be visible as it would be buried and there would be no noticeable changes to either the flare unit or Plant 23. Machinery would be visible during the installation of the pipeline, however, given the distance of the pipeline corridor from any sensitive receptors and the screening remnant vegetation between the nearest receptors and the pipeline corridor, the construction would not affect the visual amenity of the area when viewed from the nearest sensitive receptor or the suburb of Erskine Park. Based upon the above, the visual effects of the installation activities would be negligible.

4.5 ECOLOGY

The pipeline corridor would avoid, through the use of underboring methods where required and as shown in **Figure 2.2**, any disturbance of ecologically sensitive ecosystems, particularly the riparian vegetation adjacent to Ropes Creek and its tributaries and the biodiversity offset area managed by the DP&I. Sufficient clearance (1.5m minimum) would be maintained between all creek beds and the top of the pipeline when underboring. Care would also be taken to, where possible, undertake works outside the dripline of trees. Where this is not possible, the operators would ensure that the drillhead does not adversely affect the main root structure of any established trees.

Should any trees be impacted by the proposed pipeline corridor during the construction period, a suitably qualified arborist would be engaged to ensure that any damage to trees is minimised. Through the adoption of the above safeguards, the effects upon the existing ecology would be negligible.

4.6 GROUNDWATER

Based on the field investigations undertaken by Douglas Partners, the groundwater level is expected to be approximately 2.5m to 3.5m below the ground surface particularly near the watercourses. The groundwater level in the more elevated land would be greater than 3.5m below natural ground level. Underboring activities undertaken at these depths would only occur during the underboring of the watercourses. Given the minor size of the underbored holes, and that entry and exit holes will not intersect the groundwater table, there would be minimal effect on the groundwater table as a result of any underboring operations.

Given that all trenching would occur to a maximum depth of approximately 1.4m, it is anticipated that trenching would not intersect the groundwater table.

4.7 AIR QUALITY

The localised extent of excavation and the proposed short duration of activities would result in negligible generation of dust and therefore negligible environmental effects.

4.8 EXISTING INFRASTRUCTURE

The pipeline corridor would pass through three areas of existing infrastructure, being the Warragamba – Prospect water supply pipelines and the two road reserves both with buried services. By using underboring methods to install the gas pipeline beneath the Warragamba - Prospect water supply pipelines (and between the pipeline foundations), and given the conclusions drawn in the geotechnical investigations by Douglas Partners, any adverse effects on the integrity of the existing pipelines would be avoided.

The proposed depth of underboring beneath Old Wallgrove Road would be sufficient not to cause any adverse effects on the operation of the road.

The crown road reserve at the western end of the corridor is an unformed road, with no public access available by road. As such, trenching would have no adverse effects on the integrity of the existing infrastructure.

Prior to any works taking place, the exact locations of all other existing services, including sewerage, pipework, water pipes and cables, would be located and clearly marked on the ground in order for an appropriate buffer to be maintained between these and the gas pipeline.

4.9 LANDFILL GAS COMBUSTION

The combustion of the landfill gas from the EPWMF in Plant 23 would be undertaken in accordance with the Australian Gas Association rules, all of which are already in place for the combustion of natural gas on site.

Overall, the positive effects of utilising landfill gas as a supplement to natural gas (over a 20 year period) would be as follows.

i) Landfill gas is a biogenic fuel emitting considerably lower greenhouse emissions than natural gas.

ii) The calorific value of the landfill gas is substituted for the natural gas which in turn extends the availability of natural gas for other uses or the life of the gas field.

iii) Avoidance of 3% to 5% losses normally incurred where natural gas is transported many thousands of kilometres.

It is recognised that a detailed prediction of the composition of gas emissions is not possible. However, given its approved use (by the USEPA) at brick manufacturing plants in the USA and at Austral's Plant 21, Austral considers it appropriate to proceed with the use of the landfill gas but undertake a program of emission testing more frequently than is required at present under its Environment Protection Licence. Austral proposes to undertake a test of emission gases within one month of the commissioning of the new equipment and then after a further six months. Subject to the results of these two sampling programs, monitoring would revert to annually.

4.10 CONCLUSIONS

The introduction of the landfill gas as a supplement to natural gas in the kilns at Plant 23 would deliver positive benefits to Austral, Transpacific and the air quality in the surrounding environment. During the 20 year period when the landfill gas would be used, fewer greenhouse gases would be generated and the emissions from Plant 23 would continue to comply with the conditional requirement of Environment Protection Licence.

Section 5
EVALUATION OF THE PROJECT

5.1 EVALUATION OF THE RESIDUAL EFFECTS OF THE PROPOSAL

5.1.1 Biophysical Considerations

The Project would result in minimal land disturbance, and where appropriate, underboring methods would be utilised to minimise the surface disturbance of construction activities, particularly adjacent to Ropes Creek and the biodiversity offset area managed by DP&I.

The use of the landfill gas would remove the need for Plant 23 to rely solely on natural gas as its source of energy for its brick manufacturing operations. As such, emissions from the EPWMF would be substantially reduced whilst not increasing the emissions from Plant 23.

5.1.2 Social Considerations

Given the distance from any sensitive receptors, and the short duration of the installation and commissioning of the pipeline, the Project would have minimal social effects whilst the buried pipeline would have no social effects.

5.1.3 Economic Considerations

The Project would reduce the reliance placed on natural gas for the brick manufacturing process at Plant 23 and utilise a resource which would otherwise be flared, as it is currently. The Project would result in the use a finite resource whilst reducing the need to utilise natural gas as is presently used, reducing the overall cost of the brick manufacturing process. The containment of costs through the use of landfill gas would assist Austral to remain financially viable and retain employment levels.

5.1.4 Public Interest

The Project would benefit the public interest by reducing the reliance at Plant 23 on natural gas as well as reducing overall emissions of greenhouse gases to the environment. The Project also serves the public interest by utilising a resource that would otherwise be disposed of via the existing flare at the EPWMF and providing it as an alternative to the natural gas currently used in Plant 23.

5.2 COMPLIANCE WITH PLANNING INSTRUMENTS

The relevant planning instrument relating to the application area is the SEPP WSEA. This over rides the Local Environment Plans for both Penrith and Fairfield City local government areas. While the SEPP WSEA remains silent on such infrastructure as the proposed pipeline, the type of infrastructure is required for employment generating projects within what is recognised as an employment area.

5.3 SITE SUITABILITY

Given the proximity of the EPWMF to Plant 23, the minor construction requirements, and limited effects arising from the installation of the pipeline, and indeed the benefits to be gained from the utilisation of the landfill gas, the proposed location of the pipeline corridor is considered to be entirely suitable.

5.4 CONSEQUENCES OF NOT PROCEEDING WITH THE PROJECT

The consequences of not proceeding with the Project would include the following.

1. Reliance would continue to be placed on natural gas at Plant 23, with landfill gas from the EPWMF continuing to be flared, as currently occurs.
2. The economic benefits of the reduced costs of ongoing operations at Plant 23 would be foregone.

5.5 CONCLUSION AND JUSTIFICATION OF THE PROPOSAL

This *Statement of Environmental Effects* has been prepared in support of a development application by the Applicant, The Austral Brick Company Pty Limited, to construct and operate a landfill gas pipeline between the Erskine Park Waste Management Facility and Plant 23. This document provides an overview of the proposed activities and assesses their potential effects on the existing environment.

The assessments of the environmental effects have concluded that the residual effects of the proposed installation of the pipeline would be negligible given the minor nature of the construction operations, and the operational safeguards Austral would adopt during the comparative short construction period. Once operational and delivering gas to Plant 23, operation of the pipeline would have no environmental effects along its length. The proposed pipeline would in fact reduce Austral's reliance on natural gas and reduce the carbon emissions (approximately 330 000 tonnes per annum of CO_2) resulting from the EPWMF. These factors are in Austral's, Transpacific's and the public's interest. Following the assessment of the potential environmental effects of the Project, it is concluded that there is no evident environmental reason to prevent the Project from proceeding.

Section 6
References

DECC (2009), *Interim Construction Noise Guideline*, Department of Environment and Climate Change NSW, July 2009.

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Appendices

(Total No. of pages including blank pages = 70)

Appendix 1 Development Application Forms and Land Owner Approvals

Appendix 2 Council Requirements

Appendix 3 Landfill Gas Analysis

Appendix 4 Geotechnical Assessment

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Appendix 1

Development Application Forms and Landowner Approvals

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PENRITH CITY COUNCIL
DEVELOPMENT APPLICATION

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PENRITH CITY COUNCIL
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Application for Development and/or Construction

Planning and/or Building Construction Applications/Certificates under the Environmental Planning and Assessment Act 1979 , or Local Government Act 1993

Type of Application

Please tick the type/s of applications required

☑ **Development Application**

Please also nominate below (if applicable)

- ☐ Designated Development
- ☐ Modification (S96) DA No
- ☑ Integrated Development
- ☐ Extension of Consent DA No
- ☐ Advertised Development
- ☐ Review of Determination DA No
- ☐ Other

☐ **Subdivision**

Number of lots
Existing
Proposed
Road ☐ Yes ☐ No

☐ Subdivision Certificate
☐ Strata
☐ Land/Torrens Title
☐ Community Title

Related DA No

Does the Subdivision include works other than a road? ☐ Yes ☐ No

☐ **Construction Certificate**

Related DA No

☐ **Complying Development Certificate**

Please select the Planning Policy you are applying under

- ☐ State Environmental Planning Policy (Name and Number)
- ☐ Penrith Council Local Environmental Plan (Policy Name)

☐ **Install a Sewerage Management System**
(Section 68 Local Government Act 1993)

- ☐ Aerated (Brand and Model)
- ☐ On Site Disposal or ☐ Pump Out
- ☐ Irrigation ☐ Trench Disposal

☑ **Other Approvals** *(Section 68 Local Government Act 1993)*

Section 138 Roads Act 1993

Office Use Only

Receipt Date | Fees Paid
Application Number | Receipt Number

1

PENRITH CITY COUNCIL
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Property Details

Location of the proposal. All details must be provided.

Lot No/Sec No. | DP/SP No. | Land No (Office Use)
See Statement of Environmental Effects

Street No | Street Name

Suburb | Post Code

Provide details of the current use of the site and any previous uses. Eg vacant land, farm, dwelling, car park.

Description of Current and Previous Use/s of the Site
Landfill/Biodiversity Offset/Water Conveyance/Grazing

Is this use still operating? ☑ Yes ☐ No | If no, when did the use cease?

Description of the Proposal

Include all work associated with the application. Eg construction of single dwelling, landscaping, garage, demolition.

Installation and use of a gas pipeline between the Erskine Park Waste Management Facility and Horsley Park Plant 23.

Value of Work Proposed

Estimated or contract value of the works. Council may request verification through builders quote or by a Quantity Surveyor.

Must include materials, labour costs and GST. Subdivision applications are to provide details of costs of construction. Major developments are to provide Capital Investment Value (CIV) where required.

$ 1.7 million

Applicant Details

All correspondence relating to the application will be directed to the applicant. The applicant may be, but is not necessarily, the owner.

First Name/s: Stephen | Surname/s: Wall

Company Name (if applicable)
The Austral Brick Co. Pty Limited

Street No | Street Name / PO Box / DX
PO Box 655

Suburb: Wetherill Park | Post Code: 1851

Contact Phone Number: 0418 255 535 | Email Address: stephen.wall@australbricks.com.au

Declaration

I declare that all particulars supplied are correct and all information required has been supplied. I also certify that all information supplied digitally/electronically is a true copy of all plans and documents submitted with this application and that electronic data is not corrupted and does not contain any viruses.

Signature/s | Date: 27-6-13

2

PENRITH CITY COUNCIL
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Owners Details

This must be completed to include details of ALL owners. If there are more than two owners please attach a separate authority.

Owner 1
First Name: See Separate correspondence
Surname:

Owner 2
First Name:
Surname:

Postal Address
Street Number:
Street Name:
Suburb:
Post Code:
Contact Phone Number:
Email Address:
Company Name (if applicable):
Name of signatory for company:
Position held by signatory:

Owners Consent

This must be completed to include signatures of ALL owners (see above note). If the property is subject to strata or community title the application must have consent from the Body Corporate.

As owner/s of the property the subject of this application I/we consent to the application. I/we grant permission for Council Officers to enter the premises for the purpose of assessment of this application and to conduct inspections relative to this application.

Owner 1/Company Signatory
Print: See separate correspondence
Signature:
Date:

Owner 2
Print:
Signature:
Date:

Pecuniary Interest

Details of any pecuniary interest to be disclosed here.

Is the applicant an employee of Penrith City Council, or is the application being submitted on behalf of an employee of Penrith City Council?

☐ Yes ☑ No

Does the applicant have a relationship to any staff or Councillor of Penrith City Council or is the application being submitted on behalf of someone who has such a relationship?

☐ Yes ☑ No

If the answer is yes to any of the above the relationship must be disclosed

3

PENRITH CITY COUNCIL
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Builder/Owner Builder Details

Please Nominate

☐ Licenced Builder ☐ Owner Builder

First Name | Surname/Company Name | Licence No

Postal Address
Street No. | Street Name

Suburb | Post Code

Contact Phone Number | Email Address

Materials to be used

Please Nominate

This is required to be completed for the Australian Bureau of Statistics

Floor	Frame	Walls	Roof
☐ Concrete	☐ Timber	☐ Brick Veneer	☐ Tiles
☐ Timber	☐ Steel	☐ Double Brick	☐ Fibre Cement
☐ Other	☐ Aluminium	☐ Concrete	☐ Aluminium
	☐ Other	☐ Fibre Cement	☐ Steel
		☐ Curtain Glass	☐ Other
		☐ Steel	
		☐ Aluminium	
		☐ Other	

Gross Floor Area of Proposal (if applicable)

Existing + Proposed = Total

Integrated Development

If the development is Integrated and requires approval under another Act, please nominate which approvals are required.

If the Application is for Integrated Development Please indicate under which Act/s the Licences/Permits are required.

☐ Fisheries Management Act
☐ National Parks and Wildlife Act
☐ Protection of the Environment Operations Act
☑ Water Management Act
☐ Heritage Act
☑ Roads Act
☐ Rural Fires Act
☐ Other

Pre Lodgement/Urban Design Review Panel

Have you attended a Prelodgement/UDRP meeting regarding this application?

☑ Yes ☐ No Reference No. PL 12/0084

4

PENRITH CITY COUNCIL
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Political Donations

All political donations must be disclosed

It is required to disclose the following reportable donations and gifts (if any) made by any person with a financial interest in the application within the period commencing two (2) years before the application is made and ending when the application is determined:

- all reportable donations made to any Councillor of Penrith City Council, and
- all gifts made to any Councillor or employee of Penrith City Council.

If required, a disclosure is to be made in a statement accompanying the relevant application by the person who makes the application. If a further donation or gift is made after the lodgement of the application a further statement is required to be provided within seven days after the donation or gift is made.

Is a disclosure statement required? ☐ Yes ☑ No

If yes, has it been attached to the application? ☐ Yes ☐ No

Privacy Notice

All information contained in your application including plans and supporting documents may be available for public access or disclosure under the Government Information (Public Access) Act 2009 (GIPA) and other legislation.

Acceptance of Application

The form must be completed correctly and all required information and copies of plans/ documents provided before the application can be accepted.

Council will not process applications that are incomplete or non-complying with lodgement requirements. These will not be accepted or may be returned to applicants within fourteen (14) days.
A guide to application requirements is contained on the next page.
Certain applications may require the submission of additional information not listed in the guide.

(Office Use)

Additional Information required before the application will be accepted

Satisfactory to Lodge? ☐ Yes ☐ No

Responsible Officer

Date

5

PENRITH CITY COUNCIL
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Submission Requirements

MATRIX OF INFORMATION TO ACCOMPANY APPLICATION (see separate information sheet for meanings of symbols)	Residential Dwellings	Alterations or Additions to Residential Dwellings	Garage, Outbuilding, Awning Carport, etc	Farm Building	Swimming Pool	Dual Occupancy	Multi Unit Housing	Commercial / Industrial Building	Alteration and Additions to Commercial / Industrial	Demolition	Subdivision of Land	Septic Tank (Sewage Management)	Advertising Sign	Home Business	Applicant Checklist	Council Checklist - supplied Y/N
Site plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Floor Plan	✓	✓	✓	✓		✓	✓	✓	✓		✧	✓		✓		
Elevation Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	☼		
Section Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✧	☼		
Specifications	☼	☼	☼	☼	☼	☼	☼	☼	☼	✓		✓	✧	☼		
Statement of Environment Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
BASIX	✓	✧			✧	✓	✓									
Shadow Diagrams	✧	✧				✧	✧	✧	✧							
Notification Plan (A4)	✓	✓	✓	✓	✓	✓	✓	✧	✧					✓		
Landscaping	✧	✧	✧	✓		✓	✓	✓	✧			✓				
Erosion/Sediment Control	✓	✓	✧	✧	✧	✓	✓	✓	✧	✓	✧	✧	✧			
Drainage Plan (Stormwater) Drainage Plan (Effluent)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✧	✧	✓				
Waste management	✓	✧		✧	✓	✓	✓	✓	✧	✓				✧		
External Colour Schedule	✓	✓		✓		✓	✓	✓	✓							

The matrix identifies the minimum information (plans and supporting documents) required for the most common types of developments.

- ✓ Indicates this information must be provided.
- ✧ Indicates this additional information must be provided if applying for a Construction Certificate or Complying Development Certificate.
- ☼ Indicates this information may also be required (refer to the relevant policies or contact Council for further details before lodging your application).

Requirements for submission of applications, plans and documentation.

- A minimum of 6 complete sets of all plans and documentation.
- Please fold all plans to A4 size. Rolled plans will not be accepted (originals of subdivision certificates may be rolled).
- Notification plans are to be A4 size and are to be kept separate from other plans.
- Notification plans should not include any floor plans that may affect your right to privacy
- **An electronic copy is also to be provided in PDF format.** One file is to be submitted for each document or plan. File names are to include; document name, plan type, description, and number (including version and date). Exemptions from this requirement may apply to proposals of a minor nature. Digital files must be virus free.

(Where applications for minor development do not provide an electronic copy a scanning fee may apply.)

NB Additional types or copies of plans/documents may be required for major developments. Please contact the Development Services Department on 4732 7991 to confirm documentation required.

Applications for major developments: (including advertised and integrated development). An appointment is required for lodgement of these applications. Please contact the Development Services Duty Planner on 4732 7991 to arrange an appointment for the lodging of your application.

Contact Us

STREET ADDRESS
Penrith City Council
601 High Street
PENRITH NSW 2750

POSTAL ADDRESS
PO Box 60
PENRITH NSW 2751, or
DX 8017 PENRITH

TELEPHONE: (02) 4732 7991
FACSIMILIE: (02) 4732 7958
EMAIL: council@penrithcity.nsw.gov.au
WEB: www.penrithcity.nsw.gov.au

6

LANDOWNER APPROVALS

(Total No. of pages including blank pages = 8)

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Owner/s details and consent

Lot/DP	**Lot 4 DP 1094504**
Landowner (First name SURNAME)	**Enviroguard Pty Ltd**
Postal Address	PO Box 804 ST MARYS NSW 1790
Contact Phone Number	02 98343411
Email Address	Eric.leprovost@transpac.com.au
Company Name (If Applicable)	Transpacific Industries
Name of Signatory for company	Eric Le Provost
Position Held by signatory	State Manager NSW Post Collections
Signature	
Date	28.6.13.

CSR LIMITED
Triniti 3 39 Delhi Road North Ryde
NSW 2113 Australia
Locked Bag 1345 North Ryde BC
NSW 1670 Australia
T 61 2 9235 8000
F 61 2 8362 9024
www.csr.com.au
ABN 90 000 001 276

24 June 2013

Dear Sir/Madam

Austral Bricks (Applicant) — Gas Pipeline Project
Development Application Submission — Letter of Authorisation Lot 103 in DP 1143935 (Property)

The Applicant is proposing to construct a 4.7km gas pipeline between Mamre Road, Erskine Park and Old Wallgrove Road, Horsley Park (Proposed Development).
As the owner of the Property, CSR Limited authorises the submission of a development application for the Proposed Development to Penrith City Council.
This Letter of Authorisation is not a grant of easement or permission to enter the Property.

Any agreement to a grant of easement is conditional upon, but not limited to, the parties agreeing to the final design of the Proposed Development and the terms of the easement.

Further, this Letter of Authorisation does not imply planning consent and any costs incurred by the Applicant whilst operating under this Letter of Authorisation and/or associated with lodgement of the development application by the Applicant will not be the responsibility of CSR Limited.

Please contact the undersigned if you require any further information with respect to this matter.

Yours faithfully,

Andrew Mackenzie
General Manager Property

NSW GOVERNMENT Planning & Infrastructure

Office of Strategic Lands

Our Ref: 13/07026

Mr Stephen Wall
Manufacturing Manager, Austral Bricks
738-780 Wallgrove Road
Horsley Park NSW 2175

22 April 2013

Dear Mr Wall

Subject: Austral Bricks – Transpacific Industries Landfill Gas Project DA Submission

I refer to your request for landowner consent to submit a development application for a gas pipeline on land owned by the Corporation Sole (the Minister Administering the *Environmental Planning and Assessment Act 1979*).

As the owner of the Lot 6 Deposited Plan 1124329, the Department authorises the submission of a development application to Penrith City Council. This letter of support is not a *Grant of Easement* or *Permit to Enter*.

Additionally this letter of support given by the Department in its capacity as landowner does not imply any planning consent. In addition, any costs incurred whilst operating under this authority and/or associated with lodgement of any applications by the applicant will not be the responsibility of the Department.

Should you have any further enquiries about this matter, I have arranged for Belinda Rollason, Project Manager – Open Space, Office of Strategic Lands, of the Department of Planning and Infrastructure to assist you. She can be contacted on telephone number 02 4904 2706.

Yours sincerely

Stephen Dewick
A/Director – Office of Strategic Lands

Bridge St Office 23-33 Bridge St Sydney NSW 2000 GPO Box 39 Sydney NSW 2001 DX 22 Sydney
Telephone: (02) 9228 6111 Facsimile: (02) 9228 6191 Website planning.nsw.gov.au

SYDNEY CATCHMENT AUTHORITY

PO Box 323 Penrith NSW 2750
Level 4, 2-6 Station Street
Penrith NSW 2750
Tel 1300 722 468 Fax 02 4725 2599
Email info@sca.nsw.gov.au
Website www.sca.nsw.gov.au

Ref: D2013/23920

Cassandra Steppacher
Environmental Planner
Austral Bricks
738-780 Wallgrove Road
HORSLEY PARK NSW 2175

Dear Ms Steppacher

I refer to your email dated 8 February 2013 and the Statement of Environmental Effects (SEE) provided to the Sydney Catchment Authority (SCA).

I understand Austral Bricks is proposing the construction of a 4.7 km gas pipeline between Mamre Rd, Erskine Park and Old Wallgrove Rd, Horsley Park. Construction will require installing the gas pipeline under a section of the Warragamba to Prospect Pipelines corridor by underboring.

The Warragamba to Prospect Pipelines are critical items of public water supply infrastructure which are owned and managed by the SCA. The SCA land affected by the proposal includes Lot 10 DP 229784; Lot 12 DP 229784; Lot B DP 154739 and Lot 1 DP 84578.

As the owner of the site, the SCA authorises the submission of a development application for this development to Penrith City Council. Please note this does not in any way imply that the SCA supports the proposal. The SCA is a NSW Government authority and has not made any reportable political donations or gifts in the past two years. The owner's details should be recorded as follows:

Sydney Catchment Authority
Level 4, 2-6 Station Street
Penrith NSW 2750
Ph: 02 4724 2200

Please note that the Pipelines corridor is a "controlled area" and all activities, including access for inspections, are regulated under the Sydney Water Catchment Management Regulation 2008. Consequently any request from the Council to inspect the site will need to be coordinated with the SCA.

Please contact Neil Abraham, Senior Environmental Assessment Officer, on 4724 2456 if you have any queries regarding this authorisation.

Yours sincerely

3/4/13

IAN TANNER
Group General Manager Assets & Major Projects

Printed on recycled paper
ABN 36 682 945 185

Owner/s details and consent

Lot/DP	**Lot 11 DP 1178389**	
Landowner (First name SURNAME)	**The Austral Brick Co Pty Ltd**	
Postal Address	PO Box 6550 WETHERILL PARK 1815	
Contact Phone Number	02 9830 7800	
Email Address	NA	
Company Name (If Applicable)	The Austral Brick Co Pty Ltd	
Name of Signatory for company	Alex Payne	Ian Thompson
Position Held by signatory	Chief Financial Officer	Company Secretary
Signature		
Date	5/2/13	5/2/13

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Appendix 2

Council Requirements

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DEVELOPMENT ADVISORY PANEL MEETING

31 July 2012 at 10am

PREMISES: **Lot 1 DP 120673**
2-18 Aldington Road, KEMPS CREEK and
Lot103 Quarry Road Erskine Park

PROPOSAL: Gas Pipeline from Cleanaway Site to Austral Bricks Site

Pre-Lodgement Advice PL12/0084

Planning

- Land is zoned IN1 General Industrial and E2 Environmental Conservation under the State Environmental Planning Policy (SEPP) Western Sydney Employment Area (WSEA) 2009.
- The proposal shall be defined under the land use table of the above SEPP and commentary on compliance with zone objectives for all lands involved shall be provided in the statement of environmental effects to accompany the development application. It is noted that the gas pipe is proposed to be mainly used for industrial purposes.
- It is suggested that a Planning Consultant shall prepare the statement of environmental effects (SEE).
- It needs to be established whether the proposal is a Designated Development under Schedule 3 of the Environmental Planning and Assessment Regulation 2000. If it is designated development, an Environmental Impact Statement (EIS) needs to be prepared and the NSW Department of Planning shall be consulted prior to the preparation of that EIS.
- Compliance with other relevant provisions of the SEPP (WSEA) 2009 shall be addressed in the statement of Environmental effects.
- It needs to be established whether the proposal is integrated development under Section 91 of the Environmental Planning and Assessment Act 1979. NSW Office of Environment and Heritage shall be consulted for their requirements regarding integrated development. NSW Office of Water shall be consulted for their requirements if any existing creek/s will be affected by the proposed pipeline.
- The land is partly bushfire prone. NSW Rural Fire Service shall be consulted for their requirements and bushfire safety matters shall be addressed in the SEE.
- Controls that may apply to the proposed development under the Penrith Development Control Plan 2006 shall be addressed in the SEE.
- Any tree removal shall be supported by an Arborist's report which shall accompany the development application.
- Some of the land may be affected by road widening. The pipeline shall not to be proposed in that part of land reserved for road widening.
- Any easements affected by the proposed pipeline shall be addressed in the SEE.
- Owner's consents for all the lands involved shall be obtained prior to the lodgement of the Development Application.

Environment • It is expected that the proposal will be covered by licences which can be obtained from other departments after the development application is determined. • Council will consider amenity impacts on adjoining properties. These impacts will mainly be assessed at the property boundary not plant. • Noise impacts shall be addressed in the SEE. Specifications of noise generating equipment shall accompany the development application. • Any excess soil taken off site will need to be classified. • SEE shall show return rates of water, if any, to the operating system.
Engineering • The development application shall be accompanied by a detailed survey plan. • Long section of pipeline will be required for the entire length of the pipe. • The plans shall show where services cross/impede the pipeline. • The easement width for the pipeline shall be 3m.

** ***Important Note*** **

The pre-lodgement panel has endeavored to provide information which will enable you to identify issues that must be addressed in any application. The onus remains on the applicant to ensure that all relevant controls and issues are considered prior to the submission of an application.

Information given by the pre-lodgement panel does not constitute a formal assessment of your proposal and at no time should comments of the officers be taken as a guarantee of approval of your proposal.

It is noted that there is no Development Application before the Council within the meaning of the *Environmental Planning and Assessment Act 1979*. This response is provided on the basis that it does not fetter the Council's planning discretion and assessment of any Development Application if lodged. It is recommended that you obtain your own independent expert advice.

The response is based upon the information provided at the time of the meeting.

Gurvinder Singh
Senior Planner – Team Leader
Ph: 47327539

Appendix 3

Landfill Gas Analysis

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EML AIR PTY LTD ABN 98 006 878 342
Melbourne (Head Office)
PO Box 466, Canterbury, Victoria 3126
427 Canterbury Road, Surrey Hills, Victoria 3127
T. +61 3 9836 1999 **F.** +61 3 9830 0670
E. emlair@emlair.com.au **W.** www.emlair.com.au

Our reference: **N90053**
Page 1 of 5

21 November 2012

Transpacific Cleanaway Ltd (Erskine Park NSW)
P.O. Box 804
ST MARY'S NSW 1790

Attention Mr Eric Le Provost

ERSKINE PARK PLANT

Emission Testing Report - OCTOBER 2012

Tests were performed at the request of Transpacific Cleanaway Ltd (Erskine Park NSW) to determine emissions to air as detailed below;

Test Summary		
Location	Test Date	Test Parameters*
Landfill Test Point	25 October 2012	Speciated C_1-C_4 hydrocarbons, speciated volatile organic compounds, sulfur gases, methane, carbon dioxide, oxygen.

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated.

Please refer to the following pages for results, plant operating conditions, test methods, quality assurance / quality control information and definitions.

Greg Sceneay
Client Manager
cs doc:n90053.doc

Matthew Cook
Laboratory Manager

Air Emission Specialists
MELBOURNE • SYDNEY • PERTH • BRISBANE

EML AIR PTY LTD ABN 98 006 878 342 Our reference: **N90053**
Test report prepared for Page 2 of 5
Transpacific Cleanaway Ltd (Erskine Park NSW) 21 November 2012

RESULTS

Date	25/10/2012	**Client**	Transpacific Cleanaway Ltd		
Report	N90053	**Stack ID**	Landfill Test Point		
Licence No.	-	**Location**	Erskine Park	**State**	NSW
EML Staff	AD				
Process Conditions	Normal operating conditions				
Reason for testing:	Client requested testing to determine emissions to air				

Sampling Plane Details		
Sampling plane dimensions (mm) & area	150	0.0177 m²
Sampling port size, number & depth	1 x 1/4" nipple	
Access & height of ports	Ground level	1 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Bend	2 D
Upstream disturbance	Bend	6 D
No. traverses & points sampled	1	1
Traverse method & compliance	AS4323.1	Satisfactory

Comments
Due to sampling port size restrictions, the temperature and volumetric flow rate could not be measured. Transpacific provided flowrate data averaging 650scmh for the duration of the testing programme.
Unless otherwise indicated, the methods cited in this report have been performed without deviation
All results reported on a dry basis at NTP

Stack Parameters		
Moisture content, %v/v	1	
Gas molecular weight, g/g mole	35.0 (wet)	35.2 (dry)
Gas density at NTP, kg/m³	1.56 (wet)	1.57 (dry)

Gases	Average	Minimum	Maximum
Sampling time	930-1104	930-1104	930-1104
	Concentration %	Concentration %	Concentration %
Methane	55	55	56
Carbon dioxide	44.3	43.8	45
Oxygen	<0.1	<0.1	0.2

Total Reduced Sulfur	Average	Test 1	Test 2
Sampling time		1035-1040	1040-1045
	Concentration g/m³	Concentration g/m³	Concentration g/m³
Hydrogen Sulfide	0.16	0.17	0.15
Carbonyl Sulfide	<0.0027	<0.0027	<0.0027
Methyl Mercaptan	<0.0021	<0.0021	<0.0021
Ethyl Mercaptan	<0.0028	<0.0028	<0.0028
Dimethyl Sulfide	<0.0028	<0.0028	<0.0028
Carbon Disulfide	<0.0034	<0.0034	<0.0034
Dimethyl Disulfide	<0.0042	<0.0042	<0.0042
Isopropyl Mercaptan	<0.0034	<0.0034	<0.0034

Total VOC's	Average	Test 1	Test 2
Sampling time		0950-1005	1006-1021
	Concentration g/m³	Concentration g/m³	Concentration g/m³
Total	0.25	0.2	0.29

EML AIR PTY LTD ABN 98 006 878 342 Our reference: **N90053**
Test report prepared for Page 3 of 5
Transpacific Cleanaway Ltd (Erskine Park NSW) 21 November 2012

Date	25/10/2012	**Client**	Transpacific Cleanaway Ltd		
Report	N90053	**Stack ID**	Landfill Test Point		
Licence No.	-	**Location**	Erskine Park	**State**	NSW
EML Staff	AD				
Process Conditions	Normal operating conditions				
Reason for testing:	Client requested testing to determine emissions to air				

VOC's C_1-C_4	Average	Test 1	Test 2
Sampling time		1025-1030	1030-1035
	Concentration g/m³	Concentration g/m³	Concentration g/m³
Ethane	<0.0013	<0.0013	<0.0013
Ethylene	<0.0013	<0.0013	<0.0013
Propane	<0.002	<0.002	<0.002
Cyclopropane	<0.0019	<0.0019	<0.0019
Propylene	<0.0019	<0.0019	<0.0019
Isobutane	<0.0026	<0.0026	<0.0026
Butane	0.013	0.013	0.013
Propadiene	<0.0018	<0.0018	<0.0018
Acetylene	<0.0012	<0.0012	<0.0012
trans-2-Butene	<0.0025	<0.0025	<0.0025
1-Butene	<0.0025	<0.0025	<0.0025
cis-2-Butene	<0.0025	<0.0025	<0.0025
1,3-Butadiene	<0.0024	<0.0024	<0.0024
Propyne	<0.0018	<0.0018	<0.0018

VOC's (speciated)	Average	Test 1	Test 2
Sampling time		0950-1005	1006-1021
	Concentration g/m³	Concentration g/m³	Concentration g/m³
Detection limit(1)	<0.0007	<0.0007	<0.00071
Benzene	0.017	0.015	0.018
Toluene	0.064	0.054	0.075
Ethylbenzene	0.011	0.0078	0.014
m + p-Xylene	0.025	0.018	0.032
o-Xylene	0.0059	0.0041	0.0078
1,3,5-trimethylbenzene	<0.00074	<0.0007	0.00078
Acetone	0.014	0.013	0.015
Hexane	<0.0039	<0.0007	0.0071
Cyclohexane	0.0078	0.0072	0.0084
2-Methylhexane	0.005	0.0047	0.0054
2,3-Dimethylpentane	0.0024	0.0022	0.0027
Isooctane	<0.0026	0.0045	<0.00071
Heptane	0.011	0.01	0.013
Methylcyclohexane	0.018	0.016	0.02
MIBK	0.0074	0.0061	0.0088
Octane	0.006	0.0049	0.0072
Nonane	0.0035	0.0024	0.0046
alpha-Pinene	0.027	0.02	0.035
beta-Pinene	0.0019	0.0013	0.0026
Decane	<0.0011	<0.0007	0.0014

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Isopropanol, Isobutanol, Butanol, 1-Methoxy-2-propanol, Cyclohexanol, 2-Butoxyethanol
Pentane, Hexane, Heptane, Octane, Nonane, Decane, Undecane, Dodecane, Tridecane, Tetradecane
Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Isooctane, Methylcyclohexane, alpha-Pinene, beta-Pinene, d-Limonene, 3-Carene
Acetone, Methyl ethyl ketone, Ethyl acetate, Isopropyl acetate, Propyl acetate, MIBK, 2-Hexanone, Butyl acetate, 1-Methoxy-2-propyl acetate, Cyclohexanone, Cellosolve acetate, 2-Butoxyethyl acetate, Ethyldiglycol acetate, Diacetone alcohol, Isophorone
Benzene, Toluene, Ethylbenzene, m+p-Xylene, Styrene, o-Xylene, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, alpha-Methylstyrene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, m-Diethylbenzene, o-Diethylbenzene, p-Diethylbenzene
Dichloromethane, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Carbon tetrachloride, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Trichloroethene, Tetrachloroethene, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Chlorobenzene, Fluorobenzene

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PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Transpacific Cleanaway Ltd (Erskine Park NSW)'s records for complete process conditions.

TEST METHODS

Unless otherwise stated, the following methods meet the requirements of the NSW Office of Environment and Heritage (as specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007)*. All sampling and analysis was performed by EML Air unless otherwise specified. Specific details of the methods are available upon request.

Parameter	NSW Test Method	Reference Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample Plane Criteria	TM-1	AS 4323.1	-	✓	NA
Flow rate, temperature and velocity	TM-2	USEPA 2	8%, 2%, 7%	✓	NA
Moisture content	TM-22	USEPA 4	8%	✓	✓
Speciated volatile organic compounds (VOC's)	TM-34	USEPA 18	19%	✓	✓
Speciated C_1-C_4 Hydrocarbons	-	USEPA 18	19%	✓	✓
Reduced sulfur gases (DMDS DMS H_2S CH_3SH)	-	USEPA 16	19%	✗	✓
Methane	-	USEPA 25A	not specified	✓	✓
Carbon dioxide	TM-24	USEPA 3A	13%	✓	✓
Oxygen	TM-25	USEPA 3A	13%	✓	✓

* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

AS – Australian Standard
USEPA – United States Environmental Protection Agency
TM - Test Method

QUALITY ASSURANCE / QUALITY CONTROL INFORMATION

EML Air Pty Ltd is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources (Accreditation number 2732). Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for EML Air at NATA's website www.nata.asn.au.

EML Air is accredited to Australian Standard 17025 – General Requirements for the Competence of Testing and Calibration Laboratories. Australian Standard 17025 requires that a laboratory have a quality system similar to ISO 9002. More importantly it also requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Assurance Manager.

A formal Quality Control program is in place at EML Air to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

DEFINITIONS

The following symbols and abbreviations may be used in this test report:

NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
BSP	British standard pipe
NA	Not applicable
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately

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Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geotechnical Investigation

Proposed Gas Pipeline
Old Wallgrove Road, Horsley Park

Prepared for
The Austral Brick Company Pty Ltd

Project 73287.00
January 2013

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

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Revision	Electronic	Paper	Issued to
0	1	3	Robert Zvirgzdins
1	1	0	Cassandra Steppacher, David Schumacher

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		10 January 2013
Reviewer	for MJT	10 January 2013

NCS INTERNATIONAL CERTIFIED QUALITY MANAGEMENT SYSTEM

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Douglas Partners
Geotechnics / Environment / Groundwater

Table of Contents

Douglas Partners
Geotechnics / Environment / Groundwater

Report on Geotechnical Investigation
Proposed Gas Pipeline
Old Wallgrove Road, Horsley Park

1. Introduction

This report presents the results of a geotechnical investigation undertaken by Douglas Partners Pty Ltd (DP) for a proposed gas pipeline that is to extend between Erskine Park and Horsley Park through existing rural land. The work was commissioned by Mr Robert Zvirgzdins of The Austral Brick Company Pty Ltd (Austral), and was carried out in accordance with the agreed scope of works, as outlined in DP's proposal dated 20 November 2012.

It is understood that the gas pipeline will be used to transfer methane gases from a landfill to Austral's brick kilns. The pipeline will be approximately 4.5 km long and will extend along the common boundary line on the southern side of the Sydney water supply lines and the northern side of an existing rural allotment fronting the western side of Old Wallgrove Road. The development is currently at the design stage, although preliminary information suggests that the pipe will be buried in shallow trench excavations, deepening below two creek crossings and a crossing below the Sydney water supply lines.

The purpose of the investigation was to determine the subsurface conditions at three proposed underbore locations and to provide comments on design and construction practice. The geotechnical investigation included the drilling of six boreholes, laboratory testing of selected rock core samples recovered from the borehole, followed by engineering analysis and reporting. The details of the field and laboratory work are presented in the report.

2. Site Description

The investigation sites are located within rural land on the western side of Old Wallgrove Road, immediately south of the Warragamba to Prospect water supply pipelines and opposite the entry to Austral's Plant 23 at Horsley Park. The rural property is a large, irregularly shaped parcel of land that extends approximately 3 km east to west and up to 1 km north to south. The three underbore investigation sites are located along the northern boundary, one at each of the two creek crossings near the centre of the northern boundary and the other at the north western corner of the property.

The ground surface in the local area is gently undulating with slopes generally less than ten degrees and mostly less than five degrees. Each underbore site is relatively level and covered with grass. Mature tree growth is present along the line of each of the two creeks, otherwise the surrounding area is essentially cleared.

At the time of the site investigation, the rural property was operating as a grazing lot for cattle and horses. An unsealed access track meanders its way through the property, mostly within the southern

part. At least one rural dam is present within the western part of the property between the water supply pipeline and creek crossings.

3. Geology

Reference to the Sydney 1:100,000 Geological Series Sheet indicates that the two creek underbore sites are underlain by Quaternary Fluvial Sediments comprising fine grained sand, silt and clay. These deposits are local to the creek alignments and are underlain by Bringelly Shale, which generally consists of shale, carbonaceous claystone, claystone, laminite, fine to medium-grained lithic sandstone, rare coal and tuff. The weathered portion of this formation typically includes clays and silty clays of medium to high plasticity. The underbore below the water supply lines is underlain by Bringelly Shale.

The field work confirmed the presence of predominantly shale and siltstone bedrock, with occasional sandstone beds also present. Overlying soils comprised shallow topsoil, sandy clay, sandy silty clay, and silty clay.

4. Field Work Methods

The field work was conducted over four days on 28, 29 and 30 November and 4 December 2012. The geotechnical investigation included:

- A walkover inspection of the site by a senior geotechnical engineer.
- Drilling of six boreholes (BH1 to BH6) using a truck-mounted DT100 drill rig. Initially, the bores were drilled using solid flight augers fitted with a Tungsten-Carbide (TC) bit until practical refusal on rock occurred at a depths of between 1.4 m and 4 m. Rotary wash bore drilling then occurred for 0.2 m to 1.8 m within extremely low strength rock before the bores were further advanced to depths of 7.7 m to 8.7 m within higher strength rock using NMLC diamond core methods.
- Standard penetration test (SPT) at 1.5 m depth intervals commencing at 1 m depth in the overburden materials.
- Collection of soil and rock core samples from the boreholes for examination, logging and to provide laboratory test specimens for point load strength index testing.

The borehole locations were selected to coincide with the eastern and western ends of each proposed underbore location, generally as requested by Austral's site representative. The approximate borehole locations are shown on Drawing No. 1, presented in Appendix B. The locations were chosen based on drill rig accessibility and existing buried services. Prior to drilling at the site, the bore locations were scanned for the presence of in-ground service lines. The borehole locations and surface levels interpolated from a site survey plan (Drawing No. 111783020, prepared by Hard & Forester Pty Ltd). Coordinates and levels are recorded on the attached borehole logs presented in Appendix C.

5. Field Work Results

Details of the subsurface conditions encountered are given on the borehole logs presented in Appendix C, together with notes defining classification methods and descriptive terms.

A summary of the typical sequence of subsurface conditions encountered during drilling is presented below:

Topsoil:	Approximately 50 mm thickness of light brown, silty clay with a trace of fine sand and with some grass rootlets. The topsoil was generally humid.
Clay Soils:	Sandy clay, sandy silty clay and silty clay below the topsoil and extending to depths of between 1.6 m and 5.1 m. Generally brown orange-brown and light grey, mottled and sandy near the two creek crossings, some fine grained ironstone gravels and tending to shaly clay at depth. The clays were generally firm to very stiff and moist to wet.
Weathered Rock:	Intersected from depths of 1.6 m to 5.1 m and consisting of shale overlying siltstone in all boreholes except BH6 where sandstone was also intersected. The rock was initially highly to moderately weathered within the upper 2 m to 3 m then mostly slightly weathered to fresh at depths below 6 m. The rock was initially of typically very low to low strength (varies between extremely low and medium strength) to a depth of approximately 7 m and then remained medium strength to the base of all boreholes. The degree of fracturing varied considerably, although was mostly fractured to slightly fractured, less so within the sandstone bed intersected in BH6. Bedding was essentially near horizontal and joints ranged in slope angle from 30 to 90 degrees in siltstone and shale. Thin clay seams and clay smears were identified in the rock core samples, generally along bedding separations.

Free groundwater was encountered during auger drilling in boreholes BH1 to BH5 at depths of between 2.4 m to 3.7 m. No free groundwater was encountered in BH6. Once water was introduced into the boreholes to facilitate rotary and NMLC drilling, further observation of groundwater seepage flows and levels was precluded. Long term/ongoing groundwater depth monitoring was beyond the scope of the investigation.

6. Laboratory Testing

Rock core samples were collected from boreholes BH1 to BH6 during the field investigation. Several sub-samples of the cores were subjected to point load strength index testing in their axial direction for classification according to rock strength. The test results are presented on the log sheets in Appendix C, at the relevant depth.

7. Proposed Development

The proposed development includes the construction of a gas pipeline from an existing landfill site in Erskine Park to Austral's Plant 23, located on the eastern side of Old Wallgrove Road, Horsley Park. It is understood that the gas pipeline will be used to transfer methane gases from landfill to Austral's brick kilns. The pipeline will be approximately 4.5 km long and will extend along the common boundary line on the southern side of the Sydney water supply lines and the northern side of an existing rural allotment fronting the western side of Old Wallgrove Road. The gas pipeline will require shallow excavation for most of its length, as well as three underbores below two existing creek lines and one crossing below the Sydney water supply pipelines.

8. Comments

8.1 Interpreted Geotechnical Model

The results of the geotechnical investigation show that the site is generally underlain by the following profile:

- Topsoil to a typical depth of 0.05 m;
- Alluvial soils at BH1 to BH4 to depths of 2 m to 4 m. Typically stiff to very stiff with some local areas of firm clays. Mostly sandy clays and silty clays;
- Residual soils at BH1 to BH6 to depths of 2 m to 5 m but underlying the alluvium, where present. Typically stiff to very stiff and comprising silty clays and shaly clays.
- Weathered shale or siltstone bedrock. Variably weathered but typically extremely very low to low strength becoming more competent below 7 m depth. Some sandstone was also encountered in BH6.

Based on the field observations, the groundwater level is expected on average to be about 2.5 m to 3.5 m below the ground surface.

8.2 Excavations

Excavation of the alluvial and residual soils should be readily undertaken using conventional earthmoving equipment such as hydraulic excavators or similar. Groundwater seepage should be expected into any excavations deeper than 2 m, and provisions for dewatering by sump and pump methods will be required for any such excavations.

Excavation of extremely low strength and very low strength shale and siltstone should also be readily undertaken using excavators, but excavation of low strength rock or better may require the use of rock hammers, particularly in sandstone.

The following maximum batter slopes are recommended for temporary or permanent unsupported excavation faces.

Table 1: Maximum Unsupported Batter Slopes

Strata	Maximum Batter Slopes	
	Temporary	Permanent
Topsoil	2H:1V	3H:1V
Alluvial and Residual Clays	1.5H:1V	2H:1V
Extremely low and very low strength rock	1H:1V	1.5H:1V
Low and medium strength rock	0.5H:1V	1H:1V

The alluvial and residual soils are expected to be highly dispersive and therefore potentially highly erodible. Protection of any exposed excavation slopes in these soils will be required to minimise the impacts of erosion and flooding.

Any excavated material to be disposed of off-site should be tested for contaminants to allow Waste Classification Assessment in accordance with NSW EPA requirements. DP would be pleased to assist with this work, if required.

8.3 Underbore

The boreholes drilled at the proposed underbore locations intersected alluvial soils from depths of 0 m to 4 m, over stiff to very stiff residual silty clay and shaly clay and then very low to low strength shale, siltstone and sandstone bedrock below depths of 1.6 m to 5.1 m. Groundwater was noted in five of the six boreholes during drilling at depths ranging from 2.4 m to 3.7 m.

The depth and dimensions of the underbore have not yet been determined, but it is assumed that the underbore will be drilled at depths of about 4 m to 5 m below the existing surface levels at the boreholes, equating to a depth of about 2 m below the creek bed. The underbore depth at the water supply line is likely to be shallower. This will mean that the underbore will be drilled mostly through stiff to very stiff alluvial and residual soils, and possibly very low to low strength rock.

The alluvial and residual soils included stiff to very stiff sandy clays and silty clays. It is likely that the underbore contractor will aim to limit the depth of the underbores to avoid drilling in weathered bedrock, where possible. It is anticipated that drilling conditions for the underbores will be relatively straightforward.

Provided the underbores are of relatively small diameter and are fully supported by a lining, it is anticipated that the underbores will have no effect on the stability or settlement of the surrounding ground profile.

9. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for the proposed gas pipeline from Erskine Park to Horsley Park in accordance with DP's proposal dated 20 November 2012 and acceptance

received from Mr Robert Zvirgzdins from The Austral Brick Company Pty Ltd (Austral). The work was carried out under DP's conditions of engagement. This report is provided for the exclusive use of Austral for the specific project and purpose as described in the report. It should not be used for other projects, other sites or by a third party. DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are considered to be indicative of the sub-surface conditions on the site only to the depths investigated at the specific sampling and/or testing locations, and only at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

July 2010

About this Report

Site Anomalies
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

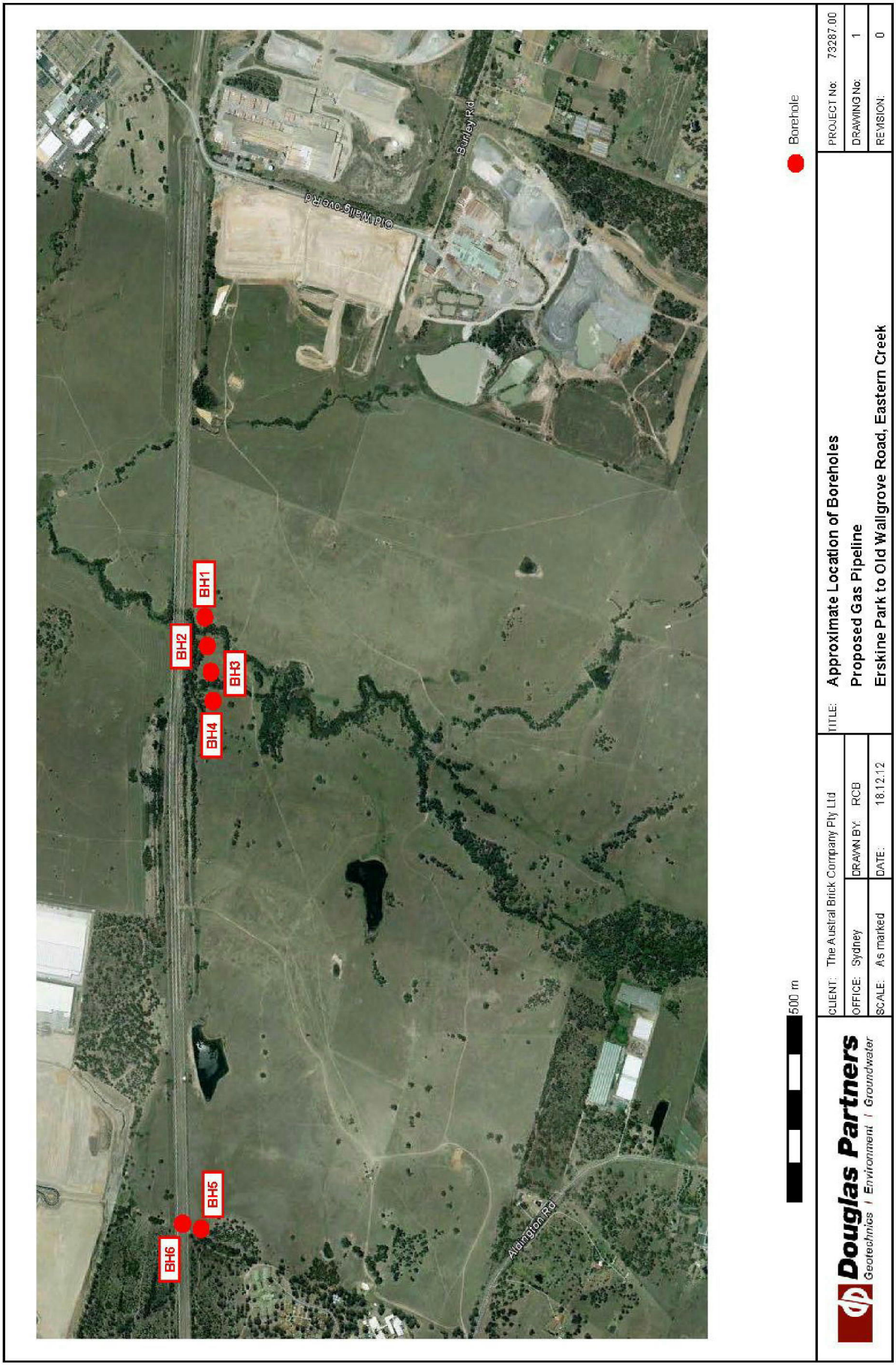
Information for Contractual Purposes
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

July 2010

Appendix B

Drawing No. 1 – Approximate Location of Boreholes


BH1
BH2
BH3
BH4
BH5
BH6
Old Wallgrove Rd
Burley Rd
Aldington Rd
Borehole
500 m
Douglas Partners
Geotechnics / Environment / Groundwater
CLIENT: The Austral Brick Company Pty Ltd
OFFICE: Sydney
DRAWN BY: RCB
SCALE: As marked
DATE: 18.12.12
TITLE: Approximate Location of Boreholes
Proposed Gas Pipeline
Erskine Park to Old Wallgrove Road, Eastern Creek
PROJECT No: 73287.00
DRAWING No: 1
REVISION: 0

Appendix C

Field Work Results

Sampling Methods

Douglas Partners

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

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Sampling Methods

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

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Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Descriptions

Douglas Partners

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

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Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

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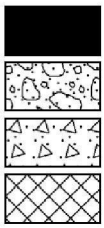
Symbols & Abbreviations

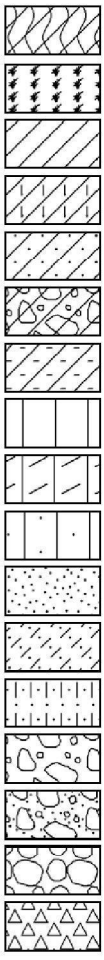
Graphic Symbols for Soil and Rock

General



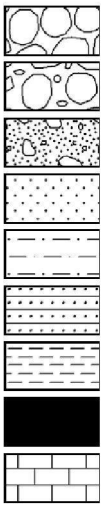
Asphalt
Road base
Concrete
Filling

Soils



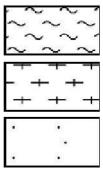
Topsoil
Peat
Clay
Silty clay
Sandy clay
Gravelly clay
Shaly clay
Silt
Clayey silt
Sandy silt
Sand
Clayey sand
Silty sand
Gravel
Sandy gravel
Cobbles, boulders
Talus

Sedimentary Rocks



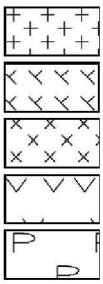
Boulder conglomerate
Conglomerate
Conglomeratic sandstone
Sandstone
Siltstone
Laminite
Mudstone, claystone, shale
Coal
Limestone

Metamorphic Rocks



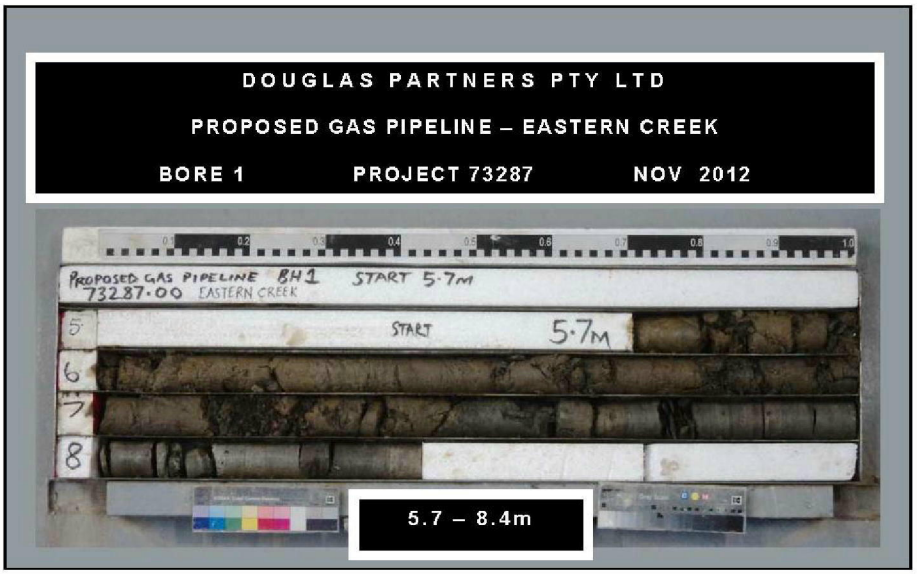
Slate, phyllite, schist
Gneiss
Quartzite

Igneous Rocks



Granite
Dolerite, basalt, andesite
Dacite, epidote
Tuff, breccia
Porphyry

July 2010


DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 1 PROJECT 73287 NOV 2012
PROPOSED GAS PIPELINE BH1 START 5·7m
73287·00 EASTERN CREEK
START 5·7m
5
6
7
8
5.7 – 8.4m

BOREHOLE LOG

CLIENT: The Austral Brick Co Pty Ltd
PROJECT: Proposed Gas Pipeline
LOCATION: Old Wallgrove Road, Eastern Creek

SURFACE LEVEL: 53.4 m AHD
EASTING: 297555
NORTHING: 6255320
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 73287
DATE: 28/11/2012
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
53	0.05	TOPSOIL - light brown silty clay top soil with some grass rootlets, humid							A			
		SILTY CLAY - brown, silty clay with some fine grained sand, humid							A			
52	1.1	SANDY SILTY CLAY - very stiff mottled orange brown and light grey fine grained sandy silty clay, damp							A			
									S			7,8,8 N = 16
51	2.0	SILTY CLAY - very stiff, light grey mottled orange, silty clay with some fine grained sand and ironstone gravel, moist to wet							S			2,6,11 N = 17
50									S			
49	4.0	SHALY CLAY - very stiff light grey-brown shaly clay with ironstone bands, damp							S			7,7,12 N = 19
48	5.1	SHALE - extremely low to very low strength. Light grey, brown shale						NOTE: Unless otherwise stated, rock is fractured along rough planar bedding, dipping 0°-10°	S			25/114mm refusal
	5.7	SHALE - very low and low strength, slightly weathered, fractured and slightly fractured, grey brown shale. 5.7-5.9m; low to medium strength bands						5.8m: J60°, sm, pl, cln 5.86m: J45°-70°, ro, cu, cly 6.1m: B5°, cly 6.25m: J85°-90°, sm, un, cly 6.58m: J 55°, sm, un, cly 6.66m: B5°, fe 6.77m: J, 85°, ro, pl, fe 7.15 to 7.3m: cz, (drilling induced) 7.45m: J45°, sm, pl, cln	C	100	54	PL(A) = 0.3
47									C	100	52	PL(A) = 0.2
46	7.45	SILTSTONE - medium strength, fresh, slightly fractured, light grey and grey siltstone with some fine grained sandstone laminations and bands						7.75 to 7.78m, fg 8.1m: J85°, sm, pl, cln	C	100	96	PL(A) = 0.4 PL(A) = 0.4
45	8.4	Bore discontinued at 8.4m target depth reached										
44												

RIG: DT100 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 4.6m
TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 5.7m; NMLC-Coring to 8.4m
WATER OBSERVATIONS: Free groundwater observed at 2.4m whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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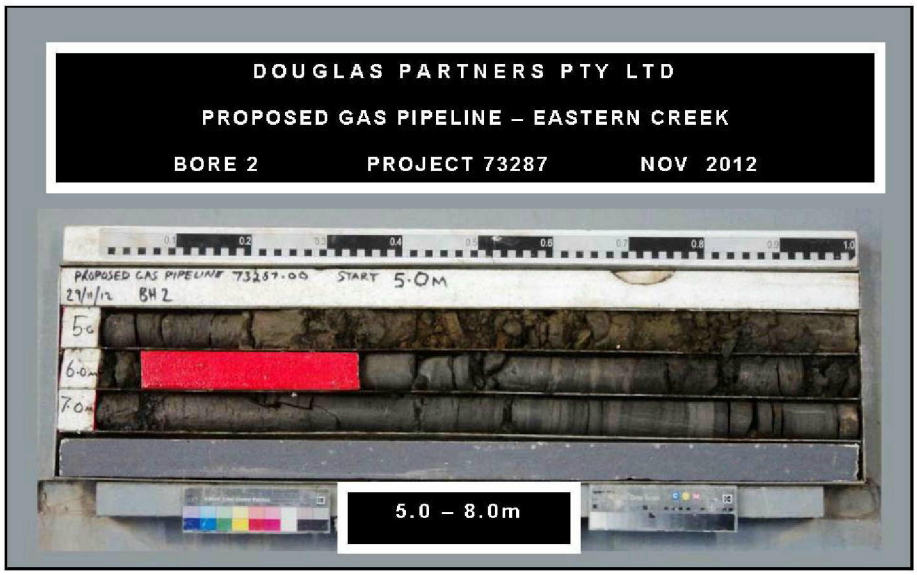
DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 2 PROJECT 73287 NOV 2012
PROPOSED GAS PIPELINE 73287.00 START 5.0M
29/11/12 BH 2
5.0
6.0m
7.0m
5.0 – 8.0m

BOREHOLE LOG

CLIENT: The Austral Brick Co Pty Ltd
PROJECT: Proposed Gas Pipeline
LOCATION: Old Wallgrove Road, Eastern Creek

SURFACE LEVEL: 53.4 m AHD
EASTING: 297536
NORTHING: 6255314
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 73287
DATE: 29/11/2012
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
53	0.05	TOPSOIL - brown silty clay topsoil with some fine grained sand and grass rootlets, humid							A			
	0.7	SILTY SAND - brown fine grained silty sand, humid							A			
52	1	SILTY CLAY - very stiff, light grey mottled brown, silty clay with trace of fine grained sand, moist							A			
									S			8,11,13 N = 24
51	2	2.0 SANDY CLAY - stiff, brown fine to medium grained sandy clay with some ironstone gravel, moist, becoming wet at 2.6m										
	3								S			4,4,7 N = 11
50	4	4.15 SHALE - extremely to very low strength, light grey brown shale						Unless otherwise stated, rock is fractured along south planar bedding, dipping at 0° to 10°	S			10,25/100mm refusal
49	5	5.0 SHALE - very low and low to medium strength, highly to moderately weathered, slightly fractured, grey to grey brown shale						5.2m: B 0°- 5°, cly 5.41m: J 10°, ro, pl, fe 5.63m: J 60°,sm, pl, cly 5.74m: J 45°, ro, pl, cly	C	100	57	PL(A) = 0.3
48	6							6.05m: CORE LOSS: 300mm				
47	6.35	SILTSTONE - medium strength, slightly weathered then fresh, slightly fractured, light grey to grey siltstone with some fine grained sandstone laminations and bands 6.85-7.2m: low strength band										PL(A) = 0.6
46	7							6.75m: J 10°, ro, pl, cln 6.8m: J45°, sm, pl, cz 30mm 6.93m: B 0°, cz, 30mm 7.20-7.33m: J, 45°-75°, sm, cu, cly 7.53m: B0°, cly, 2-3mm	C	85	74	PL(A) = 0.5
45	8	8.0 Bore discontinued at 8.0m target depth reached										PL(A) = 0.5
44	9											

RIG: DT 100 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m, Rotary to 5.0m, NMLC-Coring to 8.0m
WATER OBSERVATIONS: Free groundwater observed at 2.6m whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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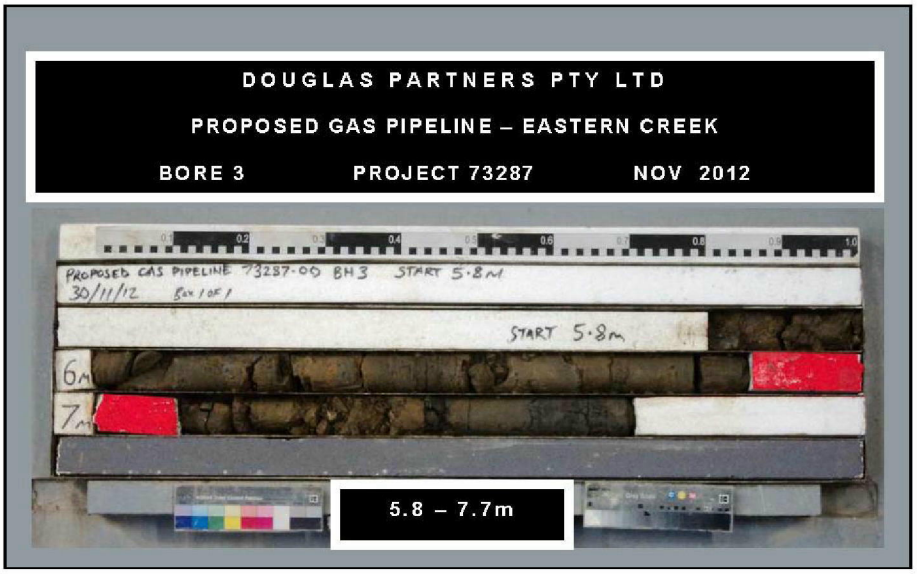
Geotechnics / Environment / Groundwater


DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 3 PROJECT 73287 NOV 2012
PROPOSED GAS PIPELINE 73287-00 BH3 START 5.8m
30/11/12
START 5.8m
6m
7m
5.8 – 7.7m

BOREHOLE LOG

CLIENT: The Austral Brick Co Pty Ltd
PROJECT: Proposed Gas Pipeline
LOCATION: Old Wallgrove Road, Eastern Creek

SURFACE LEVEL: 54.2 m AHD
EASTING: 297415
NORTHING: 6255278
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 73287
DATE: 30/11/2012
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low, Very Low, Low, Medium, High, Very High, Ex High		0.01, 0.05, 0.10, 0.50, 1.00	B - Bedding J - Joint S - Shear F - Fault				
54	0.05	TOPSOIL - brown silty clay topsoil with trace of fine grained sand and grass rootlets, humid							A			
		SILTY CLAY - stiff to very stiff light-brown silty clay, humid							A			
53	1								A			
									S			5,12,10 N = 22 22
52	2											
	2.2	SANDY CLAY - stiff, brown fine to medium grained sandy clay, moist										
51	3								S			3,5,6 N = 11 11
	3.5	SILTY CLAY - stiff, brown silty clay with some fine grained sand and ironstone gravel, wet										
50	4								S			4,6,8 N = 14 14
	4.8	SHALE - extremely low strength, light grey to gray shale						Unless otherwise stated, rock is fractured along south planar bedding, dipping at 0° to 10°				
49	5	5.6m: becoming very low strength							S			10,25/100 refusal
	5.8	SHALE/ SILSTSTONE - alternate bands of very low and medium strength, highly to moderately weathered then fresh, slightly fractured, light grey shale/ siltstone with some fine grained sandstone laminations and bands						6.05m: J,30°, sm, pl,cly, J 85°, sm, pl, cly 6.35m: B 0°-5°, fe 6.63m: J 30°, ro, pl, fe	C	100	38	PL(A) = 0.4 PL(A) = 0.4
48	6											
	7.1	6.85-7.2m: low strength band						6.85m: to 7.1m: cl, 250mm CORE LOSS: 250mm 7.38m: J 40°, sm, pl, cly 7.55m: J, 85°, he 7.6m: 7.6-7.65m: cu, 50mm	C	71	53	PL(A) = 0.4
47	7											
	7.7	Bore discontinued at 7.7m target depth reached										
46	8											
45	9											

RIG: Dt 100 **DRILLER:** SY **LOGGED:** SI **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m, Rotary to 5.8m, NMLC-Coring to 7.7m
WATER OBSERVATIONS: Free groundwater observed at 3.7m whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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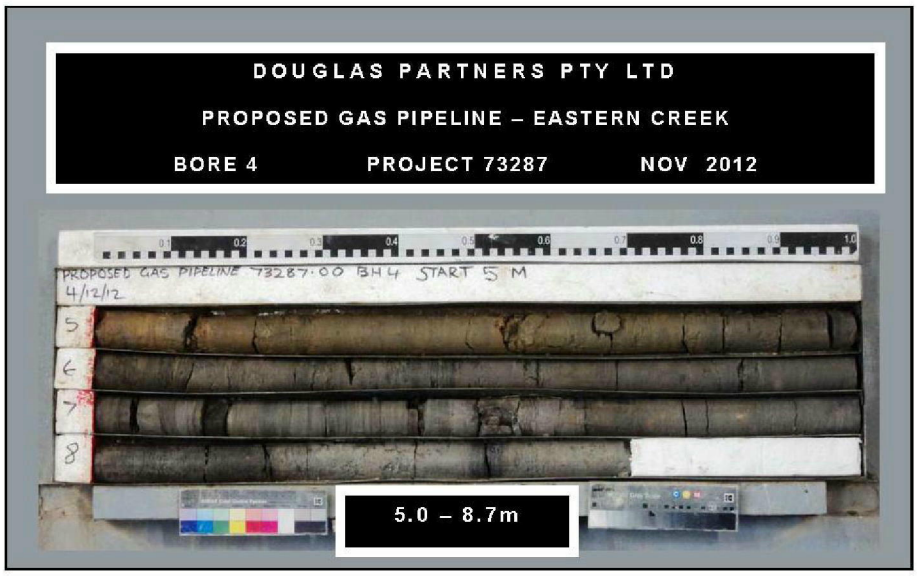
DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 4 PROJECT 73287 NOV 2012
PROPOSED GAS PIPELINE 73287:00 BH4 START 5 M
4/12/12
5.0 – 8.7m

BOREHOLE LOG

CLIENT: The Austral Brick Co Pty Ltd
PROJECT: Proposed Gas Pipeline
LOCATION: Old Wallgrove Road, Eastern Creek

SURFACE LEVEL: 54.0 m AHD
EASTING: 297390
NORTHING: 6255271
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 73287
DATE: 4/12/2012
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
54	0.05	TOPSOIL light brown silty clay topsoil with some grass rootlets, humid							A			
		SANDY CLAY - firm, brown fine grained sandy clay, humid							A			
53	1								A			
	1.1	SILTY CLAY - firm, brown silty clay with trace of fine grained sand, moist							S			3,4,3 N = 7
52	2											
	2.1	SANDY CLAY - stiff to very stiff, light brown then mottled brown and light grey fine grained sandy clay moist to wet										
		3.5m: sandy clay with ironstone gravel							S			4,7,8 N = 15
51	3											
50	4											
	4.0	SHALE - extremely low strength, extremely weathered light grey to grey shale							S			5,11,20 N = 31
49	5							Unless othewise stated, rock is fractured along rough planar bedding, dipping at 0°-10°				
	5.0	SHALE - low strength, highly to moderately weathered, Slightly fractured, grey brown shale with some very low strength bands						5.13m: B0°-5°, fe, cly 10mm 5.53m: J35°, sm, pl, cln 5.65m: J40°, sm, pl, cln 6.12m: J20°, ro, un, cln 6.33m: to 6.57m: B(3x) 0°, cly 2-5mm	C	100	85	PL(A) = 0.2 PL(A) = 0.2
48	6											
47	7											
	7.0	SILTSTONE/ SHALE - medium then low to medium strength, slightly weathered and fresh, slightly fractured, light grey to grey siltstone/ shale 7.2 to 7.25m: very high siderite band 8.55 to 8.7m : very low strength band						7.15m: J85°, sm, pl, cln 7.43m: B0°, cly 5mm 8.21m: J20°, ro, pl, cbs 3mm	C	100	80	PL(A) = 0.4 PL(A) = 4.5 PL(A) = 0.4 PL(A) = 0.3
46	8											
	8.7	Bore discontinued at 8.7m target depth reached										
45	9											

RIG: DT100 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m; Rotary drilling to 5.0m; NMLC casing to 8.7m
WATER OBSERVATIONS: Free groundwater observed at 2.5m whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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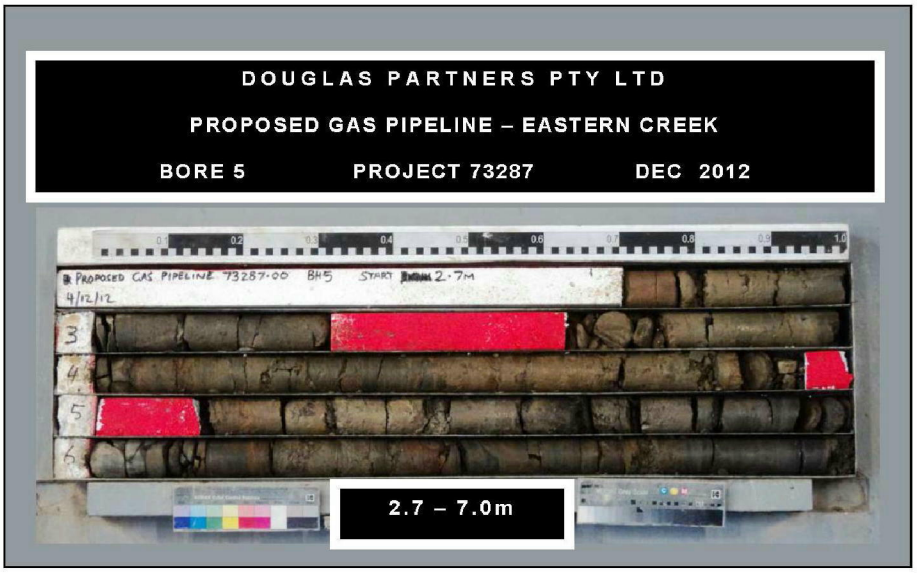
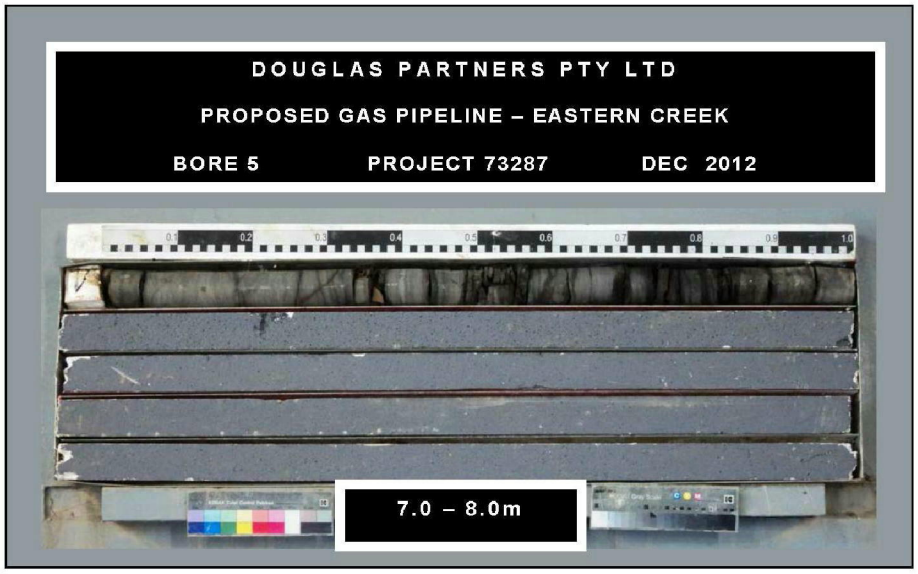

DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 5 PROJECT 73287 DEC 2012
2.7 – 7.0m


DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 5 PROJECT 73287 DEC 2012
7.0 – 8.0m

BOREHOLE LOG

CLIENT: The Austral Brick Co Pty Ltd
PROJECT: Proposed Gas Pipeline
LOCATION: Old Wallgrove Road, Eastern Creek

SURFACE LEVEL: 52.4 m AHD
EASTING: 295912
NORTHING: 6255037
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 73287
DATE: 4/12/2012
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.05	TOPSOIL - light brown, silty clay topsoil with some grass rootlets, humid							A			
		SILTY CLAY - brown silty clay, humid							A			
	0.7	SHALY CLAY - hard, light grey, mottled orange shaly clay with trace of ironstone band, damp							A			
	1								A			
									S			3,19,20/40mm refusal
	1.8	SHALE - very low to low strength, light grey brown shale						Unless otherwise stated, rock is fractured along rough planar bedding, dipping at 0°-10°				
	2											
	2.7	SHALE - alternate bands of very low and medium strength highly then highly to moderately weathered, slightly fractured, grey brown shale							S			20/130mm refusal
	3							2.8m: B0°, fe				
								3.31m: CORE LOSS: 320mm				
	3.63							3.75m: B/J, 20°, ro, vn, cly	C	86	28	PL(A) = 0.6 PL(A) = 0.4
	4							4.28m: J20°, ro, un, cly				PL(A) = 0.4
	4.5	SHALE - very low strength, highly weathered, light grey brown shale										
	5							4.95m: CORE LOSS: 200mm				
	5.15											
	5.8	SILTSTONE/ SHALE - medium strength, slightly weathered then fresh, slightly fractured, light grey brown then grey siltstone/ shale 7.0 to 7.3m: high strength fine grained sandstone										PL(A) = 0.8
	6							5.93m: J25°, sm, pl, fe 6.05m: J30°, sm, pl, cln 6.23m: B0°, fe, Cz, 30mm 6.47m: J85°, ro, pl, cln	C	93	63	PL(A) = 1.8
	7							6.72m: B0°, fe, Cz 30mm 6.97m: B5°, fe, Cz 20mm 7.27m: J55°, ro, un, fe 7.36m: B0°, fe 7.5m: J70°, ro, un, cln 7.68m: J40°, ro, un, cln 7.83m: B0°, Cz 15mm				
	8											
	8.0	Bore discontinued at 8.0m target depth reached										PL(A) = 0.4
	9											

RIG: DT100 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 2.3m
TYPE OF BORING: Solid flight auger to 2.5m; Rotary drilling to2.7m; NMLC coring to 8.0m
WATER OBSERVATIONS: Free groundwater observed at 2.5m whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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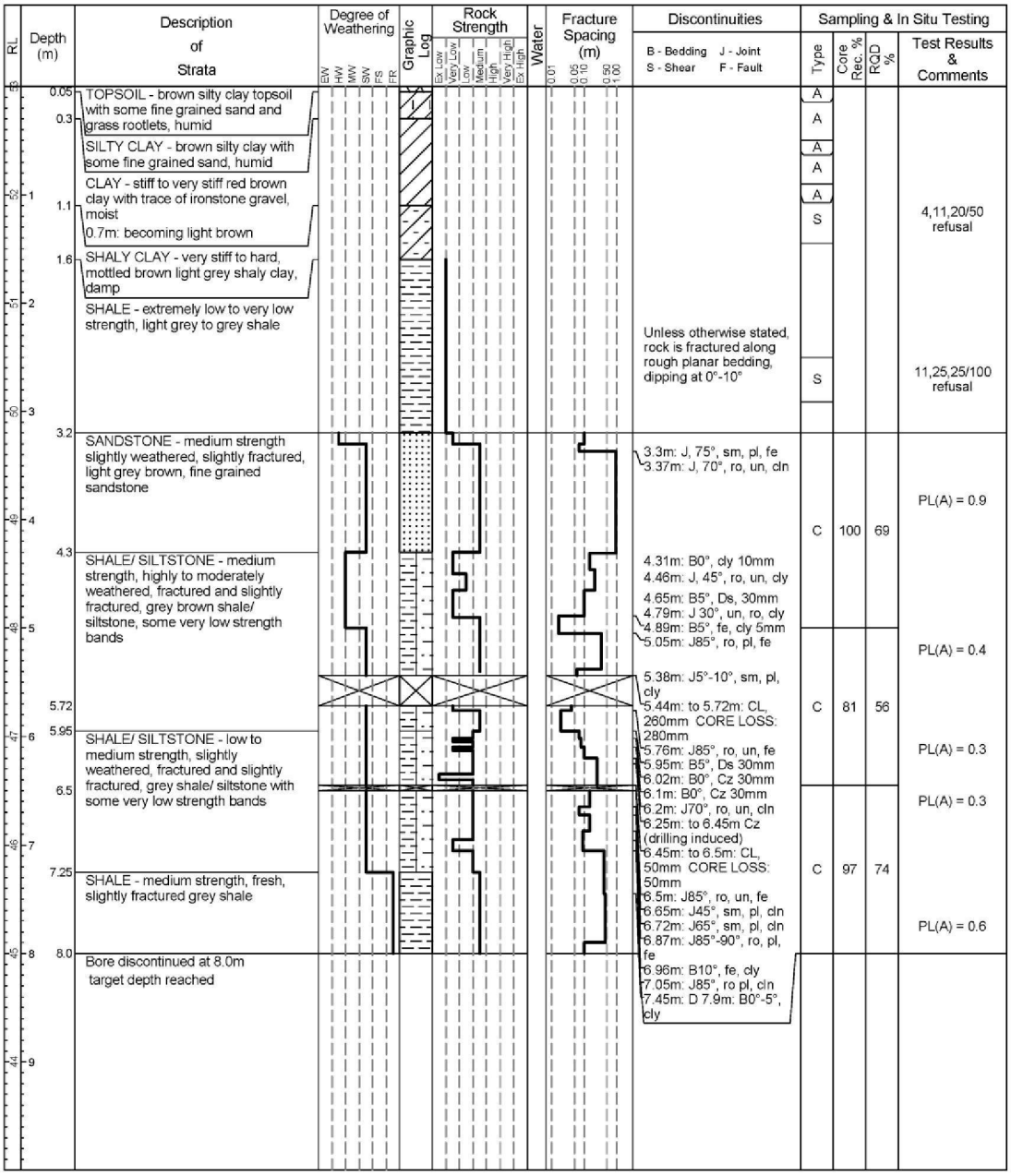
DOUGLAS PARTNERS PTY LTD
PROPOSED GAS PIPELINE – EASTERN CREEK
BORE 6 PROJECT 73287 DEC 2012
3.2 – 8.0m

BOREHOLE LOG

CLIENT: The Austral Brick Co Pty Ltd
PROJECT: Proposed Gas Pipeline
LOCATION: Old Wallgrove Road, Eastern Creek

SURFACE LEVEL: 53.0 m AHD
EASTING: 295913
NORTHING: 6255070
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 73287
DATE: 30/11/2012
SHEET 1 OF 1



RIG: Dt 100 **DRILLER:** SY **LOGGED:** SI **CASING:** HW to 1.4m
TYPE OF BORING: Solid flight auger to 1.4m, Rotary to 3.2m, NMLC-Coring to 8.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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