CLYDE TERMINAL CONVERSION PROJECT

APPENDIX E

CLYDE TERMINAL HISTORICAL ARCHAEOLOGICAL ASSESSMENT

Clyde Terminal Conversion Project
The Shell Company of Australia Ltd
08-Nov-2013

Clyde Terminal Historical Archaeological Assessment

Clyde Terminal Conversion Environmental Impact Statement

Clyde Terminal Historical Archaeological Assessment

Clyde Terminal Conversion Environmental Impact Statement

Client: The Shell Company of Australia Ltd

ABN: 46004610459

Prepared by

AECOM Australia Pty Ltd
Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

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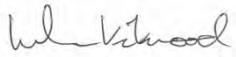
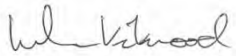
1	24-Jul-2012	Draft	Luke Kirkwood – Principal Archaeologist	
2	23-Oct-2012	Draft	Luke Kirkwood – Principal Archaeologist	
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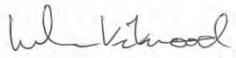
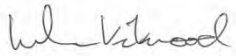
4	23-Aug-2013	Revised Final	Luke Kirkwood – Principal Archaeologist	
5	8-Nov-2013	Revised Final after Adequacy Review	Luke Kirkwood – Principal Archaeologist	

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by the Shell Company of Australia Ltd (Shell) to undertake a historical heritage assessment for the Clyde Terminal Conversion (the Project). The purpose of this assessment is to form part of an Environmental Impact Statement (EIS) being prepared by AECOM to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the conversion of the Clyde Terminal for use solely as a finished fuels terminal.

This assessment has addressed the Director General's Requirements (DGRs) for the project, which are to complete:

A non-Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:

- *Include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items including the Shell Oil Refinery Wharf and the surrounding wetland areas on the banks of the Parramatta and Duck Rivers and their tributaries; and*
- *Outline any proposed management and mitigation measures.*

The then Clyde Refinery was established by John Fell & Co. between 1918 and 1926. Shell purchased the site in 1928 and has operated it as a Crude Oil refinery until refining cessed on 5 October 2012. This report assessed the heritage significance of the site, using NSW Heritage Branch guidelines (NSW Heritage Office, 2001) and based on historical research and a site inspection. It was determined to be of State significance on historical, associative, rarity and representative grounds. It was also found to be locally significant, holding aesthetic, social, technical and research values. The following summary of the site's significance, a Statement of Significance, was developed:

The Clyde Terminal is of State historical, associative, rarity and representative significance. Historically, it demonstrates NSW's increasing use of and reliance on fossil fuels and the expansion of business in the State from import to production. It is associated with the Shell Company, one of the leading producers and retailers of fuel in NSW. The Terminal is representative of an oil refinery and is rare, being one of only two in NSW.

The Clyde Terminal is of local social, research and technical significance. It is likely to be of social significance to the local community – it has been an employer of locals for over 80 years and has been an active participant and supporter of community events throughout that time. The Terminal can also demonstrate technical developments in the process of refining Crude Oil. The plant dates from the 1960s onwards, while the Central Control Room was considered as world class on its completion in 1988. The site contains two areas of archaeological significance, which have the potential, at a local level, to provide information, through archaeological investigation, not available from other sources. One relates to three houses formerly located on the corner of Devon and Colqhoun Streets and anecdotally used as accommodation for the site managers. The second area may contain information relating to the layout and functions of the initial refinery established by John Fell & Co.

An assessment of the proposed works found that the demolition of redundant refinery infrastructure would have a negative impact on the significance of the site. Conservation, however, was determined not to be a viable option due to financial and practical reasons around the on-going management and maintenance of the site. It has been recommended that oral histories be recorded of past and present employees regarding the day to day operations of the then Clyde Refinery in order to capture some of the historical significance of the site. A full photographic and documentary archival recording has also been recommended in order to capture the physical fabric of the site. In relation to the areas of archaeological potential, it has been recommended that an Archaeological Research Design and Methodology be developed and implemented to manage these archaeological values. Further, should archaeological values remain at the completion of works, a standalone management document or heritage section be inserted in the Operational Environmental Management Plan (OEMP) to guide the management of these areas.

1.0 Introduction

1.1 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by the Shell Company of Australia Ltd (Shell) to undertake a historical heritage assessment for the Clyde Terminal Conversion (the Project). The purpose of this assessment is to form part of an Environmental Impact Statement (EIS) being prepared by AECOM to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the conversion of the Clyde Terminal for use solely as a finished fuels terminal.

1.2 Assessment Objectives

The assessment objective is to address the Director-General's Requirements (DGRs) for the project. These were issued by the Department of Planning and Infrastructure on 16 March 2012. In relation to historical heritage the DGRs specifies the following must be completed:

A non-Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:

- Include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items including the Shell Oil Refinery Wharf and the surrounding wetland areas on the banks of the Parramatta and Duck Rivers and their tributaries; and
- Outline any proposed management and mitigation measures.

In order to address the DGRs the following objectives were established:

- To identify, through background research, targeted archaeological survey and assessment of the built structures, the heritage significance of the Project Area, using Heritage Branch guidelines *Assessing Heritage Significance* (NSW Heritage Office, 2001) and *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009);
- Complete a statement of heritage impact (SOHI), using Heritage Branch guidelines *Statements of Heritage Impact* (NSW Heritage Office, 2002); and
- To provide, on the basis of significance and impact assessments, an appropriate management strategy for the historical heritage resource of the Project Area.

1.3 The Project Area

Shell's Clyde Terminal is located at the confluence of Parramatta and Ducks Rivers in Rosehill, New South Wales (NSW); approximately 16km west of Sydney's CBD (see **Figure 1**). The Terminal, which receives finished fuel products Shell's Gore Bay Terminal via 19 km of underground pipeline, is bounded to the north by Parramatta River, to the south and east by Duck River, and to the west by industrial complexes. The Project Area falls wholly within the Parramatta Local Government Area (LGA) and is zoned *IN3 Heavy Industrial* under the Parramatta Local Environment Plan 2011 (Parramatta LEP 2011).

1.4 Project Description

Before October 2012, the Clyde Terminal was known as the Clyde Refinery, and site used to receive, refine, blend and distribute crude oils as well as finished fuels. Since the cessation of refining activities, the site has been known as the Clyde Terminal. Shell is seeking approval under Division 4.1 of Part 4 of the EP&A Act to complete the conversion of the Clyde Terminal for use solely as a finished fuels terminal. The conversion of the Clyde Terminal would involve the removal of redundant refining assets to enable Shell to operate the sites more effectively and efficiently. The conversion of the Clyde Terminal would comprise (see **Figure 2**):

- Demolition of redundant tanks and other infrastructure; and
- Upgrades and improvements to site infrastructure.

The key components of the conversion of the Project Area would comprise:

- Demolition of the existing Clyde Terminal processing units and other redundant infrastructure at the Project Area. Existing storage tanks to be retained would be reallocated into final grades of finished petroleum products. Storage tanks surplus to the ongoing operation of the Clyde Terminal would be demolished. This would reduce the capacity and quantity of storage for petroleum fuels at the Clyde Terminal from 638 ML to 264 ML of fuels;
- Conversion of part of the existing Clyde Terminal assets to more efficiently receive, blend, store and distribute solely imported finished petroleum products. These products would continue to be supplied from the Clyde Terminal to Shell's existing Parramatta Terminal (which lies adjacent to the Clyde Terminal), and directly via existing pipelines from the Clyde Terminal to Sydney Airport and Newcastle.

The proposed Project would also include:

- Conversion of current finished petroleum product and previous Crude Oil storage tanks as required to suit operation of the converted Clyde Terminal;
- Upgrades to tank instrumentation and tank control systems to enable remote and automated control;
- Upgrades to tank bunds where necessary;
- Reduction of the gas storage capacity of the Clyde Terminal from 10,851 cubic metres (m^3) to 1,550 m^3 metres to accommodate the continued receipt (by road tanker) and storage of Butane. Butane would continue to be blended with winter grades of Gasoline;
- Upgrades to the electrical supply, control and safeguarding systems;
- Increased automation of terminal systems;
- Installation of equipment to provide improved product quality segregation;
- Revised drainage and water treatment to suit reduced operations;
- Changes to the current fire system to provide articulated foam deployment and fire response for the converted Clyde Terminal arrangement;
- Revised internal facility pumping and piping arrangements;
- Associated works to increase the efficiency and effectiveness of the Clyde Terminal and to facilitate safe and efficient operations, such as lighting, safety shutdown systems, control room facilities and amenity upgrades; and
- An overall reduction in the operational footprint of the Clyde Terminal.

The Project would only involve minimal excavation activities, including grading works surrounding existing tankfarms, and foundation works for new substations and firewater tanks and the removal of some existing foundations. No other sub-surface disturbance is anticipated as part of the Project.

The Clyde Terminal would remain operational as a receipt (from the Gore Bay Terminal), storage and distribution facility for finished petroleum products during the proposed works. Once the Project is executed and implemented, the Clyde Terminal would continue to receive, store and distribute finished petroleum products.

The Project would only involve minimal excavation activities as follows:

- Grading works would be undertaken surrounding Tankfarms B, B1, E1, E2 and K, and also surrounding Tanks 32 to improve tank bund drainage. Excavations required as part of these works would be undertaken to an estimated depth of between 0.6 metres below ground surface (mbgs) and 1 mbgs;
- Tank 52 is to be demolished;
- Foundations for new substations to an estimated maximum depth of 1.5 mbgs; and
- Foundations for new firewater tanks to an estimated maximum depth of 1 mbgs.

The conversion would reduce the number of tanks in use at the Clyde Terminal from the current 36 tanks to the proposed 16 tanks. Products stored would include Unleaded Petrol 91, 95 and 98, Jet A1 fuel, Automotive Gas Oil (AGO) and Butane. The current Gore Bay – Clyde pipeline would continue to be used to transfer petroleum products from the Gore Bay Terminal to the Clyde Terminal.

1.5 The Project Team

The historical heritage assessment was managed by AECOM archaeologist Dr Susan Lampard. Dr Lampard was assisted by AECOM archaeologist Rochelle Coxon.

The site inspection was undertaken by an AECOM archaeologist (Dr Susan Lampard). Luke Kirkwood (AECOM NSW Heritage Team Leader) reviewed this report for Quality Assurance (QA) purposes. Tim Osborne (Designer, AECOM) created all figures within this report. Jodie Glennan (IAP Team Secretary, AECOM) provided administrative support throughout the assessment.

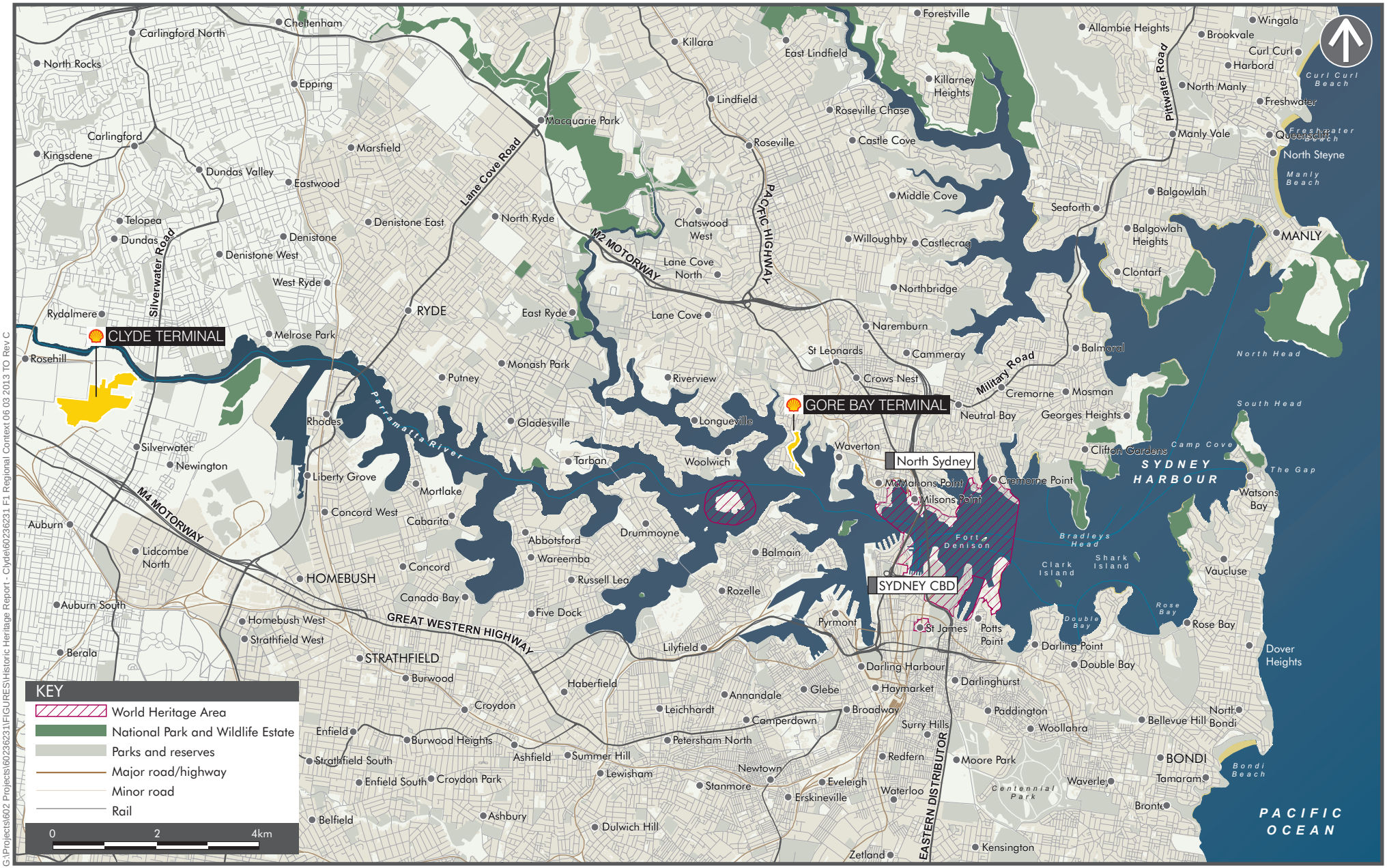
1.6 Report Structure

This report contains twelve sections. This section - **Section 1.0** - has provided background information on the Project and the investigation undertaken. The remainder of the report is structured as follows:

- **Section 2.0** outlines the statutory framework within which this investigation has been undertaken.
- **Section 3.0** describes the methodology utilised during the assessment.
- **Section 4.0** describes the historical context of the Project Area on a regional and local scale.
- **Section 5.0** summarises previous studies and significance assessments undertaken for the Project Area.
- **Section 6.0** describes the results of the site inspection, including descriptions of the built and archaeological components of the site.
- **Section 7.0** outlines the assessed heritage significance of the built and archaeological components of the site.
- **Section 8.0** provides an assessment of the potential impacts of the Project on identified sites.
- **Section 9.0** details a comprehensive management strategy for the built and archaeological resource of the Project Area.
- **Section 10.0** provides a SOHI.
- **Section 11.0** concludes the report and summarises the recommendations.
- **Section 12.0** lists the references cited in-text.

1.7 Acknowledgements

AECOM would like to acknowledge and thank the following people for their assistance: Naomi Bassford and Margaret Farlow of Local Studies, Lane Cove Library, Erica Salazar and Julie Sanchez of Shell Australia.



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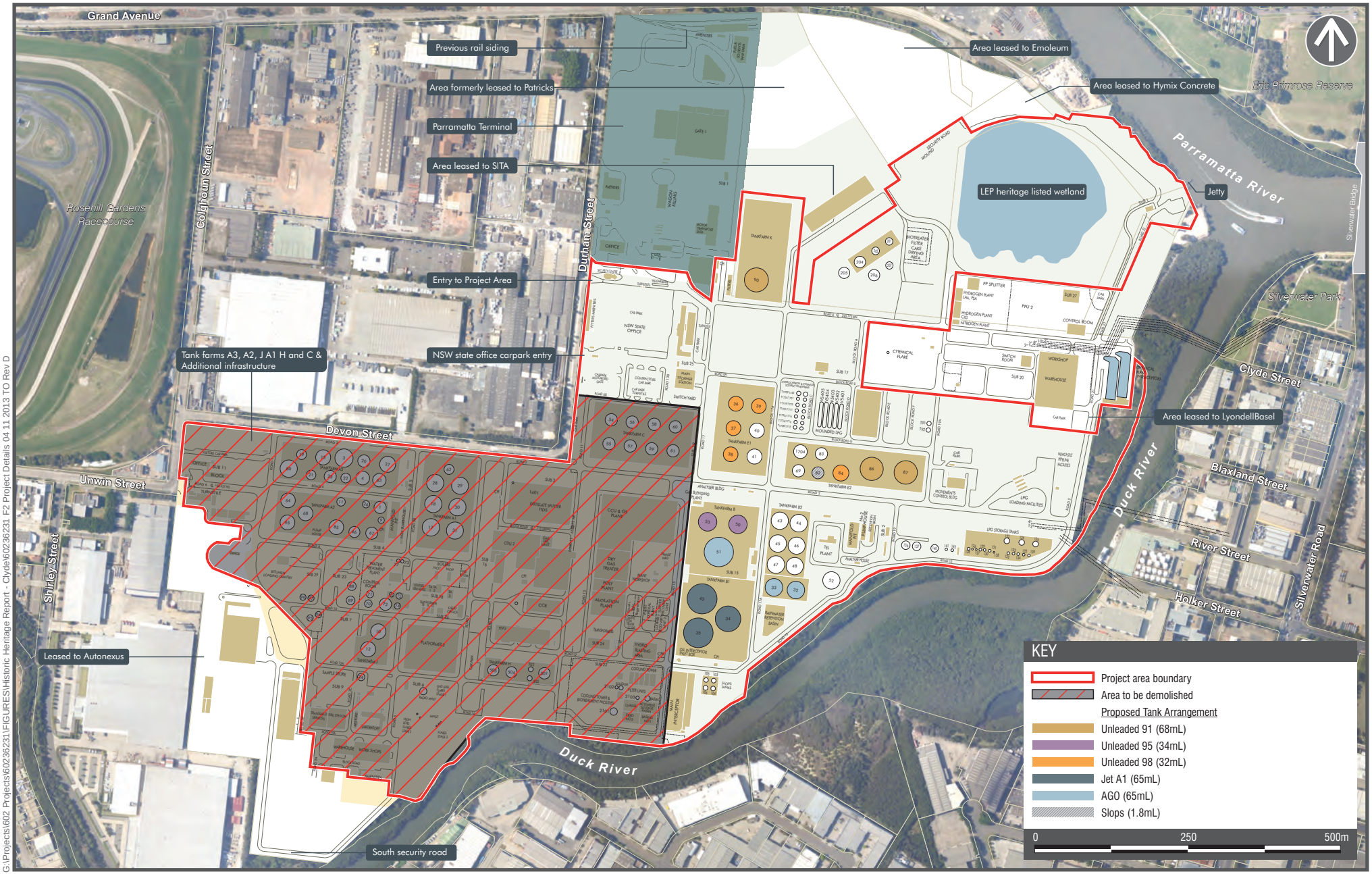
REGIONAL CONTEXT

Clyde Terminal Conversion Project
Environmental Impact Statement

FIGURE 1



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PROJECT DETAILS

Clyde Terminal Conversion Project
Environmental Impact Statement

FIGURE 2

2.0 Statutory Framework

2.1 Introduction

A number of planning and legislative documents govern how heritage is managed in New South Wales and Australia. The following **Section 2.0** provides an overview of the requirements under each as they apply to the Project.

2.2 Federal Legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on 16 July 2000.

Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a matter of National Environmental Significance (known as a controlled action under the Act), may only progress with approval of the Commonwealth Minister for the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). An action is defined as a project, development, undertaking, activity (or series of activities), or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines 'environment' as both natural and cultural environments and therefore includes Aboriginal and non-Aboriginal historic cultural heritage items. Under the Act protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). The RNE has been suspended and is no longer a statutory list, however, it remains as an archive.

The heritage registers mandated by the EPBC Act have been consulted and there are no items within the Project Boundary on these registers. There are two items listed on the non-statutory RNE as being adjacent to the Project Boundary, these comprising the Lower Duck River Wetlands (RNE No. 19254) and the Parramatta and Lane Cove Rivers Landscapes (RNE No. 14309). In relation to heritage, the EPBC Act is not of further relevance to the Project site.

2.3 State Legislation

2.3.1 Environmental Planning and Assessment Act 1979

The EP&A Act allows for the preparation of planning instruments to direct development within NSW. This includes Local Environment Plans (LEP), which are administered by local government, and principally determine land use and the process for development applications. LEPs usually include clauses requiring that heritage be considered during development applications and a schedule of identified heritage items be provided. The Parramatta LEP 2011 applies to the Project and is discussed further in **Section 2.4**.

Upon repeal of Part 3A of the EP&A Act on 1 October 2011, the *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* inserted a new Division 4.1 in Part 4 of the EP&A Act. Division 4.1 provides for a new planning assessment and determination regime for State Significant Development (SSD). Section 89C of the EP&A Act stipulates that a development will be considered SSD if it declared to be such by the new *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SRD).

Under Clause 8(1) of SEPP SRD, a development is declared to be SSD if:

- The development on the land concerned is, by the operation of an environmental planning instrument, is permissible only with development consent under Part 4 of the EP&A Act, and
- The development is specified in Schedule 1 or 2.

The Project is declared to be a SSD as it meets both of these criteria.

Section 89J of the EP&A Act provides that an approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977* is not required for the Project if it is approved SSD.

2.3.2 Heritage Act 1977

The *Heritage Act 1977* (as amended) was enacted to conserve the environmental heritage of New South Wales. Under Section 32, places, buildings, works, relics, moveable objects or precincts of heritage significance are protected by means of either Interim Heritage Orders (IHO) or by listing on the NSW State Heritage Register (SHR). Items that are assessed as having State heritage significance can be listed on the SHR by the Minister on the recommendation of the NSW Heritage Council.

Archaeological relics (any relics that are buried) are protected by the provisions of Section 139. Under this section it is illegal to disturb or excavate any land knowing or suspecting that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. In such cases an excavation permit under Section 140 is required. Note that no formal listing is required for archaeological relics; they are automatically protected if they are of local significance or higher.

Proposals to alter, damage, move or destroy places, buildings, works, relics, moveable objects or precincts protected by an IHO or listed on the SHR require an approval under Section 60. Demolition of whole buildings will not normally be approved except under certain conditions (Section 63). Some of the sites listed on the SHR or on LEPs may either be 'relics' or have relics associated with them. In such cases, a Section 60 approval is also required for any disturbance to relics *associated* with a listed item.

Under Section 170 of the *Heritage Act* 1977, NSW Government agencies are required to maintain a register of heritage assets. The Register places obligations on the agencies, but not on non-government proponents, beyond their responsibility to assess the impact on surrounding heritage items. AECOM searched Section 170 registers to determine whether there are listed items within the Project Boundary. No items were identified within, adjacent to, or in the immediate vicinity of, the Project Boundary.

2.3.3 *Sydney Regional Environmental Plan No 28 –Parramatta* (deemed SEPP)

The Sydney Regional Environmental Plan No 28 -Parramatta provides statuary controls for development of the Parramatta area in relation to three core considerations:

- Ensuring Parramatta's cultural and economic growth;
- Heritage protection and improving the design of the city; and
- Improving public transport.

Schedule 6 of the SEPP provides a list of identified heritage items, conservation areas and archaeological sites, which has been examined to determine whether the items could potentially be directly impacted by the Project. No items of local significance are listed within the Project Area. Two items adjacent to the Project Area are listed on the SEPP, these comprising the Tram Alignment and Sewage Pumping Station 67. These items are outside the Project boundary and as such would not be impacted by the proposed works.

2.4 Local Legislation

2.4.1 Parramatta Local Environmental Plan 2011

The Parramatta LEP 2011 controls development in relation to heritage items within the Rosehill area.

Schedule 5 of the LEP provides a list of identified heritage items, conservation areas and archaeological sites, which has been examined to determine whether the items could potentially be directly impacted by the Project. Clause 5.10(2) of the Parramatta LEP 2011 provides that consent is required for development that involves, demolishing, moving, altering, disturbing, excavating heritage items, or erecting a building on land or subdividing land where a heritage item or heritage conservation area is located. The Project Area contains LEP 2011 Heritage listed wetlands and is adjacent to several items zoned as Heritage under LEP 2011.

3.0 Methodology

3.1 Introduction

The methodology used for the assessment consisted of two components: desktop historical research to gain an appreciation of the history of the site and a site inspection. The tasks undertaken during each are outlined below.

3.2 Desktop Historical Research

The desktop assessment was undertaken to determine the history of the Clyde Terminal, its land use history and the development of the site across its lifetime. It also examined the legislative heritage status of the site and previous heritage assessments.

3.2.1 Heritage Database Searches

Rochelle Coxon, AECOM Archaeologist, undertook online searches of the relevant heritage databases, which are:

- World Heritage List;
- Commonwealth Heritage List;
- National Heritage List;
- Register of the National Estate (non-statutory archive);
- State Heritage Register;
- State Environmental Planning Policy – Sydney Harbour;
- Parramatta LEP 2011;
- State Heritage Inventory for Section 170 and REP listed items; and
- Parramatta Archaeological Zoning Plan.

The databases were searched for the Shell site and for adjacent heritage items that may potentially be impacted by the proposal.

3.2.2 Historical research

Dr Susan Lampard examined the records held by the following institutions:

- National Archives of Australia;
- NSW State Records;
- Trove for newspaper accounts of the site;
- State Library of NSW (particularly records held within the Mitchell Library);
- Lane Cove Public Library;
- Parramatta Heritage Centre; and
- Collections of maps and images held by Shell Australia.

The National Archives did not hold items of relevance to the development of the site – the main holdings were design drawings for tugs and barges constructed for Shell at Cockatoo Island. There is also correspondence relating to inquiries regarding import duties. NSW State Records holds collections created by the State Government. As a private company, the collections relating to Shell are limited and were not of assistance in the development of a historical understanding of the site.

The records held on Trove and in Mitchell Library, Lane Cove Public Library and by Shell itself were of the greatest assistance. Information obtained from these sources is provided in **Section 4.0** and references appropriately.

3.3 Site Inspection

A site inspection was undertaken by Dr Susan Lampard on 12 September 2012. Dr Lampard was accompanied by Erica Salazar (Environment Team Lead), from Shell Australia. Due to Occupational Health and Safety considerations, the inspection was limited in duration. In order to enable assessment of the site within the timeframe, detailed notes were not taken on site. Instead, the areas set for demolition were walked on foot and photographs taken of the various elements. The photo log was recorded on a plan of the site with the direction of the image and the image number being recorded where the image was taken from. The inspection was limited to the impact areas. On completion of the inspection of the site, Dr Lampard undertook a vehicular survey of the surrounding area in order to gain an appreciation of the visual significance of the site and to identify vantage points.

Following the site inspection the historical context, previous heritage assessments, and the results of the inspection were examined and a heritage significance assessment undertaken. The methodology for the significance assessment can be found in **Section 3.4**.

The results of the inspection and significance assessment can be found in **Section 6.0**.

3.4 Significance Assessment Criteria

In order to understand how a development will impact on a heritage item it is essential to understand why an item is significant. An assessment of significance is undertaken to explain why a particular item is important and to enable the appropriate site management and curtilage to be determined. Cultural significance is defined in the Australia ICOMOS Charter for the conservation of places of Cultural Significance (the Burra Charter) as meaning "aesthetic, historic, scientific or social value for past, present or future generations" (Article 1.1). Cultural significance may be derived from a place's fabric, association with a person or event, or for its research potential. The significance of a place is not fixed for all time, and what is of significance to us now may change as similar items are located, more historical research is undertaken and community tastes change.

The process of linking this assessment with an item's historical context has been developed through the NSW Heritage Management System and is outlined in the guideline *Assessing Heritage Significance*, part of the NSW Heritage Manual (Heritage Branch, Department of Planning). The *Assessing Heritage Significance* guidelines establish seven evaluation criteria (which reflect four categories of significance and whether a place is rare or representative) under which a place can be evaluated in the context of State or local historical themes. Similarly, a heritage item can be significant at a local level (i.e. to the people living in the vicinity of the site), at a State level (i.e. to all people living within NSW) or be significant to the country as a whole and be of National or Commonwealth significance.

In accordance with in the guideline *Assessing Heritage Significance* (NSW Heritage Office, 2001), an item will be considered to be of State or local heritage significance if it meets one or more of the following criteria:

Criterion (a) *– an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).*

The site must show evidence of significant human activity or maintains or shows the continuity of historical process or activity. An item is excluded if it has been so altered that it can no longer provide evidence of association.

Criterion (b) *– an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local to area).*

The site must show evidence of significant human occupation. An item is excluded if it has been so altered that it can no longer provide evidence of association.

Criterion (c) *– an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).*

An item can be excluded on the grounds that it has lost its design or technical integrity or its landmark qualities have been more than temporarily degraded.

Criterion (d) *– an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.*

This criterion does not cover importance for reasons of amenity or retention in preference to proposed alternative.

Criterion (e) *– an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area). Significance under this criterion must have the potential to yield new or further substantial information.*

Under the guideline, an item can be excluded if the information would be irrelevant or only contains information available in other sources.

Criterion (f) *– an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area). The site must show evidence of the element/function etc. proposed to be rare.*

Criterion (g) *– an item is important in demonstrating the principal characteristics of a class of NSW's (or local area's):*

- Cultural or natural places; or
- Cultural or natural environments.

An item is excluded under this criterion if it is a poor example or has lost the range of characteristics of a type.

The Heritage Council require the summation of the significance assessment into a succinct paragraph, known as a Statement of Significance. The Statement of Significance is the foundation for future management and impact assessment.

4.0 Historical Context

4.1 Introduction

The following sections provide an overview of the historical use of the Project site to aid in the determination of its archaeological potential and heritage significance.

The Project site has four historical phases: Aboriginal occupation (pre c.1804); early land grants and Elizabeth Farm (1816-1918); John Fells & Co. (1918-1927); and British Imperial Oil/Shell (1928-present). Each of these is discussed below.

4.2 Aboriginal Occupation (Pre c.1804)

The Project Area falls within the traditional country of the Darug (also spelt Dharuk, Dharruk, Dharug and Daruk) language group. Available archaeological data indicate that Aboriginal people have occupied the Sydney Region for at least 20,000 years (McDonald 2005). Further details regarding Aboriginal occupation of the area can be found in the Clyde Terminal Conversion Aboriginal Report (AECOM 2012).

4.3 Early Land Grants: Elizabeth Farm (1793-1918)

In 1793, John Macarthur (c.1767-1834) was granted 100 acres of land adjacent to the Parramatta River by Major Francis Grose, Commanding Officer of the New South Wales Corps. Macarthur named the property 'Elizabeth Farm' after his wife. The Macarthurs' were very successful farmers and eventually became the biggest land-holders in New South Wales. By 1800, Elizabeth Farm comprised nearly 300 acres, sustaining approximately fifty head of cattle, a dozen horses and 1000 sheep, and John Macarthur's total land-holdings amounted to nearly 1300 acres. It was during these early years of the nineteenth century that John Macarthur became interested in, and a pioneer of, the Australian wool industry, importing Merino sheep from Spain to Australia.

On the 8 October 1816, the Crown granted John Macarthur an additional 850 acres of land, which encompassed the area currently occupied by the Shell Clyde Terminal. John Macarthur died in 1834 and Elizabeth Farm was passed on to his son, Edward Macarthur. Edward did not, however, immediately inherit the property, as Elizabeth Macarthur, John's widow, had use of the property until her death in 1850. From 1850 until Edward's death in 1872, Elizabeth Farm was managed by agents who may also have resided on the property in the Elizabeth Farm homestead. In the years 1869-1874, Thomas Icely, who was a pioneer pastoralist and member of the Legislative Council, is documented as a tenant of Elizabeth Farm on a five year lease. After Icely, the property was leased by William Whalen Billyard, the Civil Crown Solicitor for NSW. Billyard paid £1000 to terminate his lease. From the death of Edward in 1872 to the sale of the property in 1881, the Elizabeth Farm property was administered by trustees (Young & Barnett, 1979:3).

Elizabeth Farm was purchased in 1881 by Septimus Alfred Stephen for £50,000. Stephen and his brother, Arthur, subdivided and sold off the property. The first subdivision was auctioned on the 17 February 1883, and the second was sold on the 26 May 1883. The third subdivision known as the 'Granville Portion', was auctioned on the 13 October 1883. The fourth and final subdivision, comprising the remaining unsold lots from the second subdivision sale, was eventually sold on the 13 September 1884. Elizabeth Farm homestead was purchased by J.W Cliff (Young & Barnett, 1979:15).

The 1926 St Johns parish plan indicates that the northern portion of the Project Area had been resumed for a sewerage farm, but it also notes on the plan that it was "now sold", indicating that the works were never constructed.

4.4 The Clyde Terminal

4.4.1 Introduction

From the 1860s onwards, the Australian shale oil industry supplied a small proportion of Australia's oil needs. Until the 1920s, shale oil was refined at small scale distillation plants near the shale mining sites, predominantly in the state of New South Wales. In 1906, Sir George Newnes, a London publisher and financier, sponsored the Commonwealth Oil Corporation (COC) to take over and re-invigorate the ailing shale oil industry near Lithgow, NSW. In 1908, the COC purchased a large expanse of scrubby land at the confluence of the Parramatta and Duck Rivers, on land formerly part of the Elizabeth Farm estate, for future expansion. In 1911 the Corporation

struck financial difficulties and went into receivership. No evidence can be found that COC constructed or operated a refinery on the site and it seems unlikely that precious capital would have been expended on speculative venture when the Corporation as a whole was in jeopardy. This land was subsequently acquired from COC by John Fell & Co. in 1913, when all the assets of the Corporation were transferred (Murray, 2001).

4.4.2 Establishment of the Clyde Refinery: John Fells & Co. (1918-1927)

John Fell was born in 1862 in Scotland, the son of Scottish oil pioneer Alexander Morrison Fell. Alexander Morrison Fell later transferred his shale-oil refining operations to Australia. John Fell relocated to Australia with his family as a teenager, where he served in a number of positions with his father's company – AM Fell and Sons. John was eventually promoted to a managing partner of the company, however, in 1903 he decided to leave his father's company, and established his own, known as John Fell & Co Pty Ltd (John Fell & Co; Fell & Co.) (Stanley, Rothschild, & Higginbotham, 2009; Washington, n.d.).

John Fell & Co Pty Ltd was established to refine, blend and distribute oil, and went on to become pioneers of the Australian oil industry (Macleod, 2012). Fell established his refinery at Gore Bay, next door to the British Imperial Oil's Gore Bay terminal facilities, which had officially opened in 1901. By 1910, John Fell & Co were buying their supplies of Tarakan Crude Oil from British Imperial Oil, who were a subsidiary of the Shell Transport & Trading Co. For several years, John Fell & Co were their largest Australian customer.

In 1913, John Fell & Co Pty Ltd acquired the assets of the bankrupt Commonwealth Oil Company's shale oil mine at Newnes. The COC and Fell & Co operations were run in tandem, with references to COC being phased out in preference of Fell & Co. The Newnes operations were initially quite successful, and increasing market-growth and demand for oil lead John Fell & Co. to further expand operations. In 1918 the Company supplemented its existing shale oil operations by establishing a shale oil refinery on 60 acres of land at Clyde, NSW. As mentioned above, the land upon which Fell & Co. established the refinery had previously been part of Elizabeth Farm, before being transferred to the COC in 1908.

The genesis of the refinery remains unclear. It seems unlikely that COC established active operations at Clyde, it is therefore speculated that it John Fell & Co. who commenced construction. A Shell publication (Shell Company of Australia, n.d.) states that, in 1918, John Fell & Co. decided to establish a shale oil refinery at Clyde. In the same year, Fell offered the company's assets to Shell, however Shell did not accept as they were not considering moving into refining at the time (Murray, 2001). Facing fierce and increasing competition, falling international prices, and reductions on government import taxes, John Fell & Co were increasingly under pressure to keep their business profitable. By 1922, the shale at Newnes was exhausted and unprofitable, and Fell's refining operations there were suspended. The Newnes shale oil mine subsequently closed in 1924.

It is unclear whether refining began in 1918 – there is no mention in contemporary newspapers. Shell believe that refining was underway by 1923, when John Fell & Co. began purchasing Crude Oil to refine at Clyde (Shell Company of Australia, n.d.:8). Murray (2001) dates the agreement to sell Crude Oil to 1925 – when it is known that a refinery was definitely under construction.

In 1925, John Fell & Co consolidated their operations at Clyde, moving the storage and processing plant from Gore Bay and refining equipment from Newnes, to the site. Work on a rail siding for the refinery commenced and the area was cleared for development. The 750 Dubbs cracking plant was installed, which was the first of its kind in the southern hemisphere. The remainder of the refinery's equipment was relocated from Newnes (Murray, 2001). John Fell & Co then signed an agreement with Shell for the supply of 1,500 tonnes of Crude Oil per month, refining of which commenced at Clyde in 1926. At this time, about 40 people were employed at the then Clyde Refinery, handling the refining and distribution operations. Access to the site was generally limited to the railway siding, and the Refinery was producing Dux Motor Spirit, petroleum, coke, tractor distillate, gas oil, and Ajax Power Kerosene. In 1927, the Duck River Wharf opened, which enabled crude feed stock to be barged in along the river from Gore Bay.

Throughout 1927, the then Clyde Refinery experienced a series of unfortunate incidents. In May, a large fire at the Clyde Refinery enveloped the surrounding suburbs in smoke, and was reported in the media as far away as Adelaide:

A fire which attracted attention over a wide area of Granville and surrounding suburbs occurred on Friday night at the Clyde Oil Refinery of John Fell & Co., Limited, situated at Duck Creek Granville. The burning of 1,000 gallons of crude oil, which was contained in an open vat away from buildings, caused dense clouds of black smoke, which enveloped the whole district. It is thought that the fire was caused by a light coming in contact with a leak in a gas

pipe in a brick furnace. The furnace was seriously damaged. The firemen subdued the outbreak in about half an hour.

(*The Register*, 30 May 1927:9d)

On the 18 August 1927, a horrific explosion of an oil still at the then Clyde Refinery resulted in the death of three men, including the son of the proprietor, and caused extensive damage to the facility:

A dreadful disaster resulting in the death of one man and serious injury to two others occurred at the Refinery of John Fell & Co, at Granville. The victims are: killed; Alfred Ward of Darlinghurst; injured; John Fell; severe burns, shock and abrasions, Henry Spencer of Westmead; severe burns and concussion. Neither of the injured men are expected to recover. The explosion occurred in a gigantic still which was boiling oil, contained in the main building. John Fell with two other men were standing 15 feet away from the stills when there was a fierce roar and the top of the still was hurled with tremendous force through the roof of the building. Huge torrents of oil then leaped with irresistible fury out of the still. The explosion rendered Ward senseless and the oil streaming down in torrents engulfed him as he lay on the ground. He was almost totally incinerated. Fell was hurled bodily through an aperture in the wall of the still room over two lines of rail way trucks and a barbed wire fence and into a paddock 60 yards away. Spencer was smothered in blazing oil. His clothing was burnt from his body and he was hurled against the side of the wall of the room. Work men hearing the explosion rushed to the aid of the victims. It was impossible to do anything for Ward but wait until the oil flow ceased. It was then found that his legs and arms had been burnt away and practically nothing was left of the dead man.

(Northern Territory Times, 23 August 1927:2a)

The coronial inquiry, as reported in the *Sydney Morning Herald* on the 23 September 1927 reported that accidental death had been returned on all three deaths, with the most likely cause of explosion inconclusive, but thought to be the introduction of water to the still.

Following the explosion, the Clyde Refinery was shut down until the end of September 1927, while an investigation was conducted, and all but a small number of employees were dismissed. These events, in conjunction with John Fell's increasing age and deteriorating health resulted in the Refinery once again being offered to Shell. Shell accepted the offer, and John Fell & Co's Clyde and Gore Bay assets and facilities were sold together for £240,000, of which £40,000 was made in two annual instalments under the proviso that John Fell would operate the Refinery for Shell for a period of not more than two years and that during this time he had to demonstrate that the Refinery could be operated economically on good quality Crude Oil.

4.4.3 Shell as Owner/Operator of Clyde Refinery (1928-present)

On the 1 January 1928, Shell took over as the owner and operator of the then Clyde Refinery. Shell's ownership and operation of the Clyde Refinery marked the commencement of the first stage of expansions to the Clyde Refinery, with an additional 7 acres of land purchased on July 30, 1928. Subsequently, a further 150 acres were purchased from the Ford Motor Company in June 1930, which increased the total extent of the Clyde Refinery to 217 acres.

During the period 1929 to 1939, the Clyde Refinery underwent its first major expansion. This expansion was complemented by the purchase and construction of new equipment and buildings, as summarised below. The first element to be upgraded was the Dubbs Cracking Unit, which was restarted as a topping plant processing Crude Oil on January 16 1928. Following this, the No. 2 Boiler was built in 1929 and the Clyde Refinery commenced manufacture of black oil residue lubricating oils. The No. 3 Boiler still was also constructed in 1929, for the redistillation of heavy benzine from the topping plant. In 1930, 150 acres of land were purchased from the Ford Motor Company, which increased the total acreage of the Clyde Refinery to 217 acres. During these early years there was no fence around the perimeter of the refinery property.

In 1931, following the decision of the Commonwealth Government to impose a four pence per gallon excise duty on refined gasoline, the Clyde Refinery was temporarily closed to enable the rebuilding of the Dubbs furnace and undergo general maintenance. The Clyde Refinery was closed from May to July. The special boiling unit was constructed in 1934, the same year in which the Clyde Refinery ceased production of Shell Imperial, introducing in its place imported Super Shell Motor Spirit. In the period 1935 to 1939 the No 2 Coalinga heater was commissioned and the Dubbs heater decommissioned, a new laboratory, mess room and ablution block was erected, a Trumble fractioning unit was added to the distillation plant, and construction of a new topping plant,

boilers, additional tankage, offices, and the development of the Parramatta wharf commenced. Upon the recommendation of Mr J.W Ernste, from B.P.M Holland following a visit to the site, the capacity of the Clyde Refinery was increased and a modern distillation unit was erected to eliminate the re-distilling of gasoline. In September 1938, a new topping plant/crude distillation unit was brought on stream and the old Dubbs unit was subsequently shut down on the 8 October. The first overseas manager of the Clyde Refinery, Mr Fred Mackley, was also appointed at this time. This first period of expansion concluded in 1939 with the construction of the drum and tin filling shed.

Following the outbreak of World War II, and in particular Japan's entry into the war in 1941, Crude Oil supplies were cut to the Clyde Refinery and efforts were redirected to supplying and supporting the requirements of the Australian armed forces. With the exception of the No. 1 and 2 boiler stills, the Clyde Refinery was closed on January 30 1942, and the Clyde Refinery adapted to become an essential wartime industry. For the duration of the war, the primary function of the Clyde Refinery was as a storage terminal and drum filling area. The only products manufactured during this period were solvents from imported gasoline and wash (gas) oil made from diesel fuels. Following the resolution of the conflict in 1945, Crude Oil was once again available and refining operations at the site recommenced. The Clyde Refinery was reopened on March 21 1946 by the Premier of NSW, Mr W.J. McKell, and underwent its second phase of development and expansion. This phase of development commenced in 1947, with the construction of the bitumen plant and neutralised lubricated oil production facilities, which were officially opened in 1948. The expansion culminated with the commissioning of the LVI Lubricating Oil Plant and the official opening of new laboratories at the site in May 1953.

From 1958 – 1959, the Clyde Refinery underwent its third major expansion and development. This cost approximately $18 million and involved the erection of a platformer, significant modernisation and extension of existing ancillary facilities, and the erection of double-storey administration buildings on site (see **Plate 1**). Another major expansion phase followed almost immediately, from 1960 – 1963, which totalled a capital expenditure of $34 million. Major additions to the Refinery during this expansion phase included the catalytic cracking complex, high vacuum unit, ethylene and epikote plants, and the construction of two pipelines.

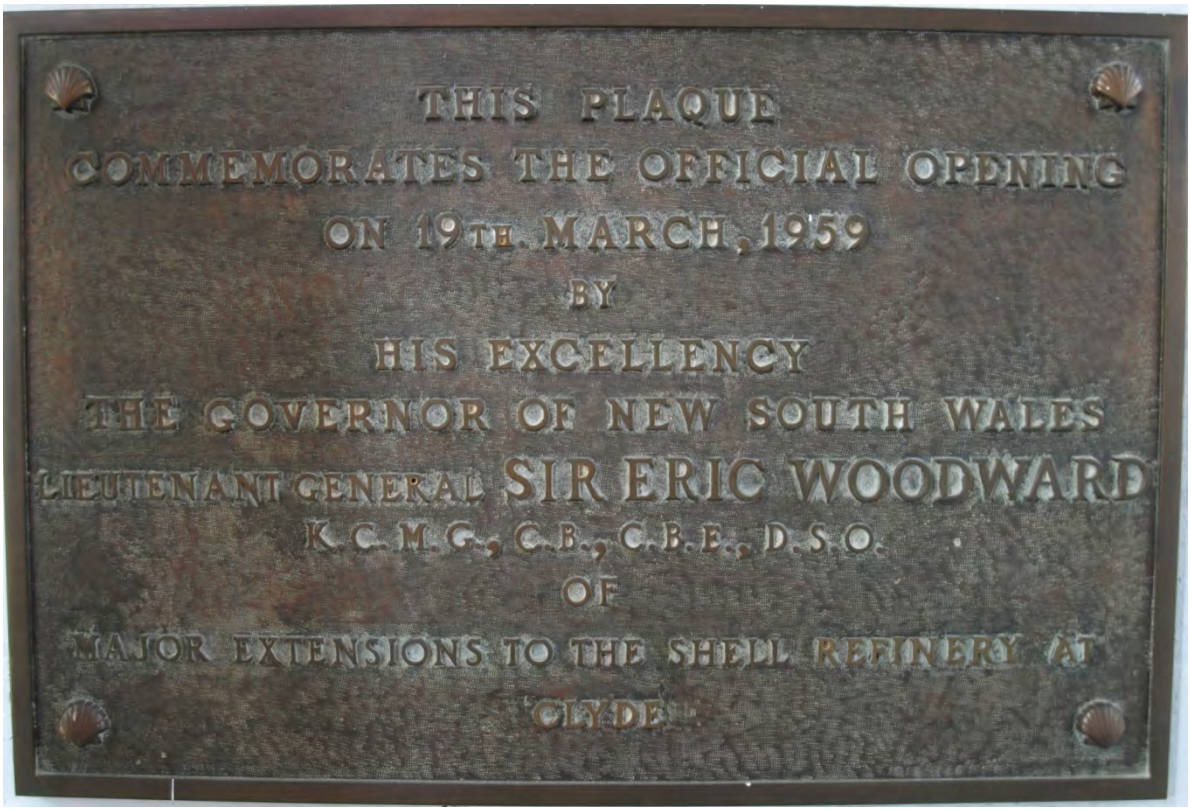


Plate 1 Commemoration plaque situated in the foyer of the Shell Clyde Refinery Administration building

In 1964, Shell completed construction of their Parramatta Terminal, which subsequently replaced the Clyde Refinery as Shell's primary distribution centre in NSW. All marketing distribution functions, with the exception of bitumen and bulk solvents, were transferred from Clyde across to the new Parramatta facility. Later that year, on the 10 June, the Clyde Refinery commenced refining of the first shipment of Australian Crude Oil from the Moonie oil fields in Queensland.

In the period 1966 – 1968, Clyde underwent another major overhaul and expansion, with a total capital expenditure of $20 million. This phase included the erection of a splitter treater, the introduction of the No. 2 crude distiller, No. 7 steam boiler, turbo generator 1, and the chemical and hydrocarbon solvents plant, as well as extensions and additions to existing ancillary facilities.

The expansion and development of Clyde continued with an additional 35 acres of land purchased from Mobil at a cost of $1.2 million in 1970. Also that year, a new polypropylene plant was erected for Shell Chemical at a capital cost of $16 million. Following this, in 1972, the processing capabilities of the Clyde Refinery experienced a significant development, with the addition of platformer 2 and turbo-generator 2 at a cost of $6 million. Despite these additions, however, the overall capacity of the Clyde Refinery's processing abilities was not affected. In 1974 -1975, at a cost of $4 million, a water recovery treatment and re-use system was installed for refinery process cooling. This enabled the Clyde Refinery to be isolated from the previous Parramatta River – Duck River system.

Following the conclusion of the major phases of expansion and development of the Clyde Refinery in the mid-1970s, only minor additions and modifications were made. In c.1987 the Butane De-Asphalting Plant (BDA Plant) and oil interceptor were demolished. The site that these elements had occupied was redeveloped, with the Central Control Room constructed at that location in 1988. In December 1993, work commenced on the Propylene Treatment Plant and in 1994 the mounded LPG Storage facility was built (Shell Refining (Australia) Pty Ltd, 1993). In 1999, however, with Shell – and the oil industry as a whole - increasingly challenged by a combination of tight economics and environmental concerns, the Clyde Refinery once again found itself facing the prospect of closure. In late 1999, the announcement was made that the closure of the Clyde Refinery at some point in time after c. 2006 was a real possibility. The Clyde Refinery continued to operate, along with six other Australian refineries, in the early years of the twenty-first century. In 2008, the Clyde Refinery was temporarily closed down in November for maintenance works, and did not resume operations until July the following year.

The former Shell Clyde Refinery was one of the longest operating, and one of the most complex, oil refineries in Australia. In April 2012, however, Shell announced that the Clyde Refinery would permanently cease refining operations as these operations were not economically sustainable. This was due to the fact that the former Clyde Refinery could no longer compete with the larger Asian refineries that have emerged in recent years, and which are capable of producing up to one million barrels of refined oil products per day, an average of 921,000 more barrels per day than the former Clyde Refinery was capable of producing.

4.5 Physical Development of the Site

The 1930 aerial photograph of the area (**Plate 2**) indicates that the Shell facility, shortly after it was purchased from John Fell & Co, was focussed on the corner of Devon and Unwin Streets, although at this time Devon Street had not been formed and was just a property boundary. At this time, the former Clyde Refinery consisted of a tank farm of approximately 18 tanks, which were located in the area now identified as Tank Farms A2 and A3. On the corner of Colquhoun and Devon Streets a residential house is indicated. This is known from anecdotal evidence to have been the manager's residence. At the termination of Unwin Street, there appears to be some buildings of unknown function. The remainder of the facilities associated with the former Clyde Refinery are located along the southern boundary of the tank farm area. The quality of the aerial is not sufficient to allow identification of these structures. The remainder of the site is shown as saltmarsh, with no apparent development. Sometime between 1930 and 1951, a wharf was constructed on Duck Creek to the south of where the workshops now stand.

The 1951 aerial (**Plate 3**) indicates there had been extensive development at the site. Tank Farm A1 had been constructed adjacent to Tank Farms A2 and A3, and two more houses had been constructed along Devon Street. Where the current administration office block stands, there was an L shaped building. There was also a building on the site of the former Shell Credit Union and contractors amenities building. The Clyde Terminal is still consolidated to the south of the tank farms. The former Clyde Refinery appears to have been connected to the tramway to the north by a track and series of branch lines. Oriented NE-SW are two structures that appear to be rail loading facilities. The northernmost structure sits to the north of a new Tank Farm area, which correlates with where Tanks 201, 203 – 207 stand today. The tank farm originally comprised nine tanks, and the six extant tanks in this area appear to be the same as from this period. Two further sheds were constructed along the Durham

Street boundary, roughly north of where the Shell NSW State office stands today. The wharf at the confluence of Parramatta River and Duck Creeks was in operation, and there appears to be a pipeline connecting the wharf to the former Clyde Refinery. The south-east portion of the site remains undeveloped.

The 1961 aerial (**Plate 4**) indicates that the residences on the corner of Devon and Colquhoun Street are still extant and have well developed gardens. The office blocks are now present on site. The Credit Union and contractors facilities, as they still stand, are evident, as is the Administration building for the bitumen rail loading facilities. Tank Farm B1 is under construction and Tank Farm B appears to be operational, but has a different configuration to the current one. Tank Farms C and E1 are complete and appear to be the same as those present on site today. Where the current distillate splitter stands, a new facility has been constructed, and the current CCU and GS plant at the corner of Road 2 and Road 11 is under construction. A third facility appears to be nearing completion to the north of Tank Farm E. The area today covered by the CCR and HVU is either occupied by a series of sheds or is vacant. The area to the east of Tank Farm E1 is largely undeveloped, although it appears that a series of causeways have been built through the swamp. The facilities to the south of Tank Farms A1, 2 and 3 have been augmented, particularly noticeable from the aerial is the insertion of a number of smaller tanks, particularly along Road 12A.

The 1965 aerial (**Plate 5**) indicates that Tank Farm B2 has been constructed, and the area to the east has been developed, with a series of smaller tanks, evident at the current location of the LPG storage tanks. The area to the east of Tank Farm E1 remains largely undeveloped. The facility previously under construction to the south of Tank Farm C has been completed. The current CCU and GS plant is now completed. The flares were in place by 1965.

The 1970 aerial (**Plate 6**) indicates that the distillate splitter treater is operational in its present location and the HVU is also in its current location. The collection of sheds that had stood on the corner where platformer 3 now stands have been demolished. Some tanks have been inserted and removed from Tank Farms A2 and A3, and sheds have also been removed from where Tank Farm H now stands. Tank Farm B2 has been extended to the south and east, and Tank Farm E2 is under construction. Also, there was a Tank Farm on the current location and to the east of the mounded LPG facility. The houses on Devon Street are still extant.

The 1978 aerial (**Plate 7**) indicates that there have been extensive demolitions around the bitumen loading gantry and to the east and south – these activities appear to have removed the majority of the remaining infrastructure associated with the operation of John Fell & Co. The high vacuum unit appears to have been upgraded and has a similar configuration to today. The water treatment facility (cooling treatment facility) has been constructed. The main interceptor had been put in place by 1970. Between 1970 and 1978 the houses on Devon Street were demolished. Tank Farm H has been constructed, as has sub-station 24. Tank Farm E2 has been completed, as had been the LPG Loading Facility to the east of Tank Farm E2.

The 1986 aerial (**Plate 8**) indicates that there have been no major alterations to the site since 1978. The movements control building had been constructed and the NSW State Office had been constructed subsequent to the 1978 aerial and prior to that from 1986.

The 1994 aerial (**Plate 9**) indicates that the Central Control Room had been constructed. The shed on the current site of the bitumen loading gantry has been demolished, and the gantry constructed. The mounded LPG facility has also been constructed at this time.

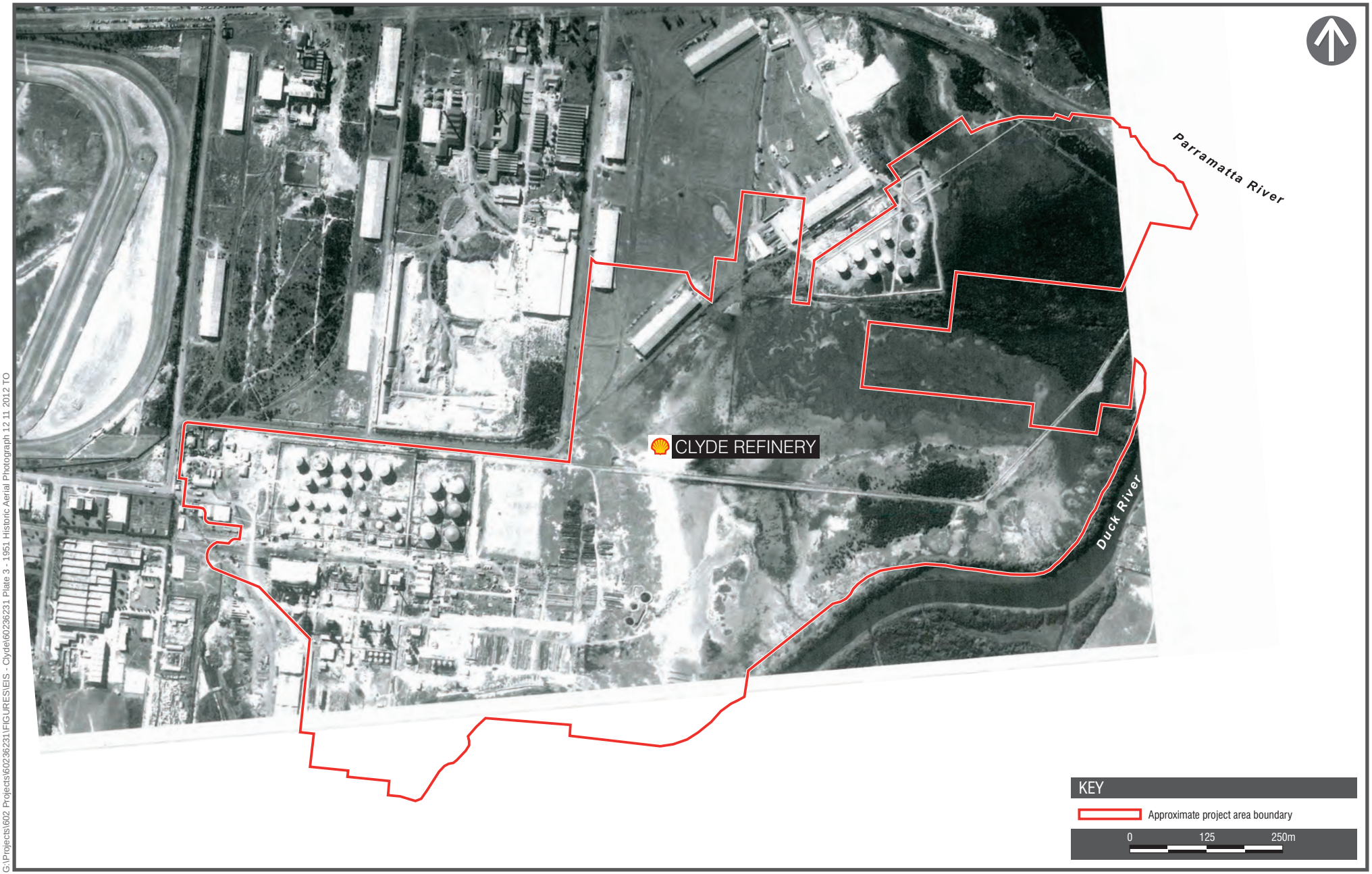
G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 2 - 1930 Historic Aerial Photograph 12 11 2012 TO

AECOM

1930 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 2



G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 3 - 1951 Historic Aerial Photograph 12 11 2012 TO

AECOM

1951 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 3

G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 4 - 1961 Historic Aerial Photograph 12 11 2012 TO

AECOM

1961 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 4

G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 5 - 1965 Historic Aerial Photograph 12 11 2012 TO

AECOM

1965 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 5

KEY

Approximate project area boundary

0 125 250m

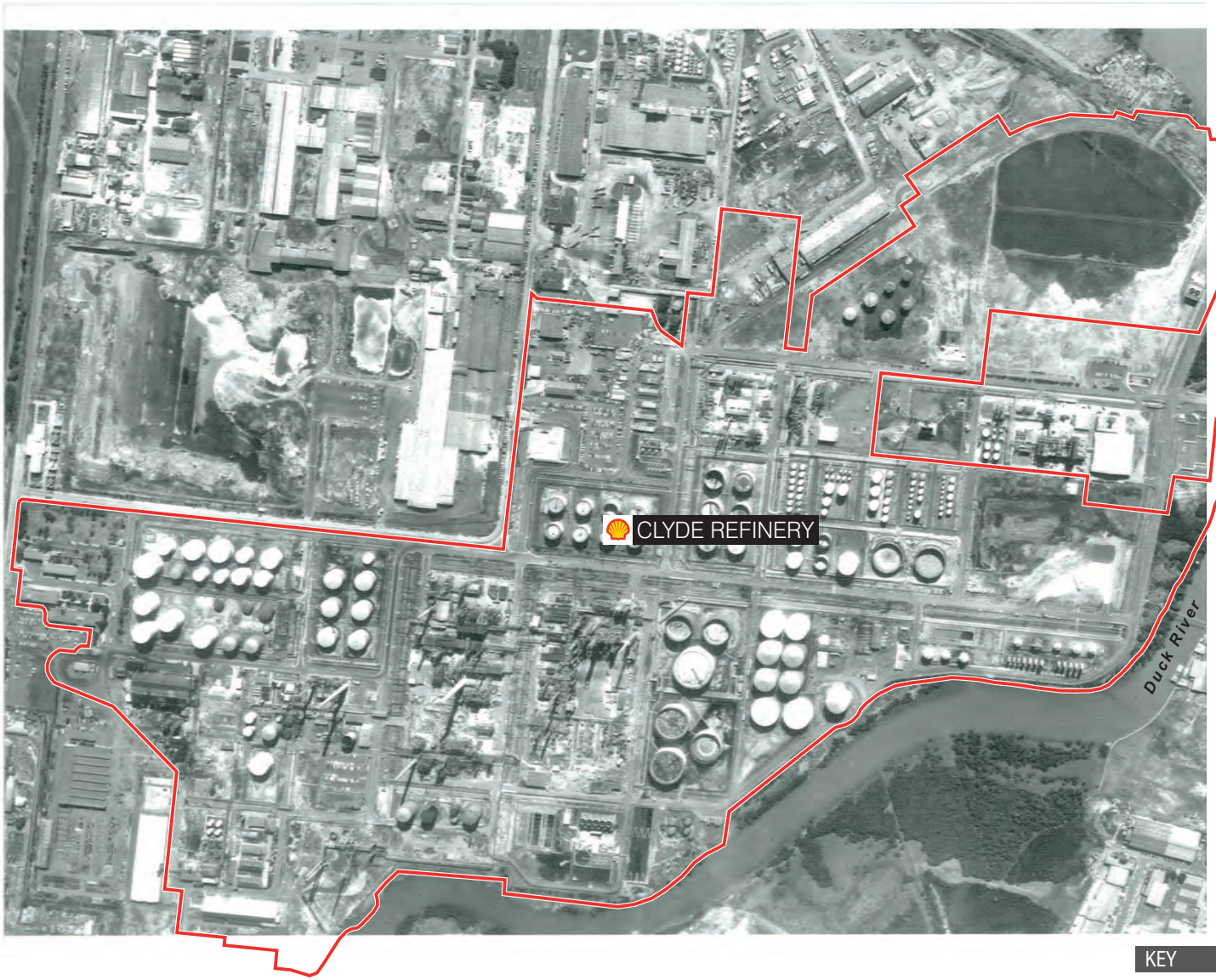
G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 6 - 1970 Historic Aerial Photograph 12 11 2012 TO

AECOM

1970 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 6



KEY

Approximate project area boundary

0 125 250m

G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 7 - 1978 Historic Aerial Photograph 12 11 2012 TO

AECOM

1978 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 7

KEY

Approximate project area boundary

0 125 250m

G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 8 - 1986 Historic Aerial Photograph 12 11 2012 TO

AECOM

1986 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 8

G:\Projects\602 Projects\60236231\FIGURES\EIS - Clyde\60236231 Plate 9 - 1994 Historic Aerial Photograph 12 11 2012 TO

AECOM

1994 HISTORIC AERIAL PHOTOGRAPH

Gore Bay Terminal Modification
Environmental Impact Statement

PLATE 9

5.0 Desktop Assessment

5.1 Introduction

This **Section 5.0** provides the results of the relevant statutory heritage schedules. This is followed by a summation of the previous heritage assessments undertaken of the site.

5.2 Heritage Database Searches

Table 1 outlines the heritage schedules that are relevant to the Project Area. The location of the items are identified on **Figure 3**.

Table 1 Listed Heritage Items within and adjacent to the Project Area

Heritage List	Sites within Project Area	Level of Significance	Sites adjacent to Project Area	Level of Significance
World Heritage List	None	N/A	None	N/A
Commonwealth Heritage List	None	N/A	None	N/A
National Heritage List	None	N/A	None	N/A
Register of the National Estate (Non-statutory archive)	None	N/A	Lower Duck River Wetlands (RNE No. 19254, Registered Place)	Registered
	None		Parramatta and Lane Cove Rivers Landscapes (RNE No. 14309, Indicative Place)	Indicative Place
State Heritage Register	None	N/A	None	N/A
Parramatta LEP	Wetlands (Item No. I1)	Local	Pumping Station (Item No. I5)	Local
			Tram alignment (Item No. I6)	Local
			Silverwater Bridge (Item No. I73)	Local
			Capral Aluminium (Item No. I575)	Local
			RTA Depot (Item No. I576)	Local
			Sewerage Pumping Station 67 (Item No. I01643)	Local
Sydney Harbour Catchment Regional Environmental Plan 2005	None	N/A	Tram alignment	Local
Sydney Regional Environmental Plan No 28 – Parramatta	None	N/A	Sewage Pumping Station 67	Local
	None	N/A	Shell Oil Refinery Wharf (Item No. 35)	Local
Parramatta Archaeological Zoning Plan	Parramatta Archaeological Management Unit 2966	No archaeological potential	N/A	N/A

*Adjacent has been defined as having a common boundary or being within a line of sight. Refer to **Section 6.14**.

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REGISTERED HERITAGE ITEMS WITHIN THE VICINITY OF THE PROJECT BOUNDARY

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FIGURE 3

There are no sites within or adjacent to the site listed on the World Heritage List, Commonwealth Heritage List or National Heritage List.

The Study area is adjacent to the non-statutory Register of the National Estate listings the Parramatta and Lane Cove Rivers Landscape (RNE No. 14309) and Lower Duck River Wetlands (RNE No. 19254). The listing for the Parramatta and lane Cove Rivers Landscape is Indicative, meaning information regarding the site had been entered into the Register, but a formal nomination had not been made at the time the RNE was suspended. The listing is undeveloped and contains no information regarding the significance of the area. Given that it is a non-statutory list and the lack sufficient information to assess the impact against, no further consideration has been given to this listing. The Lower Duck River Wetlands was a Registered place, meaning it was entered onto the Register prior to is closure in 2007. The Wetlands are listed for their ecological values and, as such, are beyond the scope of the heritage report. Consideration of the Wetlands is provided in the Biodiversity Assessment.

There is one listed on the Parramatta LEP within the Project Area – Wetlands (I1). This item is of ecological, rather than heritage significance and is assessed within the Biodiversity Assessment. There six LEP listed items located adjacent to the Project Area. All six items are sites of local significance. These items comprise the pumping station (I5), tram alignment (I6), Silverwater Bridge (I73), Capral Aluminium (I575), RTA Depot (Item No. I576) and Sewerage Pumping Station 67 (Item No. I01643). It should be noted that while these items are adjacent to the Project Area, they are not in the vicinity of proposed works or impacts from the Project. The Project Area does not fall within, or adjacent to, any heritage conservation areas. One item was also identified adjacent to the Project Area on the Sydney Harbour Catchment Regional Environmental Plan 2005, being the Shell Oil Refinery Wharf (35). No works are proposed in this area and it will not be impacted by the Project.

The Project Area falls within the Parramatta Archaeological Management Unit 2966, listed on the Parramatta Archaeological Zoning Plan.

5.3 Previous Heritage Assessments

Prior to the current report, Shell has not commissioned a heritage assessment of the Clyde Terminal site. The site was, however, encompassed within the *Parramatta Historical Archaeological Landscape Management Study*, (Godden Mackay Logan 2001), prepared for the NSW Heritage Office and the Parramatta City Council. A summary of this study is provided below.

5.3.1 The Parramatta Historical Archaeology Landscape Study

The *Parramatta Historical Archaeology Landscape Study* (PHALMS) was produced for in 2000, comprising a comprehensive study of European archaeological resources in the *Sydney Regional Environmental Plan No. 28 - Parramatta*. The study was conducted with the primary intention of providing an all-encompassing regional research framework and management recommendations to manage the historic archaeological record and heritage of the Parramatta area. Accordingly, heritage inventory sheets were produced for 'Archaeological Management Units' (AMU) identified during the study. The current Project Area was identified in the PHALMS as AMU 2966.

5.3.2 Summary of PHALMS Archaeological Potential and Heritage Significance for Archaeological Management Unit (AMU) 2966

Parramatta AMU 2966 comprises the site of the Shell Company of Australia's former refinery works and current Clyde Terminal, including all associated infrastructure, storage tanks and pipe complexes, as well as offices, amenities, and sealed internal access roads. According to the Statement of Significance on the PHALMS inventory sheet, the site has no archaeological research potential, as, even though it was assessed as providing evidence of a range of historical processes and activities relating to the history of Parramatta under SHR Criterion A (Historical significance), it was determined that the major infrastructure associated with the then Clyde Refinery would have significantly disturbed subsurface deposits throughout the area. The site was assessed as having minimal potential to contain features which could provide data pertaining to major historic themes or which could be used to address research questions, as much of the site had been reclaimed prior to development in the early twentieth century and had been subject to major disturbance resulting from the infrastructure associated with former Clyde Refinery works. It was noted that even in the event that subsurface archaeological resources have survived in the lesser disturbed portions of the site they would likely be of low archaeological significance. In its entirety, AMU 2966 was assessed as being of ***no*** archaeological significance. The PHALMS Statement of Significance is reproduced below:

This AMU has no current archaeological research potential. This area was an important area for the development of industry in Parramatta. The eastern side of the subject area was originally swampland, reclaimed prior to development in the early twentieth century. The physical archaeological evidence within this area is unlikely to include features which have the potential to yield information relating to major historic themes and current research questions. Archaeological evidence at this site is likely to be subject to major disturbance. Part of the site was reclaimed in the early twentieth century. This AMU is of no archaeological significance.

PHALMS provides 'Recommended Management' actions for all identified AMUs as an indication of the potential future management requirements of their archaeological resources. For AMU 2966 it is recommended that no action is required, and that existing management controls should be followed. It was also recommended that the AMU have prepared for it, or be included in, a Development Control Plan (DCP).

6.0 Site Inspection Results

6.1 Introduction

A site inspection was undertaken on 12 September 2012, as outlined in **Section 3.3**. The following describes the site based on the inspection, and focuses on the area proposed for demolition. The site has been divided into a number of precincts, based on the predominant function of the area, in order to provide a clearer description. **Figure 4** provides a plan of the location of the precincts. Due to the size and complexity of the site, the descriptions have necessarily been kept brief.

6.2 General Site Description

Shell's Clyde Terminal is located at 9 Devon Street, Rosehill in the Sydney Metropolitan area on the upper reaches of Sydney Harbour in NSW (refer to **Figure 1**). The site is situated within the Camellia Industrial Estate in the suburb of Rosehill and lies at the confluence of Parramatta and Duck Rivers to the west, which is approximately 16 kilometres west of the Sydney Central Business District (CBD).

The Clyde Terminal comprises 86 hectares and is located in the Parramatta Local Government Area (LGA) on parts of Lot 1, DP 109739, Lot 1 DP 383675, Lot 101 DP 809340, and Lot 2 DP 224288 which are owned by Shell. The site is zoned as IN3 Heavy Industrial under the Parramatta Local Environmental Plan (LEP) 2011.As per Shell's environmental protection licence (EPL) 570, the Clyde Terminal's operations also take place on a small parcel of land adjoining Parramatta River (Lot 1 DP 534905) that is leased by Shell from Roads and Maritime Service (RMS). On this parcel of land Shell operates a small wharf area including administrative buildings and a small jetty extending into the Parramatta River. The Project Area includes the Shell Refinery Warehouse which is located on Lot 1, DP 109739, but which is surrounded by Shell's Parramatta Terminal operations.

Shell also owns parcels of land adjacent to the Project Area, and which are currently leased to third parties. A section of Lot 101 DP 809340 forms part of Shell's operations at the Project Area. However, much of this lot is currently leased to tenants. Lot 1, DP 109739 also includes Shell's operations at the adjoining Parramatta Terminal that are not included as part of this assessment. Lot 398 DP 41324 is a small parcel of land that also comprises Shell's operations at the Parramatta Terminal which adjoins the Project Area. A small section of Lot 1, DP 109739 surrounded by the Parramatta Terminal operations is also leased to Jemena.

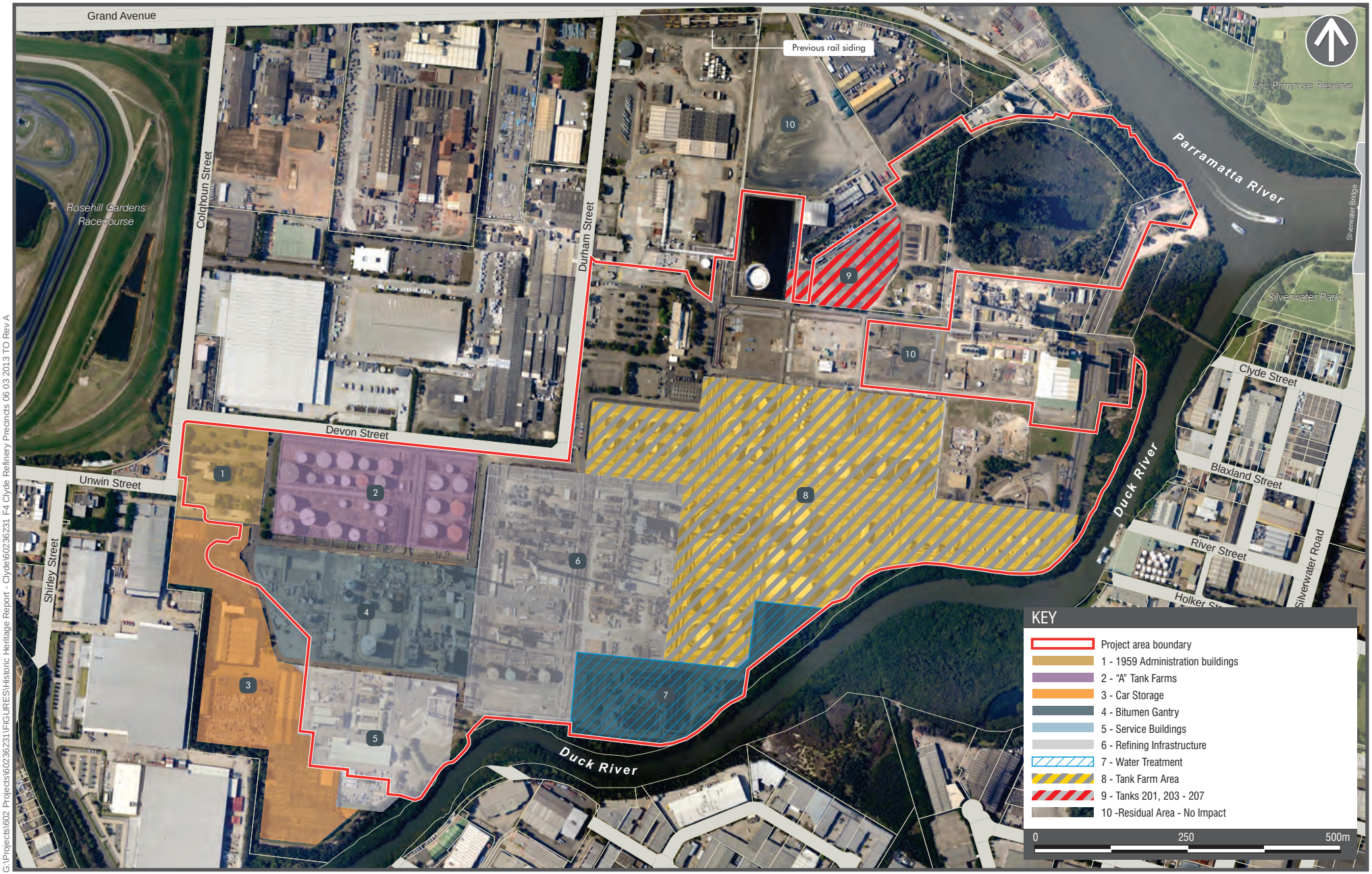
6.3 1959 Administration Buildings

There are three components to this precinct: the archaeological site associated with the former managers residences, the 1959 Administration Buildings and the Shell Credit Union and Contractors Amenities Building.

6.3.1 Archaeological Site

The examination of the aerial photographs identified three residences were constructed fronting Devon Street, near the corner with Colqhoun Street. The first was constructed prior to 1930 and the subsequent two prior to 1951. Inspection of the area indicated that it is a level grassed area with a sparse covering of randomly placed trees of both native and introduced species. There are interspersed patches of gravel, the origin and function this is unclear, but may relate to drainage.

The inspection identified a feature potentially associated with the eastern most of the three houses. It is a 500 mm long by 14 mm wide section of concrete with a high number of pebble inclusions. It may be a foundation for the former residence or part of a garden bed or similar. No other artefacts were identified on the surface.



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CLYDE REFINERY PRECINCTS

Clyde Terminal Conversion Project
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FIGURE 4

Plate 10 Archaeological Site, view West

Plate 11 Archaeological Site, Wall Feature

6.3.2 1959 Administration Building

The Administration Building, opened in 1959, is a two storey, flat rooved structure comprising two off-set components linked by a central entranceway. The exterior is a composite of cream/salmon brick, glass and metal. The western and eastern ends of the buildings are of brick, while the northern and southern are dominated by windows. The bottom third of each floor is metal sheeting that has been painted a powder blue.

The interior of the building is dominated by warm honey coloured wood panelling. Each wing has a central hall way with offices opening off each side. There appears to have been minimal intervention to the interiors following the construction of the building.

Plate 12 Administration Building – External, view North West

Plate 13 External Entrance Door Detail

6.3.3 Shell Credit Union and Contractors Amenities Building

The Shell Credit Union and Contractors Amenities buildings mirror the Administration Building in footprint, although the elements are slightly wider due to the addition of a verandah on the northern side. The building is single storey and of the same cream and salmon bricks as the Administration building. Rather than being dominated by glass on the western and eastern sides like the Administration building, the windows are limited to the upper third of the façade. The exception to this is the western most section of the building, thought to have been the branch teller office for the Credit Union.

An interior inspection was not undertaken of the building due to safety considerations as it is currently fenced, unused and in a dilapidated state.

Plate 14 Shell Credit Union and Contractor Amenities Building, view south

6.4 Tankfarms A1, A2 & A3

This precinct is comprised of Tankfarms A1 (**Plate 15**) in the east, A2 in the south (**Plate 16**) and A3 (**Plate 17**) in the north. Tankfarm A1 contains seven tanks, six of which are arranged in two rows aligned north-south. The seventh tank is placed at the northern end, central to the alignment. The tank numbers include 17, 18, 28, 29, 30, 31 and 62. Tankfarm A2 contains ten tanks (1, 9, 11, 26, 64, 65, 66, 67, 68 and 85) of various capacities with no pattern to their placement, which has probably been influenced by the replacement of tanks during the operation of the then Clyde Refinery. Tankfarm A3 contains 11 tanks (3, 4 15, 19, 20, 21, 22, 23, 27, 63 and 80), with a general trend to two rows on an east-west alignment, although this is somewhat visually disrupted by the various diameters of the tanks.

The Tankfarms are divided by concrete roads and c.2 m bund walls. A series of pipes run along the northern and southern side of Tankfarm A3. A smaller series of pipes extends along the southern side of Tankfarm A2. At the northern end of the aforementioned Tankfarm is a manifold pit, containing a series of pipes and valves. Adjacent to the manifold pit on the eastern side is the No. 1 Pumphouse, which is a single storey cream brick building approximately 62 m long and 8.5 m wide. A scaffold-like structure is attached to the roof, creating an open second storey. To the north of the Pumphouse and adjacent to Tankfarm A3 is Substation No. 5 – a cream brick building with a rectangular footprint of 19 x 7 m and a pitched roof. The interior of the building was not inspected due to safety considerations.

Plate 15 Tankfarm A1, view West

Plate 16 Tankfarm A2, view East

Plate 17 Tankfarms A2 (right) and A3 (left), view west

6.5 Car Storage

While this area forms part of the Project Boundary, it is currently leased to a third party who use the area to store new cars prior to distribution. The Project will have no impacts on this area and it was therefore not inspected.

6.6 Bitumen Gantry

This precinct contains the bitumen gantry and associated infrastructure at the western end, while to the east are five Substations (No.s 5, 18, 23, 26 and 29), a control room, water treatment plant, utilities generator house, two boilers (N07 and N09), field office and transformers No.s 1,2,3, T3, T4 and T5. Interspersed between these are 12 tanks of various diameters and capacities, being numbers 70, 71, 72, 73, 74, 75, 76, 77, 88, 89, 96 and 97.

The bitumen gantry is a green corrugated iron, pitched roof structure elevated to allow trucks to pass underneath. To the north, three rail lines, one with a buffer still in place, are extant as evidence of the former mode of bitumen transport.

Near the bitumen gantry in the western area a memorial plaque has been mounted to the wall. The plaque is a memorial to three men, being John Simpsom Fell, Horace Liddon Spencer and Albert Edward Ward. The three men were killed in an explosion at the refinery on 19 August 1927. The memorial plaque dedicated to them is a granite block with embossed gold lettering currently inset into a section of red brick wall (see **Plate 18**).

Plate 18 Bitumen Gantry Memorial Plaque

Plate 19 Bitumen Gantry, view West

6.7 Services Buildings

Located adjacent to Duck Creek, in the far south western corner of the site are the service buildings, including sample store, Substation No. 9, Transfield Services, fire station, ab store, warehouse, workshop, amenities and laboratory.

The sample store is a corrugated iron shed of 19 x 7 m. It appears to be sparsely used. Cranes and large moving plant are currently parked to the north of the store.

The fire station and Transfield services workshop are conjoined buildings of different elevations (**Plate 20**). The fire station, to the east, has three flours, the ground floor being dominated by garage space for two fire trucks. The station is constructed around concrete supports, infilled with cream/salmon brick. Windows form the upper third of each floor. Due to operational reasons the interior was not inspected, but from an external examination it appears the second floor may contain office space and amenities, while the third appears to be fitted with stairs and scaffolding for training. There are also two sets of external fire stairs. The Transfield services building is a two door garage, opening to the west. The roof is unusual, being a flattened V. As with the fire station, it is of cream/salmon brick, although the uprights appear to be of steel, rather than concrete. The interior is one open space to allow for the maintenance of vehicles. Within the road to the west of the entrance there is a short length of narrow gauge tram tracks leading into the workshop (**Plate 21**). These have been covered by concrete and bitumen within the workshop and the majority of the remaining length. The warehouse and workshops are conjoined structures of cream/salmon brick to a height of approximately 1 m with green corrugated iron walls (**Plate 22**). The monitor shaped roof has windows along the vertical wall separating the shed from the gable roof, to allow natural light into the building.

The AB store is a warehouse store building located between the fire station and the laboratory. It was used to store general items and did not house any hazardous goods during its period of use.

The laboratory is a U shaped structure with a portico on the front (eastern) elevation (**Plate 24**). It is constructed of red brick, with metal framed windows in the central third of the façade. For operational reasons the interior could not be inspected.

To the east of the laboratory is an open area containing the Stage 1, 2 and 3 high level flare stacks, as well as a radio mast and Substation No. 6.

Plate 20 Fire station (left) and Transfield Services Workshop, view South

Plate 21 Transfield Services Building and Tram Tracks, view East

Plate 22 Workshop, view East

Plate 23 Ab Store, view South

Plate 24 Laboratory, Front Façade, view East

6.8 Refining Infrastructure

This precinct contains the core of the refining operations. These are large, complex pieces of engineering and detailed descriptions of them are beyond the technical expertise of the author. Within this precinct is the:

- Distillate Splitter;
- Crude Distillation Unit 2;
- High Vacuum Unit (**Plate 25**);
- Catalytic Cracking Unit and Gas Separation Unit (**Plate 26**);
- Dry Gas Treater;
- Poly Plant;
- Alkylation Plant;
- Caustic Soda Treater and Caustic Soda Regeneration;
- Waste Disposal Plant;
- Sulphur Recovery Units 1 and 2 (**Plate 27**);
- Hydro Blasting Area; and
- These pieces of plants are operated from the Central Control Room.

Also within this precinct are Substations 3, 16 and 24 (**Plate 28**) and Tankfarm H (**Plate 29**), which contains tanks 501 to 505.

Plate 25 High Vacuum Unit, view East

Plate 26 Catalytic Cracking Unit and Gas Splitter Plant overview, view South West

Plate 27 Sulphur Recovery Units 1 & 2, view West

Plate 28 Substation 24, view North East

Plate 29 Tankfarm H, view South West. Platformer 3 Visible in Background (right)

6.9 Water Treatment

The water treatment facilities are concentrated adjacent to Duck Creek, to the south of the refining infrastructure. The facilities are powered by Substation No. 22 and include the cooling towers, basin, activated sludge basin, Basin No. 1, Feed No. 2, Main Interceptor and Slops tanks 103 to 106.

Plate 30 Water Cooling Tower

Plate 31 Slops Tanks, view South West

6.10 Tankfarm Area

This precinct encompasses Tankfarms B, B1, B2, C, E1, E2, the Mounded LPG tank area and the Hydrocarbon, Chemicals and Solvents Tanks.

Tankfarms B and B1 each contain three tanks (50, 51 and 53 and 34, 35 and 42 respectively) (**Plate 32**). Tankfarm B2 contains eight tanks arranged in two rows aligned north-south and being tank numbers 32, 33, 43-48 (**Plate 33**). This Tankfarm is proposed for demolition. To the east of Tankfarm B2 is a Tel Plant, Manifold Pit (**Plate 34**), No. 2 Pumphouse, Analyser House, Retention Basin and 21 tanks associated with LPG storage (**Plate 35**). The LPG tanks include ball and vertical bullet style tanks. These items are also proposed for demolition. Also contained within this precinct are Substation No.s 2 and 15.

Tankfarm C, containing tanks 54 to 61, is proposed for demolition (**Plate 36**). The tanks are arranged in two rows aligned east-west.

Tankfarm E1 contains six tanks (36-41) aligned in two rows north-south (**Plate 37**). Within Tankfarm E1, tanks 40 and 41 are proposed for demolition. Tankfarm E2 contains seven tanks – 69, 82, 83, 84, 86, 87 and 1704 (**Plate 38**). Tanks 69, 82 and 83 are proposed for demolition.

The Mounded LPG tank area is a series of five LPG horizontal bullet style tanks encased within a concrete and earthen mound. Located directly to the west, is the Hydrocarbon, Chemicals and Solvents Tanks comprising of 14 tall, skinny tanks. Shell propose to retain the Mounded LPG tanks, but demolish the Hydrocarbon, Chemicals and Solvents Tanks.

Plate 32 Tankfarms B and B1,view North East

Plate 33 Tankfarm B2, view South West

Plate 34 Manifold Pit and Tel Plant, view South

Plate 35 LPG Storage Tanks, view South West

Plate 36 Tankfarm C, view North West

Plate 37 Tankfarm E1, view North

Plate 38 Tankfarm E2, view North East

Plate 39 Hydrocarbon & Chemical Solvant Tanks, view North East

6.11 Tanks 201 and 203-207

Located in the central northern portion of the Project Boundary are tanks 201 and 203-207. The tanks are constructed on a different alignment to all the other Tankfarms, being north-east to south-west. This mirrors the former railway alignment that ran to the north west of the tanks. The tanks are sitting within an earthen bund wall with a chain-link fence. The bund has created a pond effect and the northern most tanks are partly submerged. All the tanks are rusted and in poor condition. They are currently not in use.

Plate 40 Tanks 207, 203 and 201 (left to right), view West

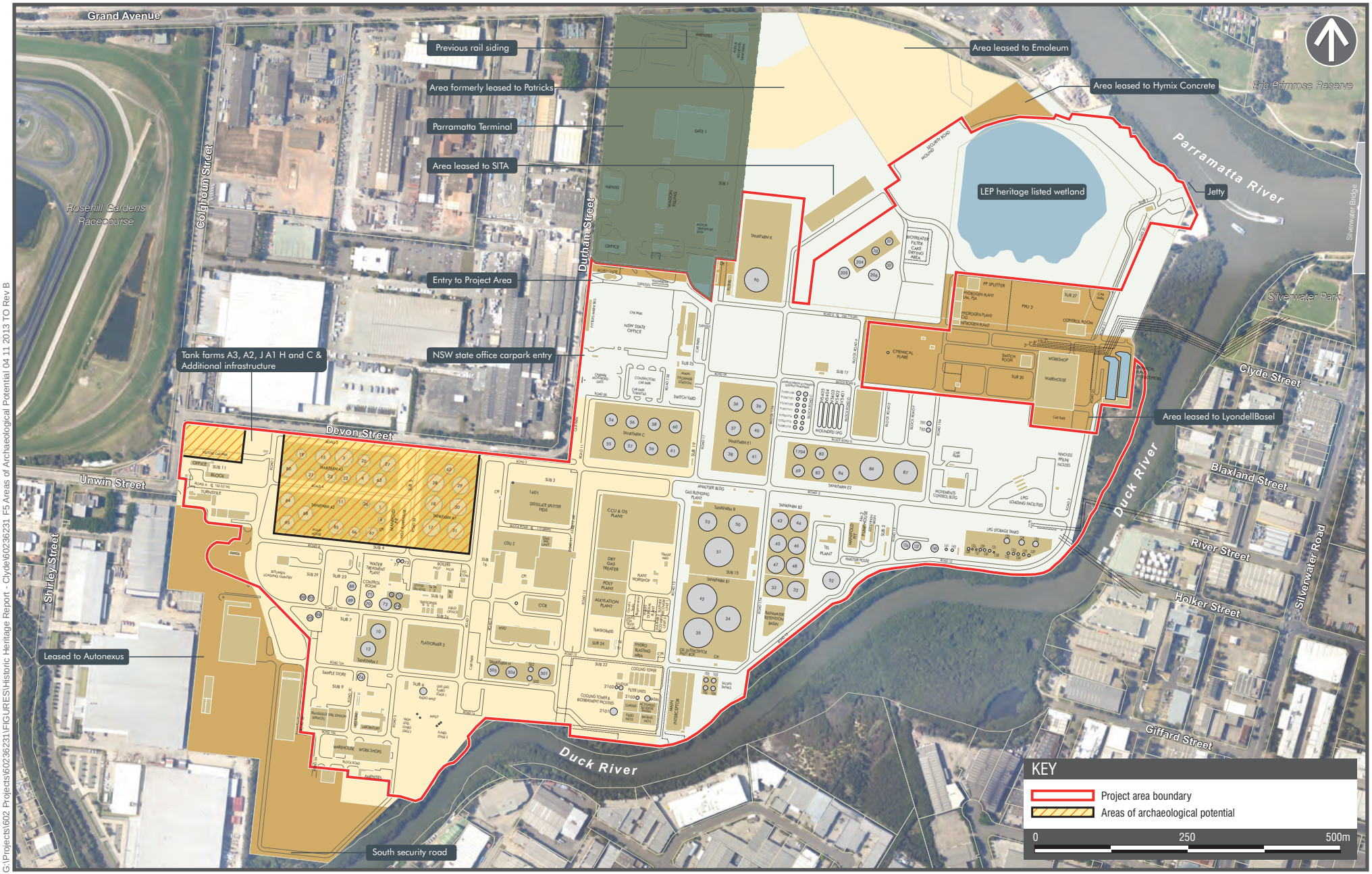
6.12 Residual Area

There are no proposed modifications to the remainder of the Project Area. This area was therefore not inspected.

6.13 Archaeological Potential and Items of Heritage Significance

The PHALMS identified the Project Area as having no archaeological potential. This has largely been substantiated by this report, with two exceptions (**Figure 5**). The first is the area along Devon Street from the intersection with Colqhoun Street. Aerial photographs identified three residences were constructed in this area, the first prior to 1930 and the second two prior to 1951 and then demolished between 1970 and 1978. There appears to have been limited disturbance to this area in the intervening years. It is therefore anticipated that there is high archaeological potential for features and deposits associated with the houses to remain intact.

The second area relates to the first installation constructed by John Fell & Co. The 1930 aerial indicates that the original Tankfarms were where Tankfarms A2 and A3 currently stand, with the Clyde Refinery infrastructure being located to the south, in what is now the Bitumen Loading Gantry area and the Water Treatment Plant. The date of construction for the original tank could not be verified, but it is mentioned in records as early as 1943 and featured in drawings dating to 1954. While there has been some subsequent disturbance to this area with the construction and demolition of a variety of sheds and other services prior to the Bitumen Lading Gantry and Water Treatment Plant, there remains potential for evidence of the previous structures to be retained beneath the current asphalt and concrete surfaces. The archaeological potential, however, is considered to be low.



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AREAS OF ARCHAEOLOGICAL POTENTIAL

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FIGURE 5

6.14 Visual Assessment

The Parramatta City Council submission to the Department of Planning and Infrastructure during the formulation of the DGRs requested the inclusion of a visual assessment to determine the significance of the Clyde Terminal.

The Clyde Terminal is a large facility – occupying over 94.38 hectares. It is located at the confluence of Parramatta River and Duck Creek. The banks of these two water courses are vegetated with mangroves, planted during the 1980s or 1990s as part of the rehabilitation of the area undertaken by Shell. The mangroves are of between three and five metres in height. As a result of these plantings, views in close proximity to the Clyde Terminal are limited – the top of the stacks are all that can be viewed from the opposite side of Duck Creek, in Silverwater and from the John Street, Rydalmere Ferry Wharf (**Plate 41**). The predominant views from the Ferry Wharf area are of the LyondellBasell Polypropylene Plant, which are not affected by the works proposed. The industrial park to the north and west of the Clyde Terminal also precludes views towards the Clyde Terminal for the most part – there are glimpses of the former Refinery stacks available at interspersed points along Grand Avenue and adjacent streets.

It is only with elevation that the Clyde Terminal becomes more visible. Such vantage points are available on the M4 (**Plate 42**) and within Ermington (**Plate 43**). Views from the M4 are fleeting, due to the speed at which vehicles travel and other traffic, which inhibits driver's ability to appreciate the Clyde Terminal. Views from Ermington towards the Clyde Terminal are constrained by the warehouses located in the area, meaning views can only be obtained when looking down a north-south aligned road. Even within these view lines, the LyondellBasell facility is more apparent than Shell's Clyde Terminal (**Plate 43**).

Plate 41 View of Shell Facilities from John St Wharf, Rydalmere, view South

Plate 42 View of Shell Facilities from the M4, view North

Plate 43 View of Shell Facilities from South Street, Ermington, view South

7.0 Significance Assessment

7.1 Introduction

This **Section 7.0** places the site of the Clyde Terminal within the Australian context through the use of the Commonwealth *Australian Historic Themes* (Australian Heritage Commission, 2001) and the NSW State themes (NSW Heritage Office & Department of Urban Affairs & Planning, 1996) and a comparative analysis with other refinery complexes in Australia. This is followed by an assessment of the historical significance of the former Clyde Refinery, using NSW Heritage Branch guidelines, as outlined in **Section 3.4**.

7.2 Historical Themes

Commonwealth and NSW heritage agencies use themes as a means of categorising how a place contributed to historical events at a national, state and local level. Historical themes are a means of relating site-specific developments to broader historical patterns. The themes which the Terminal address are provided in **Table 2**.

Table 2 Shell Terminal Historical Themes

National (Theme Group)	National Thematic Framework	State	Local
3. Developing local, regional and national economies	3.4.5 Tapping natural energy sources	Mining	Fells Shale Oil Refinery
	3.13 Developing an Australian manufacturing capacity	Industry	Refinery
	3.8.8 Getting fuel to engines	Industry	Fuel Terminal
5. Working	5.2 Organising workers and work places	Labour	Operating a fuel terminal

7.3 Comparative Analysis

Table 3 provides an overview of the development of oil refining within NSW and Australia more generally in order to place the former Shell Clyde Refinery within a historical context and to aid in the assessment of the Project Area's heritage significance.

Table 3 Summary of Australian Oil Refineries

Location	Company	Ownership (by year)	Date Established	Date Decommissioned	Comment
Former Clyde Refinery, NSW	Shell	John Fell & Co – 1913-1927 Shell – 1928-Present	1926	2012	Commonwealth Oil Corporation (COC) purchased the land in 1908, however, no reference can be found to the construction or operation of a facility on the site. John Fell & Co. acquired the COC land in 1913. In 1918 Fell & Co. announced they would build a refinery on the site. It is unclear when this refinery became operational, but it was definitely on stream in 1926.
Laverton Refinery (Altona North and COR), VIC	COR/BP	Commonwealth Oil Refineries Ltd (COR)	1922 (came on stream 1924)	1955	Commonwealth Oil Refineries (COR) was established in 1920 by the Australian Government and lead by the Prime Minister William M. (Billy) Hughes and the Anglo-Persian Company (the predecessor of British Petroleum (BP)). By 1924 it had built what is widely acknowledged to be Australia's first oil refinery on 400 acres at Laverton in Victoria (Wilkinson, 1988). The refinery produced high quality motor spirits, kerosene's, furnace oils and distillate fuels. By 1938 the Laverton Refinery was regarded as the most modern and best equipped refinery in the Southern Hemisphere. In 1952, the Anglo-Iranian Oil Company bought out the Australian Government's interests in COR and the company's name was later changed to BP Australia Pty Ltd. The refinery closed in 1955 after the company experienced financial difficulties (Wilkinson, 1988).
Matraville Refinery, NSW	AMPOL	BORAL – 1948-1969 BORAL/Total – 1969-1971 Total – 1971-1983 Ampol – 1983-1984	1948	1984	In 1948, a lubricating oil and bitumen plant was opened in Matraville, Sydney, by Bitumen and Oil Refining Australia (BORAL). In 1969 the facility was converted into a full-scale oil refining facility, although it always remained a relatively small operation. The Refinery was closed in 1984 when the oil industry both domestic and international faced significant economic challenges (Wilkinson, 1988).
Altona Refinery, VIC	ExxonMobil	Vacuum Company – 1949-1954 Mobil/Esso – 1954-1990 Mobil – 1990-Present	1949	N/A	Following WWII, in 1949, the Vacuum Company (who had, prior to WWII merged with the Standard Oil Company of New Jersey (later Exxon)) established a lubricating oil and bitumen plant at Altona, just outside Melbourne, Victoria. In 1954, this bitumen and lubricating oil plant was converted into a full scale oil refining facility by joint venture partners Mobil/Esso (Wilkinson, 1988). It was temporarily closed from October through to mid-November 2011 to undertake an extensive maintenance program (ExxonMobil, n.d.-a). The Altona Refinery is still operational today, employing approximately 350 people and producing up to 13 million litres of refined products daily (ExxonMobil, n.d.-b).

Location	Company	Ownership (by year)	Date Established	Date Decommissioned	Comment
Geelong Refinery, VIC	Shell	Shell – 1954-Present	1951 (opened in 1954?)	N/A	Shell commenced construction on their second Australian oil refinery at Geelong, Victoria, in 1951. The refinery was erected on a 250 acres site known as the 'seaplane base' near the Corio railway station at a cost of approximately £5 million. It was officially opened and on stream in 1954. Initially this refinery acquired its feed stock from British Borneo, which was almost a "100% sterling source" ("Northshore and Norlane Stories," n.d.). Subsequently, the Geelong Refinery went on to become one of the largest, most complex hydrocarbon refineries in Australia. It is still operational today and currently directly employs approximately 470 people on site, whilst also providing work for hundreds of additional contractors as well (Shell, n.d.).
Kwinana Refinery, WA	BP	BP – 1955-Present	1955	N/A	The BP Kwinana Refinery commenced operations in 1955. It was the first, and only, oil refinery to be constructed on the west coast of Australia. Significant investments in the Kwinana Refinery in subsequent years resulted in it becoming one of the most modern refineries not just in Australia, but the southern hemisphere, and today it is the largest operating in Australia, with a capacity of 137,000 barrels of Crude Oil per day. This refinery produces petroleum, diesel, and aviation fuel, which are pumped via pipeline to BP's Kewdale terminal, where it is then distributed throughout WA by road trains, rail tankers, and fuel tankers. Other products also include bitumen, fuel oil, hydrogen, kerosene, and Liquid Petroleum Gas (LPG) ("BP Australia," n.d.-a).
Kurnell Refinery, NSW	Caltex Australia Ltd/Chevron Corporation	Caltex – 1956-Present	1956	2014 (predicted)	In 1954, Australian Oil Refining Pty Ltd (AOR), a subsidiary of Caltex, commenced construction of their refinery at Kurnell. It was operational by 1956 (Wilkinson, 1988). This went on to become the largest oil refinery in Australia, a title which it maintained for several decades, until it was eventually surpassed by BP's Kwinana Refinery in Western Australia. Today Kurnell is the second largest refinery in the country after Kwinana. It is forecast to be decommissioned by 2014.
Port Stanvac Refinery, SA	Mobil/Esso	Mobil/Esso – 1963-1990 Mobil – 1990-2003	1963	2003 (Currently being demolished)	In the early 1950s the oil company 'Standard Vacuum' (Stanvac) a joint venture between Mobil and Esso, entered into negotiations with the SA Govt. for the construction of an oil refinery in Adelaide. Port Stanvac started operation in March 1963 after almost five years of planning, engineering and construction, and one year after the break-up of Standard Vacuum in the USA. In Australia, following the breakdown, a new company was formed – Petroleum Refineries (Australia) Pty Ltd – to operate their two refineries (Altona and Port Stanvac). This company was owned 70% by Mobil and 30% by Esso (in 1966 Esso increased their share to 35%) (Wilkinson, 1988). At its peak, the Port Stanvac refinery

Location	Company	Ownership (by year)	Date Established	Date Decommissioned	Comment
					produced more than 8.5 million litres of refined products a day, accounting for around 90% of SA's petrol and diesel requirements. The early 1980s was a challenging time for oil companies, and while Port Stanvac Refinery survived the 80s, as the business environment became progressively more difficult, operations became increasingly unprofitable and uneconomically viable. Finally, in 2003, the decision was made to cease operations and "mothball" the refinery, allowing for its potential restart in the event that business conditions improved. In mid-2009, following re-assessment of business operations, Mobil decided that it would not reopen the refinery and instead began planning its demolition and site remediation. Physical demolition of the site commenced in 2012 ("Port Stanvac Refinery History," n.d.).
Crib Point/ Western Port Refinery, VIC	BP	BP – 1966-1985	1966	1985	BP's Crib Point/Western Port Refinery was the last major oil refinery to be constructed in Australia. Construction commenced in 1964 at Cribb Point on Western Port Bay, and the refinery came on stream two years later in 1966. Two decades later, the oil industry globally encountered difficult times, and the Crib Point/Western Port Refinery was decommissioned following BP's acquisition of Amoco's operations, comprising both retail sites and the Bulwer Island Refinery in Queensland (Wilkinson, 1988).
Lytton Refinery, QLD	Caltex Australia Ltd/Chevron Corporation	Ampol – 1965-1995 Caltex – 1995-Present	1965	N/A	Ampol constructed the Lytton Refinery in 1964. It was completed and on stream by 1965. Until the 1980s, the bulk of the Lytton Refinery's crude was supplied by Caltex, who were also one of their fiercest competitors in the oil industry (Wilkinson, 1988). Following decades of fierce competition, Caltex and Ampol merged in 1995, with Caltex taking over operations at the Lytton Refinery. The Lytton Refinery is still operational today, producing petrol, diesel fuels.
Bulwer Island Refinery, QLD	BP	Amoco – 1965-1984 BP – 1984-Present	1965	N/A	In 1965, Amoco constructed a small refinery at Bulwer Island, on the opposite side of the Brisbane River to Ampol's Lytton Refinery, which also opened the same year. The Bulwer Island Refinery was purchased, along with Amoco's other assets, including retail sites, by BP in 1984. Following their acquisition of the Bulwer Island Refinery, BP decided to close down operations at their Western Port Refinery in Victoria. Following BP's acquisition of the site, the Bulwer Island Refinery has undergone a number of expansions and technology upgrades, which have enabled the facility to produce cleaner transportation fuels (Wilkinson, 1988). The Bulwer Island Refinery is still operational today and currently employs about 340 people. It supplies jet fuel to Brisbane airport via a direct pipeline, while the remainder of

Location	Company	Ownership (by year)	Date Established	Date Decommissioned	Comment
					its products are sent to terminals in Gladstone, Mackay, and Townsville. The refinery's products include petrol, diesel fuels, aviation fuel, bitumen, fuel oil, hydrogen, kerosene, and LPG ("BP Australia," n.d.-b).
Maranoa Oil Refinery (Roma), QLD	The Moonie Oil Company Ltd	The Moonie Oil Company Ltd – c.1975-1986	c.1975	1986	The Maranoa Oil Refinery, a 'mini-refinery' at Roma, Queensland, was opened c. 1975 by The Moonie Oil Company. This refinery was always a very small operation. Following the establishment of the other 'mini-refinery' at Eromanga in 1986, the two existed in tandem for approximately six months. Facing increasingly difficult economic challenges, however, the refinery at Roma was closed later that same year. Attempts to open a third 'mini-refinery' at Alice Springs also failed after only a few months of operation (Wilkinson, 1988).
Eromanga Refinery, QLD	IOR Energy Pty Ltd	**BP** – 1985-unconfirmed **IOR Energy Pty Ltd** - unconfirmed-Present	1986	N/A	In 1985 BP, in collaboration with a group of smaller companies, established a 'mini-refinery' at the inland Queensland town of Eromanga, approximately 1,000kms west of Brisbane (Wilkinson, 1988). Since its opening in 1986, the Eromanga Refinery has consistently processed approximately 1,250 barrels per day of locally produced Crude Oil. The refinery currently produces high quality diesel fuels, heating oils, kerosenes, and a range of specialty petroleum products for industrial uses (iOR Energy, n.d.).

7.4 Significance Assessment

Table 4 assesses the Project Area against the NSW Heritage Branch guidelines *Assessing Heritage Significance* (NSW Heritage Office, 2001).

Table 4 Clyde Terminal Significance Assessment against NSW Heritage Significance Criteria

Application of Criteria	
Historical significance SHR criteria (a)	The former Clyde Terminal is of State significance through its ability to demonstrate the course of NSW history – from its reliance on natural resources towards fossil fuels. The then Clyde Refinery was established by John Fell & Co. sometime between 1918 and 1926 to refine shale oil. This source of feedstock was quickly supplemented by Crude Oil imported by Shell. When shale oil became unprofitable, the Fell Company came to rely solely on crude imported by Shell. Increasing competition in the market, combined with an accident at the newly opened Refinery, forced the Fell Company to sell to Shell. Shell took over operations in 1928, making it one of the longest operating refineries in Australia. The physical and technological development of the former Clyde Refinery demonstrated advancements in refining. Fell & Co. established the Refinery with a Dubb's Cracking Unit – leading technology for its time. The Clyde Refinery also demonstrated the development of business and enterprise in NSW. Initially established to exploit the natural resources of the State, it was altered to continue operations with the use of imported Crude Oil.
Historical association significance SHR criteria (b)	The former Clyde Refinery is of State significance through its association with the Shell Company. The Project Area has been operated by Shell since it was purchased in 1928 and has supplied NSW with a large portion of its fuel needs.
Aesthetic significance SHR criteria (c)	The former Clyde Refinery is of local significance as a landmark within the Parramatta/Clyde area. The refinery stacks remaining at the current Clyde Terminal are clearly visible from a number of vantage points, including the M4 and the Ermington area.
Social significance SHR criteria (d)	The former Clyde Terminal is likely to be of local social significance as a provider of employment and an active community member for over 80 years. Further research is required to confirm this assessment.
Technical/Research significance SHR criteria (e)	The former Clyde Terminal is of local significance due to its ability to demonstrate the development of refining technology. The current refining facilities appear to date from the 1960s through to the present. It does not meet the criteria for State significance as there is no physical evidence of the early development (pre 1950s) of the site. The site contains two areas of archaeological significance, which have the potential, at a local level, to provide information, through archaeological investigation, not available from other sources. One relates to three houses formerly located on the corner of Devon and Colqhoun Streets and anecdotally used as accommodation for the site managers. The second area may contain information relating to the layout and functions of the initial Refinery established by John Fell & Co.
Rarity SHR criteria (f)	The former Clyde Terminal is of State significance as it is one of only two oil refineries in NSW – both of which have announced their closure.
Representativeness SHR criteria (g)	The former Clyde Terminal is of State significance as a representative example of an oil refinery. It maintains all the critical elements of an oil refinery in working order.

7.5 Statement of Significance

The former Clyde Terminal is of State historical, associative, rarity and representative significance. Historically, it demonstrates NSW's increasing use of and reliance on fossil fuels and the expansion of business in the State from import to production. It is associated with the Shell Company, one of the leading producers and retailers of fuel in NSW. The former Clyde Refinery is representative of an oil refinery and is rare, being one of only two in NSW.

The former Clyde Refinery is of local social, research and technical significance. It is likely to be of social significance to the local community as it has been an employer of locals for over 80 years and has been an active participant and supporter of community events throughout that time. The former Clyde Refinery can also demonstrate technical developments in the process of refining Crude Oil. The plant dates from the 1960s onwards, while the Central Control Room was considered as world class on its completion in 1988. The site contains two areas of archaeological significance, which have the potential, at a local level, to provide information, through archaeological investigation, not available from other sources. One relates to three houses formerly located on the corner of Devon and Colqhoun Streets and anecdotally used as accommodation for the site managers. The second area may contain information relating to the layout and functions of the initial refinery established by John Fell & Co.

8.0 Impact Assessment

8.1 Introduction

The Project would consist of demolition and construction works, followed by the operation of the fully converted Clyde Terminal. The works involved with each component is outlined below, followed by the impact it is likely to have on the heritage significance of the former Clyde Refinery. It is relevant to note that the cessation of refining activities in October 2012 has already had a negative impact on the heritage significance of the then Clyde Refinery: it was one of the longest operating refineries in Australia, being in operation from 1918 or thereabouts.

8.2 Electrical Decommissioning

A large electrical distribution system is currently in place at the Clyde Terminal. Sub-stations within the demolition area would be progressively decommissioned as part of the project works.

8.2.1 Heritage Impact

As long as no fabric is removed from the substations during decommissioning, this process will not impact the heritage significance of the former Clyde Refinery. Should fabric require removal, management measures are provided in **Section 9.3**.

8.3 Demolition Works

Decontamination and decommissioning activities have been underway since late 2012 in preparation for demolition and construction. These decontamination and decommissioning activities did not require development approval before taking place. All assets within the western portion of the Clyde Terminal would be demolished and removed as shown in **Figure 6**.

It should be noted that the scope for these demolition activities is for demolition to ground level only. Broadly speaking, demolition activities would comprise the following activities:

- Isolation and management of identified hazardous materials such as asbestos;
- Typical demolition techniques of collapsing structures to a level that allows the use of heavy machinery to cut the process equipment and piping for scrap recovery;
- Limited use of explosive techniques for two stacks;
- Civil works to remove foundations; and
- Remediation of drainage and ground water management.

The demolition of redundant infrastructure at the Clyde Terminal is proposed to be undertaken in two phases. **Figure 6** provides an indication of how these demolition activities are likely to be staged, however, this would be confirmed once the demolition and construction contractors are selected.

The first phase of demolition is anticipated to commence within six months of the grant of development consent and be completed within two to three years. It would include demolition of the following infrastructure:

- Main processing area's Crude Distillation Unit and catalytic cracking unit;
- Platformer 3 unit;
- Tankfarms A1 and H; and
- Bitumen loading gantry.

The second phase of demolition is anticipated to commence within 12 months of the grant of development consent and would be completed within five to 10 years. It would include demolition of the following infrastructure:

- Utilities plant;
- Remaining Tankfarms and selective tankage not required for the Clyde Terminal;
- LPG area; and
- Various associated buildings.

The methods employed for the demolition phase would abide by the following methodology:

- For high level and interconnecting piping:
  - Selectively cut utilising oxy-acetylene; and
  - Brought to grade via crane.
- For columns, vessels, exchanger structures:
  - Collapsed to a level such that excavators complete with mechanical shears are able to reach; and
  - Equipment cut up for scrap and taken offsite as work progresses.
- For furnaces and Boilers:
  - Either demolished via the use of mechanised equipment or deconstructed to manage hazardous materials such as asbestos or mineral fibres.
- For stacks:
  - Three stacks contain asbestos seals at intervals throughout the height of the stack. These would be scaffolded out and dismantled in sections with appropriate asbestos management procedures in place; and
  - Two of the stacks are planned to be brought to grade through the use of controlled explosion.
- For storage tanks:
  - Mechanised demolition such as excavators equipped with hydraulic shears.
- For buildings:
  - Mechanised demolition.

All of the existing infrastructure in the south-western area of the Project Area would be removed (refer **Figure 6**).

8.3.1 Heritage Impact

The demolition works at the Clyde Terminal will have a negative impact on the heritage significance of the former Clyde Refinery.

There is potential for the identified research significance of the site to be impacted by the proposed demolition in the Bitumen Gantry area. This area has the potential to contain archaeological evidence of the original John Fell & Co. refinery.

The proposed demolition will also require the removal of a memorial to John Fell, who was killed, along with two others, in 1927 when a still exploded. The memorial is identified as having historical significance.

Management measures for these impacts are provided in **Section 9.4**.

8.4 Construction Works

Subject to the obtaining of development consent and other necessary approvals, construction works would be expected to commence alongside demolition works at the Clyde Terminal. This phase would comprise the construction and modification of key infrastructure required for the operation of the fully converted Clyde Terminal.

The following infrastructure upgrades would also need to be undertaken as part of construction works during the Project:

- Upgrades to tank instrumentation and tank control systems to enable remote and automated control;
- Repair and improvements to tank bunding where necessary;
- Installation of new inlet manifold systems and remote valves with segregated product distribution piping to respective tanks;
- Reducing the gas storage capacity of the Clyde Terminal from 10,851 m^3 to 1,550 m^3 to accommodate the continued receipt by road tanker and storage of Butane, to be blended with winter grades of Gasoline;
- Upgrading electrical supply, control and safeguarding systems;

- Increasing automation of terminal systems;
- Installing equipment to provide improved product quality segregation;
- Revised drainage and water treatment to suit reduced operation;
- Fixed fire system works, including:
    - Remote operation of form and fire water to tanks and compounds as required;
    - Installation of two new firewater tanks in the current carpark area, West of tankfarm E1, as part of the upgrading of current tanks;
    - Installation and relocation of fire water pumps;
    - Installation of a new town mains water supply from street mains as make up water to replace the current source of water located in the proposed demolition zone;
    - Installation of a new fire and gas system to receive signals from existing fire detection systems such as the tank rim seal fire detection, and to activate the existing fire protection systems such as firewater deluge and foam system and the alert systems onsite; and
    - Installation of rim seal fire detection on all necessary operational tanks based on assessed risks and regulatory requirements.
- Revised pumping and piping works including:
    - Installation of a new import manifold;
    - New distribution pipework to and from operational tanks, including the reuse of existing piping wherever possible;
    - Installation of new pumps and valves wherever existing equipment are identified as unsuitable for the required service;
    - Relocation of pipeline pigging facilities; and
    - Installation of pig launcher and new piping connection.
- Associated works to increase the efficiency and effectiveness of the Clyde Terminal and to facilitate safe and efficient operations, such as lighting, safety shutdown systems, control room facilities and amenity upgrades.

8.4.1 Heritage Impact

As the former Clyde Refinery infrastructure will be demolished as part of demolition works, there will be no further impacts to the heritage significance of the Project Area as a result of construction activities, unless there is to be subsurface impacts to the areas of archaeological potential identified in **Figure 5**.These areas have been identified as having technical significance for their ability to reveal, through archaeological investigation, further information regarding aspects of the operation of the site. Management measures are provided in **Section 9.5**.

8.5 Operation

The transition to a fully converted Clyde Terminal would occur incrementally throughout the entire Project. It is expected that the conversion works would be undertaken progressively and would be completed within five to 10 years after the grant of development consent.

As of late 2012, refining operations ceased at the Project Area, and no Crude Oil products have been refined at the site. Finished fuel products continue to be transported to Clyde Terminal via pipeline from the Gore Bay Terminal.

The operation of the fully converted Clyde Terminal would continue this process of transferring finished fuel products only from the Gore Bay Terminal, where they are imported by sea tankers. These finished products would continue to be received, stored and blended at the Clyde Terminal before they are distributed from the adjoining Parramatta Terminal via pipeline and truck, and also via direct pipeline that currently lies between the Clyde Refinery and Sydney Airport (Jet fuel).

Gasoline would be pumped through filters prior to loading at the Parramatta Terminal. The filters, currently adjacent to Tank 90 would be retained for the operation phase of the Project.

The control room for the operation phase would be located at the Old Movements Control Room building. The State Office Building would remain during the operation of the converted Clyde Terminal. The existing warehouse currently located at the Parramatta Terminal will be retained to support the operation of the converted Clyde Terminal. This will continue to provide for the storage of packed oils and greases, various small quantities of hazardous materials for general cleaning and mechanical items. Package sizes would be 200 litres or less.

8.5.1 Heritage Impact

The operation of the fully converted Clyde Terminal will have no heritage impact on the significance of the site as the heritage fabric will have been removed during demolition works. Recommendations regarding the on-going heritage management of the site are provided in **Section 9.6**.

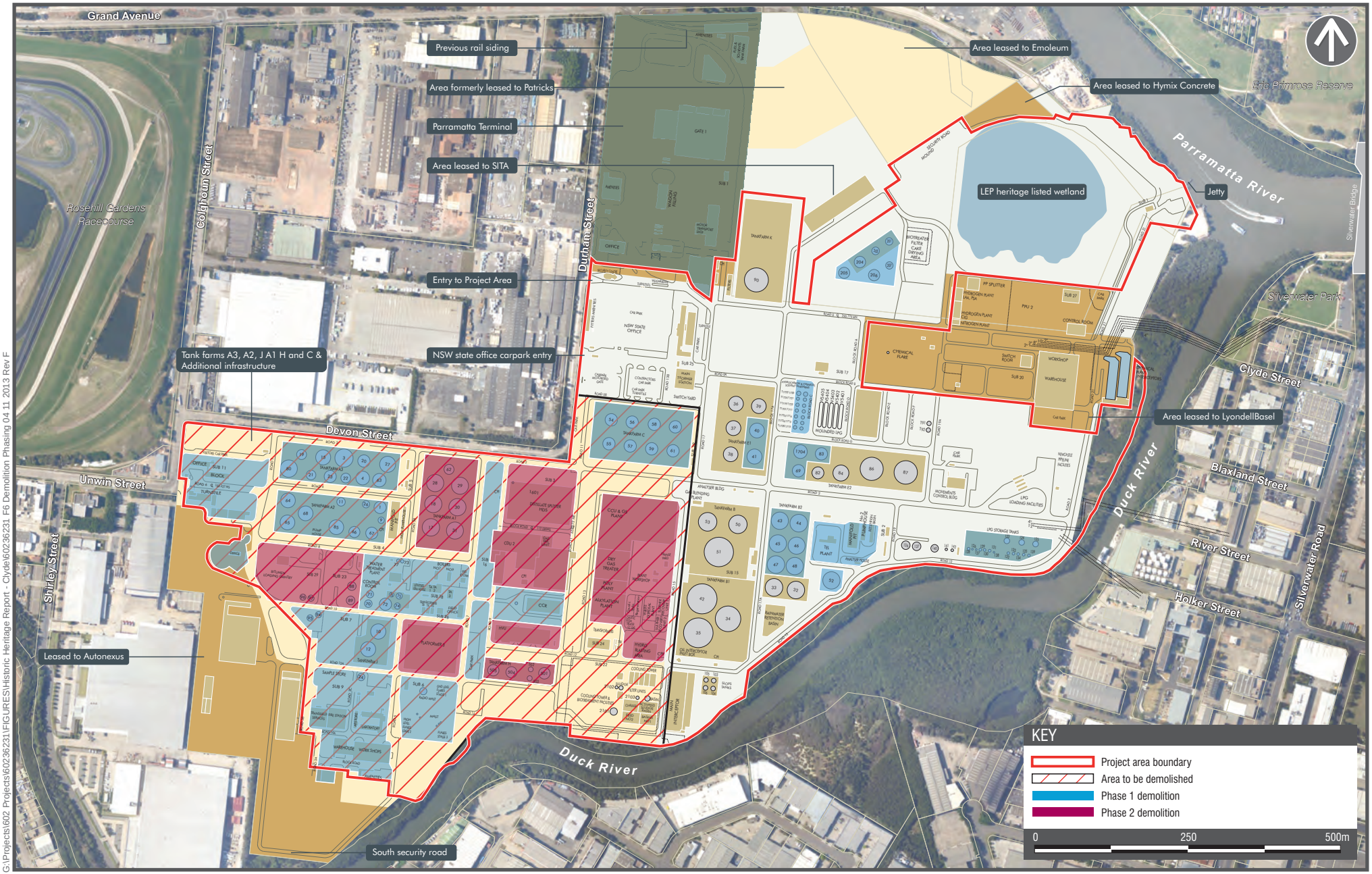
It is recommended that, should there be remaining archaeological potential in the two areas identified in **Figure 5**, a brief management document or section within the sites Operational Environmental Management Plan (OEMP) be prepared to guide the management of these areas.

8.6 Visual Impacts

The views to the Clyde Terminal were discussed in **Section 6.14**. In summary, obtaining views towards the Clyde Terminal is difficult due to the mangrove vegetation lining the banks of the Parramatta River and Duck Creek. The demolition of redundant refining infrastructure at the Clyde Terminal will result in the removal of the stacks from the skyline at selected vantage points, being mainly isolated to fleeting views from the M4 and along north-south road view corridors in Ermington.

8.6.1 Heritage Impact

Due to the limited nature of views to the Project Area, the heritage impact of the demolition will be minimal and can be mitigated through the management measures provided in **Section 9.7**.



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DEMOLITION PHASING

Clyde Terminal Conversion Project
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FIGURE 6

9.0 Management Recommendations

9.1 Introduction

The previous sections outlined the proposed works and assessed the impacts to the heritage significance of the Project Area and its archaeological potential. The following sections provide management and mitigation measures to alleviate the impact to the heritage and archaeological significance.

9.2 Pre-Project Impacts

The cessation of refining at the Clyde Terminal has negatively impacted the historical significance of the Refinery as one of the longest operating facilities in Australia. In order to alleviate this impact it has been recommended that oral histories are recorded from past and present staff regarding the operation of the Refinery. The deconstruction of process equipment for reuse or sale before demolition activities actually commence is also considered to have a negative heritage impact. It has been recommended that an archival photographic recording be undertaken of the former Clyde Refinery infrastructure. The archival recording should follow NSW Heritage Branch guidelines *How to prepare archival records of heritage items* (NSW Heritage Office, 1998) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006). The archival recordings can be staged to capture those elements being deconstructed prior to actual demolition works. It may be necessary to capture the broader context of the equipment at this stage prior to its removal.

9.3 Electrical Decommissioning

It is recommended that an archival photographic recording be undertaken if fabric is to be removed during this process. The archival recording should follow NSW Heritage Branch guidelines *How to prepare archival records of heritage items* (NSW Heritage Office, 1998) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006).

9.4 Demolition Works

The impact to the historical and technical significance of the former Clyde Refinery can be managed through a full photographic and documentary archival recording of the facility. The archival recording should follow NSW Heritage Branch guidelines *How to prepare archival records of heritage items* (NSW Heritage Office, 1998) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006). The documentary recording should contain a detailed timeline of each piece of equipment and each tankfarm, together with copies of plans and schematics. This information is available in Shell's records, but it is currently being prepared for off-site archival storage. It is recommended that collation of this information commence prior to the documentation being sent off-site.

An area of archaeological potential has been identified around the Bitumen Gantry (refer **Figure 5**). To mitigate the proposed subsurface impact, through the removal of foundations and other invasive works, it is recommended that an Archaeological Research Design and Methodology be prepared and implemented to manage the archaeological potential of the area.

Demolition within the Bitumen Gantry area will also require the removal and later remounting of a memorial to John Simpsom Fell, Horace Liddon Spencer and Albert Edward Ward, who were killed, along with two others, in 1927 when a still exploded. The memorial to John Simpsom Fell, Horace Liddon Spencer and Albert Edward Ward is to be relocated to a publicly accessible area (e.g. to the fenceline along the site boundary or to the visitor car park as feasible).Shell will investigate the feasibility of undertaking a memorial relocation ceremony involving family and descendants of the three men and use of the plaque as a teaching aid for the importance of workplace safety.

9.5 Construction Works

Should construction impact on the identified areas of archaeological potential (refer **Figure 5**), it is recommended that the Archaeological Research Design and Method recommended in **Section 9.4** include management and mitigation measures for the potential construction impacts as well.

9.6 Operation

It is recommended that, should there be remaining archaeological potential in the two areas identified in **Figure 5**, a brief management document or section within the site's Operational Environmental Management Plan (OEMP) be prepared to guide the management of these areas.

9.7 Visual Impacts

It is recommended that a photographic archival recording be undertaken prior to the demolition of the stacks. The recording should include areas within Ermington and on the M4, if it can be safely achieved. The archival recording should follow NSW Heritage Branch guidelines *How to prepare archival records of heritage items* (NSW Heritage Office, 1998) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006).

10.0 Statement of Heritage Impact

10.1 Introduction

The objective of a Statement of Heritage Impact (SOHI) is to evaluate and explain how the proposed development, rehabilitation or land use change will affect the heritage value of the site and/or place. A SOHI should also address how the heritage value of the site/place can be conserved or maintained, or preferably enhanced by the proposed works. This report has been prepared in accordance with the NSW Heritage Office & Department of Urban Affairs and Planning *NSW Heritage Manual* (1996) and NSW Heritage Office *Statements of Heritage Impact* (NSW Heritage Office, 2002). The guidelines pose a series of questions as prompts to aid in the consideration of impacts due to the Project. The questions of greatest relevance to the proposed works at the Terminal relate to demolition of a structure. Those questions provided in the guideline that are not of relevance have been omitted and appropriate substitutes developed:

- Have all options for retention and adaptive re-use been explored?
- Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?
- What measures have been put in place to mitigate the impact to the heritage significance of the Terminal?
- Has the advice of a heritage consultant been sought? Have the consultant's recommendations been implemented? If not, why not?

The above questions are explored below, before a Statement of Heritage Impact is provided in **Section 10.3**.

10.2 Heritage Impact Assessment

Have all options for retention and adaptive re-use been explored?

Refining operations at the former Clyde Refinery became increasingly unprofitable for a number of reasons, including: competition from foreign refineries and their relative economies when compared to the smaller and older Shell Clyde Refinery; continuing deregulation of the Australian petroleum market and the need for specific types of Crude Oil imports.

Foreign Competition

Oil and petroleum markets are typically regionally based, with linkages and flow-on impacts occurring within and between these regional markets (Australasian Institute of Petroleum, n.d.). Australian refineries operate in the Asia-Pacific regional market, which is a region dominated by the recent rise of large-scale 'mega-refineries' within Asia. Between 2000 and 2010, the majority of growth in refining capacity in the Asia-Pacific region grew by seven million barrels per day (BPD); an increase of 74 per cent of the total growth in the world's refining capacity. This regional fuel market is dominated by China, which accounts for approximately 51 per cent of the global growth in refining capacity (Australian Competition and Consumer Commission, 2011). Indian based company Reliance Industries also owns and operates Jamnagar, which is the world's largest refinery, further strengthening the forces tied to this Asia-Pacific fuel market. The production capacity of Jamnagar's Indian refinery alone is 1.24 million BPD – adequate to supply more than Australia's entire current annual fuel demand (Hydrocarbon Asia, 2012) of 0.94 BPD (Vivoda, 2012).

It is in this Asia-Pacific market that Australian refineries have been seeking to rationalise their competitive advantage. The efficiency and speed with which foreign refineries can produce large volumes of fuel at low cost is directly impacting on the ability of Australian refineries to compete, particularly given the relatively small scale of Australian refineries' production capacity, accounting for less than one per cent of refining capacity globally (Australasian Institute of Petroleum, n.d.; Hydrocarbon Asia, 2012). The total combined operational capacity of Australia's seven functioning refineries is 0.76 BPD (Energy Information Administration, 2011). Currently this volume is insufficient to meet the total current domestic demand.

In addition, Australian refineries are at a competitive disadvantage due to their age, with the most recent refinery constructed in Australia being over 40 years old (Hydrocarbon Asia, 2012). Shell's Sydney facilities have been in operation for over 80 years (Murray, 2001), and exist in a very different commercial environment from that which they were originally designed to accommodate. Originally intended to service a local, State-based market, the facilities are not conducive to accommodating external international competition (Australian Competition and Consumer Commission, 2011). In addition, large investments are required to upgrade refinery equipment to meet

evolving environmental standards in Australia, compared to newer and more efficiently designed refineries in Asia. As such, the refining activities of the former Clyde Refinery were no longer regionally competitive, and the Clyde Refinery would have required significant upgrades to continue competing as a domestic wholesaler of refined petroleum.

In addition, across the refinery sector in Australia, economic losses are being experienced. Results for the past three financial years were below the profitability levels of the five years prior to this (Australian Competition and Consumer Commission, 2011). The industry is also vulnerable to economic competition as the process of refining is considered a high-volume, low-margin activity. Compared to other manufacturing and production industries such as beverages, construction materials, chemicals, building and food products, refining has the lowest average rate of return on product sales, an additional factor leading to financial vulnerability in this domestic sector.

Deregulation of the Australian Market

From 1984 to 1998 the refining industry operated under a government-regulated pricing surveillance regime whereby wholesale prices were established and initially endorsed by the Prices Surveillance Authority and subsequently by the ACCC (Australian Competition and Consumer Commission, 2011). In 1998, this structure was discontinued in favour of a deregulated market (Roarty, 1999). Competition in the petroleum wholesaler and retailing markets was also encouraged by the introduction of the *Trade Practices (Industry Codes – Oilcode) Regulations 2006* on 1 March 2007, also known as the Oilcode. This regulation improves access for oil refinery importers (Minister for Resources and Energy, 2009). As a result, domestic prices for refined petroleum products are governed by international market movements, with retailers free to set their prices according to various economic conditions.

As a consequence of this market opening, Australia has become a structural importer, with exports of refined product comprising a minor percentage of the market. Australia now imports more than 30 per cent of its refined petroleum products, a figure which is expected to increase as imported refined petroleum becomes cheaper and more accessible through independent wholesale importers which in turn continue to increase in number and create greater competition in the petrol retailing market (Australian Competition and Consumer Commission, 2011).

Crude Oil Importation

Cost effective supply of Crude Oil is another issue leading to disadvantage in the Australian refining market. The majority of Crude Oils for supply to refineries are imported, at significant cost due to Australia's geographic location as well as global trends of rising Crude Oil prices.

Although Australia produces Crude Oil (approximately 22 000 million tonnes in 2010-11 (Australian Competition and Consumer Commission, 2011)) at oil fields in the North West Shelf in Western Australia and in the Bass Strait, Victoria, the majority of these products are exported at a premium price due to their light, sweet characteristic, with a sulphur content of less than 0.5 per cent (Energy Information Administration, 2011): Australian refineries, on the other hand, are better suited to heavier Crude Oils. Therefore, Australian imports equated to approximately 33 000 million tonnes of raw crude in 2010-11 (Australian Competition and Consumer Commission, 2011).

The combination of these factors is what led to the need for Shell to rationalise its former Clyde Refinery and associated Gore Bay Terminal, and alter these current operations in an increasingly globalised petroleum market.

In this context, the former Clyde Refinery was not able to operate profitably. Furthermore it is not practical to retain the former Clyde Refinery infrastructure that is no longer functioning: the on-going maintenance and associated costs and hazards are not warranted in consideration of the function and complex nature of the site. The former Clyde Refinery was specialised to the refining of Crude Oil and adaptive reuse of the refining infrastructure is not possible.

Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?

The market considerations provided above, combined with the expenditure necessary to meet current environmental and operational requirements, make it exceedingly unlikely that future circumstances will make its retention and conservation more feasible. Conservation is not considered warranted given the nature of the Project Area and the complexity of the on-going management issues that it would involve. The heritage benefit of conserving the site is overshadowed by the financial and practical problems associated with conservation.

What measures have been put in place to mitigate the impact to the heritage significance of the Terminal?

The mitigation measures have been outlined in **Section 9.0**. The majority of the impacts can be mitigated through a detailed photographic archival recording of the specified site elements prior to alteration.

Has the advice of a heritage consultant been sought? Have the consultant's recommendations been implemented? If not, why not?

This report provides the advice and recommendations of heritage consultant and archaeologist Dr Susan Lampard. Shell will implement the recommendations within this report when the Project Approval is granted.

10.3 Statement of Heritage Impact Assessment

From the detailed assessment against the Heritage Branch guidelines (NSW Heritage Office, 2002) a number of potential impacts have been assessed. These are graded to determine their impact against the significance of the site.

The impacts of the Project are summarised in **Table 5**.

Table 5 Summary of the Nature of the Direct Impacts

Impact Type	Impact
Negative impacts (substantially affects fabric or values of state significance).	The demolition of the former Clyde Refinery will have a negative impact on the historical, rarity and representative significance.
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance).	The demolition of the former Clyde Refinery will have a moderate negative impact on the assessed local aesthetic, social, technical and research significance of the site.
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values).	None
Negligible or no impacts (does not affect heritage values either negatively or positively).	None
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance).	Relocation of the memorial plaque to John Simpsom Fell, Horace Liddon Spencer and Albert Edward Ward provides an opportunity to enhance access to it by mounting it within a publicly accessible area. Further positive impacts could include a memorial relocation ceremony involving family and descendants of the three men and use of the plaque as a teaching aid for the importance of workplace safety.
Positive impacts (enhances access to, understanding or conservation of fabric or values of state significance).	None

11.0 Conclusion

AECOM was commissioned by Shell to undertake a historical heritage assessment for the Clyde Terminal Conversion (the Project). The purpose of this assessment is to form part of an EIS being prepared by AECOM to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the conversion of the Clyde Terminal for use solely as a finished fuels terminal.

This assessment has addressed the DGRs for the project, which are to complete:

A non-Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:

- *Include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items including the Shell Oil Refinery Wharf and the surrounding wetland areas on the banks of the Parramatta and Duck Rivers and their tributaries; and*
- *Outline any proposed management and mitigation measures.*

The Refinery was established by John Fell & Co. between 1918 and 1926. Shell purchased the site in 1928 and has operated it as a Crude Oil refinery until refining cessed on 5 October 2012. This report assessed the heritage significance of the site, using NSW Heritage Branch guidelines (NSW Heritage Office, 2001) and based on historical research and a site inspection. It was determined to be of State significance on historical, associative, rarity and representative grounds. It was also found to be locally significant, holding aesthetic, social, technical and research values. The following summary of the site's significance, a Statement of Significance, was developed:

The Clyde Terminal is of State historical, associative, rarity and representative significance. Historically, it demonstrates NSW's increasing use of and reliance on fossil fuels and the expansion of business in the State from import to production. It is associated with the Shell Company, one of the leading producers and retailers of fuel in NSW. The Terminal is representative of an oil refinery and is rare, being one of only two in NSW.

The Clyde Terminal is of local social, research and technical significance. It is likely to be of social significance to the local community – it has been an employer of locals for over 80 years and has been an active participant and supporter of community events throughout that time. The Terminal can also demonstrate technical developments in the process of refining Crude Oil. The plant dates from the 1960s onwards, while the Central Control Room was considered as world class on its completion in 1988. The site contains two areas of archaeological significance, which have the potential, at a local level, to provide information, through archaeological investigation, not available from other sources. One relates to three houses formerly located on the corner of Devon and Colqhoun Streets and anecdotally used as accommodation for the site managers. The second area may contain information relating to the layout and functions of the initial refinery established by John Fell & Co.

An assessment of the proposed works found that the demolition of the former Clyde Refinery infrastructure would have a negative impact on the significance of the site. Conservation, however, was determined not to be a viable option due to financial and practical reasons around the on-going management and maintenance of the site. It has been recommended that oral histories be recorded of past and present employees regarding the day to day operations of the Refinery in order to capture some of the historical significance of the site. A full photographic and documentary archival recording has also been recommended in order to capture the physical fabric of the site. In relation to the areas of archaeological potential, it has been recommended that an Archaeological Research Design and Methodology be developed and implemented to manage these archaeological values. Further, that should archaeological values remain at the completion of works, a management document or section be inserted in the Operational Environmental Management Plan (OEMP) to guide the management of these areas. As required by the DRGs, a Statement of Heritage Impact has been developed.

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AECOM
AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
T +61 2 8934 0000
F +61 2 8934 0001
www.aecom.com
ABN 20 093 846 925