9 Indigenous Heritage

9.1 Introduction

The purpose of this chapter is to provide a summary of the indigenous heritage impact assessment which was completed by the Australian Museum Business Services (AMBS). A full copy of the Heritage Impact Assessment Report is available in **Appendix C Heritage.** The non indigenous heritage impact assessment is also contained within this appendix. For ease of interpretation, a summary of this is provided separately in **Chapter 10 Non-Indigenous Heritage.**

The Heritage Assessment is required by the DGRs and is broadly consistent with the processes and principles set out in the Australia ICOMOS (International Council on Monuments and Sites) Burra Charter (*The Australia ICOMOS charter for the conservation of places of cultural significance*). The assessment of Aboriginal scientific significance has been undertaken in accordance with the *NPWS Aboriginal Heritage Guidelines (1997)*. The process associated with the preparation of the report complies with DECCW requirements for consultation with Aboriginal community representatives as per the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010).

9.2 Legislation and Planning Policy

Baseline principles for the conservation of heritage places and relics can be found in the Burra Charter, which recognizes that there are places worth keeping because they can enrich our lives on many levels. The significance of such places may be embodied in fabric (physical material), environmental setting, contents, use or its meaning to people, and should be assessed through methodical data collection. Since its adoption in 1979, The Burra Charter has become the standard of best practice in the conservation of heritage places in Australia.

9.2.1 Commonwealth Legislation

The EPBC Act provides that any action assessed as likely to have a significant effect on listed matters of national environmental significance (MNES) can be declared a *controlled action*, and may only proceed with the Minister of the Environment's approval.

9.2.2 State Legislation and Local Planning Policy

The *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that environmental impacts, including cultural heritage, are considered at a land-use planning and decision making level. Under this Act, Aboriginal heritage is protected in three different ways:

- Through planning instruments such as State Environmental Planning Policies (SEPP) and Local Environmental Plans (LEPs).
- Section 90 of the Act (Part 4, Division 5) lists impacts to the environmental resource, including cultural heritage, which must be considered before development approval is granted.
- All State government agencies acting as determining authorities on environmental issues must consider a range of community and cultural factors, including Aboriginal heritage, in their decision-making process.

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the protection of Aboriginal objects (sites, objects and cultural material) and Aboriginal places. Aboriginal sites are protected by the NPW Act, but if certain sites are deemed as having great significance, they can be further protected by a

heritage order, pursuant to the *Heritage Act 1977* issued by the Minister, on the advice of the Heritage Council.

This Project is governed by Part 3A of the EP&A Act. Consequently no permits are required under the NPW or Heritage Acts. All impacts and heritage management for a project approved under Part 3A would be undertaken through an approved Aboriginal Heritage Management Plan.

The *NSW Heritage Act 1977* establishes the Heritage Council of NSW to assess then approve or decline proposals involving modification to heritage items or places listed on the State Heritage Register.

The Project is being assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* no permits would be required under the Heritage Act. Nevertheless, works would be undertaken in a manner that avoids, protects and preserves heritage items where possible.

State Environmental Planning Policy (Kurnell Peninsula) 1989 (Kurnell SEPP) also includes provisions for protecting items and places of Aboriginal heritage. Schedule 3 of this SEPP includes a number of items which are close to Kurnell Refinery.

Similarly the *Botany Local Environment Plan (1995)* also provides protection for heritage within the LGA and lists a number of heritage conservation areas.

9.3 Assessment Methodology

9.3.1 Survey Methodology

For the purposes of this assessment, the study area is the area directly affected by the Project at the Kurnell Refinery and the Banksmeadow Terminal.

Desktop Study

In order to gauge the impact of the Project on the indigenous heritage of the area a desk based study of the indigenous sites listed on the Aboriginal Heritage Information Management System (AHIMS) was completed. The desktop study also involved reviewing numerous historical texts and reports in order to gain an understanding of the Aboriginal history of Kurnell and Banksmeadow. It also involved review the various heritage registers that exist at a Commonwealth, State and local level. The following sources were reviewed to compile a list of heritage features within close proximity to the study area.

- The National Heritage List;
- The Commonwealth Heritage List;
- The Register of National Estate;
- The NSW State Heritage Register;
- Sydney Water Corporation Heritage and Conservation Register (Section 170 Register);
- Roads and Traffic Authority Heritage and Conservation Register (Section 170 Register);
- Ports Authority Heritage and Conservation Register (Section 170 Register);
- Schedule 3 of the Kurnell SEPP; and
- Botany Local Environmental Plan 1995.

Field Survey

The field survey was completed 13 December 2010 by a suitable qualified heritage consultant. Both Kurnell and Banksmeadow were able to be surveyed. Photography is prohibited at the Banksmeadow Terminal but some photographic records were taken from the Kurnell site. The survey work was completed with a number of Aboriginal stakeholders.

9.3.2 Assessment Methodology

The criteria for assessing heritage value or significance are derived from the Burra Charter criteria of aesthetic, historic, scientific, social or spiritual value for assessing cultural significance for past, present and future generations. The assessment has also been based on the DECCW guidelines in the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (NPWS 1997b). Therefore an assessment of the scientific and cultural significance of the study area has been undertaken.

9.3.3 Consultation

Consultation was carried out with local indigenous stakeholders. This consultation included allowing indigenous stakeholders to inspect the study area for signs of potential heritage value. This was implemented through a site visit which allowed access onto the site in order to help confirm the local indigenous cultural baseline.

In accordance with DECCW guidelines, advertisements were placed in the St George & Sutherland Leader newspaper on 4 November 2010. Approaches were also made to ascertain which indigenous groups would be likely to have an interest in the land.

The following groups confirmed their interest to be consulted on the Project:

• Koomurri Management;

• La Perouse Botany Bay Corporation;

• Norma Simms, Woronora Plateau Gundungara Elders Council;

• Darug Aboriginal Cultural Heritage Assessments (who indicated that their area of interest in the Project only included the Banksmeadow Terminal study area); and

• Ken Forster (Dharawal Tribal Custodian).

Details of the draft heritage assessment methodology were forwarded to each of these stakeholders, and those who had requested a level of involvement were invited to participate in a site visit at both Kurnell and Banksmeadow. The following groups attended the site visit:

- La Perouse Botany Bay Corporation – Yvonne Simms;
- Woronora Plateau Gundungara Elders Council – Scott Franks; and
- Darug Aboriginal Cultural Heritage Assessments – Gordon Morton.

After the fieldwork was conducted, the Project and the survey findings were discussed with the representatives in the field and no objections were raised.

9.4 Existing Environment

Information regarding the geology, soils, hydrology, drainage and flora and fauna of the study area can be found in **Chapters 6 Soils, Geology and Topography**, **7 Groundwater and Surface Water** and **8 Ecology** of this EA.

Aboriginal occupation of the Sydney basin is likely to have spanned 40,000 to 20,000 years, with most archaeological sites dated between 5,000 to 3,000 years. Aboriginal activity was found to be distributed across the whole range of physiographic units and environmental zones.

9.4.1 Kurnell

Aboriginal activity at Kurnell is estimated to have occurred for the last 10,000 years. Numerous archaeological investigations have taken place on the Kurnell peninsula and several finds have been recorded. However, whilst some *in situ* archaeological deposits may be encountered, given the nature and level of disturbance in the study area, this is considered unlikely. Due to the heavy industrial use of the area prior of the works being proposed, there is already a very high level of disturbance of the natural land on the Kurnell Refinery study area.

A search of the AHIMS database noted a number of sites close to the Kurnell Refinery. However, the majority of these were located some distance from the Kurnell works themselves. The following sites were identified in this search:

- Shell Middens;
- Artefact Scatters and Isolated finds (open camp sites);
- Rock Engraving; and
- Rock shelters (with or without art).

This data was used to help guide the field survey. No Aboriginal heritage sites, objects, places or areas of archaeological potential were identified within the Kurnell study area. The refinery is a well established industrial area, and contains no undisturbed natural landforms. The area has been levelled, drained and built up and no original soil landscapes are visible within the refinery boundaries. Whilst some shell material was present on the surface of the right of way, the highly disturbed nature of the area caused by repeated maintenance excavations means that any cultural deposits are likely to be highly damaged and distributed across the landscape. The area is unlikely to retain any archaeological integrity or significant archaeological information.

9.4.2 Banksmeadow

Only a small number of archaeological investigations have taken place close to Banksmeadow Terminal. Although no archaeological sites have been found within the study area, some features (e.g. shell middens) have been found in close proximity. Nevertheless, given the heavy disturbance in the area, particularly as a result of the lime burning industries, development and land reclamation, it is considered unlikely that any in situ archaeological deposits would remain in the study area. Equally a search of the AHIMS database noted no sites within the immediate vicinity of the Banksmeadow works.

The field surveys of the Banksmeadow Terminal concluded that no Aboriginal heritage sites, objects, places or areas of archaeological potential were identified within the Banksmeadow study area. The site is a well established industrial area and contains no undisturbed natural landforms. The Banksmeadow study area is covered by concrete, asphalt or small maintained lawns. The site has been levelled and built up to allow construction of the terminal, and no natural soils are visible within the terminal boundaries.

9.5 Assessment of Impacts

9.5.1 Construction Impacts

No Aboriginal heritage sites, places or objects were identified within the Kurnell Refinery or Banksmeadow Terminal study areas. No areas of potential archaeological deposit were identified within the study areas. The proposed project impact areas do not contain Aboriginal heritage sites, and have no potential to contain subsurface archaeological deposits. Therefore the Kurnell and Banksmeadow study areas are of no scientific heritage significance.

Equally, the Aboriginal communities who were consulted throughout the Project have indicated that there are no specific cultural significances attached to either the Kurnell or Banksmeadow study areas.

No Aboriginal archaeological sites, objects or places, or areas of archaeological potential or Aboriginal sensitivity, were identified within the study area. The results of the archaeological survey of the study area conducted with representatives of the local Aboriginal community confirmed extensive disturbance from industrial development and associated ongoing maintenance of subsurface infrastructure, and it is therefore considered highly unlikely that evidence of previous occupation by Aboriginal people remains within the study area.

The proposed development would not impact on any Aboriginal heritage sites, objects or places, or areas of archaeological potential or Aboriginal sensitivity. No further Aboriginal heritage assessment is required for the current proposed KBL upgrade works.

9.5.2 Operational Impacts

Operation of the Project will not impact on any Aboriginal heritage sites, objects or places, or areas of archaeological potential or Aboriginal sensitivity. Indeed the operation of the Project will not result in any significant change to that of the existing operation in heritage terms. Therefore no operational heritage impacts are expected.

9.6 Statement of Commitments

The Project is not expected to cause any indigenous heritage impacts as no indigenous heritage sites were identified as part of this assessment. A mitigation measure is recommended in **Table 9-1** in the case that an indigenous heritage site is identified during construction.

Table 9-1 Statement of Commitments – Indigenous Heritage

Mitigation Measure	Design	Construction	Operation
Should any previously unidentified Aboriginal objects or sites be uncovered during the course of construction, work in that area would cease and DECCW would be informed to seek advice on how to best proceed. If burials are uncovered, the NSW police would be informed immediately. Should the remains be then identified as archaeological in context, DECCW would be informed to clarify how to best proceed.		✓	

10 Non - Indigenous Heritage

10.1 Introduction

The purpose of this chapter is to provide a summary of the non-indigenous heritage impact assessment which was completed by the Australian Museum Business Services (AMBS). A full copy of the Heritage Impact Assessment Report is available in **Appendix C Heritage.** The indigenous heritage impact assessment is also contained within this appendix. For ease of interpretation, a summary of this is provided separately in **Chapter 9 Indigenous Heritage.**

Although no mention of non indigenous heritage is made in the DGRs, it is important to consider the impact of the Project on the non indigenous heritage of the area especially due to the cultural and historical significance of the Kurnell as Captains Cook's landing place.

10.2 Legislation and Planning Policy

Non-Indigenous heritage is managed by a number of State and National Acts. The following section summarises the legislative requirements in relation to the Project.

10.2.1 Commonwealth Legislation

Environmental Protection and Biodiversity Conservation Act 1999

In 2004 a new National Heritage List (NHL) was established under this Act (EPBC Act), to protect places that have outstanding value to the nation. The Commonwealth Heritage List (CHL) had also been established to protect items and places owned or managed by Commonwealth agencies. In addition to these lists there is also the Register of National Estate (RNE) established under the *Australian Heritage Commission Act 1975*. No items listed on the CHL are in close proximity to the study area. The Kurnell Peninsula Headland (Listing No. 105812) is listed on the NHL and Captain Cook's Landing Place Historic Site (Listing No. 3335) is listed on the RNE.

10.2.2 State Legislation

NSW Heritage Act 1977

The Act establishes the Heritage Council of NSW to assess/approve/decline proposals involving modification to heritage items or places listed on the State Heritage Register (SHR)

The Project is being assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* no permits would be required under the Heritage Act. Nevertheless, works would be undertaken in a manner that avoids, protects and preserves heritage items where possible.

There are no items or places listed on the SHR in close proximity to the study area.

State Environmental Planning Policy (Kurnell Peninsula) 1989 (Kurnell SEPP) also includes provisions for protecting items and places of non-indigenous heritage. Schedule 3 of this SEPP includes a number of items which are close to Kurnell Refinery.

Similarly the Botany Local Environment Plan (1995) also provides protection for heritage within the LGA and lists a number of heritage conservation areas.

10.3 Assessment Methodology

The non-indigenous heritage assessment is broadly consistent with the processes and principles set out in the Australia ICOMOS (International Commission on Monuments and Sites) Burra Charter (The Australia ICOMOS charter for the conservation of places of cultural significance). The assessment has been prepared in accordance with heritage guidelines as identified in the *NSW Heritage Manual* published by the Heritage Office and Department of Urban Affairs and Planning (now the Heritage Branch, Department of Planning) and associated documents, including Assessing Heritage Significance.

10.3.1 Survey Methodology

Desktop Review

In order to understand the non-indigenous heritage context on and around the Kurnell Refinery and Banksmeadow Terminal both a desktop study and field survey were completed for the study area. For the purposes of this assessment, the study area is the area directly affected by the Project at the Kurnell Refinery and the Banksmeadow Terminal. However the assessment also examines the land directly adjacent to the study area in order to ascertain the importance of the non indigenous heritage in close proximity to the Project.

The desktop study involved reviewing numerous historical texts and reports in order to gain an understanding of the history or Kurnell and Banksmeadow. It also involved review the various heritage registers that exist at a Commonwealth, State and local level. The following sources were reviewed to compile a list of heritage features within close proximity to the heritage study area.

- The National Heritage List;
- The Commonwealth Heritage List;
- The Register of National Estate;
- The NSW State Heritage Register;
- Sydney Water Corporation Heritage and Conservation Register (Section 170 Register);
- Roads and Traffic Authority Heritage and Conservation Register (Section 170 Register);
- Ports Authority Heritage and Conservation Register (Section 170 Register);
- Schedule 3 of the Kurnell SEPP; and
- Botany Local Environmental Plan 1995.

Field Survey

The field survey was completed 13 December 2010 by a suitable qualified heritage consultant. Both Kurnell and Banksmeadow were able to be surveyed. Photography is prohibited at the Banksmeadow Terminal but some photographic records were taken from the Kurnell site. The field survey used the results of the desktop review to indentify key heritage features that required investigation.

10.3.2 Impact Assessment Methodology

The criteria for assessing heritage value or significance are derived from the Burra Charter criteria of aesthetic, historic, scientific, social or spiritual value for assessing cultural significance for past, present and future generations

10.4 Existing Environment

Information regarding the geology, soils, hydrology, drainage and flora and fauna of the study area can be found in **Chapters 6 Soils, Geology and Topography**, **7 Groundwater and Surface Water** and **8 Ecology** of this EA.

10.4.1 Kurnell

Following the initial visit of Captain Cook in 1770 and the subsequent visit of the First Fleet in 1788, the Kurnell peninsula was only formally settled by Europeans in 1815. The peninsula was used for farming, timber in the 1800's and for sand extraction in the early 1900's. Fishing was also an important source of income. Around these various industries a small community started to develop.

In the 1950's Caltex commenced building the oil refinery. The work to build the refinery involved draining swamps, clearing scrub and installing roads, water supplies and sewerage facilities. The wharf was constructed and dredging was required.

The history of the area has left a number of important heritage items across the Kurnell Peninsula. No items listed on the CHL are in close proximity to the study area. However the *Kurnell Peninsula Headland* (Listing No. 105812) is listed on the NHL and *Captain Cook's Landing Place Historic Site* (Listing No. 3335) is listed on the RNE. Although no significant sites were located within either Kurnell Refinery or Banksmeadow Terminal, a number of sites listed under Schedule 3 of Kurnell SEPP are located within the study area. These sites are listed in **Table 10-1** below.

Table 10-1 Items on Schedule 3 of Kurnell SEPP within the vicinity of the Kurnell study area

Item	Primary Address	Listing No.
Botany Bay National Park Kurnell Historic Site and Monuments	Kurnell Peninsula	L015 S
Boatshed	Prince Charles, Parade, Kurnell	B341
Silver Beach and roadway	Prince Charles, Parade, Kurnell	L012
Towra Point Nature Reserve and Quibray Bay	Towra Point	L010 R
Captain Cook Landing Site	Cape Solander Drive, Kurnell	A082
Banks Memorial	Cape Solander Drive, Kurnell	A084
Solander monument	Cape Solander Drive, Kurnell	A085
Forby Sutherland monument	Cape Solander Drive, Kurnell	A087
Landing Place Wharf abutment	Cape Solander Drive, Kurnell	A088
Alpha Farm site	Cape Solander Drive, Kurnell	A089
Captain Cook Watering Hole/Well	Cape Solander Drive, Kurnell	A090/A091
Flagpole	Cape Solander Drive, Kurnell	A092
Yena Track	Cape Solander Drive, Kurnell	A093
Muru Track	Cape Solander Drive, Kurnell	A094
Four wheel drive track	Captain Cook Drive, Kurnell	A028
Australian Oil Refinery	Sir Joseph Banks Drive, Kurnell	A038

The nearest of these to the Kurnell study area is the *Silver Beach and Roadway* within the Sutherland Shire LGA and identified in the Heritage Schedule of the Kurnell SEPP 1989.

10.4.2 Banksmeadow

The area around Banksmeadow Terminal has been used by various industries since the early 1800s. In the beginning, these industries were small in scale, however as time went on larger operation moved in bringing with them better infrastructure, such a railways. The early 1900s saw a rise in manufacturing industries and development of a power station at Bunnerong. In the 1950s Australian Oil Refineries (a subsidiary of Caltex) built the oil terminal on the present site at Banksmeadow. Further developments in the area have seen extensive land reclamation and the development of both Sydney Airport and Port Botany.

There are no items of non indigenous significance within the Banksmeadow Terminal. However, the heritage feature closest to the Banksmeadow works is the *Botany Marshalling Yards.* This site is listed in the Botany LGA and identified on the Heritage Schedule of the Botany LEP 1995.

However, no sites of non-indigenous importance were located within 500m of Banksmeadow Terminal (including the Botany Marshalling Yards).

10.5 Assessment of Impacts

10.5.1 Construction Impacts

Kurnell Refinery

The Kurnell Refinery was established in 1952 as the Australian Oil Refinery, which is identified as a heritage item on the SEPP for Kurnell Peninsula. Also, within the vicinity of the Kurnell Wharf are the nationally significant Kurnell Peninsula Headland, and associated Cook's Landing Place, as well as the locally listed Silver Beach and roadway. The scope of works associated with the Project and installation of the KBL comprise three discrete areas, which are considered below:

- The construction of a facility to house newly installed pumps and valves and associated infrastructure, which is consistent with the ongoing requirements of an operational oil refinery. The construction is wholly within the boundary of the refinery and as such there will not be an adverse impact on the identified historic and technical significance of the site.
- Excavation of the existing pipeline route within the existing right of way, laying the new KBL into this trench, and re-covering, will have a short term impact on the amenity of the local environment, which will be mitigated following construction works through backfilling and natural re-turfing of the pipeline route.
- The proposal to run an additional new pipeline along the Caltex Refinery Wharf has the potential to have an adverse impact on the national heritage values of the Kurnell Peninsula Headland and the historic and aesthetic values of Cook's Landing Place and, the local heritage significance of Silver Beach and roadway.

The EPBC Act protects items and places on the NHL from actions that will have, or are likely to have a significant impact on the national heritage values of the item or place. Where an action is deemed to be significant the matter must be referred to the Minister who will decide whether the action requires further assessment, and if necessary approval under the EPBC Act.

Adding a new pipeline to the extant Caltex pipelines along the Caltex Refinery Wharf will add visual weight to the wharf; however, this should not impede or disrupt the existing aesthetic values, views or amenity of the local environment. Views from the Peninsula to the wharf itself include the wider Botany Bay industrial landscape and, as such, the new pipeline will not have a significant impact on the national heritage values of the Kurnell Peninsula Headland. The construction of the KBL does not constitute an action requiring the advice or approval of the Minister.

There is likely to be a short term disruption to the amenity of the Silver Beach and roadway during construction; however, the local heritage significance of the beach and roadway will be maintained.

Therefore it can be concluded that there are no heritage constraints on the Kurnell works and that these works are unlikely to result in an adverse non-indigenous heritage impact provided that the right of way excavations are backfilled and returfed.

Banksmeadow Terminal

The Banksmeadow Terminal sits within a heavily industrialised landscape and contains no heritage items within its boundary. The Banksmeadow works are to be installed wholly within the terminal and will not be visible from beyond the site perimeter, other than transient views from Botany Road, which is elevated above the proposed works site. The pipeline to the Banksmeadow Terminal from the Kurnell Refinery is not being upgraded or altered in any way and as such, no other works are proposed for the site.

The Botany Marshalling Yards on Beauchamp Street is the only listed heritage item within the near vicinity of the Banksmeadow Terminal. However, its location beyond Botany Road is such that there will be no impact on its identified heritage significance. As the Project does not impact any land beyond a small part of the existing Banksmeadow Terminal, it is considered unlikely that it will impact the non-indigenous heritage located to the north of Botany Bay.

Therefore it can be concluded that there are no heritage constraints on the Banksmeadow works and that these works are unlikely to result in an adverse non-indigenous heritage impacts.

10.5.2 Operational Impacts

Operation of the Project will not impact on any non-indigenous heritage sites. Indeed the operation of the Project will not result in any significant change to that of the existing operation in heritage terms. Therefore no operational heritage impacts are expected.

10.6 Mitigation Measures

The Project is not expected to cause any indigenous heritage impacts. Any impact that would be caused by excavation of pipeline trench through the right of way would be mitigated by backfilling the pipeline trench with the existing soils (if not contaminated) and returfing the surface. This will return the site, as far as possible, to its pre-construction condition.

10.7 Statement of Commitments

Table 10-2 Statement of Commitments – Non-Indigenous Heritage

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Burying and returfing the new pipeline with existing soil, where possible, through the Kurnell Refinery right of way.		✓	

11 Traffic and Transportation

11.1 Introduction

This Chapter addresses the traffic related impacts associated with the construction and operation of the Project. The DGRs for the Project have asked for:

- *an assessment of the potential for disruption to traffic and increase in traffic movements during the construction and operation phase; and*
- *an assessment of the impacts on any road and proposed measures to mitigate these impacts.*

Therefore impacts on traffic volumes and road conditions are considered and assessed within this Chapter. Where appropriate a number of measures have been recommended to ensure that any impacts are avoided or mitigated.

11.2 Assessment Methodology

This traffic and transport assessment was conducted as a desktop analysis using internet-based aerial photography. Traffic count data for relevant locations along classified roads was obtained from the New South Wales (NSW) Roads and Traffic Authority (RTA) database. Traffic generation during the construction and operational phases of the Project was estimated based on construction vehicle volumes and operational activities provided by Caltex. These traffic generation estimates were applied to existing traffic volumes to determine the proportional increase arising as a result of the Project.

Sources used in this traffic and transport assessment include RTA Traffic Count Station Data (to determine baseline traffic volumes) and ABS Census Data (to determine projected population increases) and the AustRoads *Guide to Traffic Engineering Practice – Roadway Capacity* (to determine Level of Service and assess traffic impact).

11.3 Existing Environment

The Project is located on the northern and southern shores of Botany Bay and is surrounded by a large number of main arterial roads and local streets. The arterial roads that are located adjacent to the Project include General Holmes Drive, Botany Road, Foreshore Road and Captain Cook Drive. A location plan showing the surrounding road network can be found in **Figure 11-1**.

Figure 11-1 Location Plan

11.3.1 Kurnell

Captain Cook Drive

Captain Cook Drive is the only road accessing the Kurnell Peninsula on the southern shore of Botany Bay from the wider Sydney road network. It connects Taren Point Road to the west (and further to the Princes Highway via The Boulevard) with Prince Charles Parade to the east and the suburb of Kurnell. It has three lanes in each direction west of Gannons Road with a median strip separating each carriageway, reducing to two lanes in each direction and divided carriageways between Gannons Road and Woolooware Road, and further decreasing to an undivided carriageway with one lane in each direction east of Woolooware Road.

Other Roads

Other roads within the transport study area near Kurnell include:

- Prince Charles Parade, Kurnell (local residential street – undivided road with one lane in each direction);
- Cook Street, Kurnell (local residential street – undivided road with one lane in each direction); and
- Solander Street, Kurnell (industrial access road to Kurnell Refinery – undivided road with one lane in each direction).

11.3.2 Banksmeadow

General Holmes Drive

General Holmes Drive forms part of State Highway 1 and connects The Grand Parade at Brighton-Le Sands to the south, and Joyce Drive to the north at Mascot. It forms as part of the loop road around the perimeter of Sydney Airport and also has a direct interchange with the eastern terminus of the M5 East Freeway. General Holmes Drive serves as a key road to the major freeway network in Sydney's inner south.

West of Sydney Airport, General Holmes Drive has three lanes in each direction. This is expanded to four lanes between its interchanges with the M5 and Southern Cross Drive. It reduces to two lanes in each direction north of Southern Cross Drive.

Foreshore Road

Foreshore Road straddles the northern shore of Botany Bay between General Holmes Drive and Botany Road. It acts as an expressway link along the eastern boundary of Sydney Airport with its only intersections at its northern and southern terminus. It is a dual carriageway providing two lanes in each direction for the majority of its length separated by a wide median strip. It is a vital link given that it has direct access to the Port of Botany Bay and the wider Sydney freeway and arterial road network.

Botany Road

Botany Road intersects Henderson Road in Waterloo at its northern terminus and continues in the south to its terminus with Bunnerong Road in Port Botany. The southern half of Botany Road acts as the continuation of Foreshore Road along the northern shore of Port Botany while the northern half follows a similar alignment to Foreshore Road and veers north to follow Southern Cross Drive (State Highway 1). It is a dual carriageway with three lanes in each direction between Foreshore Road and Bunnerong Road. It reduces to an undivided road with two lanes in each direction north of Foreshore Road (with some provision of parallel on-street parking).

11.3.3 Existing Traffic Volumes

Table 11-1 provides an outline of the 2005 Average Annual Daily Traffic (AADT) volumes for the traffic count stations relevant to this traffic impact assessment as well as an estimate for 2011 (the assumed construction year). An annual growth rate of 1.3% per annum has been applied to the 2005 data and has been based upon the population increase of Inner Sydney (Statistical Region) between the 2006 and 2011 Census results.

Table 11-1 Existing 2005 AADT data and 2011 AADT Estimate for Existing Road Network

RTA Traffic Count Station	Road	Location	2005 AADT (two-way)	2011 Estimated AADT (two-way) *(1.3% pa growth)*
16.013	Botany Road	Beauchamp Road	39,342	42,513
16.088	Foreshore Road	General Holmes Drive	33,454	36,150
00.375	General Holmes Drive	Bestic Street	79,602	86,017
36.206	Captain Cook Drive	Gannons Road North	35,455	38,312

11.3.4 Level of Service

Level of Service is an index of the operational performance of traffic on a given traffic lane, carriageway, road or intersection, based on service measures such as speed, travel time, delay and degree of saturation during a given flow period. This is measured based upon traffic data such as turning movements counts (for intersections) or AADT volumes (for midblocks - i.e a location between two adjacent intersections).

The level of service for a particular location is defined at one of six threshold ranges (Level Of Service (LOS) A through to LOS F). LOS A implies that traffic is free-flowing and drivers are unaffected by surrounding vehicles, while LOS F implies a condition of 'forced flow' whereby the amount of traffic is above capacity and significant congestion and queuing occurs. The other LOS thresholds from B to E indicate a gradual decline in the operational performance of the particular location until it reaches LOS F.

For the purposes of this assessment, the existing Levels of Service provided in **Table 11-2** have been identified for the midblock AADT volumes outlined in **Table 11-1**.

Table 11-2 Existing Level of Service

Road	Level of Service Range [1] (veh / hr, two-way)						2011 Estimated Volume		2011 Level of Service
	A	*B*	*C*	*D*	*E*	*F*	*AADT (two-way)*	*Peak Hour (two-way)* [2]	
Botany Road [3]	-	<4,140	4,140 – 5,519	5,520 – 6,999	7,000 – 9,199	9,200+	42,512	4,252	C
General Holmes Drive [4]	-	<4,140	4,140 – 5,519	5,520 – 6,999	7,000 – 9,199	9,200+	86,016	8,602	E
Foreshore Road [5]	<2,160	2,160 – 3,259	3,260 – 4,239	4,240 – 5,219	5,220 – 6,519	6,520+	36,150	3,615	C
Captain Cook Drive [6]	-	<2,760	2,760 – 3,679	3,680 – 4,659	4,660 – 6,139	6,140+	38,312	3,832	D

Assumptions:

[1] Level of Service has been calculated based on AustRoads 'Guide to Traffic Engineering Practice – Roadway Capacity'.

[2] Peak Hour traffic volumes are assumed to be 10% of the total AADT, and the total volume during the AM and PM peak hour is equal

[3] Botany Road is assumed to have the following: 3 lanes in each direction; divided carriageways; lanes are 3.3m in width; obstructions are located more than 2m from the edgeline, a design speed of 80km/h given the posted speed limit of 70km/h; a heavy vehicle proportion of 10% of all traffic; level terrain; all drivers are commuters; and is considered a suburban environment.

[4] General Holmes Drive is assumed to have the following: 3 lanes in each direction; divided carriageways; lanes are 3.3m in width; obstructions are located more than 2m from the edgeline, a design speed of 80km/h given the posted speed limit of 60km/h; a heavy vehicle proportion of 10% of all traffic; level terrain; all drivers are commuters; and is considered a suburban environment.

[5] Foreshore Road is assumed to have the following: 2 lanes in each direction; divided carriageways; lanes are 3.3m in width; obstructions are located more than 2m from the edgeline; a design speed of 100km/h given the posted speed limit of 90km/h; a heavy vehicle proportion of 10% of all traffic; level terrain; all drivers are commuters; and is considered a suburban environment.

[6] Captain Cook Drive is assumed to have the following: 2 lanes in each direction; divided carriageways; lanes are 3.3m in width; obstructions are located more than 2m from the edgeline, a design speed of 80km/h given the posted speed limit of 70km/h; a heavy vehicle proportion of 10% of all traffic; level terrain; all drivers are commuters; and is considered a suburban environment.

11.4 Proposed Activities

11.4.1 Vehicle Routes

Kurnell Refinery

Captain Cook Drive is the primary route connecting the Kurnell Peninsula with the wider Sydney road network via:

- Taren Point Road – connecting to the northern regions of Inner Sydney;
- Port Hacking Road – connecting to the M1 and western Sydney region; and
- Kingsway – connecting to the southern regions of Sydney.

The main access to the Kurnell Refinery site is via Captain Cook Drive and Solander Street as indicated in **Figure 11-2**. This is the proposed route for all vehicle movements generated by the Project in accessing the Kurnell Refinery site. Given the nature of the Project, access to the existing pipeline between the refinery and the Kurnell Wharf will also be required. Access to the right of way and wharf are via Captain Cook Drive, Silver Beach Road and Prince Charles Parade. These roads are also shown on **Figure 11-2**.

Banksmeadow Terminal

The Banksmeadow works are taking place entirely within the limits of the existing terminal. Vehicular access to this site will be along Foreshore Road, as shown in **Figure 11-3.**

Figure 11-2 Proposed Vehicle Routes – Kurnell Peninsula

Figure 11-3 Proposed Vehicle Routes – Banksmeadow Terminal

Access to the wider Sydney road network is possible via General Holmes Drive (Princes Highway / Highway 1) and the nearby M5 to the west of Sydney Airport.

11.4.2 Traffic Generation

The traffic generated at the Kurnell Refinery and Banksmeadow Terminal sites will incorporate a mix of construction plant vehicles, delivery vehicles and construction personnel movements. A summary of the construction vehicle mix and the components that will be transported on the public road network includes:

- Construction Vehicles;
  - 10 trucks (20 daily return trips) will be required at the Kurnell Refinery during the construction phase – it should be noted that this is a 'worst-case' scenario and many days will have very few, if any, construction vehicle movements.
  - 8 trucks (16 daily return trips) will be required at the Banksmeadow Terminal during the construction phase – it should be noted that this is a 'worst-case' scenario and many days will have very few, if any, construction vehicle movements.
- Plant Delivery Vehicles; and
  - 10 trucks (20 return trips) will be required to deliver the construction plant materials to Kurnell Refinery.
  - 4 trucks (8 return trips) will be required to deliver the construction plant materials to Banksmeadow Terminal.
  - Construction plant vehicles to transport equipment such as bevelling machines; backhoes; bobcats; de-watering equipment; x-ray equipment; HPW equipment; site sheds; tip trucks; mobile cranes; diesel generators; welding equipment; handheld grinders; handheld shrink wrapping torch; diesel air compressors and jackhammers; and concrete pumping equipment.

- Construction Personnel.
  - 40 personnel (80 daily return trips) are required at the Kurnell site during the construction phase.
  - 30 personnel (60 daily return trips) are required at the Banksmeadow site during the construction phase.

For the purposes of this assessment, the largest construction vehicle and plant delivery vehicle will be a semi-trailer (i.e. heavy vehicle) of which its dimension and mass will not exceed the maximum unrestricted permissible size on NSW public roads (i.e. B-Double). All personnel are assumed to travel to and from the site using personal vehicles.

A summary of the likely traffic generation for the Kurnell Refinery and the Banksmeadow Terminal during construction is provided in **Table 11-3**.

Table 11-3 Traffic Generation

Description		Kurnell Site		Banksmeadow Site	
		Daily Movements (return trips)	***Peak Hour Trips[1]***	***Daily Movements (return trips)***	***Peak Hour Trips[1]***
Heavy Vehicles	Construction Vehicles	20	2	16	2
	Plant Delivery Vehicles	20	2	8	1
Cars, Utes etc.	Construction Personnel	80	40	60	30
TOTAL		***120***	***44***	***84***	***33***
Heavy Vehicle Proportion		33%	10%	29%	9%

1. Assumptions

- *All personnel will arrive to site during the AM Peak Hour and depart during the PM Peak Hour;*
- *Each personnel member will utilise their own private vehicle with no use of car-pooling or public transport;*
- *Heavy vehicle movements will be evenly distributed throughout the hours of operation (10 hour workdays); and*
- *All plant delivery vehicles are assumed to occur on the same day in order to produce a 'worst-case' scenario.*

11.4.3 Hours of Operation

A 10-hour working day (7:00am to 6:00pm, Monday to Saturday) has been assumed for the purposes of this traffic impact assessment. Work outside this time would only being required on an 'as needed' basis and would be only carried out following consultation with the required parties.

11.5 Assessment of Impacts

11.5.1 Construction Phase Impacts

The impact of the Project on the traffic in the area is determined by taking the base level traffic prediction (shown in **Table 11-2**) and adding the expected level of traffic generated by the Project (shown in **Table 11-3**). This assessment will determine whether the Project will produce a significant impact to the local road network.

Table 11-4 provides a summary of the impact assessment during the construction phase of the Project.

Table 11-4 Construction Impact Assessment Summary

Road	Pre-Construction		During Constriction Phase		
	2011 Existing Peak Hour Volume (two-way)	*2011 Level of Service*	*Peak Hour Trips Generated by Construction Activities*[1]	*Total Peak Hour Volume*	*Predicted Level of Service*
Botany Road	4,252	C	33	4,285	C
General Holmes Drive	8,602	E	77	8,679	E
Foreshore Road	3,615	C	33	3,648	C
Captain Cook Drive	3,832	D	44	3,876	D

1.For the purposes of developing a 'worst-case' scenario the vehicles generated by the Banksmeadow site activities will be applied to Botany Road, General Holmes Drive and Foreshore Road, and the vehicles generated by the Kurnell site activities will be applied to General Holmes Drive and Captain Cook Drive. As such, it is assumed that General Holmes Drive incorporates the vehicle movements generated by both sites.

As indicated in **Table 11-4**, the number of trips generated by construction activities is very minor (approximately 1%) when compared to the existing volumes on each of the roads. As such, the Level of Service on all routes remains unchanged during the construction phase. Therefore the traffic impact of the Project during construction will be negligible on the roads analysed and on the surrounding road network to both of the sites.

It should be noted however that the road network around the Kurnell Refinery and Banksmeadow Terminal sites already experience significant congestion issues during peak periods without the inclusion of the vehicles generated by the Project. This is illustrated, in particular, by the Level of Service for General Holmes Drive (LOS E) and Captain Cook Drive (LOS D). Consequently, construction vehicles utilising these roads during the AM or PM Peak Hour will experience significant traffic congestion with subsequent delays.

Minor impacts may be experienced on the local road network within Kurnell during times of deliveries to the pipeline easement and wharf area. The affected roads may include Prince Charles Parade, Cook Street and Solander Street. However deliveries to the pipeline easement and wharf area will only be infrequent and temporary in nature and it is expected that no significant impacts will arise from these vehicle activities.

11.5.2 Operational Phase Impacts

No additional employees will be required as a result of the Project at either the refinery or the terminal during operation. Equally no other additional traffic movements are envisaged. Therefore no operational traffic impacts are expected.

11.6 Mitigation Measures

The impact assessment illustrated in **Table 11-4** has identified that the Project will have no significant impact to the local road network. However, in order to mitigate and manage vehicle activities during the construction phase of the Project it is recommended that a Traffic Management Plan be developed. The Traffic Management Plan would include:

- hours of permitted vehicle activity (particularly in the residential streets of Kurnell);
- designated routes for construction traffic and defined access points to Kurnell Refinery and Banksmeadow Terminal;

- a community consultation plan to ensure residents in close proximity to the pipeline right of way (i.e. within Kurnell) are informed of upcoming construction activities and have a point of contact during construction activities;
- designated areas within the construction sites for truck turning movements, parking, loading and unloading;
- sequence for implementing traffic works and traffic management devices should these be required; and
- procedures and/or principles for construction vehicle speed limits and the safe operation of construction vehicles.

11.7 Statement of Commitments

The measures outlined above are summarised and outlined below in **Table 11-5**.

Table 11-5 Statement of Commitments – Traffic and Transport

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Vehicle movements would be limited to the designated routes to minimise impacts to road users caused by the Project.	✓		
All construction traffic will drive in a safe and responsible manner at all times to reduce the risk of accidents occurring.		✓	
Local Government councils and local residents will be contacted for concurrence to any work which will affect the road network.		✓	
A Traffic Management Plan will be developed for the construction phase. The Traffic Management Plan will comply with all relevant Regulations and By-Laws and in particular address safe access and egress to the public road network.	✓	✓	

12 Noise and Vibration

12.1 Introduction

This chapter assesses the potential noise and vibration impacts during the construction and operation of the Project. The DGRs ask for:

- a noise impact assessment, including an assessment of predicted noise impacts and road traffic noise during both construction and operation;
- consideration of vibration impacts from excavation works; and
- details of the proposed noise mitigation, monitoring and management measures.

The noise and vibration assessment work was completed by Renzo Tonin & Associates. Their reports can be found in full in **Appendix D Noise**. This chapter summarises that work and outlines measures to avoid and mitigate any impact.

12.2 Glossary of Technical Terms

A range of acoustic parameters and technical terms are used in this assessment. To assist in understanding the technical content, a brief description of the acoustic terms used within this chapter is provided below:

- dB (Decibel): A unit of sound level measurement that uses a logarithmic scale.
- "A" Frequency Weighting: The method of comparing an electrical signal with a noise measuring instrument to simulate the way the human ear responds to a range of acoustic frequencies. The symbol to show this parameter has been included in the measurement is "A" (e.g. L_{Aeq}).
- Background Noise: Background noise is the term used to describe the level of noise measured in the absence of the noise under investigation. It is measured statistically as the A-weighted noise level exceeded for ninety per cent of a sample period. This is represented as the L_{A90} noise level. The measurement sample time may be indicated in the form $L_{A90,t}$ where t is the measurement sample time i.e. $L_{A90,15\ min.}$
- Assessment Background Level (ABL): The background level representing each assessment period (day, evening and night) which is determined for each 24-hour period of monitoring.
- Rating Background Level (RBL): The overall background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30dB(A), then it is set to 30dB(A).
- L_{Aeq}: A weighted equivalent continuous noise level that is used as the constant level of noise that would have the same energy content as the varying noise signal being measured. The letter "A" denotes that the A-weighting has been included and "eq" indicates that an equivalent level has been calculated. This is referred to as the ambient noise level. The measurement sample time may be indicated in the form $L_{Aeq,t}$ where t is the measurement sample time i.e. $L_{Aeq,15\ min.}$
- Tonality: Noise containing a prominent frequency and characterised by a definite pitch.
- Ground Vibration: The level of vibration measured in mm/s.

- Peak Particle Velocity (PPV) – The instantaneous sum of the velocity vectors (measured in millimetres per second) of the ground movement caused by the passage of vibration from blasting.
- Linear Peak (LIN Peak) – the maximum level of air pressure fluctuation measured in decibels without frequency weighting (see 'A Frequency Weighting' above).
- Perception of Sound: Audible sound ranges from the threshold of hearing at 0dB to the threshold of pain at 130dB and over. A change of 1dB or 2dB in the level of a sound is difficult for most people to detect, whilst a 3dB to 5dB change corresponds to small but noticeable change in volume. An increase of about 8 – 10dB is required before the sound subjectively appears to be significantly louder.
- Sound Pressure (SPL): Sound pressure is the measure of the level or loudness of sound. Like sound power level, it is measured in logarithmic units. The symbol used for sound pressure level is SPL, and it is generally specified in dB. 0dB is taken as the threshold of human hearing.

Table 12-1 Sound Pressure Levels of Some Common Sources

Sound Pressure Level (dB)	Sound Source	Typical Subjective Description
120	Riveter; rock concert, close to speakers; ship's engine room	Intolerable
100 – 110	Grinding; sawing, Punch press and wood planers, at operator's position; pneumatic hammer or drilling (at 2 m)	Very noisy
70 – 80	Kerbside of busy highway; shouting; Loud radio or TV	Noisy
50 – 60	Office, department store, restaurant, conversational speech	Moderate
40 – 50	Private office; Quiet residential area	Quiet
30 – 40	Unoccupied theatre; quiet bedroom at night	
20 – 30	Unoccupied recording studio; Leaves rustling	Very quiet
0 – 10	Hearing threshold, excellent ears at frequency of maximum sensitivity	

12.3 Assessment Methodology

In order to understand the noise and vibration impacts of the Project, the assessment has:

- identified noise sensitive receptors in the area that could be affected by noise and vibration caused by the Project;
- estimated background noise levels;
- predicted noise and vibration emission levels from the proposed construction activities at selected receptor locations;
- assessed potential noise and vibration impacts from construction and operation of the works;
- assessed the likeliness of noise impact during operation of the Project; and
- recommended noise and vibration management strategies to minimise potential noise and vibration impacts.

12.3.1 Noise Assessment Criteria

Construction Noise

Potential noise impacts associated with the Project have been assessed in accordance with the following NSW Department of Environment, Climate Change and Water (DECCW) guidelines:

- NSW *Interim Construction Noise Guidelines* (ICNG, DECC, 2009) for the assessment of noise from construction activities;
- NSW *Environmental Criteria for Road Traffic Noise* (ECRTN, EPA, 1999) for the assessment of the off-site traffic noise on public roads; and
- NSW *Industrial Noise Policy* (INP, EPA, 1999) for the assessment of the operational noise of the Project.

The noise criteria set out in the ICNG (DECC, 2009) have been used to assess the potential construction noise impact on residential receptors. **Table 12-2** outlines the Interim Construction Noise Guidance (ICNG) guidelines for acceptable levels of noise at different times of day.

Table 12-2 Construction Noise Criteria Specified in the ICNG.

Time of Day	Noise Level $L_{Aeq, 15min}$	How to apply
Recommended standard hours: Monday to Friday: 7.00am to 6.00pm Saturday: 8.00am to 1.00pm No work on Sundays or public holidays	Noise affected Rating Background Level (RBL) + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq, 15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences). if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community.

According to the guidelines, construction noise during non working hours, when measured in $L_{Aeq,15min}$ should not exceed the background noise level (L_{A90}) by more than 5dB(A). This means that during these times any occasional or intermittent noise would be no more than 5dB(A) above the normal level of noise produced. Under normal work schedules, evening and night-time construction work is not proposed as part of the Project.

Operational Noise

Operational noise impacts were assessed against Condition L6 of the Environmental Protection Licence (EPL) (Licence No. 837) for the Kurnell Refinery. Based on the licence conditions and the assumption that the proposed pumps may operate at any time, the following criterion was used:

$L_{A10\ (15\ minute)} \leq$ 65dB(A)

In order to predict noise operational impacts, an Environmental Noise Model (ENM) computer programme was used. Noise levels were calculated to the nearest affected residential location considering the worst case scenario of all plant (existing refinery plant, one proposed jet fuel pump and control valve) operating simultaneously. In addition the noise from only one jet fuel pump and control valve operating was also calculated.

12.3.2 Vibration Assessment Criteria

Disturbance to Building Occupants During Construction

There is no Australian Standard for assessing the affect of vibration on people. However, the NSW vibration guideline uses British Standard British Standard 7385: Part 2 “Evaluation and measurement of vibration in buildings” as its basis.

Vibration sources are defined as C*ontinuous, Impulsive* or *Intermittent.* Section 2 of the technical guideline defines each type of vibration as follows:

- **Continuous** vibration continues uninterrupted for a defined period (usually throughout the day-time and/or night-time);
- **Impulsive** vibration is a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds; and
- **Intermittent** vibration can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude.

Preferred and maximum values for continuous and impulsive vibration are defined in **Table 12-3**. Only values applicable to residential, industrial (workshop) and commercial (office) receptors have been considered. The x, y and z axis referred to in **Table 12-3** are in reference to the axes of the human body. Vibration measured in the horizontal plane should be compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z-axis criteria if the concern is for people in a lateral position (e.g. asleep at night). Where the orientation of the occupant is unknown or could vary, then the most conservative approach should be adopted (DECCW, 2010). This approach was undertaken for the assessment.

Table 12-3 Acceptable Vibration Values for continuous and impulsive vibration 1 – 80 Hz (m/s^2)

Location	Assessment Period[1]	Preferred values[2]		Maximum values[2]	
		z axis	x and y axis	z axis	x and y axis
Continuous vibration					
Residences	Daytime	0.01	0.0071	0.02	0.014
	Night time	0.007	0.005	0.014	0.01
Offices	Day and Night	0.02	0.014	0.04	0.028
Workshops	Day and Night	0.04	0.029	0.08	0.058
Impulsive vibration					
Residences	Daytime	0.3	0.21	0.6	0.42
	Night time	0.1	0.071	0.2	0.14
Offices	Day and Night	0.64	0.46	1.28	0.92
Workshops	Day and Night	0.64	0.46	1.28	0.92
Notes:	1 Daytime is 7.00am to 10.00pm and night time is 10.00pm to 7.00am. 2 All figures are measured in Root Mean Squared (RMS).				

Intermittent vibration is assessed using vibration dose values (VDVs). Preferred and maximum VDVs for residential, industrial (workshop) and commercial (office) receptors are shown in **Table 12-4**.

Table 12-4 Acceptable VDVs for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night time[1]	
	Preferred values[2]	Maximum values[2]	Preferred values[2]	Maximum values[2]
Residences	0.2	0.4	0.13	0.26
Offices	0.4	0.8	0.4	0.8
Workshops	0.8	1.6	0.8	1.6
Notes:	1 Daytime is 7.00am to 10.00pm and night time is 10.00pm to 7.00am. 2 All figures are measured in Vibration Dose Values (VDVs) $m/s^{1.75}$.			

Damage to Buildings During Construction

Currently there is no Australian Standard for assessment of structural building damage caused by vibration. Therefore reference is made to both the relevant British Standard (BS 7385 Part 2 '*Evaluation and measurement of vibration in buildings*') and the German Standard (DIN 4150 – Part 3 – '*Structural vibration in buildings – Effects on structures*').

BS7385 provides levels at which 'cosmetic', 'minor' and 'major' categories of damage may occur. BS7385 recommends that the peak particle velocity is used to quantify vibration and specifies damage criteria for frequencies within the range 4Hz to 250Hz, which is the range usually encountered in buildings. At frequencies below 4Hz, a maximum displacement value is recommended.

The recommended limits (guide values) provided by BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and heavy commercial/industrial buildings are presented in **Table 12-5**.

Table 12-5 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse (mm/s)	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures; Industrial and heavy commercial buildings.	50mm/s at 4Hz and above	
Unreinforced or light framed structures; Residential or light commercial type buildings.	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

The figures shown in **Table 12-5** are the peak vibration limits set for minimal cosmetic damage. 'Minor' damage is considered possible at vibration magnitudes which are twice those given, and 'major' damage to a building or structure may occur at levels greater than four times the values shown. These values relate to transient vibration and to low rise buildings.

Similarly, the German Standard also recommends maximum levels of vibration that reduce the likelihood of building damage. These values are presented in **Table 12-6**.

Table 12-6 DIN 4150-3 Structural Damage Criteria

Type of structure	Vibration velocity mm/s			
	At foundation at frequency of			Plane of floor uppermost storey
	Less than 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that because of their particular sensitivity to vibration, do not correspond to those structures listed above and have an intrinsic value.	3	3 to 8	8 to 10	8

12.3.3 Road Traffic Noise Criteria

The L_{eq} noise level or the "equivalent continuous noise level" correlates best with the human perception of annoyance associated with traffic noise. The NSW Environmental Criteria for Road Traffic Noise (ECRTN) uses the $L_{Aeq(15hr)}$, $L_{Aeq(9hr)}$ and $L_{Aeq(1hr)}$ to assess traffic noise impact.

The ECRTN is used to assess the potential traffic noise impact from construction traffic travelling on public roads onto residential receivers only. Construction traffic in Kurnell is likely to travel along Captain Cook Drive, Cook Street and/or Prince Charles Parade. Residential receivers are located in Kurnell along the roads where construction traffic is likely to travel. Therefore this traffic would be assessed against the ECRTN accordingly.

The ECRTN, 'Road Traffic Noise Criteria for Proposed Road or Residential Land Use Developments', divides land use developments into different categories and lists the respective noise criteria for each

case. Captain Cook Drive is categorised as a 'collector' road, while Cook Street and Prince Charles Parade are classified as 'local' roads. **Table 12-7** summarises the applicable road traffic noise criteria at residential receivers for the day and night periods.

Table 12-7 Applicable Road Traffic Noise Criteria, dB(A)

Type of Development	Day (7am – 10pm)	Night (10pm – 7am)	Where criteria are already exceeded
Land use developments with potential to create additional traffic on collector road	$L_{Aeq(1hr)\ 60}$	$L_{Aeq(1hr)\ 55}$	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating time of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.
Land use developments with potential to create additional traffic on local roads	$L_{Aeq(1hr)\ 55}$	$L_{Aeq(1hr)\ 50}$	In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB

Given that construction activities are to only occur during the day time period, only the day period (7.00am to 10.00pm) will be assessed for traffic noise from herein.

12.3.4 The Study Area

Construction Noise and Vibration

For the Kurnell works the survey for the construction noise concentrated on the area around Road 7, located on the north western side of the Caltex refinery and along the pipeline right of way from Road 7 through to the refinery wharf. For the Banksmeadow works the nearest commercial receptor was considered. Specifically, this study investigated construction noise and vibration impacts along the noise and vibration study area. The receptors that had the potential to be worst affected are listed as follows:

- **Receiver R1 – 44-64 Cook Street (Industrial Premises)** - Industrial premises adjacent to the Caltex refinery to the west and sharing a common boundary. Potentially impacted by construction noise from within the refinery and along the pipeline easement;
- **Receiver R2 – 30D Cook Street (Residential)** - Residential property adjacent to the Caltex refinery to the west and sharing a common boundary. Potentially impacted by construction noise from within the refinery and along the pipeline easement;
- **Receiver R3 – 21 Cook Street (Residential)** - Residential property west of the refinery and potentially impacted by construction noise along the pipeline easement; and
- **Receiver R4 – 48 Prince Charles Parade (Residential)** - Residential property south of the refinery wharf and potentially impacted by construction noise along the pipeline easement.
- **Receiver R5 – EGL Eagle Global Logistics (Industrial / Commercial Premises)** - Industrial and commercial premises to the north of the Banksmeadow Terminal, across Botany Road. Potentially impacted by noise from construction activities on the northern side of Banksmeadow Terminal. For a conservative assessment, this receiver will be assessed as a commercial receiver.

Operational Noise

In order to measure the increase in operational noise of the Kurnell works, two receptors were identified for use in the analysis. These receptors are most likely to be affected by the proposed works:

- **Receiver R1 – 30D Cook Street, Kurnell** - Residential property located approx. 270m north of the proposed jet fuel pumps and control valve; and
- **Receiver R2 – Proposed New Caltex Office Buildings** - Proposed new office buildings located within the Caltex refinery site, where existing heli-pad is located and approx. 170m south west of the proposed jet fuel pumps and control valve**.**

12.4 Existing Environment

Background noise varies over the course of any 24 hour period, typically from a minimum at 3am to a maximum during morning and afternoon traffic peak hours.

Therefore, the NSW 'Industrial Noise Policy' (INP) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods. The INP defines these periods as follows:

- **Day** is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- **Evening** is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- **Night** is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

To determine background L_{90} noise levels for the noise assessment, previous long-term unattended noise monitoring results were used. This long term noise monitoring was carried out between 27th April and 4th May 2006 at 15 Cook Street, Kurnell (**Location M1**). The long term noise monitoring was undertaken in the rear yard of this property.

The noise environment at Location M1 is considered to be representative of residences potentially impacted by the proposed construction activities, including receivers R2 – R4. The results of the background noise measurements are shown in **Table 12-8**.

Table 12-8 Background (L_{90}) Noise Levels for Kurnell

Noise Monitoring Location	L_{A90} Background Noise Level, dB(A)		
	Day	Evening	Night
Location M1 – 15 Cook Street	41	43	39

Using the representative sound level taken from location **M1** and the ICNG criteria listed in **Table 12-2** it is possible to work out the maximum permissible sound level at any one of the receiver locations around the Project. **Table 12-9** below outlines the noise affected management level (standard hours), the highly noise affected management level and the noise affected management level (outside standard hours) for R1 – R5. The noise management levels presented within the ICNG for industrial and commercial premises are also presented in **Table 12-9**.

Table 12-9 Permissible sound level at R1 – 5

Receiver	Type of premises	Management Level, dB(A)		
		Noise Affected (Standard Hours)	Noise Affected (Outside Standard Hours)	Highly Noise Affected
R1	Industrial (workshop)	75dB(A)		
R2, R3, R4	Residential Properties	51dB(A)	Evening 48dB(A) or Night 44dB(A)	75dB(A)
R5	Commercial (office)	70dB(A)		

12.5 Assessment of Impacts

12.5.1 Construction Impacts

Noise Impacts

The level of noise that is expected to be created by the construction of the Project at each receiver location has been estimated below in **Table 12-10.** For each receptor the total noise for a 'worse case' scenario where all plant and equipment are operating concurrently at the closest point to the receiver location is also presented. Receivers R1 and R2 would be impacted by construction activities within the refinery and the pipeline right of way, Receivers R3 and R4 are only impacted by construction activities along the pipeline right of way, and R5 would only be impacted by activities at Banksmeadow Terminal. Typical construction equipment sound pressure levels are provided in **Appendix D Noise**. Due to the close proximity of the works and the nature of the topography it was assumed that there were no intervening structures between the noise source and receptor.

Table 12-10 Predicted L_{eq} Construction Noise Levels, dB(A)

Plant Item	Plant Description	Receiver Locations				
		R1	R2	R3	R4	R5
Equipment used at Caltex Refinery						
1	Jack Hammer	82	68	-	-	-
2	Mobile Crane	82	68	-	-	-
3	Bevelling Machine (pneumatic)	82	68	-	-	-
4	Hand Held Grinders	80	67	-	-	-
5	De-watering Equipment	79	66	-	-	-
6	Tip Truck	77	93	-	-	-
7	Welder	74	61	-	-	-
8	Backhoe	73	60	-	-	-
9	Bobcat	73	60	-	-	-
10	Power Generator	72	59	-	-	-
11	Compressor	67	53	-	-	-
Worse Case Scenario – All plant operating concurrently		**89**	**76**	**-**	**-**	**-**
Equipment used along Pipeline Right of Way						
12	Mobile Crane	78	71	77	82	-
13	Bevelling Machine (pneumatic)	78	71	77	82	-

Plant Item	Plant Description	Receiver Locations				
		R1	R2	R3	R4	R5
14	Hand Held Grinders	76	69	75	80	-
15	De-watering Equipment	75	68	74	79	-
16	Tip Truck	73	66	72	77	-
17	Welder	70	63	69	74	-
18	Backhoe	69	62	68	73	-
19	Bobcat	69	62	68	73	-
20	Power Generator	68	61	67	72	-
Worse Case Scenario – All plant operating concurrently		**84**	**77**	**83**	**88**	**-**
Equipment used at Banksmeadow Terminal						
21	Jack Hammer	-	-	-	-	63
22	Mobile Crane	-	-	-	-	63
23	Bevelling Machine (pneumatic)	-	-	-	-	63
24	Hand Held Grinders	-	-	-	-	62
25	Tip Truck	-	-	-	-	58
26	Concrete Pump	-	-	-	-	55
27	Welder	-	-	-	-	56
28	Backhoe	-	-	-	-	55
29	Bobcat	-	-	-	-	55
30	Power Generator	-	-	-	-	54
31	Compressor	-	-	-	-	48
Worse Case Scenario – All plant operating concurrently		**-**	**-**	**-**	**-**	**70**

Based on the construction noise levels predicted in **Table 12-10**, the construction noise criteria would generally be exceeded at the nearest sensitive receiver locations in Kurnell by most plant when operating near the receiver. However, construction noise from the Banksmeadow works will comply with the noise criteria for R5 (refer to **Table 12-9**). Therefore no construction noise impacts are likely to be caused by the Banksmeadow works on nearby receptors. .

At Kurnell, a reasonable and feasible approach towards noise management measures would be required to reduce noise levels as much as possible to manage the impact from construction noise. It should also be noted that noise levels could exceed those shown if two or more items of plant are operating concurrently in close proximity.

Vibration Impacts

The construction plant most likely to cause significant vibration impacts are:

- **Jackhammers**- vibration ranges from 1mm/s to 2mm/s at approximately 5m and <0.2mm/s at 20m.
- **Backhoe/Bulldozer**- vibration ranges from 1mm/s to 2mm/s at approximately 5m and <0.2mm/s at 20m.
- **Truck Traffic**- on normal road surfaces they generate low vibration levels of 0.01 – 0.02mm/s at 10m from the roadway. Road surface irregularities can cause levels to increase.

This information can be used to develop a number of safe working distances to avoid human discomfort for the construction plant listed above. **Table 12-11** shows the safe working distance for each item.

Table 12-11 Recommended safe working distances for vibration intensive plant

Plant Item	Safe Working Distance
Jackhammer[1]	5m
Backhoe / Bulldozer[2]	5m
Truck Movements[2]	10m
Notes: 1. TIDC Construction Noise Strategy (Rail Projects) November 2007. 2. Renzo Tonin & Associates project files, databases & library.	

Vibration levels are unlikely to exceed the criteria for human comfort at all the nearest receivers as all the receivers are at least 10m away which is equal to or more than the recommended minimum safe working distances for each plant item shown in **Table 12-11**. However, these are indicative distances only and more detailed site specific safe working distances should be determined once vibration emission levels are measured from each plant item prior to the commencement of their regular use on site.

Furthermore, since the above safe working distances were determined based on the requirements for human comfort, safe working distances to avoid structural damage would significantly be lower as the requirements for human comfort are more stringent than those for structural damage. Therefore no adverse impacts in relation to vibration are expected as a result of construction of the Project.

12.5.2 Construction Traffic Noise Impacts

Kurnell

Construction traffic movements are discussed in more detail in **Chapter 3 Project Description** and **Chapter 11 Traffic and Transportation**. Using the construction traffic estimates located in these chapters, the road traffic noise levels shown in **Table 12-12** have been predicted. These noise levels have been based on a maximum of two truck movements over a one hour period, and have been determined for the nearest residences along Captain Cook Drive, Cook Street and Prince Charles Parade.

Table 12-12 Predicted Traffic Noise Levels During Construction

Road	Distance of nearest dwelling to road	$L_{Aeq, 1hr}$ Criteria	Traffic noise level from construction traffic	Complies?
Captain Cook Drive	5m	60	56	Yes
Cook Street	9m	55	54	Yes
Prince Charles Parade	5m	55	55	Yes

The Maximum noise level expected from the anticipated construction traffic is 56 L_{AEQ1hr} . Therefore the noise that is likely to be produced by construction traffic during the day would be compliant with the NSW *Environmental Criteria for Road Traffic Noise* and, as such, no adverse impacts relating to construction traffic noise are expected.

Banksmeadow

The Banksmeadow works construction traffic will travel along Foreshore Road and briefly along Penrhyn Road before entering the site. There are no residential receivers along Foreshore Road, and the road is already subject to numerous vehicle movements, causing a loud traffic noise environment. Therefore no construction traffic noise impacts are expected as a result of the Banksmeadow works.

12.5.3 Operational Impacts

Kurnell

The ENM predicted the noise levels that were likely to be caused by the Project during operation. Noise levels were calculated for the nearest residential receiver considering the worst case scenario of all plant operating simultaneously, and the noise emission from only one jet fuel pump and control valve operating. **Table 12-13** presents the calculated noise levels at the two receiver locations.

Table 12-13 Results of Operational Noise Modelling

Receiver	Noise Level due to Existing Refinery	Noise Level due to Refinery with Additional Pump & Control Valve	Noise level due to One Jet Fuel Pump & Control Valve Only	Within Current Limits?
Receiver R1 – 30D Cook St	57	58	36	Yes
Receiver R2 – New office buildings	65	65	40	Yes

Table 12-13 shows that the Project and the other refinery plant operating together would not exceed the EPL noise limit of $L_{A10\ (15\ minute)}$ 65dB(A). Therefore it can be concluded that operation of the Project would not cause any significant increase in existing noise levels at the receiver locations and will comply with the noise limits of the DECCW licence.

Banksmeadow

The operational noise associated with the Banksmeadow works are expected to be significantly quieter than the construction works at Banksmeadow. Therefore, given the low level of noise likely to be produced by the Banksmeadow works during operation, as well as the numerous other noise sources (roads, aircraft, etc.) close to the site, it is considered that operational noise would not be an issue at nearby receivers given that construction noise levels complied with the relevant standards.

12.6 Mitigation Measures

Suitable mitigation measures would be undertaken throughout the construction of the Project. The level of expected noise during construction at the Kurnell site is higher than the existing background noise. It would be possible to reduce the noise from the construction plant through the use of acoustic screens, engine enclosures and silencing. A Construction Noise and Vibration Management Plan would be included in the CEMP for the Project to help avoid adverse noise and vibration impacts. **Table 12-14** outlines the relevant measures for the Project to help avoid or mitigate any adverse impacts.

12.7 Statement of Commitments

Table 12-14 Statement of Commitments - Noise

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
A CNVMP would be developed and included in the CEMP for the Project.	✓	✓	
Low-noise plant and equipment would be selected in order to minimise potential for noise and vibration, all equipment would be regularly checked to ensure that the mufflers and other noise reduction equipment is working correctly.		✓	
Alternatives to reversing alarms and horns, such as manually adjustable or ambient noise sensitive types (“smart” reversing alarms) and closed circuit TV systems would be considered.		✓	
Equipment would be located to take advantage of the noise screening provided by existing site features and structures, such as embankments, storage sheds and/or boundary fences.		✓	
Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register would be maintained.		✓	
Any noise complaint(s) would be investigated immediately and noise monitoring would be undertaken to ascertain the extent of any exceedance at the locations concerned. Reasonable and feasible measures would then be implemented to reduce noise impacts.		✓	
Construction works would be carried out between the hours of 7.00am to 6.00pm Monday to Saturday, except for: • The delivery of materials which is required outside these hours as requested by the RTA or other authorities for safety reasons; • Emergency work to avoid the loss of lives, property and/or prevent environmental harm; • Any works which do not cause emissions to be audible at any nearby residential property; • any other work as agreed through negotiations between Caltex and potentially affected noise receivers. • Work outside standard hours would require the formal written consent of Caltex.		✓	
Construction work outside standard hours requires a further noise reduction to meet the noise management level of 35 dB(A). Further reduction in noise levels can be achieved by programming quieter works during these hours: • by reducing number of truck movements and equipment used at the same time on site; and • not operating noisy equipment such as a bulldozer.		✓	
Construction stages would be scheduled to minimise the multiple use of the noisiest equipment or plant items near noise sensitive receptors.	✓	✓	
Plant items would be strategically positioned to reduce the noise emission to noise sensitive receptors, wherever possible.	✓	✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Awareness training of staff and contractors in environmental noise issues would be undertaken.		✓	
Any equipment not in use for extended periods during construction work would be switched off.		✓	✓
Heavy vehicle entry and exit from site would be restricted to the nominated construction hours, except where the RTA or other authorities require movements to be outside these hours.		✓	
Should any unexpected construction activities occur which could potentially generate significant noise not described in this report, monitoring would be undertaken to ensure equipment noise emission levels do not deteriorate.		✓	
Where noise level exceedances cannot be avoided, consideration would be given to applying time restrictions and/or providing quiet periods for nearby residents.		✓	

13 Air Quality

13.1 Introduction

This chapter provides an assessment of potential air quality impacts in line with the DGRs request to:

'include a comprehensive air quality assessment of both the construction and operational phases, focusing on dust, odour and vapour (including volatile compounds.'

This assessment has been both qualitative and quantitative depending on particular circumstances and has included modelling where required. Where necessary, measures to avoid or mitigate and adverse impacts or risks have been suggested.

13.2 Assessment Methodology

The assessment has adopted the following methodology:

- Consideration of Key Emissions Sources and associated Air Quality Issues; and
- Assessment of Identified Key Air Quality Issues.

These are detailed in the following sections.

13.3 Existing Environment

13.3.1 Kurnell

Given the coastal location and isolation from main roads, local air quality in the Kurnell is likely to be primarily influenced by emissions from existing operations within the refinery. These emissions primarily include combustion products (e.g. oxides of nitrogen, oxides of sulphur, carbon monoxide) and Volatile Organic Compounds (VOCs) arising from both fugitive process emissions, and combustion processes.

The key sensitive receptors to air quality in the area will be located in the village of Kurnell which is adjacent to the refinery. The right of way is primarily bordered by residential properties. It is approximately 570m long and links the Kurnell Refinery to the wharf loading facility. The width of the right of way varies between approximately 35m and 50m. The refinery itself is over 30m from the nearest residential receptor.

13.3.2 Banksmeadow

The Banksmeadow Terminal is located within an industrial area of Sydney, where emissions from a range of activities are likely to impact on local air quality to some extent. These include roadways and railways on major freight routes, port facilities, petrochemical facilities, and a range of other industries including Sydney Kingsford Smith Airport. As a result of these activities, and VOC emissions from Banksmeadow Terminal, the air quality in the vicinity of the Banksmeadow Terminal is likely to below that which is typical of the wider Sydney area. The terminal is over 500m from the closest residential receptor.

13.4 Assessment of Impacts

13.4.1 Construction

Key Air Quality Issues

Table 13-1 provides a summary of the works proposed, duration and proximity to residential receptors. This table summarises the relevant information for assessing air quality impacts.

Table 13-1 Consideration of Key Air Quality Issues

Parameter	Kurnell Refinery	Kurnell Right of Way	Kurnell Wharf	Banksmeadow Terminal
Works proposed	• Delivery of Materials; • Concreting, welding, cutting and grinding etc; • Jack hammering; • Excavation, Stockpiling, delivery/removal and backfilling of soil.	• Delivery of Materials; • Welding, cutting and grinding etc; • Excavation, Stockpiling, delivery/removal and backfilling of soil.	• Delivery of Materials; • Installation of new pipeline; • Welding, cutting and grinding etc;	• Delivery of Materials; • Concreting, welding; cutting and grinding etc; • Jack hammering.
Pollutants of interest	Particulate matter and VOC emissions associated with earthworks.	Particulate matter and VOC emissions associated with earthworks.	Particulate matter	Particulate matter
Emissions potential	Moderate	Moderate	Low	Low
Duration of works	Approximately 10 months (Kurnell total). Intrusive works are planned to take place over a 3 month period.			Approximately 9 months
Distance from site works to residential receptors	Greater than 30m (approximately 5 residences at less than 150m)	Adjacent to works (approximately 15 residences at less than 30m)	Greater than 30m	Greater than 500m
Potential for adverse air quality impacts	Low	Moderate	Low	Low

From the consideration of proposed works and proximity to residential receptors it is considered that the following issues represent key emissions in terms of potential air quality impacts:

- Particulate matter emissions from earthworks; and
- VOC and odour emissions from earthworks (i.e. the excavation of potentially contaminated soil).

These key emissions may occur from works both within the Kurnell Refinery and the Kurnell right of way. Given the relative receptor proximities, subsequent assessment has been focused on the right of way.

Due to the distance between Banksmeadow Terminal and the nearest residential receptor, no air quality impacts are expected as a result of the Banksmeadow works.

13.4.2 Particulate Matter Emissions from Earthworks

The construction phase of the Project involves digging a trench to contain the new pipeline, as well as other activities that would result in earthworks. This section of the report outlines the methodology of assessing the potential air quality impacts associated with particulate matter emissions from these earthworks. A generic emission inventory has been prepared using an estimation of potential material handling procedures. This approach is considered appropriate for assessing the scale of potential air quality impacts associated with particulate matter emissions from the Project.

Particulate Matter Background

Particulate matter (dust) is generally divided into two broad fractions: deposited and suspended. Deposited particulate matter is dust that, because of its aerodynamic diameter and density, rapidly falls from the air. In general terms, deposited particulate has a diameter of greater than about 20 microns (µm). However there is no distinct dividing line between these particles and the smaller particles of suspended matter that fall more slowly out of the air. The effects of deposited particulate are primarily considered a nuisance and are unlikely to represent a health risk as the size of the particles generally makes them too large to enter the body.

Suspended particulate matter is dust or aerosol that stays suspended in the atmosphere for significant periods. The current nomenclature is to describe fractions of suspended particulate as:

- PM_{10}: all particulate effectively less than 10 µm in diameter; and
- TSP: Total Suspended Particulate, generally less than 50µm in diameter.

Assessment Criterion

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005) contain criteria to assess the impact of air pollutants on public health and amenity values. Due to the brief (three month) period over which intrusive works are proposed, and the short time within this period in which activities will occur in any one place, the assessment has been limited to short term PM_{10} impacts and has not considered annual averaged criteria. The applicable impact assessment criterion is shown in **Table 13-2**.

Table 13-2 Particulate Matter Assessment Criterion (DEC, 2005)

Pollutant	Impact Assessment Criterion (µg/m^3)	Averaging Time
PM_{10}	50	24 hours

It should also be noted short term criterion listed in the *Approved Methods* applies to predicted cumulative impacts, which include a background concentration. Background concentrations have not been incorporated into this assessment due to the limited ability of the *Approved Methods* to accommodate the assessment of the proposed activities. Rather, the criterion has been included for the purpose of allowing the qualitative comparison of the potential incremental impact, relative to the cumulative goal. This approach is considered appropriate in the context of the resolution of the modelling predictions.

Particulate Matter Emissions

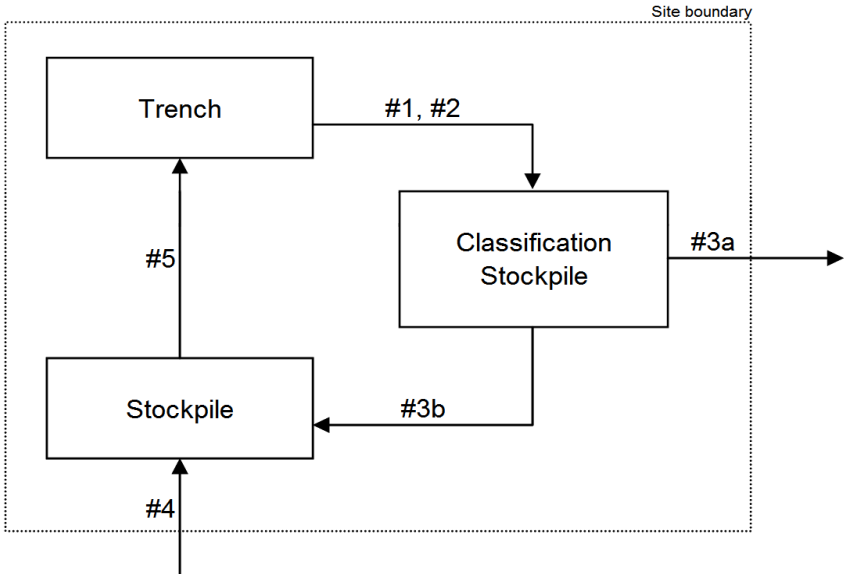
A generic emission inventory has been prepared using an estimation of potential material handling procedures, as well as material volumes which have been derived from pipeline trench dimensions and an estimation of Virgin Excavated Natural Material (VENM) requirements for backfilling the trench. This approach is considered appropriate for assessing the scale of potential air quality impacts associated with particulate matter emissions occurring within the right of way. **Table 13-3** provides a summary of assumed material handling procedures.

Table 13-3 Estimated Material Handling Procedures

Activity	Description
#1	Excavation of material from trench using bucket excavator.
#2	Transfer of excavated material to classification stockpile.
#3a	Transfer of classified material to waste truck.
#3b	Transfer of classified material to stockpile.
#4	Delivery of VENM to Site.
#5	Emplacement/backfilling of VENM/excavated material.

Figure 13-1 shows a schematic of the material flow of material associated with these procedures.

Figure 13-1 Flowchart of Estimated Material Handling Procedure



Based on the procedures identified above, a generic dust emission inventory has been prepared. Emissions have been calculated using the default emission factors provided in the National Pollution Inventory *Emission Estimation Technique Manual for Mining* (NPI, 2001). Emissions have been limited to material handling operations, which include excavation, stockpile transfer, waste loading and dumping of VENM at the Site.

The inventory has excluded the following emissions:

- ***Vehicle movements on the Site*** – It is expected that around 20 additional daily truck movements will be associated with the construction works at Kurnell. Due to the limited number of vehicle movements, and low vehicle speeds, these emissions are considered negligible.
- ***Wind Erosion from stockpiles*** – the volume of erodible material in the stock piles is considered to be negligible. This is due to the rate at which material is stockpiled and the high moisture content of the excavated material. Moist material has a tendency to form a crust as it dries, thereby preventing further wind erosion. The fact that stockpiles are not active, continuously disturbed or replenished also helps to reduce the impact of wind erosion.

As discussed in **Chapter 7 Groundwater and Surface Water**, groundwater at the Site is present at between 1m and 2m below ground level. Given that the excavations will to extend to 1.5m below ground level, the excavated material is likely to be either moist or saturated. Based on guidance from the *National Pollution Inventory Emission Estimation Technique Manual for Mining,* the moisture content and the default emission factor of the soil are known to be related (NPI 2001). Based on this guidance and given that the soils will be moist to saturated, the predicted emissions from soil movements are likely to be negligible.

The soil moisture content of saturated sandy soil is in excess of 20% (Tschapek,1981) from which in practice, emissions would be negligible. Hence, the inclusion of dust emissions from material close to or below the water table is considered conservative.

The inventory has been based on a trench length of 530m, and a width and depth of 1.5m. This equates to a total volume of 1,200m^3, which assuming a density of 1.4t/m^3, equates to a total weight of 1,680t. The inventory has assumed that 25% of material requires disposal off site. Estimated backfilling volumes have not accounted for the volume displaced by pipeline or the swell factor of excavated material, which is conservative for the purposes of this assessment. Intrusive works will take place over a period of approximately 13 weeks, which equates to an excavation rate of approximately 10m per day. The daily average emissions have been calculated from 13 weeks of 6 working days proportioned by the respective length of excavation through the right of way (530m) as a proportion of the total length of excavation at Kurnell (730m). **Table 13-4** provides an estimation of PM_{10} emissions from within the right of way.

Table 13-4 Dust Emission Inventory

Activity	Equipment Type	Emission Factor (kg/t)	Volume Handled (m3)	(t)	Particulate Emissions (kg PM10)
#1	Excavator	0.0033	1200	1680	5.6
#2	Bobcat	0.0033	1200	1680	5.6
#3a, #3b	Bobcat	0.0033	1200	1680	5.6
#4	Haul truck	0.0043	300	420	1.8
#5	Bobcat	0.0033	1200	1680	5.6
TOTAL					**24.2**
Daily emissions (based on 57 working days)					0.43

Particulate Matter Dispersion Modelling

Dispersion of emissions has been assessed using the Ausplume dispersion model. This model is approved by DECCW for use in most simple, near-field applications where coastal and terrain effects are unimportant. This model is considered capable of representing the key dispersion mechanisms in a manner appropriate to this assessment.

Emissions have been represented in Ausplume as a series of 11 volume sources, arranged in a line spanning 60m. This is representative of the allocation of emissions to line of 60m in the alignment of the trench. The daily emissions have been spread equally across the 11 volume sources, and assigned to eight hours under which construction is expected to take place. Emissions were assumed to take place for each day of the meteorological dataset, in order to estimate potential impacts over 12 months of meteorological conditions.

Emissions have been represented in the model as an average. Given that works are planned to progress simultaneously in several work sections, fluctuations in emissions intensity are expected to be small, and averaged emission rates are considered representative of emissions from the Site. Furthermore, for the calculation of near field impacts, the compression of emissions onto a short section of the right of way is considered to represent a worst case scenario. **Table 13-5** provides a summary of emission parameters that were used in the dispersion modelling.

Table 13-5 Emission Parameters Used in Dispersion Modelling

Emission Parameter	Value	Units
Number of volume sources	11	-
Source separation (along right of way)	6	m
Source height	1	m
Horizontal spread	2	m
Vertical spread	1	m
Emission rate	53	g PM_{10}/hr
Emission rate (per source)	4.84	g PM_{10}/hr
Hours of emissions	8-11 and 13-16	hour of day (1-24, inclusive)

Due to the need to predict dust concentrations for a 24 hour averaging period, screening meteorological datasets that feature hourly meteorological cases for a single wind direction are not suitable. Hence the Ausplume model was run using a New South Wales Environment Protection Authority (NSW EPA) prepared Ausplume file for Botany, *BOTANY.AUS*. This dataset is for the year 1995, and was used in the air quality assessment contained in URS (2001). In order to produce results on a cartesian grid which is aligned with the right of way, the wind directions within the meteorological dataset have been increased by 30 degrees (the approximate alignment of the right of way from true north).

Figures 13-2 and **13-3** provide wind roses showing distributions of winds for all hours and daytime hours (the period of proposed operation) respectively. It is noted that these wind roses are based on true north, and not the modified (right of way-aligned) dataset.

Figure 13-2 Wind Rose for BOTANY.AUS (1995 - all hours)

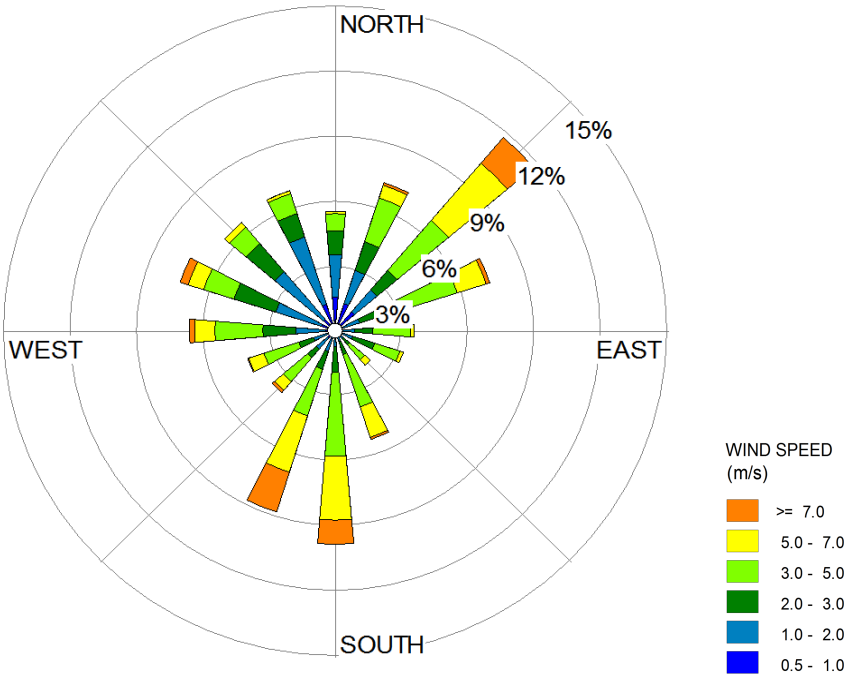
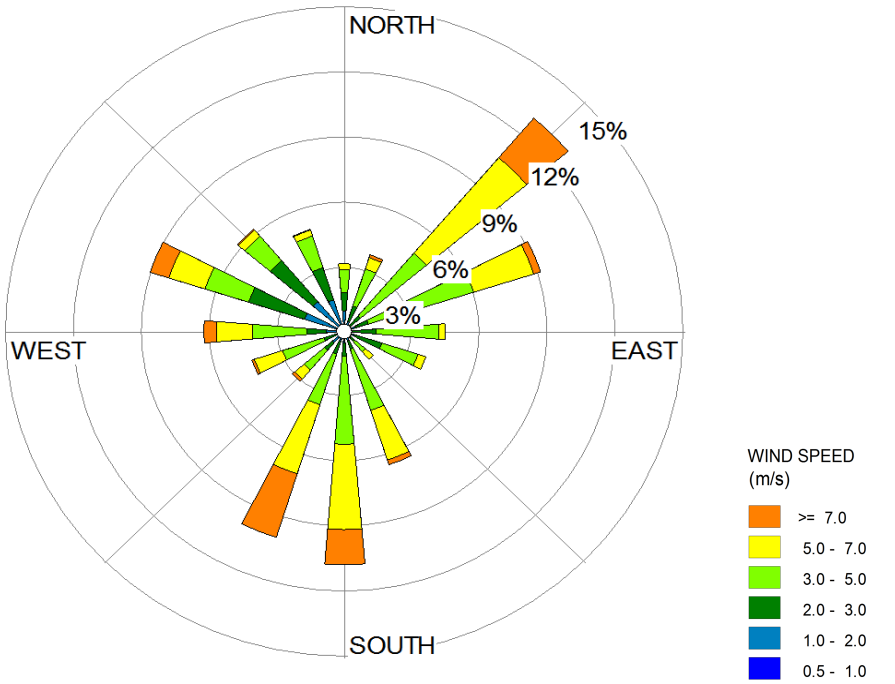


Figure 13-3 Wind Rose for BOTANY.AUS (1995 - construction hours: 7am - 5pm)



As can be seen in **Figures 13-2** and **13-3**, daytime winds are primarily from the north east, south, and west north west, and are stronger than those which occur overnight.

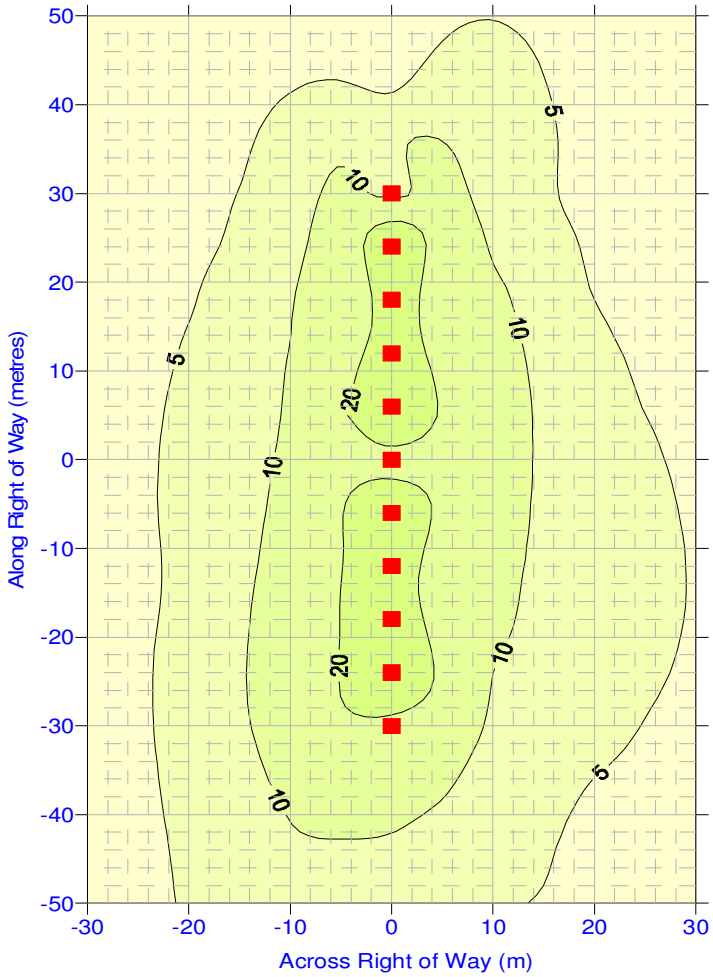
Ausplume was run using the following settings:

- The modelling domain was configured on a grid 100m long and 60m wide at 5m resolution;
- Due to the small scale of the modelling domain and lack of terrain features, terrain effects were ignored;
- Deposition and particle settling effects were ignored (i.e. emissions were treated as a tracer gas);
- Pasquill Gifford dispersion coefficients were used for both horizontal and vertical dispersion;
- Irwin Urban wind profile exponents were used;
- The 'Adjust PG curves for roughness' option was selected; and
- A roughness height of 0.4m was used.

Particulate Matter Dispersion Modelling Results

Figure 13-4 shows the results of the dispersion modelling. For the line source arrangement modelled, a peak incremental PM_{10} impact in the order of 10µg/m³ was predicted at a distance of between 10m and 15m.

Figure 13-4 Dispersion Modelling Contour Isopleth – 100th Percentile 24 hour PM_{10} Impact (µg/m³)



This statistic represents the peak predicted impact from a year of meteorological cases. The Project timeline implies that excavations will progress at an average rate of approximately 10m per day, hence the use of a peak statistic is considered conservative. It is noted that there are several significant limitations that restrict the ability of dispersion modelling to reliably predict peak 24 hour averaged dust impacts. The key limitations include:

- Limitations in the ability of dispersion models to provide accurate predictions close to emission sources; and
- Uncertainty and variability in dust emission factors.

Acknowledging these limitations, it is considered that the predicted peak dust concentrations are of a scale which implies that dust emissions can be managed through appropriate mitigation and management measures. Further discussion of these measures is provided in **Section 13-6**. This approach above is consistent with that which is typically adopted for works of the nature proposed, for which a quantitative assessment is not typically performed.

13.4.3 VOC and Odour Emissions

The right of way has been used for industrial purposes for over 50 years, and it is expected that contaminated soil and groundwater will be encountered during excavations.

Chapter 6 Soils, Geology and Topography notes that recent studies have shown that contamination has been reported within certain areas, with other areas showing contaminant concentrations below the limits of detection. This contamination has the potential to result in air emissions of VOCs, which given the nature of operations at Kurnell, would typically include odorous petroleum hydrocarbons such as BTEX (Benzene, Toluene, Ethylbenzene, Xylenes) and PAHs (Polycyclic Aromatic Hydrocarbons).

Given the spatial limitations of the available contamination information, the uncertainty in levels of contamination present, and the technical limitations in representing emissions, a quantitative assessment of VOC potential emissions has not been undertaken. Caltex propose to manage these emissions through the mitigation and monitoring practices which will be detailed in the Air Quality Management Plan (AQMP) for the Project. These practices would include the following:

- Staged installation of the pipeline, which will limit the amount of open excavations at any one point;
- Staged excavation of the trench with inspection of the excavation for odour and contamination;
- Control of excavation rates in order to manage the presence of contamination; and
- Monitoring of air quality at the work zone using Photo-Ionization Detector (PID) or similar real time VOC analysis instruments.

A further description of management and mitigation procedures is provided in **Section 13.6**.

13.5 Assessment of Operational Impacts

The operational phase of the Project is unlikely to result in any additional air quality impacts, over and above those already present as a result of the refinery operations. For this reason no further investigation has been carried out into the operational impact of the Project.

13.6 Mitigation Measures

As discussed above, the assessment of activities associated with the construction phase of the Project has indicated that there would be only minor impacts on air quality. For this reason, providing the following management, mitigation and monitoring controls (refer to **Tables 13.6** and **13.7**) are implemented there will be no anticipated permanent residual effects.

Specifically, the EPA Licence (L836) requires that no offensive odours occur beyond the Kurnell Refinery boundary. **Section 13.4.3** notes the potential for such offensive odours to be released as contaminated soils are excavated from the pipeline trench and stockpiled along the proposed pipeline route. To mitigate this risk the following odour suppression measures would be implemented.

- Soil excavation rates would be controlled in order to manage potential odour emissions.
- Soils would be tested for both for contaminants (**Section 6.5**) and odour through standard practices (e.g. field testing using a Photo Ionising Detector (PID) to measure VOC concentrations and soil, leachate and water sampling etc.) as they are stockpiled following excavation.
- The presence of significant hydrocarbon staining or obvious hydrocarbon odours would result in the suspect materials being transported via tipper truck and stored on the refinery site at a distance of over 800m from the nearest residential property in Kurnell. No contaminated or offensive odour producing soils would be stored in the Right of Way close to residential receptors.
- The pipeline trench would be inspected for hydrocarbon odours as the works progress.
- Part of the odour management controls would include VOC monitoring along the pipeline trench. Any elevated VOC levels would result in corrective actions being implemented on a case-by-case basis as controlled through the CEMP.

The above measures are considered sufficient to deal with the short-term odour impacts resulting from the excavations.

Odour control and other local air quality management measures will be controlled through the CEMP, and include the following components:

- an Air Quality Management Plan (AQMP) including VOC control measures;
- a Waste Management Plan (WMP);
- procedures for handling complaints; and
- procedures for informing local residents of air quality issues related to the proposed Project.

13.7 Statement of Commitments

Table 13-6 and **Table 13-7** provide the air quality mitigation measures and air quality monitoring (respectively) that would be implemented during the course of the Project.

Table 13-6 Statement of Commitments – Air Quality Mitigation

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Vehicles on the right of way would be subject to a speed limit of 10 km/h.		✓	
Vehicle movements on unsealed roads would be minimised where practical.		✓	
Haul vehicle tailgates would be properly sealed, such that they do not deposit loose dirt onto the road surface.		✓	
Vehicles would be loaded to less than the height of the side and tailboards, and loads of fill would be covered during transport.		✓	
Any soil adhering to the undercarriage and wheels of trucks would be removed prior to departure from the site.		✓	
All vehicles would travel on designated roadways where feasible.		✓	
Vehicles would not be left with engines idling for extended periods.		✓	
Vehicles would be properly maintained to operate in an efficient manner.		✓	
Material transfer requirements will be optimised through excavation planning, such that material double handling would be avoided where possible and work areas would be minimised.	✓	✓	
Soils would be tested for contamination and odour as they are stockpiled. Material deemed to be contaminated or odorous would be stored within the refinery at a distance of over 800m from the nearest residential property in Kurnell.		✓	
Stockpiles within along the proposed pipeline route would be monitored for odour.		✓	
Excavation rates would be controlled in order to manage potential VOC and odour emissions.		✓	
Where visible dust emissions are present during unloading / loading events near to sensitive receptors, water sprays and/or mists would be used.		✓	
Operations would be minimised or ceased during undesired weather conditions or forecasts (e.g. periods of high winds) near sensitive receptors or when offensive odours are noticed by receptors.		✓	
In unfavourable weather conditions (e.g. dry and windy conditions), water sprays would be used to dampen down soils prior to excavation and handling in locations likely to impact on sensitive receptors. Exposed surfaces and stockpiles would also be watered, sprayed or covered where required, to minimise nuisance dust to sensitive receptors.		✓	
Soil stockpiles would be covered as required.		✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Works would be undertaken during favourable meteorological conditions.		✓	
Exposed soil on completed areas would be re-vegetated.		✓	

Table 13-7 Statement of Commitments – Air Quality Monitoring

Monitoring Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Workers would maintain a visual awareness of dust emissions.		✓	
Excavations would be inspected for hydrocarbon odours.		✓	
In the Right of way, portable aerosol monitoring (e.g. DustTrak) would be used to monitor particulate matter levels where dust emissions are present near to residential receptors.		✓	
VOC monitoring would be used near to excavations.		✓	

14 Hazard and Risk

14.1 Introduction

This chapter summarises the Hazards and Risks assessment for the Project. A Hazards and Risks assessment was requested by the DoP via the DGRs. The DGRs stated that:

The Preliminary Hazards Assessment (PHA) should consider changes proposed within the Kurnell Refinery boundary, the upgraded pipeline arrangements between the refinery and wharf, increase in pipeline operating pressures and the modifications within the Caltex Banksmeadow terminal. The analysis should include:

- *identification of potential hazards associated with the Project, to determine the potential for offsite impacts;*
- *an estimate of the consequences and likelihood of significant events;*
- *comparison of the estimated overall risks against the Department's risk criteria; and*
- *proposed safeguards to ensure risks are minimised.*

This PHA is found in full in **Appendix E Hazards**. This work was completed by Planager Pty Ltd.

14.2 Assessment Methodology

The PHA was prepared in line with State Environment Planning Policy No 33 (Hazardous and Offensive Development), and in accordance with the NSW DoP's Hazardous Industry Planning Advisory Papers (HIPAPs) Numbers 4 (Risk Criteria) and 6 (Hazard Analysis). Further reference is also made to Australian Standard AS2885 (Pipelines - Gas and Petroleum Liquids) with respect to the pipeline component of the Kurnell works.

HIPAP No 4 and HIPAP No 6 describe the PHA methodology and the criteria, as required by the DoP for major "potentially hazardous" development. There are five stages in risk assessment. These are outlined below. Further details can be found in **Appendix E Hazards**.

14.2.1 Stage 1 - Hazard Identification

The hazard identification includes a review of potential hazards associated with all dangerous and hazardous goods, to be processed, used and handled as part of the Project. The hazard identification includes a comprehensive identification of possible causes of potential incidents and their consequences to public safety and the environment, as well as an outline of the proposed operational and organisational safety controls required to mitigate the likelihood of the hazardous events from occurring.

The hazard identification process includes a review of all relevant data and information to highlight specific areas of potential concern and points of discussion, including drafting up of a preliminary hazard identification (HAZID) word diagram. For this particular study, a Hazard and Operability (HAZOP) study had already been completed by Caltex led multidisciplinary team comprised of people with operational / engineering / risk assessment expertise. The HAZID word diagram was prepared party based on the output from this study and partly based on Planager's knowledge of similar installations and facilities.

The final HAZID word diagram is presented in Table 6, Section 4 of **Appendix E Hazards**.

14.2.2 Stage 2 - Consequence and Effect Analysis

Correlations between exposure and effect on people are used to calculate the impacts or consequences of identified hazards. An estimate of the effect any exposure would have on the biophysical environment can also be made.

A set of representative fire and explosion scenarios were identified in the Fire Safety Study (Matrix Risk 2010). These scenarios include a range of hazardous events that have some potential to occur. The PHA expanded on these scenarios. The scenarios can be divided into the following categories:

- Moderate releases, characterised by a hole equivalent to that of a flange failure (representing a potential flange or a pump seal). If ignited, such a leak may result in:
  - A jet fire (from an aerosol formed);
  - A sump fire; or
  - A flash fire.
- Large releases (ruptures), characterised by a hole with a diameter equal to the pipe diameter. If ignited, this leak may result in:
  - A pool fire;
  - A flash fire; or
  - A vapour cloud explosion.

Quantitative consequence analysis was undertaken using the Quantitative Risk Assessment program Riskcurves (version 7.6) and consequence modelling software program Effects (version 8.0).

14.2.3 Stage 3 - Frequency Analysis

For incidents with significant effects, the incident frequencies were estimated based on historical data. A probabilistic approach to the failure of vessels and pipes is used to develop frequency data on potentially hazardous incidents.

14.2.4 Stage 4 - Risk Analysis

The combination of the consequence of an outcome, such as injury, propagation or death, combined with the probability/frequency of an event, gives the risk from the event. In order to assess the merit of the proposal, it is necessary to estimate the risk at a number of locations so that the overall impact can be assessed. The risk for each incident is defined according to:

Risk = Consequence x Frequency

The risk associated with the Project is determined both qualitatively, using a risk matrix approach, and quantitatively using risk assessment software.

Qualitative risk: The result of the qualitative risk analysis is presented in table form in the Hazard Identification Word Diagram found in Section 4 of **Appendix E Hazards**.

Quantitative risk: In quantitative risk analysis, risk levels from each scenario are calculated by considering each modelled scenario, and combining its frequency with the extent of its harm footprints. Total risk is obtained by adding together the results from the risk calculations for each incident, i.e. the total risk is the sum of the risk calculated for each scenario. The results of the quantitative risk analysis are presented in three forms:

- Fatality Risk:
  - Individual Risk of Fatality: The likelihood (or frequency) of fatality to notional individuals at locations around the site. The units for individual risk are probability (of fatality) per million per year.
  - Societal Risk of Fatality: Societal risk takes into account the number of people exposed to risk. Societal risk considers the likelihood of actual fatalities among any of the people exposed to the hazard. Societal risk are presented as so called f-N curves, showing the frequency of events (f) resulting in N or more fatalities.
- Injury risk: The likelihood of injury to individuals at locations around the site as a result of the same scenarios used to calculate individual fatality risk.
- Propagation risk: The risk of propagation from one incident at the Project to neighbouring installations and infrastructure.

The event frequency and hazard consequence data has been combined to produce estimates of risk using a risk calculation and contour plotting program entitled Riskcurves.

Having determined the risk from a Project, it must then be compared with accepted criteria in order to assess whether or not the risk level is tolerable. If not, specific measures must be taken to reduce the risk to a tolerable level. Where this is not possible, it must then be concluded that the Project is not compatible with the existing surrounding land uses.

14.2.5 Stage 5 - Risk reduction

Where possible, risk reduction measures were identified within the PHA as recommendations. These recommendations have been used to form the Hazard and Risk Statement of Commitments for this Project.

14.3 Existing and Proposed Safety Management Systems

Caltex has a commitment to Occupational Health and Safety (OH&S) and has numerous policies and procedures to achieve a safe workplace. Procedures specific to the Project and its environment will be developed and incorporated into the safety management system.

The upgraded plant equipment will comply with all current, relevant codes and statutory requirements with respect to work conditions. There will be no changes to existing precautions observed on site, in particular, standards and requirements for the handling of flammable liquids. All personnel required to work with these substances are trained in their safe use and handling, and are provided with all the relevant safety equipment.

Emergency procedures have been developed and will be reviewed in the light of the proposed changes. The emergency procedures include responses to emergency evacuation, injury, major asset damage or failure, critical failures, spillages, major fire, and threats.

Kurnell Refinery and Banksmeadow Terminal each have a manager with overall responsibility for safety, who is supported by experienced personnel trained in the operation and support of the plant.

A Permit to Work system (including Hot Work Permit) and a Management of Change system are in use on site to control work on existing plant and to protect existing plant and structure from substandard and potentially hazardous modifications.

Injury and incident management is proceduralised and staff and contractors are trained in how to report incidents. An established incident reporting and response mechanism has been established, providing 24 hour coverage.

Protective Systems will be tested to ensure they are in a good state of repair and function reliably when required to do so. This will include scheduled testing of trips, alarms, detectors, relief devices and other protection systems.

All persons on the premises are provided with appropriate personal protective equipment suitable for use with the specific hazardous substances.

At least one person on the premises is trained in first aid, and a list of persons trained in, and designated as being responsible for the administering of, first aid is shown on the notice boards on both premises.

Table 14-1 shows some of the main codes and standards which are applicable for the Project.

Table 14-1 Codes and Standards for Design of Project

Area of Concern	Standard/Code
Plant layout and design philosophy	Chevron Global Aviation Specs: • GPS A5 – Refinery layout and spacing • GPS A6 – Design philosophy
Bunding arrangement and design	• AS1940 *The storage and handling of flammable and combustible liquids*)
Pump and piping design	• STD 40.06.CES.PIM-LA-5112-B Piping Materials • STD 40.06.CES.PIM-LA-5138-A Piping Design • STD 40.06.CES.PVM-LA-4750-E Carbon Steel Pressure Vessels for General Refinery Service • STD 40.06.CES.PMP-983 Centrifugal Pumps for General Refinery Services • API 1581 – Aviation Jet Fuel Filter/Separators 5th Edition • API 610 – Refinery Pumps • ASME B31.3 - Process Piping • AS 1200:2000 - Pressure equipment
Pipeline (design, operation and maintenance)	• AS2885 Pipelines - gas and liquid petroleum.
Electrical design	• GPS P1 – Electric Power and Lighting • STD 40.06.SPEC-P12 High Voltage Electric Motors • AS/NZS 2381 Electrical Equipment for Explosive Atmospheres – Selection, Installation and Maintenance • AS/NZS 3000 Australian / New Zealand Wiring Rules • AS/NZS 60079 Explosive Atmospheres - Explosion Protection Techniques • AS/NZS 60079.10.1:2009 Explosive Atmospheres Part 10.1: Classification of areas – Explosive gas atmospheres.
Emergency response and fire safety	• Control Of Major Hazard Facilities - National Standard • National Code of Practice; • Hazardous Industry Planning Advisory Papers No 1 and No 2: *Emergency Planning Guidelines* and *Fire Safety Study*; • Building Code of Australia for any buildings and protected works.
Dangerous goods storage and transport	*Australian Code for Transport of Dangerous Goods by Road and Rail* (ADG Code), 7th Ed.
Occupational health and safety	(NSW) Occupational Health and Safety Act 2000. (NSW) Occupational Health and Safety Regulations 2001.

14.4 Assessment of Impacts

14.4.1 Hazard Identification

The main risk associated with the proposed upgrade involves the transfer and storage of jet fuel, a flammable material at atmospheric conditions.

Other, less prominent, hazards associated with the Project involve the use of high voltage electricity and the rotating machinery. Such hazards are predominantly experienced at a local area by operators or maintenance personnel and are unlikely to give rise to off-site hazards. As such, these potential hazards are generally dealt with using training, procedures, Job Safety Analysis (JSA), permit to work etc., and are not discussed in the PHA.

A hazard identification exercise was undertaken by a multidisciplinary team (composed of personnel from design operations and engineering), addressing the nature of hazards that might occur during operation of the facility after implementation of the Project. Further, a safety management assessment in accordance with AS2885 requirements was conducted for the Project, using a multidisciplinary team from design, process, inspection, operation and project management.

A group of 10 hazards was identified. These are listed in **Table 14-2** below.

Table 14-2 Summary of Identified Hazards

Hazardous Event Potential
Loss of Containment Events (Jet Fuel or Energy)
Leak of jet fuel from pipes or pumps on-site or off-site due to generic faults or impact leads to fire event
Leak of jet fuel from pipes or pumps on-site or off-site due to generic faults or impact leads to threat to the biophysical environment
Natural Hazards
Earthquake / Seismic hazard
Land subsidence hazard
Bush/brush fire
Flooding
Lightning strike
Other types of hazards
Aircraft crash
Intentional acts
Knock-on Effects / Cumulative Effects

A Hazard Identification Word Diagram was prepared for the PHA and is presented in Table 6 of **Appendix E Hazards**. This table draws from the potential incident scenarios identified during the hazard identification exercises (**Table 14-2**). The risk associated with each incident scenario was evaluated for the situation before and after the Project. The risk matrix from AS2885 was used in this exercise. This exercise included examining initiating causes, consequences and proposed / existing safeguards to minimise consequences of likelihood of an incident. Risks were examined for the Kurnell and Banksmeadow pumping stations and the KBL pipeline (i.e. the new pipeline running from the proposed Kurnell Pumping station to the wharf).

Eleven incident scenarios were identified:

Scenario 1. KBL loss of containment event: Uncontrolled release from the pipeline due to generic faults.

Scenario 2. KBL loss of containment event: Loss of containment due to aging pipeline.

Scenario 3. KBL loss of containment event: Uncontrolled release of jet fuel due to impact or damage to the pipeline.

Scenario 4. KBL loss of containment event: Maloperation.

Scenario 5. KBL loss of containment event: During maintenance.

Scenario 6. KBL loss of containment due to natural event.

Scenario 7. KBL loss of containment due to other types of hazards (terrorism, aircraft crash, knock-on event).

Scenario 8. Pumping station loss of containment event: Uncontrolled release of jet fuel due to generic faults.

Scenario 9. Pumping station loss of containment event: Uncontrolled release of jet fuel due to mechanical impact or damage at one of the pump stations.

Scenario 10. Pumping station loss of containment due to natural hazards.

Scenario 11. Pumping station due to other types of hazards (terrorism, aircraft crash, knock-on event).

14.4.2 Qualitative Risk Analysis

These scenarios were assessed qualitatively by using the Hazard Identification Word Diagram. This qualitative risk analysis provided risk profiles of the existing pumping stations and the KBL, as well as the risk profiles of the proposed pumping stations and the KBL. The results of this analysis show that a net risk reduction would be expected following once the Project was operational. This is discussed below:

Risk Reduction: The risk associated with the following incident scenarios will be reduced (by approximately one order of magnitude):

- Loss of containment event: Scenario 1 - Loss of containment due to aging pipeline. The risk is expected to reduce from Intermediate to Low.
- Loss of containment event: Scenario 5 - During maintenance (failure during pigging causes loss of containment from the pigging station). The risk is expected to reduce from Intermediate to Low.

There will be some increased complexity in the operation of the pipeline which may increase the risk of operational error. This is discussed below:

Increase in Risk: The risk associated with the following incident scenario will be somewhat increased:

- Loss of containment event: Scenario 4 - Operational error upstream or downstream of facility.

However the increase in risk is not expected to be a whole order of magnitude. Further, safety features (including leak detection, pressure trips and alarm functions) and procedures will come together to manage this risk.

The increase in pressure and flowrate may increase the rate of release if a pipeline leak was to occur and it may increase the stress on the pipeline. However, this increase is only relevant for certain operational modes and the pipeline and pumps have been designed to withstand higher operational pressures. Therefore the increase in pressure and flowrate is not expected to substantially affect the risk levels of the KBL.

14.4.3 Quantitative Risk Analysis

For the new pumping stations at Kurnell Refinery and Banksmeadow Terminal, a quantitative risk analysis has been completed for the following risks:

- Individual fatality risk;
- Societal fatality risk;
- Propagation risk; and
- Injury risk.

The results of this analysis are summarised in **Table 14-3**.

Table 14-3 Quantitative Risk Analysis Results

Risks	Risk Criterion	Conclusions
Kurnell Pumping Station		
Individual fatality risk	Residential areas: $1x10^{-6}$ per year	This risk criterion is fully contained within the Kurnell Refinery boundary. The risk of fatality at the nearest residential area is less than $1x10^{-11}$ per year.
	Active open spaces: $10x10^{-6}$ per year	This risk criterion is fully contained within the Kurnell Refinery boundary. The risk of fatality at the nearest open space is $0.08x10^{-6}$ per year.
	Industrial areas: $50x10^{-6}$ per year	This risk criterion is never reached.
	Sensitive development: $0.1x10^{-6}$ per year	This risk criterion is contained within the Kurnell Refinery boundary in most directions except for a small excursion of 1-2m into the wetlands. The criterion does not however extend anywhere near any sensitive developments (e.g. schools, etc.)
Societal fatality risk	N/A	The risk of fatality at the nearest residential area from the new pumping station is less than 1×10^{-11} per year. With such low fatality risks at locations where residents and the public may reside, societal risk of fatality does not apply.
Propagation risk	$50x10^{-6}$ per year	This risk criterion is fully contained within the Kurnell Refinery boundary. Further, it does not extend into any major infrastructure on the refinery site. The risk of propagation associated with the proposed pumping station is well below tolerable risk levels
Injury risk	$50x10^{-6}$ per year	The risk criterion, representing the maximum risk of injury outside the Kurnell Refinery boundary, is contained within the site boundary. The risk of injury associated with the proposed pumping station is below tolerable risk levels.

Risks	Risk Criterion	Conclusions
Banksmeadow Pumping Station		
Individual fatality risk	Residential areas: $1x10^{-6}$ per year	This risk criterion is fully contained within the Banksmeadow Terminal boundary. The risk of fatality at the nearest residential area is less than $1x10^{-11}$ per year.
	Active open spaces: $10x10^{-6}$ per year	The risk criterion is fully contained within the Banksmeadow Terminal boundary in all directions.
	Industrial areas: $50x10^{-6}$ per year	The risk criterion is fully contained within the Banksmeadow Terminal boundary in all directions.
	Sensitive development: $0.1x10^{-6}$ per year	The risk criterion is fully contained within the Banksmeadow Terminal boundary in all directions.
Societal fatality risk	N/A	The risk of fatality at the nearest residential area from the new pumping station is less than 1×10^{-11} per year. With such low fatality risks at locations where residents and the public may reside, societal risk of fatality does not apply.
Propagation risk	$50x10^{-6}$ per year	This risk criterion is fully contained within the Banksmeadow Terminal boundary. Further, it does not extend into any major infrastructure on the terminal site. However the foam shed is located close to the new booster pumps and may be affected during a major fire at the pumps. The risk of propagation associated with the proposed pumping station is well below tolerable risk levels.
Injury risk	$50x10^{-6}$ per year	The risk criterion, representing the maximum risk of injury outside the Banksmeadow Terminal boundary, is contained within the site boundary. The risk of injury associated with the proposed pumping station is below tolerable risk levels.

14.4.4 Discussion and Conclusions

Overview of risks

The main hazard associated with the Project is associated with the handling of jet fuel that is a flammable liquid at atmospheric conditions. The predominant mode in which a hazardous incident may be generated is associated with a leak. This would generally only have the potential to cause injury or damage if there was ignition that resulted in a fire or explosion incident. If the leak was not adequately contained and the jet fuel was allowed to enter the natural environment, an unignited release would be a threat to the biophysical environment.

The factors involved are:

- Failure must occur causing a release. There are several possible causes of failure, with the main ones being corrosion and damage to the equipment by external agencies;
- For a pollution incident to occur, the release must either occur outside of contained areas (such as bunds) or containment must fail. The level of pollution will depend on the quantities of material released, the ease in which it can be removed and the area cleaned up, and the sensitivity of the environment in which the material was released;

- For a fire to occur, the released material must come into contact with a source of ignition. In some cases this may be heat or sparks generated by mechanical damage while in others, the possible ignition source could include non-flame proof equipment, vehicles, or a heat-source some distance from the release;
- Depending on the release conditions, including the mass of material involved and how rapidly it is ignited, the results of an ignition may be a localised fire (for example a so called jet fire or a pool fire) or a flash fire. If there is confinement a vapour cloud explosion is possible;
- Finally, for there to be a risk, people must be present within the harmful range (consequence distance) of the fire or explosion or the released jet fuel must enter the biophysical environment.

Adherence to Quantitative Risk Criteria – Pumping Stations

Despite the fact that many of the assumptions in this hazard and risk assessment are conservative, the results show that the risk associated with the Kurnell Refinery and the Banksmeadow Terminal pumping stations fall within acceptable limits.

The quantitative risk assessment showed that all landuse criteria, as defined by the DoP, are met for the two proposed pumping stations. The risk at any nearby residential areas, open spaces and sensitive development is well below the maximum tolerable risk criteria. The risk associated with the new pumping stations does not preclude further industrial development in the vicinity of the sites.

The risk of propagation from the pumping stations to neighbouring facilities on the same site, such as the neighbouring storage tanks at the refinery and the Terminal, is also below the DoP risk criteria.

The most stringent risk criteria, as set by the DoP for acceptable risks in industrial installations, are also adhered to for the two pumping stations.

Acceptability of Other Risks and Hazards

Qualitative Evaluation of Risk

The net result of the Project is an overall reduction in the risk associated with the KBL. This is due to:

- The Project ensures that the entire KBL can be subject to a Non Destructive Testing method (called intelligent pigging) whereby any reduction in the integrity of the pipeline can be identified through measurement of loss of wall thickness or coating damage, before it becomes an issue. This process, while performed typically every 7 years for the rest of the pipeline, cannot currently be completed for a length of pipeline between the Kurnell refinery and the wharf. Once the Project is operational the entire pipeline would be able to be pigged.
- The relocation of the pigging station from the wharf to the refinery, where any spills or leaks can be better contained, is also considered a clear risk reduction measure.

The slight increase in risk associated with the more complex operational procedures required to transfer jet fuel at different rates to different customers (which may lead to operational error at the upstream or downstream facilities) is managed through the installation of hardware features such as valve position pumping permissives, pressure trips and alarm functions as well as procedures and training.

The increase in maximum operational pressure in the KBL is not believed to substantially increase the risk associated with this pipeline, as the design pressure and Maximum Allowable Operational Pressure (MAOP) exceeds this value. Further, the pressure trips and alarms would also reduce the likelihood of any risk.

The risk associated with the Kurnell Refinery and the Banksmeadow Terminal is not substantially changed as a result of the installation of the new pumping stations.

Risk to the Biophysical Environment

Risk to the biophysical environment from accidental releases of hazardous material at the new pumping stations will be minimised throughout the design, operation and maintenance process of plant and equipment.

Natural Hazards

Earthquake / Seismic Hazard and Hazards from Land Subsidence - The risk of earthquake, seismic hazards or land subsidence is minimal and is not altered as a result of the Project.

Bushfire / Brush Fire - The risk associated with the new pumping stations initiating a brush or bushfire is minimised through a combination of active and passive protection (in the form of plant layout, equipment spacing, drainage, fire and/or hydrocarbon (flammable vapour) detection, a firewater system and overpressure protection). The risk of a bush fire initiating an event at the KBL is not altered as a result of the Project.

Flooding / Erosion - The risk associated with flooding or erosion is considered negligible in accordance with the risk ranking methodology in AS2885.1 (refer to **Appendix E Hazards**). It is not altered as a result of the Project.

Lightning - The risk from lightning strike will be minimised through the use of relevant Australian or International standards.

External Hazards

Aircraft Crash - The risk associated with an aircraft crash is considered negligible in accordance with the risk ranking methodology in AS2885.1 (refer to **Appendix E Hazards**). It is not altered as a result of the Project.

Incident Causes Knock-on Effect at Neighbouring Facility - The propagation risk calculations show that the current criteria for maximum acceptable risk at neighbouring industrial facilities is met at the boundary of the Kurnell Refinery pumping station and at Banksmeadow Terminal booster pump station. Equally the risk contours do not enter into major infrastructure at the two sites (such as storage tank areas).

The risk of knock-on effects at neighbouring installations is considered negligible in accordance with the risk ranking methodology in AS2885.1 for the KBL. It is not altered as a result of the Project.

Intentional Acts - The risk of intentional acts (such as vandalism, terrorism etc.) is considered negligible in accordance with the risk ranking methodology in AS2885.1. It is not significantly altered as a result of the Project.

Overall Conclusion

The construction, commissioning and operation of the Project will be subject to rigorous scrutiny by Caltex and the designing company, safeguarding delivery and operation of the Project in a manner that minimises the risk to workers, contractors and the community.

The potential for incidents is well understood and the design of the plant and equipment will minimise the probability of an incident occurring as well as mitigating an incident if it did occur.

The preliminary hazard and risk assessment of the Project has found that the levels of risks to public safety from the two pumping stations are within accepted safety and risk guidelines. Indeed the Project is expected to result in a net reduction in the overall risk from the KBL.

The PHA concludes that the overall risk associated with the Project is low and does not introduce an excessive additional risk to the surrounding area.

14.5 Mitigation Measures

Where possible, risk reduction measures have been identified throughout the course of the PHA. Three recommendations have been made to further reduce any chance of hazards or risks occurring. These are:

- Recommendation 1: As far as practicable, ensure pipes outside of contained areas are fully welded (not flanged).
- Recommendation 2: Review existing Emergency Response Plans at both the Kurnell Refinery and Banksmeadow Terminal as well as for the KBL for any changes required following implementation of the Project.
- Recommendation 3: Depending on the results of the final Fire Safety Study, further risk reduction may need to be considered for the risk associated with a knock-on effect at the neighbouring foam pump house at Banksmeadow Terminal, in case of a major fire at the proposed booster pump station.

These recommendations have been used to form the Hazard and Risk Statement of Commitments shown in **Table 14-4** below.

14.6 Statement of Commitments

Table 14-4 Statement of Commitments – Hazards and Risk

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
All pipes outside of contained areas will be full welded not flanged.		✓	
Emergency Response Plans for Kurnell Refinery, Banksmeadow Terminal and the KBL will be updated prior to the Project being commissioned.	✓	✓	
The final Fire Safety Study will be reviewed prior to the Project being commissioned to ensure that any further risk reduction measures are appropriately implemented.	✓	✓	

15 Socio-Economic

15.1 Introduction

This Chapter presents the socio-economic assessment undertaken for the Project. The assessment presents current and historic demographic, employment and industrial socio-economic data. It identifies social, economic and employment generation impacts associated with the Project.

The Project is considered sufficient to meet the short- to medium-term demand for jet fuel from airlines operating through Sydney Airport, thereby removing the potential adverse impact on the airlines and Sydney Airport that could arise from the need to ration the supply of jet fuel as has occurred in the past (SJFIWG, 2010). The cost of the investment is projected at $25 million of which 70 per cent will be for labour and 30 per cent for materials (capital). Virtually all of the labour should be able to be sourced locally.

15.2 Existing Environment

15.2.1 Project Region

The Project would occur in a well established commercial and industrial sector of Greater Sydney that includes Sydney Airport and shipping port facilities at Port Botany. The study region also includes a residential population from which much of the labour, skills and expertise to service the needs of the commercial and industrial enterprises of the region is drawn.

15.2.2 Existing Caltex Facilities

Kurnell Refinery

The Kurnell refinery employs 520 permanent staff and 360 contractors, giving the facility a total of 880 employees. The majority of staff live near the refinery and are employed on a full time basis. The type of employment provided by the Kurnell Refinery is split between managerial, professional and technical occupations with some additional staff employed in the service sector.

Banksmeadow Terminal

The Banksmeadow Terminal employs 31 permanent staff and 21 contractors giving the facility a total of 52 employees. The majority of the staff are employed on a full time basis and live in the vicinity of the plant. The area around the plant is also home to many other people who are employed in industries around the Sydney Metropolitan area including Sydney Airport.

15.2.3 Statistical Socio-economic Analysis

Statistical analysis for this chapter has been based on Australian Bureau of Statistics (ABS) data collected as part of the 2006 census. Statistical Divisions (SD) form the main structural hierarchy of this statistical analysis and provide a broad range of social, demographic and economic statistics.

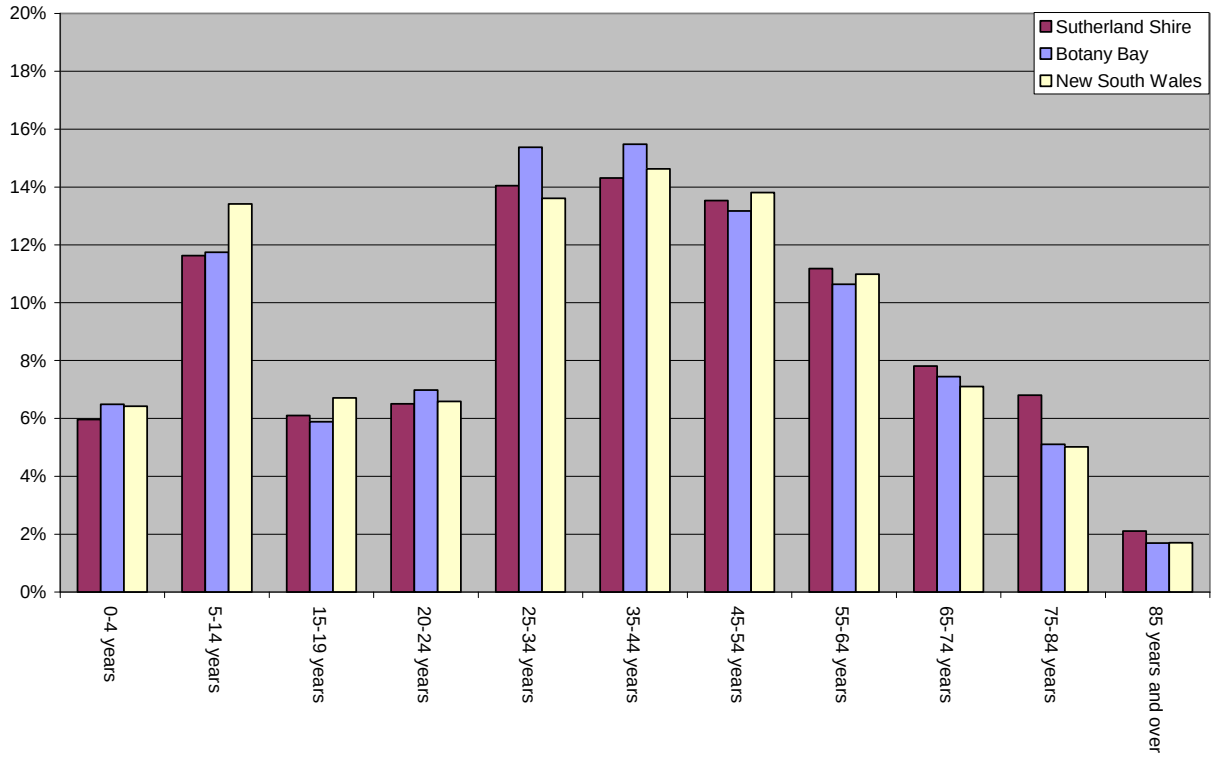
The two areas identified to be impacted by the Project are Sutherland Shire East and Botany Bay. This section examines the socio-economic break down of these two areas in order to establish the impact caused by the Project.

Population Age Structure

Figure 15-1 shows the breakdown of age groups in the two study areas compared to the state average in NSW. As is shown by the chart, the age breakdown in both the regions closely mirrors the average in the wider state area.

The age structure of the region is similar to that for NSW (ABS 2006). The same is true of the share of the population aged between 16–64 years. This part of the population is referred to as 'the labour force bracket'. The population for Sutherland Shire – East was recorded at 97,424 and for Botany Bay at 35,993. This gives a total study region population of 133,417 at the time of the 2006 Census.

Figure 15-1 Age Breakdown of the Study Area



Labour Force

An insight to the skills, expertise and capability of the local labour force to construct and operate the upgraded pipeline can be gained from the level of educational attainment, occupation by profession and trade, and the relative level of economic activity in different sectors of the regional economy. These aspects are presented in **Figures 15-2** to **15-7** for the Statistical Local Areas (SLAs) of Botany Bay and Sutherland Shire (A) – East. All charts have been prepared using data sourced from the ABS relating to the 2006 Census.

Based on the information presented in the figures, over 40 per cent (%) of potential workforce from within these regions hold post secondary qualifications (refer to **Figures 15-2** and **15-3**). When combined with the number of people employed as "technicians and trade workers" and "machinery operators and drivers" (**Figures 15-4** and **15-5**), as well as the share of the workforce employed in "manufacturing", "construction" and "professional, scientific and technical services" sectors of the economy (**Figures 15-6** and **15-7**), it can be concluded that the workforce required to construct and operate the upgraded pipeline would be available locally.

Although the unemployment rate in the regions is likely to be relatively low (given the ongoing strength of the Australian economy), the Project itself is not large and as such will not give rise to labour supply pressures and associated cost increases. Therefore the assertion that most of the labour will be sourced locally is a reasonable one and is unlikely to adversely impact the local labour market.

Figure 15-2 Level of Educational Attainment - Botany Bay

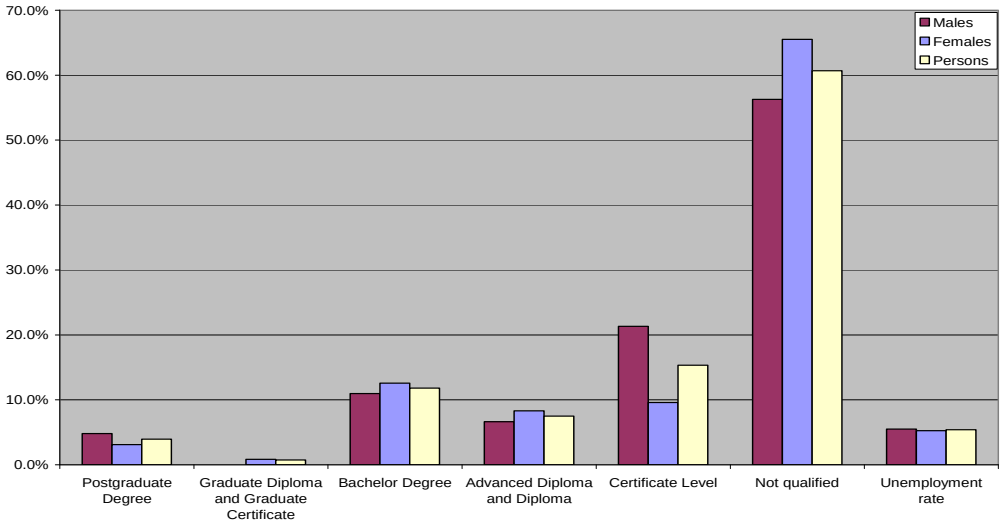


Figure 15-3 Level of Educational Attainment - Sutherland Shire East

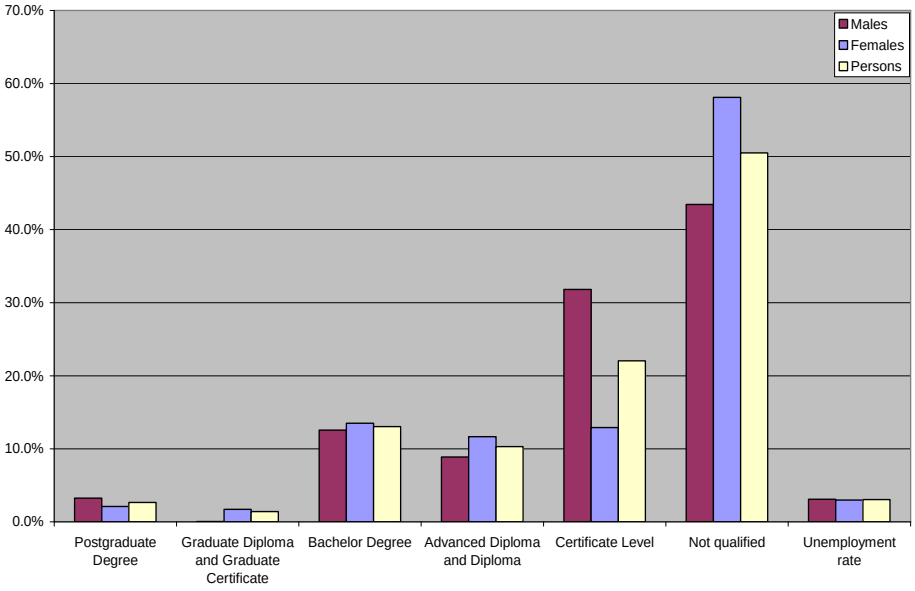


Figure 15-4 Labour Force of Sutherland Shire East

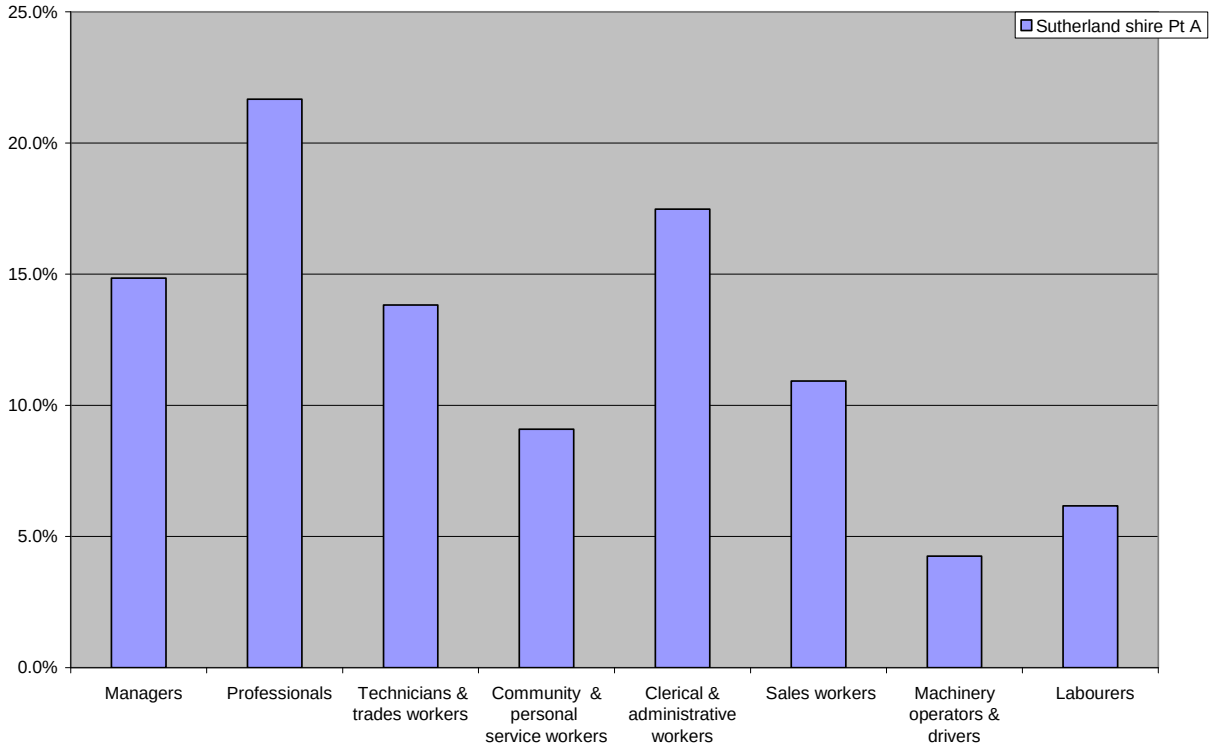


Figure 15-5 Labour Force of Botany Bay

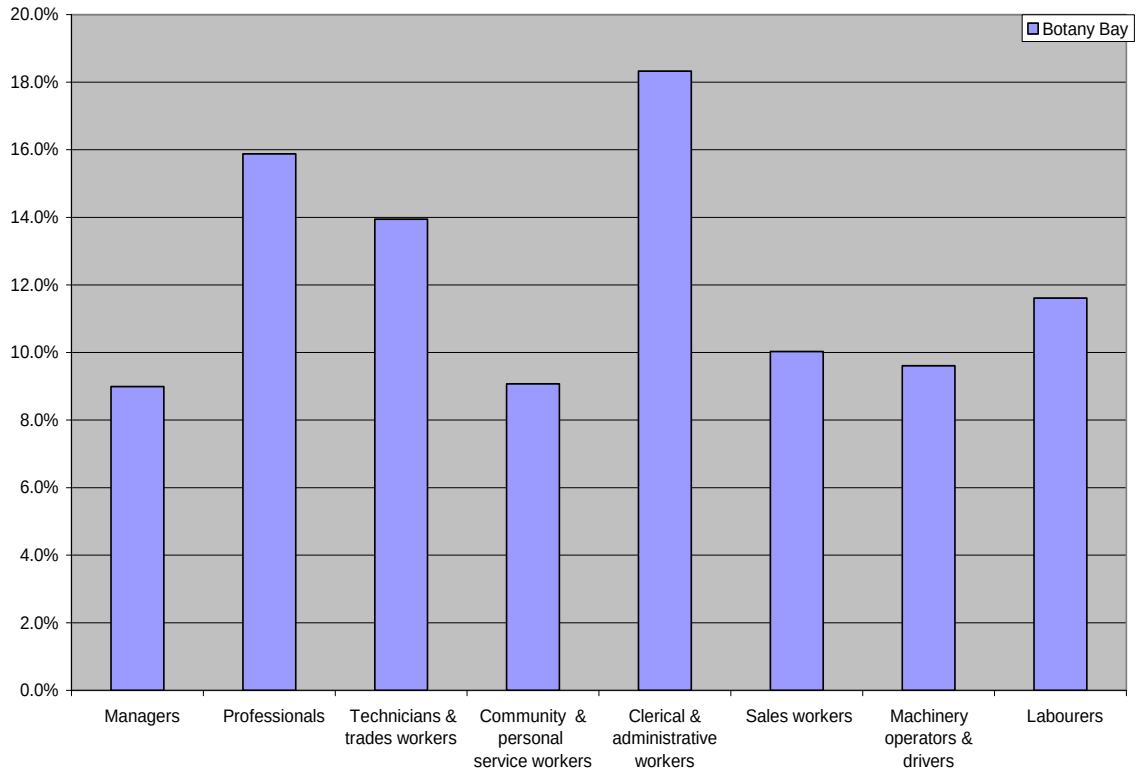


Figure 15-6 Industry Breakdown, Sutherland Shire East

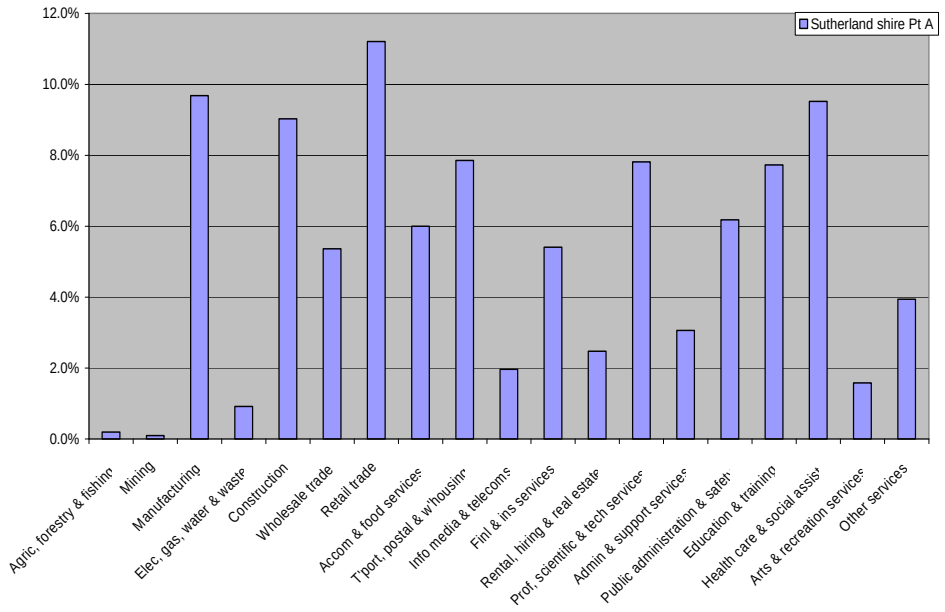
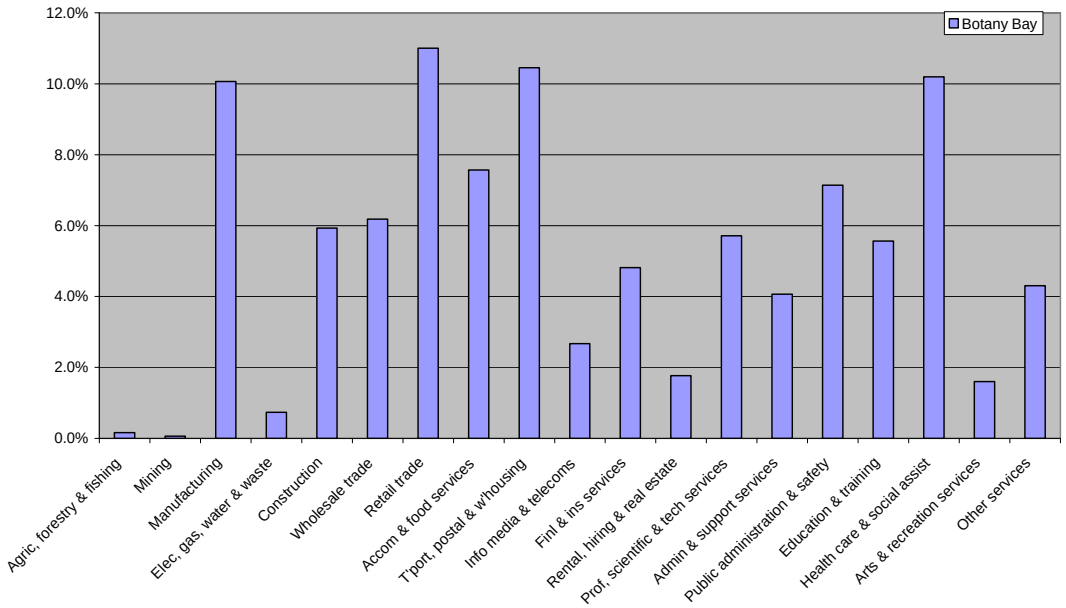


Figure 15-7 Industry Breakdown, Botany Bay



15.3 Assessment of Impacts

This section provides an assessment of the potential economic impacts on the study region which may arise as a result of the Project. These include impacts on employment and the local economy during the construction and operational phases of the investment. No changes to landownership or land use are expected as a result of this Project.

15.3.1 Methodology

The Input-Output tables for the Australian economy produced by the ABS provide the means to estimate the impact of the investment proposed by Caltex on the study region. In essence, these tables are constructed by categorising the Australian economy into 109 industry sectors. They provide a detailed dissection of intermediate transactions within these sectors and the ability to describe the supply and use of the products of the total economy.

The Input-Output tables also enable the derivation of multipliers. These are summary measures used for predicting the total impact on all industries in an economy, of changes in the demand for the output of any one industry, such as the changes in demand that would result from the proposed investment by Caltex. Several types of multipliers can be derived to capture different levels of associated activity within an economy as a result of a change in demand in one sector.[1]

An 18 sector Input-Output table of the Australian economy was derived from the 109 Sector Table published by the ABS. Multipliers for each of these sectors were then derived based on the methodology employed by the ABS.

Given the nature of the proposed investment by Caltex, the Construction and Manufacturing sectors were selected as being most representative of the construction and operational stages of the Project. For the Construction and Manufacturing sectors, the derived Type 1a multipliers are 1.65 and 1.55 respectively. The use of Type 1a multiplier limits the potential to overestimate the overall economic impact on the Australian economy of an increase in demand for the output of a particular sector.

15.3.2 Construction Phase

The cost of the Project is estimated at approximately $25 million. A description of the construction stages and sequencing is provided in **Chapter 3 Project Description**. Construction of the proposed works would be completed by around 40 staff working in successive “teams” at Kurnell. The proposed works at Banksmeadow are expected to require around 30 construction staff. The workforce engaged on the Project would vary during the construction program and would depend on specific activities.

The Project would generate a positive economic impact within the local community through the creation of local employment opportunities during the construction phase. The construction of the pipeline would provide short-term work (approximately one year) for construction crews. The construction workforce would be a combination of labourers and skilled employees that can carry out specialised work. Given the characteristics of the labour force in the study region, it is anticipated that the workforce required would be sourced from the local area.

A number of Caltex personnel and local contractors currently reside in the local area. It is assumed that the majority of the workforce would be sourced locally and that from between 30 to 50 percent of materials (capital) will be sourced locally. Construction activity in the area would provide flow-on economic benefits, including increased spending in the local area through demand for materials. The increased direct spending within the local economy would have a positive impact on local services and businesses during construction.

[1] ABS, Catalogue No 5246.0, Information Paper; Australian National Accounts; Introduction to Input-Output Multipliers.

Total impact of proposed upgrade expenditures on the local regional economy

Using the expenditure information provided by Caltex, especially the share of labour and capital that are to be sourced locally, together with the derived Type 1a multipliers for the Manufacturing and Construction sectors, the total impact of the proposed expenditure on the regional economies of the two SLAs can be calculated. The expenditure of $17.5 million on locally sourced labour will result in a total value to the economy of the two regions of $29 million (using the Construction Sector multiplier of 1.65).

With respect to the proposed capital expenditure of $7.5 million, it is necessary to make adjustments for the share of materials/capital that would be sourced from outside the study region. Based on the nature of the proposed investment, two scenarios were assessed. The first was to cover the ability to source 50% of materials ($3.8 million) from the study region, and the second for the situation that only 30% (($2 million) could be sourced from the study region. Using the multiplier for the Manufacturing Sector of 1.55, the total impact of this expenditure, if 50% is sourced locally, on the local economy is calculated at $6 million. If 30% of materials were sourced locally the total impact on the local economy is calculated at $3 million. When combined with the impact of labour expenditure of $29 million, the total impact of the proposed upgrade works on the local region (from the initial investment of $25 million) is calculated to be either $35 million or $32 million.

Contribution to Gross Regional Product

The calculated total impact of the expenditure associated with the proposed upgrade works of $35 million overestimates the contribution of the investment to the local economy. This is because the figures include the value of intermediate goods/services (inputs) sourced from other sectors of the economy. The value of these inputs needs to be removed to determine the contribution that the proposed expenditure makes to the value of Gross Region Product of the local economy.

In the case of capital expenditure, the adjustment to remove the value of intermediate inputs is derived from the 18 Sector Input/Output table for the Australian economy with reference to the Manufacturing Sector. Based on these tables, the gross value added of the Manufacturing Sector to the Australian economy represents 55.8 per cent of the value of intermediate inputs. This percentage share is then used to adjust the calculated total impact of $6 million from the capital expenditure (if 50 per cent sourced locally) to derive the contribution of that expenditure to Gross Regional Product for the two regions. This contribution is calculated at $3 million.

With respect to the calculated total impact of labour expenditure of $29 million, no adjustment is required for intermediate inputs associated with personal consumption. Accordingly, all of the labour expenditure in the local region makes a direct (or 100 per cent) contribution to Gross Regional Product.

Summarised in **Table 15-1** are the calculated impacts (as described above) of the proposed investment with respect to the total impact of the project expenditure on the study region and the contribution of that impact on the Gross Regional Product of $32 million (based on the assumption that 50 per cent of the materials would be sourced locally). Should only 30 per cent of materials be sourced locally, the corresponding calculated impacts are summarised in **Table 15-2**, with a contribution to Gross Regional Product of $31 million.

Table 15-1 Gross Regional Product: 50% of materials sourced locally

Description	Labour	Capital	Total
Project Expenditure ($m)	$17.5 M	$7.5 M	$25 M
Project Expenditure in Region - Sutherland (A) – East and Botany Bay SLAs ($m)	$17.5 M	$3.8 M	$21 M
Share from local area (%)	100%	50%	
Construction multiplier Type 1a (National I-O)	1.65		
Manufacturing multiplier Type 1a (National I-O)		1.55	
Total impact of project expenditure ($m)	**$29 M**	**$6 M**	**$35 M**
Value added share	100%	55.8%	
Contribution to Gross Regional Product	**$29 M**	**$3 M**	**$32 M**

Table 15-2 Gross Regional Product: 30% of materials sourced locally

Description	Labour	Capital	Total
Project Expenditure ($m)	$17.5 M	$7.5 M	$25 M
Project Expenditure in Region - Sutherland (A) – East and Botany Bay SLAs ($m)	$18 M	$2 M	$20 M
Share from local area (%)	100.0%	30.0%	
Construction multiplier Type 1a (National I-O)	1.65		
Manufacturing multiplier Type 1a (National I-O)		1.55	
Total impact of project expenditure ($m)	**$29 M**	**$3 M**	**$32 M**
Value added share	100.0%	55.8%	
Contribution to Gross Regional Product	**$29 M**	**$2 M**	**$31 M**

15.3.3 Operational Phase

Following construction and commissioning, the amount of activity in relation to the Project would decrease substantially. Ongoing maintenance of the Project components would be undertaken. However it is expected that there would be no change to the permanent workforce employed pre-construction at either the refinery or terminal.

Maintenance activities would fall within the existing inspection, assessment, maintenance and repair programmes that Caltex already implement. As such no additional operational staff would be required at either site as a result of this Project. The ongoing operation of the Project would not therefore result in any affect on employment or demand for goods and services within the area.

However the operation of the Project would reduce the requirement for jet fuel rationing at Sydney Airport in the short to medium term. The Project would therefore result in the airport running more efficiently over this timescale. This in turn would safeguard both the existing airport jobs and those jobs in related industries, as well as maintaining the airport's significant contribution to both the State and national economies. This contribution currently stands at 6% and 2% respectively. The Project and any other future works would also allow the airport to grow. Estimates suggest that the airport could create an additional 100,000 jobs over the next 10 years. The Project would help achieve this target and help maintain Sydney Airport as a key international transport hub.

15.4 Conclusion

Based on the expenditure information provided by Caltex and the ABS data outlined above, the projected total impact on the local economy from the initial expenditure of $25 million is calculated at $35 million.

After adjustments for intermediate inputs for the capital/materials expenditure, the contribution of the initial approximate expenditure of $25 million to Gross Regional Product is calculated at $32 million. If only 30 per cent of materials were to be sourced locally, the contribution to Gross Regional Product would become $31 million.

Operation of the Project will help Sydney Airport maintain its current economic position and will provide it with the opportunity to grow in the short to medium term.

15.5 Statement of Commitments

No commitments are required for this technical area.

16 Greenhouse Gas Emissions

16.1 Introduction

This chapter describes the legislative framework and potential greenhouse gas (GHG) emissions associated with the Project.

16.1.1.1 Greenhouse Gases (GHG)

GHG are gases in the earth's atmosphere that absorb and radiate infrared radiation (heat) reflected from the earth's surface. The most abundant of these gases are carbon dioxide (CO_2) and water (H_2O). Other naturally occurring greenhouse gases such as methane (CH_4) and nitrous oxide (N_2O) are present in the atmosphere in much smaller quantities.

The less abundant GHG (e.g. CH_4 and N_2O) are much more efficient in trapping infrared radiation than CO_2. Global Warming Potential (GWP) is a measure of how "efficient" a greenhouse gas is in trapping infrared radiation, and is defined as the ratio of infrared radiation trapped by one kilogram of non-CO_2 greenhouse gas compared to one kilogram of CO_2, over a defined time frame. For example, over a 100 year time-frame, methane traps approximately 21 times as much infrared radiation from the earth as CO_2, and nitrous oxide traps approximately 310 times as much infrared radiation as CO_2[1]. When compiling greenhouse gas inventories, this difference in greenhouse potential is accounted for by converting the mass of each non-CO_2 greenhouse gas emitted into a CO_2 equivalent (CO_2-e) amount, using the GWP for each particular non-CO_2 gas.

16.1.2 Legislative Framework

16.1.2.1 National Greenhouse and Energy Reporting Act 2007 (NGER Act)

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) established a national framework for Australian corporations to report GHG emissions, reduction removals and offsets, and energy consumption and production. It is designed to provide robust data as a foundation to the Carbon Pollution Reduction Scheme (CPRS).

For the 2010 -2011 reporting year, corporations have been required to register and report if:

- They control facilities that emit greater than 25 kilotonnes CO_2-e of GHG, or produce/consume 100 terajoules or more of energy; or
- Their corporate group emits greater than 50 kilotonnes CO_2-e of GHG, or produces/consumes 200 terajoules or more of energy.

Caltex is currently listed on the National Greenhouse and Energy register and reports GHG emissions under the NGER framework.

[1] DCCEE 2010a - *Department of Climate Change and Energy Efficiency National Greenhouse Accounts (NGA) Factors*, July 2010.

16.1.2.2 Energy Efficiency Opportunities (EEO)

The Commonwealth Government's Energy Efficiency Opportunities (EEO) program came into effect in July 2006. The program mandates large energy users (over 0.5 petajoules of energy consumption per year) to participate in the program. Businesses are required to identify, evaluate and report publicly on cost-effective energy saving opportunities.

The EEO program is designed to promote:

- Improved identification and uptake of cost-effective energy efficiency opportunities;
- Improved productivity and reduced greenhouse gas emissions; and
- Greater scrutiny of energy use by large energy consumers.

Caltex is currently a participant in the EEO program and have subsequently identified and responded to a number of energy efficiency opportunities at the Kurnell Refinery.

16.2 Assessment Methodology

Where greenhouse gas emission estimates have been provided they have been determined based on the methodologies outlined in the following documents:

- The World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) Greenhouse Gas Protocol (WRI/WBCSD, 2005);
- National Greenhouse and Energy Reporting (Measurement) Determination 2010; and
- The Australian Government National Greenhouse Accounts (NGA) Factors 2010 (DCCEE, 2010a).

Emissions have been defined as Scope 1, Scope 2 or Scope 3 as described below.

Scope 1 Direct Greenhouse Gas Emissions:

Direct greenhouse gas emissions are defined as those emissions that occur from sources that are owned or controlled by the entity. Direct greenhouse gas emissions principally result from the following types of activities.

- Generation of electricity, heat or steam, i.e. combustion of fuels in stationary sources.
- Physical or chemical processing, e.g. manufacture of cement, aluminium, etc.;
- Transportation of materials, products, waste and employees, e.g. combustion of fuels in mobile combustion sources, e.g. motor vehicles, trains, ships, aeroplanes; and
- Fugitive emissions, i.e. intentional or unintentional releases from equipment.

Scope 2 Energy Product Use Indirect Greenhouse Gas Emissions

Scope 2 emissions are indirect emissions from the use of energy products (e.g. electricity, steam/heat) purchased or otherwise brought into the Project boundary. Scope 2 emissions physically occur at the facility where electricity purchased is generated.

Scope 3 Other Indirect Greenhouse Gas Emissions

Scope 3 emissions are defined as those emissions that are a consequence of the Project activities but do not occur from sources owned or controlled by the project initiator. Some examples of Scope 3 activities provided in the Greenhouse Gas Protocol are:

- Extraction, processing and transport of materials or fuels; or
- Use of sold products and services.

Scope 3 emissions associated with the construction phase of the Project are reportable as Scope 1 emissions from facilities that manufacture or transport the products.

16.3 Existing Environment

Existing accounts of greenhouse gases provided by the Department of Climate Change and Energy Efficiency (DCCEE 2010b) estimate that approximately 575 Mega tonnes (Mt) CO_2-e was emitted in Australia during the 2007-08 financial year. A breakdown of the individual state and territory contributions is shown in **Table 16-1** below.

Table 16-1 Australian State and Territory Greenhouse Gas Emissions 2008 (DCEE 2010b)

State or Territory	Total Emissions (Mt CO_{2-e})	% of Total
New South Wales	164.7	28.6 %
Queensland	160.3	27.9 %
Victoria	119.1	20.7 %
Western Australia	72.8	12.7 %
South Australia	31.7	5.5 %
Northern Territory	16.3	2.8 %
Tasmania	9.1	1.6 %
Australian Capital Territory	1.2	0.2 %
External Territories	0.03	<0.1 %
Total	575.2	100 %

In New South Wales, stationary energy and transport were reported to be the prime contributors to the 2008 inventory with 81.2 and 21.8 MtCO_2-e accounted for respectively.

16.4 Assessment of Impacts

An assessment of the GHG emissions for the construction and operational phase of the Project is provided in the following sections.

16.4.1 Construction Phase GHG Emissions

Direct GHG emissions (Scope 1) during the construction phase of the Project would originate from the combustion of fuels in construction equipment. Diesel would be the primary fuel used in construction equipment such as backhoes, bobcats and delivery trucks. Emissions from electricity use (Scope 2) are expected to be negligible as construction equipment is predominantly fuel based, and where electricity needs are required it is expected that diesel generators would be utilised. Scope 2 emissions are more appropriate during the operational phase of the pipeline. Indirect emissions (Scope 3) would be present in the form of embedded emissions associated with construction materials such as steel and concrete used in the pipeline construction.

Construction within the Kurnell Refinery and along the Kurnell Right of Way is expected to take 10 months, with a subsequent 9 month construction timeframe at the Banksmeadow Terminal. Given the nature of the direct emissions (combustion of fuel), and the extent of the construction activities, GHG emissions during the construction phase are considered immaterial and have not been quantified.

16.4.2 Operational Phase GHG Emissions

Greenhouse gas emissions during operation of the pipeline are predominantly Scope 2. Scope 1 emissions would likely be generated from the combustion of fuel in vehicles used for maintenance activities, however these are considered negligible. Predictions of greenhouse gas emissions associated with power consumption in the pumps and motors has been estimated by Caltex for three scenarios. These scenarios are:

- Existing (current pumps and motors);
- Proposed (within the first year of operation 2012); and
- Future (increased fuel line capacity in 2020).

An emission factor of 0.9 tonnes (t) CO_2-e/MWh (DCCEE 2010a) has been adopted for estimation of Scope 2 emissions from the operational phase of the Project. Results are provided in **Table 16-2**.

Table 16-2 Operational Phase GHG Emissions

Scenario	Fuel Delivered (ML)	Power Consumption (MWh)	GHG Emissions (tCO2-e)	GHG Intensity (tCO2-e/ML)
Current	1,472	845	761	0.5
Proposed (2012)	2,000	4,223	3,800	1.9
Future (2020)	3,434	7,250	6,525	1.9

Operational GHG emissions have been estimated to increase from 761tCO_2-e to 3,800 tCO_2-e in 2012, and to 6,525tCO_2-e in 2020. GHG emission intensity has been estimated to increase from 0.5 to 1.9 tCO_2-e /MegaLitre (ML) of fuel transferred. These emissions are considered small relative to total emissions from the Caltex Kurnell Refinery[2].

Alternatives to the increased pipeline capacity would include transporting the fuel to the airport via road tanker. Predictions of greenhouse gas emissions associated with fuel combustion in road tankers has been predicted based on a round trip (to the airport and back) of 50 km, with an assumed tanker capacity of 30kL and a fuel consumption rate of 0.54L/100 km (CSIRO 2008). An emission factor of 69.6kg $CO_{2\text{-}e}$/Giga Joules (GJ) and energy content of 38.6GJ/kilo litre (KL) (Diesel Oil) from DCCEE 2010a. Emission estimations are provided in **Table 16-3**.

[2] Based on energy consumption of 26,100 GJ estimated for the Project in the future scenario when compared against the Kurnell Refinery energy consumption of 20,877,011 GJ, as reported for the 2009-2010 reporting year in the EEO program.

Table 16-3 GHG Emissions for Road Tankers Delivering Fuel

Parameter	Value	Units
Distance Travelled	50	Km/round trip
Fuel Consumption	0.54	L/km
	27	L/round trip
Energy Content	38.6	GJ/kL
Emission Factor	69.6	Kg/GJ
Tanker Capacity	30	kL
GHG Emissions	72.5	Kg/round trip
	2.4	$tCO_{2\text{-}e}$/ML

The greenhouse gas intensity of fuel delivery by tanker was estimated to be 2.4tCO_2-e/ML. This is similar in scale to the anticipated rate 1.9tCO_2-e per ML of fuel delivered through the KBL during operation of the Project.

16.5 Mitigation Measures

The assessment of GHG emissions during construction and operation of the Project are considered immaterial to minor. Mitigation measures for potential GHG saving opportunities would be outlined within the Construction Environmental Management Plan (CEMP) for the construction phase. The CEMP would incorporate procedures for maintenance and inspections of construction equipment to ensure equipment is of an appropriate size for the nature of the works, and is working in an efficient manner. Identification of energy efficiency saving opportunities would be conducted during the detailed design phase.

16.6 Statement of Commitments

Table 16-4 outlines the mitigation measures to be implemented through the life of the Project.

Table 16-4 Statement of Commitments – Greenhouse Gases

Mitigation Measure	Project Stage		
	Pre-construction	Construction	Commissioning & Operations
Equipment will be inspected and maintained to ensure efficient running and so it is appropriately sized for the task in hand.	✓	✓	
Local supplies and/or facilities will be utilised to minimise vehicle kilometres travelled (where reasonable and feasible)	✓	✓	
Energy efficiency opportunities will be identified and implemented (where reasonable and feasible) during construction and operation of the Project.	✓	✓	✓

17 Cumulative Impact Assessment

17.1 Introduction

The purpose of this chapter is to identify whether the Project is likely to have a significant cumulative impact with any other developments in the local area. An assessment of the cumulative impacts has been required by the DGRs as part of the detailed assessment of key issues involved with the Project.

17.2 Assessment Methodology

Cumulative Impact Assessment (CIA) is a receptor led assessment, i.e. in order to have a cumulative impact, two projects or impacts need to affect the same receptor. Cumulative impacts can be antagonistic, synergistic or additive. They are often caused by an action in combination with other past, present, and reasonably foreseeable future human actions.

In order for a Project to have an adverse cumulative impact, it must:

- have a residual adverse impact; and/or
- result in another project's mitigation measures being less effective.

Therefore the first stage in any cumulative impact assessment is to understand the adverse residual impacts the Project. The second stage is to identify any other projects nearby that may affect similar receptors and or affect the efficacy of each others mitigation measures. Other relevant projects that may have a cumulative impact with this Project have been identified using the following assessment parameters:

- Spatial parameter - The Project occurs in two LGAs, Sutherland Shire and the City of Botany. These two LGAs act as the spatial parameters for the cumulative impact assessment. The small scale of the works and the resulting minor impacts justify the use of a small spatial parameter. The EA has concluded that impacts relating to this Project are unlikely to affect any receptors beyond the local area.
- Temporal parameter- Projects that have been submitted for adequacy review, are on exhibition, have gained planning approval, or have gained planning approval but are not yet finish construction have been considered. Projects that have been constructed have been considered as part of the baseline for the assessment. Projects that are not submitted for adequacy review do not contain enough detail on residual effects or final design to allow a robust cumulative assessment to take place.

In order to identify relevant projects two databases were reviewed:

- Major Project Assessments register on the NSW DoP website; and
- Public notices and invitations to comment register on SEWPAC's website.

A review of these databases was considered the most effective way of identifying projects that are likely to have significant residual impacts, and therefore may have a cumulative effect with this Project.

17.3 Assessment of Impacts

17.3.1 Banksmeadow

The Botany Works are small is scale and any residual impacts are considered to be negligible provided that the relevant mitigation measures outlined within this EA are implemented. A lack of sensitive ecological or residential receptors close to Banksmeadow Terminal, combined with the small scale of the works, has result in no residual impacts.

A review of the other major projects close to Banksmeadow Terminal identified a number of works occurring at Orica Botany and the Port Botany Expansion project. These projects are unlikely to be affected by the small scale of Banksmeadow works and the Project will not adversely affect the mitigation measures for these projects. Therefore it can be concluded that the Banksmeadow works are unlikely to result in any adverse cumulative impacts.

17.3.2 Kurnell

The Kurnell works are larger in scale than the Botany works, but are still contained within the operational boundary of the Kurnell Refinery. At this stage, provided that the mitigation measures outlined within this EA are followed, it is unlikely that the Project will result in any adverse impacts.

A review of other major projects within Sutherland Shire identified a number of projects that were too far from the Kurnell works either to adversely affect mitigation measures, or affect the same receptor. Projects that were reviewed but not considered relevant due to distance included: Lucas Heights Alternative Waste project, Bangor Bypass, and Kareena Private Hospital. In addition, the Cronulla Marina, whilst close, is unlikely to affect the same receptors as the Project. Other projects were complete and/or are operational and have therefore not been considered as part of this cumulative impact assessment. The Botany Bay Cable Crossing project is close to the site, however construction work at Kurnell has now ceased and therefore it would not have a cumulative impact.

No major construction works are taking place at the same time close to Kurnell Refinery. Therefore no cumulative construction or operational impacts are expected.

17.4 Conclusions

Therefore it can be concluded that there is unlikely to be any cumulative impact from the Project.

18 Statement of Commitments

18.1 Introduction

The preceding chapters of this Environmental Assessment describe the potential impacts of the Project and identify a range of measures to manage risk, and mitigate or eliminate impacts. This chapter provides a summary of these mitigation measures in the form of commitments. It outlines how these commitments would be implemented and monitored through the Construction Environmental Management Plan (CEMP).

18.2 Statement of Commitments

The adoption of the mitigation measures discussed in **Chapters 6 - 17** is an important component of the Project and reinforces Caltex's commitment to mitigation and management of the environmental impacts identified in this EA.

Table 18-1 summarises these safeguard measures and sets out the timeframe for their implementation. These would be updated following the Exhibition of the EA and review of the submissions received.

Table 18-1 Statement of Commitments

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
General			
Caltex would carry out the construction and operation of the Project in accordance with the EA and the approval conditions.	✓	✓	✓
Caltex would implement all practicable measures to avoid, or minimise, any impacts to the environment that may arise from the construction and operation of the Project.	✓	✓	✓
Caltex would ensure that the Contractor prepares and implements a Construction Environmental Management Plan (CEMP) that would be reviewed and approved by an EMR.		✓	
Caltex would appoint an EMR to monitor the implementation of all environmental management measures. The Environmental Management Representative (EMR) would ensure that all mitigation measures are being effectively applied during construction and that the work is being carried out in accordance with the CEMP and all environmental approval and legislative conditions.		✓	
Caltex personnel would undergo training in accordance with the CEMP and any other training commitments agreed as part of Project Approval.		✓	
Soil			
A Site specific contamination management plan would be prepared.	✓	✓	
Any contaminated soils would be tested and disposed of within one month of excavation.		✓	
Soils would be tested for contamination as they are stockpiled. Any contaminated soils would be stored within Kurnell Refinery at least 800m from any properties within Kurnell.		✓	
Contaminated soil would be disposed of off-site to appropriately licensed landfill facility once it has been classified in accordance with the DECC, NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste		✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Any soil excavated and stockpiled on-site would be appropriately validated prior to reuse as backfill.		✓	
Stockpiled soils would be appropriately managed (in accordance with 'Blue Book' requirements to reduce the risk of soil erosion and/or dust creation and propagation. Silt fences would be installed around the stockpiles where necessary and stockpiles would be covered and wetted down as required.		✓	
A Preliminary assessment would be carried out to assess the presence of potential acid sulphate soils (PASS)	✓	✓	
An Acid Sulphate Soils Management Plan would be prepared in accordance with the Acid Sulphate Soil Manual (ASS Management Advisory Committee 1998) if ASS are encountered	✓	✓	
The pipeline would be maintained and repaired as required to ensure public safety, EPA licence compliance and to maintain high levels of system reliability.			✓
Ground and Surface Water			
The proposed relocation of pigging launching system from the Wharf to within the boundaries of the Kurnell Refinery avoids the risk of any pollution events affecting Botany bay.	✓		✓
Groundwater removed by dewatering, and any runoff that may accumulate in excavations, would be periodically tested for elevated levels over contamination. Any water removed by dewatering that was considered contaminated would be disposed of into the oily water system and treated in the Waste Water Treatment Plant (WWTP).		✓	
Clean water removed through the dewatering process would be collected and re-used onsite where possible to minimise discharges to the stormwater drainage system.		✓	
A Groundwater Management Plan (GWMP) would be developed to manage contaminated groundwater and prevent the infiltration of contaminated runoff. This plan would be included as part of the CEMP.	✓	✓	
Erosion control measures would be implemented at each work site as per **Chapter 6 Soil, Geology and Topography** for the EA		✓	
Any required dewatering activities would be carried out in strict compliance with NSW Office of Water licensing conditions.		✓	
In the event of prolonged wet conditions creating vulnerability for water quality impacts, Caltex would direct the contractor to cease work at any location where it is considered that there is a significant risk to water quality until conditions improve.	✓		
Platforms will be attached to the wharf as the new pipeline is installed to intercept any rust or metals falling from the works.		✓	
Spill teams will be placed along the route of the new pipeline as it is hydro-tested to check for leaks and ensure a swift response in the unlikely event of a leak.		✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Ecology			
Flora Management			
A Weed Management Plan will be developed as part of the CEMP if noxious/ exotic weeds are identified on site during construction. This plan would include: • wash down procedures to reduce the spread of weeds via vehicles and machinery; • target areas of potential new outbreaks including soil stockpiles and any other disturbed areas; • recommend measures including cleaning of vehicle tyres before leaving a property, cleaning of footwear and minimising soil movement between locations; • monitoring programs for noxious and problematic weeds on sites and in the surrounding areas; and • measures to mitigate noxious and problematic weeds, should they be found, would be in accordance with the DII specifications for the Sutherland Shire and Botany Bay Council area.		✓	
Standard industry measures for sediment runoff on urban developments would be implemented according to the '*The Blue Book* Volumes 1 and 2 (Landcom 2004), and *Managing* Urban Stormwater: Soils and Construction Volume 1, and (DECC, 2008). Specifically, sediment and pollutant run-off controls would be managed to protect sensitive ecological receptors in adjacent areas to the footprint. Management methods would include: • stockpiling to be appropriately sediment fenced to avoid scouring and runoff into adjoining creeklines and vegetated areas; • if excavated soils are found to be contaminated they would be removed from site as soon as possible and taken to an appropriate waste facility. In circumstances where soils need to be temporarily stored on site, contaminated materials would be stockpiled on non-permeable sheeting and covered with plastic sheeting to prevent infiltration of rain water and possible run-off; and • wash down protocols of construction vehicles and machinery to prevent the spread of root-rot fungus (*Phytophthora cinnamomi*).		✓	
Fauna Management			
Frog-friendly and wetland friendly herbicides such as Roundup Biactive or Weedmaster DUO will be used for the control of noxious weeds.		✓	✓
Wash down protocols In accordance with DECCW guidelines (DECC, 2008b) to prevent the spread of amphibian chytrid disease *chytridiomycosis* would be included. Wash down would occur whenever vehicles enter or leave an excavation area.		✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Indigenous Heritage			
Should any previously unidentified Aboriginal objects or sites be uncovered during the course of construction, work in that area would cease and DECCW would be informed to seek advice on how to best proceed. If burials are uncovered, the NSW police would be informed immediately. Should the remains be then identified as archaeological in context, DECCW would be informed to clarify how to best proceed.		✓	
Non-Indigenous Heritage			
Burying and returfing the new pipeline with existing soil, where possible, through the Kurnell Refinery right of way.		✓	
Traffic and Transport			
Vehicle movements would be limited to the designated routes to minimise impacts to road users caused by the Project.	✓		
All construction traffic will drive in a safe and responsible manner at all times to reduce the risk of accidents occurring.		✓	
Local Government councils and local residents will be contacted for concurrence to any work which will affect the road network.		✓	
A Traffic Management Plan will be developed for the construction phase. The Traffic Management Plan will comply with all relevant Regulations and By-Laws and in particular address safe access and egress to the public road network.	✓	✓	
Noise			
A Construction Noise and Vibration Management Plan (CNVMP) would be developed and included in the CEMP for the Project.	✓	✓	
Low-noise plant and equipment would be selected in order to minimise potential for noise and vibration, all equipment would be regularly checked to ensure that the mufflers and other noise reduction equipment is working correctly.		✓	
Alternatives to reversing alarms and horns, such as manually adjustable or ambient noise sensitive types (“smart” reversing alarms) and closed circuit TV systems would be considered.		✓	
Equipment would be located to take advantage of the noise screening provided by existing site features and structures, such as embankments, storage sheds and/or boundary fences.		✓	
Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register would be maintained.		✓	
Any noise complaint(s) would be investigated immediately and noise monitoring would be undertaken to ascertain the extent of any exceedance at the locations concerned. Reasonable and feasible measures would then be implemented to reduce noise impacts.		✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Construction works would be carried out during the hours of 7.00am to 6.00pm Monday to Saturday, except for: • The delivery of materials which is required outside these hours as requested by the RTA or other authorities for safety reasons; • Emergency work to avoid the loss of lives, property and/or prevent environmental harm; • Any works which do not cause emissions to be audible at any nearby residential property; • any other work as agreed through negotiations between Caltex and potentially affected noise receivers. • Work outside standard hours would require the formal written consent of Caltex.		✓	
Construction work outside standard hours requires a further noise reduction to meet the noise management level of 35 dB(A). Further reduction in noise levels can be achieved by programming quieter works during these hours: • by reducing number of truck movements and equipment used at the same time on site; and • not operating noisy equipment such as a bulldozer.		✓	
Construction stages would be scheduled to minimise the multiple use of the noisiest equipment or plant items near noise sensitive receptors.	✓	✓	
Plant items would be strategically positioned to reduce the noise emission to noise sensitive receptors, wherever possible.	✓	✓	
Awareness training of staff and contractors in environmental noise issues would be undertaken.		✓	
Any equipment not in use for extended periods during construction work would be switched off.		✓	✓
Heavy vehicle entry and exit from site would be restricted to the nominated construction hours, except where the RTA or other authorities require movements to be outside these hours.		✓	
Should any unexpected construction activities occur which could potentially generate significant noise not described in this report, monitoring would be undertaken to ensure equipment noise emission levels do not deteriorate.		✓	
Where noise level exceedances cannot be avoided, consideration would be given to applying time restrictions and/or providing quiet periods for nearby residents.		✓	
Air Quality			
Vehicles on the right of way would be subject to a speed limit of 10km/h		✓	
Vehicle movements on unsealed roads would be minimised where practical.		✓	
Haul vehicle tailgates would be properly sealed, such that they do not deposit loose dirt onto the road surface.		✓	
Vehicles would be loaded to less than the height of the side and tailboards, and loads of fill will be covered during transport.		✓	
Any soil adhering to the undercarriage and wheels of trucks would be removed prior to departure from the site.		✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
All vehicles would travel on designated roadways where feasible.		✓	
Vehicles would not be left with engines idling for extended periods.		✓	
Vehicles would be properly maintained to operate in an efficient manner.		✓	
Material transfer requirements would be optimised through excavation planning, such that material double handling will be avoided where possible and work areas will be minimised.	✓	✓	
Soils would be tested for contamination and odour as they are stockpiled. Material deemed to be contaminated or odorous would be stored within the refinery at a distance of over 800m from the nearest residential property in Kurnell.		✓	
Stockpiles within along the proposed pipeline route would be monitored for odour.		✓	
Excavation rates would be controlled in order to manage potential VOC and odour emissions.		✓	
Where visible dust emissions are present during unloading/loading events near to sensitive receptors, water sprays and/or mists would be used.		✓	
Operations would be minimised or ceased during undesired weather conditions or forecasts (e.g. periods of high winds) near sensitive receptors or when offensive odours are noticed by receptors.		✓	
In unfavourable weather conditions (e.g. dry and windy conditions), water sprays would be used to dampen down soils prior to excavation and handling in locations likely to impact on sensitive receptors. Exposed surfaces and stockpiles would also be watered, sprayed or covered where required, to minimise nuisance dust to sensitive receptors.		✓	
Soil stockpiles would be covered as required.		✓	
Works will be undertaken during favourable meteorological conditions.		✓	
Exposed soil on completed areas would be re-vegetated.		✓	
Workers would maintain a visual awareness of dust emissions.		✓	
Excavations would be inspected for hydrocarbon odours.		✓	
In the Right of way, portable aerosol monitoring (e.g. DustTrak) would be used to monitor particulate matter levels where dust emissions are present near to residential receptors.		✓	
VOC monitoring would be used near to excavations.		✓	
Hazard and Risk			
All pipes outside of contained areas will be full welded not flanged.		✓	
Emergency Response Plans for Kurnell Refinery, Banksmeadow Terminal and the KBL will be updated prior to the Project being commissioned.	✓	✓	
The final Fire Safety Study will be reviewed prior to the Project being commissioned to ensure that any further risk reduction measures are appropriately implemented.	✓	✓	

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Greenhouse Gas			
Equipment will be inspected and maintained to ensure efficient running and so it is appropriately sized for the task in hand.	✓	✓	
Local supplies and/or facilities will be utilised to minimise vehicle kilometres travelled (where reasonable and feasible)	✓	✓	
Energy efficiency opportunities will be identified and implemented (where reasonable and feasible) during construction and operation of the Project.	✓	✓	✓

18.3 Environmental Management

The Project would require the preparation of a Construction Environmental Management Plan (CEMP). The CEMP will cover all environmental aspects associated with the construction of the Project and will include the controls and mitigation measures identified in the Environmental Assessment approval.

Caltex maintains high environmental standards when undertaking all its activities and has an Environmental Management System accredited to ISO14001.

This system ensures that:

- all work complies with all relevant environmental statutes, regulations and standards;
- environmental factors are taken into account for each activity; and
- regular audits are performed to confirm compliance with environmental policies and standards.

Caltex will appoint an independent Environmental Management Representative (EMR) to regularly audit the work activities to ensure that all mitigation measures are being effectively applied and that the work is being carried out in accordance with the CEMP and all environmental approval and legislative conditions.

18.4 CEMP Outline

The CEMP outlines the procedures that would be implemented to address and manage environmental impacts associated with construction of the Project. The CEMP shall be prepared by the Contractor engaged by Caltex to carry out the construction works.

The primary purpose of the CEMP is to provide a reference document that ensures that the safeguards and mitigation measures specified as part of the Project approval are being implemented and monitored. The CEMP shall outline the key steps to be taken by all site personnel to manage the environmental hazards and risks associated with the Project and to effectively minimise the potential for environmental harm. The CEMP will be subject to the EMR review prior to commencement of construction works and ongoing throughout the construction period.

The CEMP shall include the following:

- a description of the proposed construction works;
- an outline of the proposed construction program;
- statutory requirements – licences and approvals required;
- standards and/or performance measures for the relevant environmental issues associated with the construction work;

- a description of what actions and measures will be implemented to mitigate the potential impacts associated with the construction works and ensure that these works will comply with the relevant standards and/or performance measures;
- a description of the procedures to ensure all employees are trained in regards to their responsibilities under the CEMP;
- a description of the procedures that will be implemented to register, report and respond to any complaints during the construction work;
- a description of the procedures that will be implemented to manage any environmental incidents and associated reporting requirements;
- identification of key personnel who will be involved in the construction works, and provide their contact numbers;
- monitoring procedures and a description of the process to be followed if any non-compliance is detected; and
- detailed:
  - Waste Management Plan;
  - Contamination Management Plan;
  - Acid Sulfide Soil Management Plan;
  - Erosion and Sediment Control Plan;
  - Groundwater Management Plan;
  - Flora Management Plan;
  - Fauna Management Plan;
  - Weed Management Plan (if required);
  - Traffic Management Plan; and
  - Air Quality Management Plan.

These items are consistent with the commitments presented in **Table 18-1**.

19 Project Evaluation & Justification

This chapter provides an evaluation of the Project and outcomes of this Environmental Assessment, including discussion of the Project's justification. The chapter also provides:

- a risk assessment;
- an assessment of the Project against the principles of Ecologically Sustainable Development;
- a description of the Project's benefits;
- consideration of the consistency of the Project with the objects of the EP&A Act; and
- the justification for the Project.

19.1 Environmental Risk Analysis

This section has been included to address the DGRs that the EA must include *'a General Environmental Risk Analysis*' (ERA).

An initial qualitative environmental scoping exercise was completed for the Preliminary Environmental Assessment (PEA). This exercise identified the key environmental issues for the Project and described them within the PEA. The DGRs issued for the Project confirmed this scope. As result of the DGRs, desk-top studies, modelling and targeted field investigations were undertaken. These studies identify key issues, which have been considered as part of the Project through the Environmental Assessment process.

The EA process has confirmed the potential environmental impacts associated with the Project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures.

An ERA was undertaken using the methodology described below to determine the risk associated with each environmental issue. The ERA has been based upon the methodology outlined in Standards Australia's document *Environmental Risk Management – Principles and Processes and Australian Standard AS/NZ 4360 Risk Management*.

The analysis categorised levels of risk for a given event based on the significance of effects (consequences) and the manageability of effects (probability). The measures of probability categories and the measures of consequences categories as well as the risk ranking matrix are detailed in **Tables 19-1**, **19-2** and **19-3** below.

Table 19-1 Measures of Probability Categories for ERA

Rank	Probability	Description
A	Almost Certain	Happens often and is expected to occur
B	Likely	Could easily happen and would probably occur
C	Possible	Could happen and has occurred elsewhere
D	Unlikely	Unlikely to happen but may occur
E	Rare	Could happen, but only in extreme circumstances

Table 19-2 Measures of Consequence Categories for ERA

Rank	Consequence	Description
1	Extreme	Permanent and catastrophic impacts on the environment; Large impact area; reportable incident to external agency; large fines and prosecution; operational Constraints; substantial community concern.
2	Major	Permanent and detrimental impacts on the environment; large impact area; reportable incident to external agency; may result in large fines and prosecution; operational constraints; high level of community concern.
3	Moderate	Substantial temporary or minor long term detrimental impacts on the environment; moderate impact area; reportable incident to external agency; action required by reportable agency; community interested.
4	Minor	Minor detrimental impacts on the environment; small impact area; reportable incident internally; no operational constraints; some local community interest.
5	Low	Nil or temporary impacts on the environment; small or isolated impact area; not reportable incident; no operational constraints; uncontroversial project no community interest.

Table 19-3 Risk Matrix for ERA

		CONSEQUENCES				
		1 Extreme	2 Major	3 Moderate	4 Minor	5 Low
Probability	A (Almost Certain)	VH	VH	H	H	H
	B (Likely)	VH	VH	H	H	M
	C (Possible)	VH	VH	H	M	L
	D (Unlikely)	H	H	M	L	L
	E (Rare)	H	H	M	L	L

Risk Matrix is defined as follows: VH = Very High, H = High, M = Medium and L = Low.

Taking into account the Project's design, mitigation measures described in **Chapters 6-17** and the commitments provided in the **Chapter 18 Draft Statement of Commitments**, **Table 19-4** provides an assessment of the mitigated risks associated with the Project, or the residual risk analysis. This has been completed for each potential environmental impact identified in **Table 19-4** based on the likelihood of occurrence and potential environmental consequence.

Table 19-4 Environmental Risk Analysis

Environmental Issue	Chapter Reference	Potential Impacts	Actions/Proposed Mitigation Measures	Probability	Consequence	Risk
Soils, Geology & Topography	Chapter 6	Contaminated soil may be encountered during construction.	A number of mitigation measures regarding the management of contaminated soils, odour, dust, acid sulphate soils and stockpile management have been recommended (refer to **Section 6.5** of **Chapter 6 Soils, Geology and Topography**).	C	4	M
		Contamination has the potential to spread		D	4	L
		Odours may be generated during disturbances of contaminated soils.		C	4	M
		Acid Sulfate Soils may be encountered during construction.		D	3	M
		Spills and leaks during construction could affect soils.		D	4	L
Surface Water	Chapter 7	Soil erosion could result in high levels of sediments in run off.	The following measures would be implemented to mitigate any impacts on surface water and groundwater: • Implementing the measures outlined in Managing Urban Stormwater – Soils and Construction, Volume 1 & 2; • Keeping hardstanding areas clear during works; • Using interception techniques (silt fences, platforms etc.) to collect any potential pollutants; • Managing stockpiled soils appropriately and using dust suppression measures;	D	4	L
		Water quality could be lowered by the release of various pollutants and/or acid sulfate soils.		D	3	M
Groundwater	Chapter 7	Pollution of clean groundwater by pollutants and contamination.		D	4	L

Environmental Issue	Chapter Reference	Potential Impacts	Actions/Proposed Mitigation Measures	Probability	Consequence	Risk
		Interception of contaminated groundwater during construction.	• Identifying and managing Acid Sulfate Soils; • Developing a Groundwater Management Plan for the Project as part of the CEMP; • Testing and where necessary treating and disposing of contaminated groundwater; • Inspection and maintenance of drainage systems and any control structures.	D	3	M
		Generation of waste water through dewatering activities.		D	4	L
Ecology	Chapter 8	Minor vegetation clearance.	The measures mentioned in Chapters 6 and 7 will help mitigate any pollution, sedimentation and contamination impacts. In addition a Flora Management Plan and a Fauna Management Plan will be incorporated into the CEMP. Wash down protocols will ensure that any spread of certain invasive species is limited. Vegetation that is cleared on the right of way will be reinstated.	E	5	L
		Pollution of soils and water leading to adverse effects on species and habitats.		D	3	M
Indigenous Heritage	Chapter 9	No Impacts are expected.	Should any aboriginal objects or relics be uncovered during the course of construction, then work would cease and DECCW would be consulted on how best to proceed.	E	5	L
Non-Indigenous Heritage	Chapter 10	No Impacts are expected	N/A	N/A	N/A	N/A
Traffic and Transport	Chapter 11	Small increases in road traffic movements in relation to the construction phase.	A Traffic Management Plan would be developed for the construction phase, which would be included within the CEMP. The Traffic Management Plan would comply with all relevant Regulations and By-Laws and in particular address 'long' and 'heavy' load movement requirements and safe access and egress off the public road network.	C	5	L

Environmental Issue	Chapter Reference	Potential Impacts	Actions/Proposed Mitigation Measures	Probability	Consequence	Risk
Noise	Chapter 12	Construction noise impacts on nearby residential receivers from the Kurnell works.	Construction works would generally be carried out during 7.00am to 6.00pm Monday to Saturday. Construction stages would be scheduled to minimise the multiple use of the loudest equipment or plant items near noise sensitive receptors. A construction noise and vibration management plan would be implemented for the construction phase of the Project. Community consultation would take place to help avoid or resolve any concerns.	C	4	M
Air Quality	Chapter 13	Dust and other particulate emissions from construction activities.	An Air Quality Management Plan will be included within the CEMP. This plan will include a number of mitigation and monitoring measures. Appropriate stockpile management techniques and measures to reduce the dust from construction vehicles will be implemented. Exposed soils will be revegetated.	3	D	M
		VOC and Odour emissions.		4	D	L
Hazard & Risk	Chapter 14	Leaks of jet fuel from the Project igniting and resulting in fire events.	Numerous precautions and safety measures have been put into place to ensure that the likelihood of any impact is low. All emergency plans will be reviewed prior to the Project being commissioned.	E	5	L
Socio Economic	Chapter 15	Increased efficiency at Sydney Airport	None required	B	3	H
Green House Gas	Chapter 16	No Impacts are expected	Energy efficiency opportunities will be identified and implemented where feasible.	N/A	N/A	N/A

19.1.1 Summary of Risk Analysis

As per the DGRs, all identified risks have been included in the EA and an appropriate level of impact assessment has been undertaken.

The Residual Risk Analysis outlined in **Table 19-4** identified that the residual risk of contamination being identified remains high. However provided the measures suggested in the EA are implemented, any contaminated soils or water will be managed appropriately and no impacts are expected. Noise will also be an issue during construction at Kurnell. However, these impacts will be limited to daytime hours only and mitigation measures will ensure that any impact is minimised.

The Residual Risk Analysis demonstrates that the proposed safeguards and management measures are anticipated to reduce the risk, but that residual risk remains for some potential impacts. These residual risks have been addressed through the mitigation measures proposed in the respective chapters within the EA. Particular attention to these potential impacts would be taken in the detailed design phase of the Project.

19.2 Ecologically Sustainable Development

This section provides a review of the Project, its impacts and associated safeguards against the principles of Ecologically Sustainable Development (ESD) in accordance with the *Environmental Planning and Assessment Regulation 2000*. The principles, as listed in the Regulation, are as follows:

a) *"The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*

b) *Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;*

c) *conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration; and*

d) *improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services."*

19.2.1 Precautionary Principle

The precautionary principle deals with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

An EA is a public procedure, involving the examination of the potential effects of the proposed development. Therefore the EA process is precautionary in nature. The requirement to assess the environmental impact of the proposal is a form of regulation designed to identify and address uncertainty about the effects of the proposed development.

For the proposed Project, Caltex has commissioned specialists to undertake detailed assessments on a range of environmental aspects identified during the consultation and risk assessment phases. These assessments provide sufficient scientific understanding of the Project and the surrounding environment to enable the Minister to make a decision consistent with this principle.

Project Objectives

The Project has been designed to include a number of internal and external design elements to reduce the risk of any potential impacts, or avoid potential incident scenarios from occurring. The Project is also designed to ensure that compliance with environmental criteria, community expectations, as well as all relevant statutory requirements is achieved through appropriate design and mitigation measures.

Design Safeguards

A number of design safeguards were incorporated during the initial design stage in response to the Precautionary Principle. These design features and modifications included the following:

- The area of the Project does not extend beyond either the Kurnell Refinery site or the Banksmeadow Terminal site.
- Safeguards have been introduced regarding the treatment of contaminated soil and water to ensure the containment of any by-products of the production or transportation of jet fuel within the site.
- Measures to reduce the risk associated with any leaks or incidents have been implemented to reduce any Project risks.

Construction and Operational Principles

Should the Project be approved, the safeguards and mitigations included in this EA, together with the Statement of Commitments (SoC) would form the basis of a Construction Environmental Management Plan (CEMP). Monitoring programs would be developed, to address the specific content requirements within the Project Approval.

19.2.2 Inter -Generational Equity

Inter-generational equity requires the present generation pass onto the next generation an environment that does not limit the ability of future generations to attain a quality of life at least equal to that of the current generation.

Through the design of the Project, the implementation of operational safeguards mitigating any short-term or long-term environmental impacts, and the proposed rehabilitation of any disturbed areas, inter-generational social equality impacts have been addressed. Examples of matters that are relevant to the various stages of the Project are described below.

Project Objectives

The objectives of the Project are to ensure the continued operational effectiveness of Sydney Airport through increasing the reliability of the supply of jet fuel. A more reliable supply of jet fuel to the airport will allow one of New South Wales' key employers to maintain its economic position in the future. Equally, this work is small in environmental terms and would result in a cleaner environment if any contamination is removed. Therefore the Project is likely to provide a cleaner environment for future generations.

Design Principles

The Project would maintain inter-generational equity by ensuring components of the existing bio-physical, social and economic environment available now would also be maintained for future generations. Relevant design considerations include the following:

- ensuring that any areas of vegetation that are disturbed along the right of way are reinstated once the construction phase is complete;
- ensuring that no ecology or heritage features are impacted as a result the construction and operational phases of the Project;
- reducing potential contamination by managing pollution risks during construction and removing any contamination that is found as part of the works;
- establishing and implementing of noise and air quality controls; and
- a 'whole of life' approach to the Project to benefit future generations (e.g. positive socio economic impacts).

Construction and Operational Principles

Caltex would continue to maintain inter-generational equity through the safeguards identified in this EA, including but not limited to the following:

- ongoing consultation and engagement with the local community to provide an opportunity to ask questions and identify and manage areas of concern; and
- development of an appropriate environmental protocols in consultation with relevant State agencies.

19.2.3 Conservation of Biological Diversity and Ecological Integrity

The Environmental Assessment assesses the ecological impacts of the Project with regard to both Commonwealth and NSW planning and environmental legislation. This includes guidelines for biodiversity impact assessment under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act), which requires that the Project is required to meet the 'improve or maintain' principle.

The ecological impact assessment concluded that the Project is unlikely to cause an ecological impacts provided that certain mitigation measures were followed.

Design Principles

As part of the planning for the Project, the following design features were incorporated to minimise the impact of the proposed activities on the biodiversity and ecological integrity of the locality:

- the location of the Project does not directly impact any important ecological areas or threatened ecological species or communities; and
- mitigation measures would be put into place that reduce the likelihood of any indirect ecological impacts affecting any threatened ecological species or communities.

In addition to these design features, flora and fauna management plans would be incorporated into the final CEMP.

Management and Operational Safeguards

The Project would not have an adverse impact on ecology during operation. Both the Kurnell Refinery and Banksmeadow Terminal operate in line with existing legislation and guidance to ensure that the risk of any potential impact on the local environment is minimised.

19.2.4 Improved Valuation and Pricing of Environmental Resources

This ESD principle is premised on an assumption that all resources should be appropriately valued based upon a full life cycle consideration of those resources.

Project Objectives

The Project will provide value to the local and State economy whist at the same time not compromising the natural value of the local environment and the services it provides.

Conclusion

The value placed by Caltex on environmental resources is evident from the extent of site-specific investigations, planning and environmental safeguards and measures that have been undertaken and which would be implemented to prevent irreversible damage to the local environment.

19.2.5 Compatibility with the Principles of ESD

The approach taken in planning the Project has been multi-disciplinary, involving consultation with stakeholders and various government agencies. Emphasis has been placed on the avoidance of impacts through careful design as well as management and mitigation measures to minimise potential negative environmental, social and economic impacts, during construction and operation. The principles of ESD have been incorporated into every stage of the Project.

19.3 Objects of the Environmental Planning & Assessment Act 1979

As required by the DGRs issued for this Project, consideration has been given to the consistency of the Project with the objects of the EP&A Act as outlined below.

a) to encourage:

i. the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.

The Project would facilitate the proper management of resources by improving the efficiency of Sydney Airport by increasing the amount of jet fuel that can pass through the KBL. It would ensure that in the medium term no other, potentially more environmentally harmful development, would be required to allow the airport to operate efficiently. Equally the Project will allow the airport to remain operational, safeguarding the various jobs that it provides, thereby promoting the social and economic welfare of the community.

ii. the promotion and coordination of the orderly and economic use and development of land.

As noted in **Chapter 16 Hazards and Risks**, the future development of land close to Kurnell Refinery or Banksmeadow Terminal will not be jeopardised by the Project. Indeed the Project will help promote existing land uses by helping maintain the existing Caltex and airport facilities.

The Project would not significantly affect the future orderly use or development of land as it does not compromise any existing LGA Planning Policy.

iv. the provision of land for public purposes.

The Project would not directly impact on the provision of land for public purposes.

v. the provision and coordination of community services and facilities.

The Project would not impact on the provision of existing community services and facilities.

vi. the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.

The Project would not directly or indirectly impact any threatened species, populations and ecological communities, and their habitats. Equally the numerous mitigation measures outlined within this EA, would ensure that any impact on native plants and animals would be unlikely.

vii. ecologically sustainable development.

An assessment of the Project against the principles of ecologically sustainable development has been undertaken in **Section 19.2** above.

viii. the provision and maintenance of affordable housing.

The Project would not impact on the provision or maintenance of affordable housing.

b) To promote the sharing of the responsibility for environmental planning between the different levels of government in the State.

The Project is to be assessed under Part 3A of the EP&A Act. The Minister for Planning assesses Part 3A Project applications. Input into the Director-General's Requirements were obtained from the relevant NSW Government departments, agencies and stakeholders. Sutherland Shire and City of Botany Councils have been consulted as the Project has progressed.

c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.

Caltex has undertaken consultation activities to inform and receive feedback from the public and government agencies as the Project has progressed. In addition, the EA would be placed on public exhibition by the NSW DoP for a minimum of 30 days. In accordance with the requirements of the EP&A Act, stakeholders and the public are invited to make submissions. This process provides further opportunity for public involvement and participation in the environmental planning and assessment process for this Project.

19.4 Project Justification

The reliability of the jet fuel supply to Sydney Airport has been inconsistent over the past decade. This has resulted in jet fuel rationing at the airport, which in turn has affected the efficiency of the facility. In order to provide a solution, a working group was established to investigate the issue. This working group identified a number of potential solutions, one of which, this Project, was investigated further by Caltex.

A secure and sufficient fuel supply is considered a prerequisite to the continued successful operation of the airport. The success of the airport has a direct impact on the NSW and Australian economies, contributing an estimated 6% and 2% respectively to those economies as well as some 131,000 jobs indirectly. It is expected to generate an additional 100,000 jobs over the next 10 years.

By increasing the reliability and efficiency of jet fuel supply to the airport, this Project would contribute to ensuring that the airport will remain efficient and operational over the short, medium and long term. It therefore, in turn, helps to maintain the existing jobs at the airport and indirect jobs associated with it. It also will play a role in future job creation at the airport as well as providing approximately $31 million to the local economy.

As noted above, the environmental impacts related to the Project are not significant and can be managed through accepted mitigation measures. Key impacts relate to noise and soils. These impacts are only likely during the short construction phase, and can be mitigated by implementing the measures outlined in **Chapter 18 Statement of Commitments**. No impacts on any heritage or ecology features are expected. The PHA also concluded that the overall risk associated with the Project is low and does not introduce an excessive additional risk to the surrounding area.

19.5 Conclusion

The EA provides a comprehensive assessment of the Project and includes investigations regarding all relevant environmental issues.

Potential adverse impacts have been assessed and strategies to avoid, minimise and mitigate those impacts form a key part of the EA. The Project includes a number of commitments to manage environmental impacts during its construction and operation.

The Project has, to the extent feasible, been designed to address the issues of concern to the community and Government. This EA has identified the Project should proceed because it would:

- result in no long term impacts on the environment or local community;
- provide an increased jet fuel supply to Sydney Airport;
- provide local employment opportunities and result in positive economic impacts;
- potentially reduce contamination on the Kurnell Refinery and remove the risks associated with having the KBL pigging station located on the wharf;
- satisfy sustainable development principles.

This EA has highlighted a range of issues which would be addressed through the careful design and operation of the Project.

On the basis of the studies detailed within the Environmental Assessment, and with the implementation of the recommended mitigation measures, the Project is considered to be justified.

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