

ENVIRONMENTAL IMPACT STATEMENT



VOLUME 1

Main Report

May 2013

Kurnell Refinery Conversion

URS



CALTEX

Statement of Validity

Submission of Environmental Impact Statement

Prepared as 'State Significant Development' under Part 4 of the *Environmental Planning and Assessment Act 1979* and under the *State Environmental Planning Policy (State and Regional Development 2011)* (SEPP SRD).

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In respect of

Applicant and Land Details

Applicant	Caltex Refineries (NSW) Pty Ltd 2 Solander Street, Kurnell, NSW, 2231
Subject Site	Caltex is seeking development approval to convert the existing Kurnell Refinery into a Finished Product Terminal.
Project Summary	The Project would include modifications to the existing Kurnell Refinery to convert it to a working finished product terminal. The proposed terminal would manage a nominal maximum of 925 ML of the following products: • Gasoline – Unleaded Petrol (ULP), Premium Unleaded Petrol (PULP) and Super Premium Unleaded Petrol (SPULP); • Diesel; • Jet Fuel; and • Fuel Oil. The terminal would also manage the following by-products: • Slop; and • Wastewater. The Project would involve the conversion of tanks and installation of pipelines within the Project Area to allow for the expansion of terminal operations. All Project related works would take place within the existing boundary of the Refinery site.

Lot and DP	Lot 56/ DP 908; Lot 57/ DP 908; Lot 62/ DP 908; Part Lot 11/ DP 7632; Part Lot 12/ DP 7632; Lot 189/ DP 7632; Lot 190/ DP 7632; Lot 43/ DP 8135; Lot 44/ DP 8135; Lot 45/ DP 8135; Lot 46/ DP 8135; Part Lot 77/ DP 8135; Lot 78/ DP 8135; Lot 79/ DP 8135; Part Lot 122/ DP 8135; Part Lot 123/ DP 8135; Part Lot 124/ DP 8135; Part Lot 125/ DP 8135; Lot 48/ DP 9564; Lot 77/ DP 9564; Lot 78/ DP 9564; Lot 81/ DP 9564; Part Lot 1/ DP 215818; Part Lot 2/ DP 215818; Lot 1/ DP 215819; Lot B/ DP 338897; Lot D/ DP 361103; Part Lot F/ DP 361103; Lot G/ DP 361103; Lot J/ DP 362655; Lot K/ DP 362655; Lot H/ DP 362655; Lot 570/ DP 752064; Lot 24/DP 776328; Lot 1/ DP 1044690; Lot 25 / DP 776328; Lot 283 / DP 752064; and Lot 1 / DP 132055.
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Environmental Impact Statement

An Environmental Impact Statement (EIS) is attached. The EIS assesses the environmental impacts of this Project and includes the matters referred to in Director-General's Requirements provided to the Proponent on the 1st December 2011 under Section 89G of the *Environmental Planning and Assessment Act 1979*.

Declaration

I certify that I have prepared the contents of the EIS in accordance with the requirements of the Environmental Planning and Assessment Act 1979 and Regulation and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Signature:



Name:

WILLIAM MILES

Date:

May 2013

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Appendix H	Heritage Impact Assessment
Appendix I	Ecology Impact Assessment

Limitations

URS Australia Pty Ltd (URS) has prepared this Environmental Impact Statement (EIS) in accordance with the usual care and thoroughness and based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this EIS.

This EIS has been produced in accordance with the stipulations in the *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000*.

Where this EIS indicates that information has been provided to URS by third parties, URS has made no independent verification of this information except as expressly stated in the EIS. URS assumes no liability for any inaccuracies in or omissions to that information.

This EIS was prepared between October 2012 and May 2013 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This EIS should be read in full. No responsibility is accepted for use of any part of this EIS in any other context or for any other purpose.

Notes on Text

As a determination of the Project will only be made after the Environmental Impact Statement has been on public display and submissions considered, the future consolidated tense is used throughout this Environmental Impact Statement when describing the proposed works, alternatives and assessing impacts. “Would” is, therefore, used throughout the text in preference to “will”.

If all approvals are given for the proposed works to proceed, where applicable, all “would” references should be interpreted as “will”, subject to final conditions of consent.

Abbreviations

Abbreviation	Description
AADT	Annual Average Daily Traffic
ABL	Assessment Background Level
ACP	Aggregate Consequence Plot
AHC Act	<i>The Australian Heritage Council Act 2003</i>
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information System
ANZECC	Australia and New Zealand Environment Conservation Council
ANZECC/ARMCA NZ	<i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)</i>
AORA Act	<i>The Australian Oil Refining Agreements Act 1954</i>
AOS	Assessments of Significance
AQIA	Air Quality Impact Assessment
AQMP	Air Quality Management Plan
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acid Sulfate Soils
AWS	Automatic Weather Stations
BA	<i>Birdlife Australia, the New Atlas of Australian Birds 1998-2012</i>
BAT	Best Available Technology
bgs	below ground surface
BoM	Bureau of Meteorology
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BWMP	Biodiversity and Weed Management Plan
CBD	Central Business District
CCO	Chemical Control Orders
CEMP	Construction Environmental Management Plan
CHL	Commonwealth Heritage List
CIA	Cumulative Impact Assessment
CLM Act	<i>Contaminated Land Management Act 1997</i>
CLOR	Caltex Lubricant Oil Refinery
CMA	Catchment Management Authority
CMZ	Contamination Management Zone
CO ₂	carbon dioxide
CO ₂ -e	carbon dioxide equivalent
COAG	Council of Australian Governments
COPC	Contaminants of Potential Concern
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DA	Development Application

Abbreviation	Description
dB	Decibel
DCP	Development Control Plan
DECC	NSW Department of Environment and Climate Change (now NSW EPA)
DGRs	Director General's Requirements
DIPNR	Department of Infrastructure, Planning and Natural Resources
OP	Draft Economic Evaluation in Environmental Impact Assessment
DP	Deposited Plan
DP&I	NSW Department of Planning and Infrastructure
DSEWPac	Australian Government Department of Sustainability, Environment, Water, Population and Communities
DUAP	Department of Urban Affairs and Planning
EC	European Commission
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Representative
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000 (NSW)</i>
EPA	Environmental Protection Agency
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (C'th)</i>
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ERA	Environmental Risk Analysis
ESA	Environmental Scoping Assessment
ESD	Emergency Shut Down
FM Act	<i>Fisheries Management Act 1994</i>
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
HAZID	Preliminary hazard identification
Heritage Act	<i>The Heritage Act 1977</i>
ha	Hectares
HHIMS	Historic Heritage Information Management System
HHRA	Human Health and Ecological Risk Assessment
HIA	heritage impact assessment
HIPAP No. 4	<i>Hazardous Industry Planning Advisory Paper No. 4</i>
HIPAP No. 6	<i>Hazardous Industry Planning Advisory Paper No. 6</i>
HNCMA	Hawkesbury-Nepean Catchment Management Authority
HSLs	Health Screening Levels
IAS	Industrial Archaeological Sites List
ICNG	Interim Construction Noise Guidance

Abbreviation	Description
IFHs	Isolation Flux Hoods
INP	NSW Industrial Noise Policy
JUHI	Joint User Hydrant Installation
KTPs	Key Threatening Processes
LALC	La Perouse Local Aboriginal Land Council
LGAs	Local Government Areas
LIN Peak	Linear Peak
LNAPL	Light Non-Aqueous Phase Liquid
LOS	Level of Service
LPG	Liquefied Petroleum Gas
mbgl	Metres below ground level
MHF	Major Hazard Facilities
MIIB	Major Incident Investigation Board
MNES	Matter of National Environmental Significance
MSDSs	Material Safety Data Sheets
MSP	Caltex Management System Process
NEPC	National Environmental Protection Council
NEPMs	National Environment Protection Measures
NHL	National Heritage List
NMP	Noise Management Plan
NP&W Act	<i>National Parks and Wildlife Act 1974</i>
NPI	national pollution inventory
NPWS	NSW National Parks and Wildlife Services
NSW	New South Wales
NSW DECC	NSW Department of Environment and Climate Change (now NSW OEH)
NSW DECCW	NSW Department of Environment, Climate Change and Water (now NSW OEH)
NSW DP&I	NSW Department of Planning and Infrastructure
NSW DPI	NSW Department of Primary Industries
NSW EPA	NSW Environmental Protection Authority
NSW OEH	NSW Office of Environment and Heritage
NSW RMS	NSW Roads and Maritime Services
NV Act	<i>Native Vegetation Act 2003</i>
NVIA	Noise and Vibration Impact Assessment
NW Act	<i>Noxious Weed Act 1993</i>
OEH	NSW Office of Environment and Heritage
OEMS	Operational Excellence Management System
OMC	Oil Movements Centre
ORP	Odour Reduction Program
OWMS	Oily Water Management System
PAC	Planning Assessment Commission
PAH	Polycyclic aromatic hydrocarbons

Abbreviation	Description
Pb	Lead
PCB	Polychlorinated Biphenyl
PELA Act	<i>The Protection of the Environment Legislation Amendment Act 2011 (NSW)</i>
PHA	Preliminary Hazard Analysis
PIRMPs	Pollution Incident Response Management Plans
PoEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PPE	Personal protective equipment
PPV	Peak Particle Velocity
PRP	Pollution Studies and Reduction Programs
PSNL	Project Specific Noise Levels
PTW	Permit to Work
PULP	Premium Unleaded Petrol
QRAs	Quantitative Risk Assessment
RBL	Rating background level
RNE	Register of National Estate
ROTAP	Rare or Threatened Australian Plants
RTNP	NSW Road Traffic Noise Policy
SEPP	State Environmental Planning Policy
SEPP 14	<i>State Environmental Planning Policy No 14 – Coastal Wetlands</i>
SEPP 55	<i>State Environmental Planning Policy No. 55 - Remediation of Land</i>
SEPP 71	<i>State Environmental Planning Policy No. 71 - Coastal Protection</i>
SEPP S&RD	<i>State Environmental Planning Policy (State and Regional Development) 2011</i>
SHI	State Heritage Inventory
SHR	State Heritage Register
SIC	Significant Impact Criteria
SMCMA	Sydney Metropolitan Catchment Management Authority
SMP	Stormwater Management Plan
SMS	Safety Management System
SPC	Sydney Ports Corporation
SPL	Sound Pressure
SPULP	Super Premium Unleaded Petrol
SSC LGA	Sutherland Shire Council Local Government Area
SSD	State Significant Development
SSFCF	Swamp Sclerophyll Forest on Coastal Floodplains
SSLEP	Sutherland Shire Local Environment Plan
SSLGA	Sutherland Shire Local Government Agency Authority
SVOC	Semi-volatile Organic Compound
T&I	Turnaround and Inspection
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TMP	Transport Management Plan

Abbreviation	Description
TPH	Total Petroleum Hydrocarbons
TSC Act	<i>Threatened Species Conservation Act 1995 (NSW)</i>
ULP	Unleaded Petrol
VC	Vapour Cloud Explosion
VKT	Vehicle Kilometres Travelled
VOC	Volatile Organic Compound
VOL	Volatile Organic Liquid
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001 (NSW)</i>
WH&S Act	<i>Work Health and Safety Act 2011 (NSW)</i>
WH&S Regulation	<i>Work Health and Safety Regulation 2011 (NSW)</i>
WM Act	<i>The Water Management Act 2000</i>
WMP	Weed Management Plan
WMS	Waste Management System
WRMP	Waste & Resource Management Plan
WWTP	Waste Water Treatment Plant

Glossary

Term	Description
"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. LAeq).
"C" Frequency Weighting	The response of the human ear varies with the sound level. At higher levels, 100 dB and above, the ear's response is flatter, as shown in the C-Weighted Response below. Although the A-Weighted response is used for most applications, C-Weighting is also available on many sound level meters. C-Weighting is usually used for Peak measurements and also in some industrial and entertainment noise measurement, where the transmission of low frequency noise can be a problem. C-weighted measurements are expressed as dBC or dB(C).
Acid Sulphate Soils (ASS)	Refers to a soil or soil horizon which contains sulfides or an acid soil horizon which is affected by oxidation of sulphides.
air pollutant	A substance in ambient atmosphere, resulting from the activity of man or from natural processes, causing adverse effects to man and the environment.
Aggregate Consequence Plot (ACP)	Plot which illustrates the impact caused if a negative event causes a risk to become a loss. In this case, the negative impact of heat radiation if pool fires occur at the Site.
ambient noise	The all-encompassing sound at a site comprising all sources such as industry, traffic, domestic, and natural noises. This is represented as the Leq noise level in environmental noise assessment. (See also LAeq).
amenity	An agreeable feature, facility or service which makes for a comfortable and pleasant life.
anthropogenic climate change	Climate change induced by human activities.
aquifer	An underground layer of water bearing permeable rock, sediment or soil that yields water.
the ANZECC Guidelines	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000).
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.
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. $L_{A90,15 \text{ min}}$.
battery limits	Refers to the limit of the scope of supply.
bioremediation	The use of micro-organism metabolism to remove pollutants.
bioventing system	Provides oxygen to stimulate naturally occurring soil microorganisms to degrade compounds in soil.
bunded areas	Refers to the bunded impermeable areas surrounding oil-filled tanks to prevent spills.
bunding	Area within a structure designed to prevent inundation and prevent spillage from tanks.
capital expenditure	Refers to expenditures which result in long term financial benefits.

Term	Description
Chart Datum (CD)	A fixed height taken from measuring the tides in and around Australia.
closed-loop recycling	System in which the waste or byproduct of one process or product is used in making another product.
combustion emissions	Emissions that arise upon combustion of a substance.
Contaminants Of Potential Concern (COPC)	Refers to chemicals that are potentially site-related and whose data are of sufficient quality for use in a quantitative risk assessment.
contour plot	Refers to a plot with contour lines on it.
crude oil	Refers to a mixture of hydrocarbons that exist in liquid phase in natural underground reservoirs and remain in liquid state at atmospheric pressure after passing through surface separating facilities.
Cumulative Effects	The summation of effects that result from changes caused by a development in conjunction with other past, present or reasonably foreseeable actions.
Decibel (dB)	A unit of sound level measurement that uses a logarithmic scale.
Dewatering	The process of removing groundwater to lower the water table below the lowest level of excavation.
Dispersion Modelling	Is a mathematical simulation of emissions as they are transported throughout the atmosphere. It is undertaken to determine the likely impacts the Project would have on air quality.
dosing pump	Refers to a low volume fluid pump with a controllable discharge rate, used to inject chemical additives to the mixing or pumping system.
easement	Is a right given to another person or entity to trespass upon land that person or entity does not own.
ecological communities	Networks of Interacting Species.
Ecologically Sustainable Development (ESD)	Using, conserving and enhancing the community's natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future does not decrease.
effluent	Refers to an outflowing of water from a natural body of water or from a human made structure.
effluent water	Refers to the outflowing of water from a natural body of water or from a human made structure.
endangered ecological communities	A community listed under Schedule 1, Part 3 of the NSW <i>Threatened Species Conservation Act 1995</i> .
endangered species	Those plants and animal species likely to become extinct unless action is taken to remove or control the factors that threaten their survival.
Endemic species	Species that are unique to an area and are not found in any other areas.
environment	The physical, biological, cultural, economic and social characteristics of an area, region or site.
environmental constraints	Limitations on a project by components of the environment.
Environmental Impact Statement	The orderly and systematic evaluation of a proposal, including alternatives and objectives, and its effects on the environment, including the mitigation and management of these effects.
Environmental Management	That part of the overall management system which includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy. (Refer to related term Environmental Management System).

Term	Description
Environmental Management Plan	The control, training and monitoring measures to be implemented during the design, construction and operation phases of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental (being socio-economic, cultural, physical, biological) assessments. Prepared within the framework of Defence policies, objectives, strategies and actions.
Environmental Planning Instruments (EPI)	Collective name for Local Environment Plans and State Environmental Planning Policies. The provisions of environmental planning instruments are legally binding on both government and developers.
Extraneous Noise	Noise resulting from activities that are not typical of the area. Untypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
fauna	Animals.
finished fuel terminal	Installation where finished fuel is transferred from one conveyance to another.
finished product	Refers to finished fuel as opposed to crude oil products which need to be refined.
firewater	Water designated for use in the event of a fire emergency.
fiscal analysis	Refers to the process of evaluating the Project, to determine its suitability for investment.
fixed berths	Location in a port or harbour used specifically for mooring ships while not at sea. Fixed berths are permanent locations into which ships are moored.
footprint	Area in which site activities take place.
Frequency	Frequency is synonymous to pitch and is measured in units of Hz.
Frequency Spectrum	In environmental noise investigations, it is often found that the single-number indices, such as L_{Aeq} , do not fully represent the characteristics of the noise. If the source generates noise with distinct frequency components, then it is useful to measure the frequency content in octave or one-third octave frequency bands. For calculating noise levels, octave spectra are often used to account for the frequency characteristics of propagation.
fugitive volatilisation	Process by which chemicals are quick to evaporate under room normal conditions.
garnet grit	Small loose particles of garnet.
Geographic Information System (GIS)	A system which uses software and hardware to capture, analyse and display geographical features of an area.
geology	The study of the history of earth, the structures that make up the earth, and the processes surrounding them.
Geotechnical	Relating to the form, arrangement and structure of the geology.
Global Warming Potential (GWP)	The level of ability of a greenhouse gas to trap heat in the atmosphere when compared to another gas.
Groundwater Dependant Ecosystem (GDE)	Ecosystems that require access to groundwater to meet all or some of their water requirements to maintain their ecological processes.
groundwater recovery trench	Trench which is formed in order to collect groundwater and contain any contaminated water.

Term	Description
Hazardous Industry	A building or place used to carry out an industrial activity that would, when carried out and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the activity from existing or likely future development on other land in the locality), pose a significant risk in the locality to human health, life or property, or to the biophysical environment.
hazardous waste	A classification of waste that has the potential to pose a hazard to people of the environment.
heritage	is a broad concept that encompasses Natural, Indigenous and Historic or Cultural inheritance.
import terminal	Large storage facility from which fuel is distributed to retailers, distributors and end users.
Impulsive Noise	Noise having a high peak of short duration or a sequence of such peaks. Noise from impacts or explosions, e.g., from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of the sound pressure level.
indigenous	Native to a land or region.
Indirect Impacts	Impacts on the environment, which are not a direct result of the development but are often produced away from it or as a result of a complex pathway.
infiltration	The process of surface water soaking into the soil.
infrared radiation	The part of the electromagnetic spectrum which is characterised by wavelengths just longer than those of ordinary visible red light and shorter than those of microwaves or radio waves.
inter-generational equity	Requires that the present generation pass onto the next generation an environment that does not limit the ability of those future generations to attain a quality of life at least equal to that of the current generation.
Intergovernmental Panel on Climate Change (IPCC)	International body that assess and presents the scientific, technical and socio-economic information relevant to understanding the risks of human induced climate change.
Intermittent Noise	Noise with a level that abruptly drops to the level of or below the background noise several times during the period of observation. The time during which the level remains at a constant value different from that of the ambient being of the order of 1 s or more.
jet fuel	Comprises both gasoline and kerosene type jet fuels meeting specifications for use in aviation turbine power units.
Key Threatening Processes	Under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> , it refers to a process that threatens the survival, abundance or evolutionary development of a native species or ecological community.
Kurnell Wharf	The 1 km structure located off the Kurnell Peninsula that is used by ships delivering petroleum products and crude oil (feedstock) to the Kurnell Refinery.
LA ₁	The A-weighted sound pressure level which is exceeded for 1 % of the measurement period.
LA ₁₀	The A-weighted sound pressure level which is exceeded for 10 % of the measurement period.

Term	Description
LA ₉₀	The A-weighted sound pressure level which is exceeded for 90 % of the measurement period. It is determined by calculating the 90th percentile (lowest 10 %) noise level of the period. This is referred to as the background noise level. (See Background Noise).
LA _{eq}	A-weighted equivalent continuous noise level. This parameter is widely used and is 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. (See Ambient Noise).
LA _{max}	The A-weighted maximum Root Mean Square (RMS) sound pressure level measured during the sample period.
Land Farm Emissions	Emissions resulting from landfarm processes of bioremediation.
Level Of Service (LOS)	is a performance measure used to describe the performance of an intersection or midblock location.
Linear Peak (LIN Peak)	the maximum level of air pressure fluctuation measured in decibels without frequency weighting (see 'A Frequency Weighting' above).
Lithic Fragments, Feldspar, Mica And Clay Pellets	Minerals and fragments of pre-existing rock, found in sedimentary rock.
Local Environment Plan (LEP)	A plan developed by a council to control development in part or all of their shire or municipality.
Mercaptans	Also called thiols. Refers to an organosulphur compound. Many mercaptans have a strong garlic odour and are used as odourants to detect natural gas (which is odourless in pure form). Thiols react with mercury to form mercaptides.
Meteorological	The science that deals with the phenomena of the atmosphere.
Midden	A mound or deposit containing shells, animal bones, and other refuse that indicates the site of a human settlement.
Midstorey	Layer of vegetation in in a forest in which tree heights are in between the smallest and the tallest trees.
Non-Aqueous Phase Liquids	Refers to a liquid contaminant that (like oil) does not dissolve readily in water. There are two types: Light Nonaqueous Phase Liquid (less dense than water so spreads across the surface of the water table forming a layer) and Dense Nonaqueous Phase Liquid (more dense than water, so sink vertically through sand and gravel aquifers to the underlying layer).
Noxious Weeds	A noxious weed is a plant species that has been designated by country, state, provincial, or national agricultural authority as one that is injurious to agricultural and/or horticultural crops, natural habitats and/or ecosystems, and/or humans or livestock.
Operation Environmental Management Plan (OEMP)	An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the operational phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
Outfall Pipeline	A pipeline that empties into a water source. In this case, the pipeline would empty into the Ocean at Tabbigai Gap.
Oxidising Biocide	Refers to an agent such as chlorine which will kill bacteria via oxidation.
Particulate Emissions	Refers to the emission of solid particles of carbon and unburnt hydrocarbons.

Term	Description
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.
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.
Petroleum Hydrocarbons	Organic compounds found in petroleum, primarily composed of carbon and hydrogen.
Petroleum Hydrocarbons	Refers to the organic compounds comprising petroleum, consisting predominantly of carbon and hydrogen.
Petroleum Product	Useful materials derived from refining crude oil.
Polyaromatic Hydrocarbons	Are atmospheric pollutants that occur in oil, coal and tar deposits and are by-products of fuel burning. Some compounds have been identified as carcinogenic, mutagenic and teratogenic. Naphthalene is the simplest example of a polycyclic aromatic hydrocarbon.
Polychlorinated Biphenyls	Consists of chlorine atoms attached to biphenyl (molecule composed of two benzene rings). Used as dielectric and coolant fluids.
Ponding	Refers to a body of water smaller than a lake, which is sometimes artificially formed.
Potable Water	Also referred to as drinking water. It is water that is safe enough to be consumed by humans.
Potable Water	Refers to water that is of a high enough quality that it can be safely consumed or used without risk to short or long-term health.
Precautionary Principle	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.
Process Hazard Analysis (PHA)	Analysis of hazards associated with processes undertaken at the Site.
Pumphouse	Refers to a house in which pumps are installed and operated.
Putrescible	Refers to the potential of a substance to decompose when in contact with air and moisture at normal temperature. Liable to become putrid.
Quaternary Sands	Sands which were formed during the Quaternary period.
Radiocarbon Dating	The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon isotope 14 it contains.
Ramsar Wetlands	The Convention on Wetlands of International Importance, especially as Waterfowl Habitat. This is an international treaty for the conservation and sustainable utilisation of wetlands, signed in Ramsar, Iran in 1971.
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).
Receptor	Receivers of impacts under the proposed works.
Relict Dunes	Dunes which have formed previously, and remain in-situ.

Term	Description
Residual Risk Assessment	Refers to an assessment undertaken on any impacts that may exist after mitigation and management measures are implemented.
Run Down Lines	A line which connects one piece of equipment to another.
Seawater Cooling System	Cooling system by which seawater is employed as the cooling agent.
Semi-Volatile Organic Compounds	An organic compound which has a higher boiling point than water and may vaporise when exposed to temperatures above room temperatures. They include phenols and polynuclear aromatic hydrocarbons.
Shotcrete	A concrete (or mortar) applied at a high velocity to a surface via a hose.
Silt Fences	A fence which acts as a temporary sediment control device to prevent silt from entering nearby water bodies.
Slop	Slop, or slop oil, is a petrochemical industry term for recovered petroleum hydrocarbons in a refinery or terminal, which requires further processing to make it suitable for sale and use.
Sludge Lagoon	Lagoon that receives sludge that has been removed from a wastewater treatment facility.
Societal Risk F-N Curve For Off-Site Population	a "societal risk" measure that communicates the potential for hazardous scenarios to cause multiple fatalities by plotting the frequency of "N or more fatalities" (F) against the number of fatalities (N).
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.
Species Dormancy	Period of inactivity.
Static Dissipater	Used in order to dissipate built up static electricity.
Strike And Dip	Refers to the orientation of a geological feature. The strike is a line formed by the intersection of the horizontal plane with the surface of a layer of rock or another geological body set in an inclined or vertical position. The dip is a line on the plane of a layer or another geological body that extends perpendicularly to the strike in the direction of the inclination of the layer, which is the line of greatest steepness.
Sulphur Recovery Unit	Unit in which sulphur emissions (as a gaseous hydrogen sulfide) are recovered in order to prevent them from escaping into the atmosphere.
Tailwater	Refers to water located downstream from a hydraulic structure.
Tank Nozzle	Refers to the spout attached to the tank, used to control the velocity of the fluid.
Tank Water Draws	Event in which water is extracted from a tank.
Test Pit	Refers to an excavation from which soil samples are taken and groundwater depth is determined.
The Project Area	The area in which the proposed works would take place.
To Tank Internals	Refers to the interior area of a tank.
Tonality	Noise containing a prominent frequency and characterised by a definite pitch.
Topography	Refers to the study of distribution, position and elevation of natural and man-made features of a landscape.
Total Organic Carbon	Refers to the amount of carbon bound in an organic compound, often used as an indicator of water quality.
Total Petroleum Hydrocarbons	Any mixture of hydrocarbons found in crude oil.

Term	Description
Volatile Organic Compound (VOC)	Organic chemicals that have a higher vapour pressure in room-temperature conditions. This is due to a lower boiling point, causing many of the molecules to evaporate and enter the surrounding air.
Volatile Total Petroleum Hydrocarbons	Refers to total petroleum hydrocarbons which are easily evaporated at normal temperatures.
Washwater	Refers to water that is contacted with process streams (liquid or gas), packed beds, or filter cakes to flush or dissolve impurities.
Waste Streams	The complete flow of waste from domestic or industrial areas through to final disposal.
Well-Sorted Marine Quartz Sand	Sand of marine origin, predominantly composed of quartz mineral, with particles that are approximately the same size.
Yardlines Emissions	Refers to fugitive emissions arising from equipment that is used to move product around the Site.

Executive Summary

ES 1.1 Introduction

Caltex Refineries (NSW) Pty Ltd ACN 000 108 725 (Caltex) is seeking approval for the conversion of the Kurnell Refinery (the 'Site') to a Finished Product Terminal (the 'Project'). Due to increasing competition from more modern and efficient Asian refineries, the inability to meet changing fuel requirements and exacerbated by other impacts such as a strong Australian dollar, converting the Kurnell Refinery to a terminal would provide a reliable supply of fuel to Caltex's marketing operation and the NSW and ACT economies.

The Project would comprise:

- continued use of parts of the Site in a manner similar to that currently in place for the storage and distribution of petroleum product;
- cleaning and modification of some of the existing tanks on Site to store refined product (i.e. finished product tanks); and
- a range of ancillary works to improve safety, efficiency and capability across the Site for its conversion and use as a terminal.

The Site is approximately 187 ha in size and is located on the Kurnell Peninsula within the Sutherland Shire Local Government Area (SSLGA), approximately 15 km south of Sydney's CBD. The refinery was commissioned in 1956 and currently receives and stores some refined products and crude oil for refining into other petroleum products. The crude oil is delivered to the refinery in ships that dock at one of the three berths associated with the Kurnell Wharf in Botany Bay. Products are transferred via pipeline to storage tanks on the Site. Refined product is stored before distribution, while crude oil is piped from the storage tanks to the crude distillation units for processing into fuels to supply the NSW and ACT markets.

Should the Project be approved, refined petroleum products would continue to be brought by ship into the Site for storage and distribution. The importation and refining of crude oil at the Site would cease. Existing infrastructure associated with the refining of crude oil would be decommissioned and would remain on the Site. The removal of this infrastructure and any related remediation, should it be required, would be subject to approval under a separate development application. Under the proposed operations a nominal maximum of 925 megalitres (ML) of refined product would be stored on the Site at any one time.

This Environmental Impact Statement (EIS) considers a range of environmental, safety, legal, social and economic impacts related to the Project. It assesses and describes the methods by which those impacts would be avoided, minimised, mitigated or offset.

This Project is considered to be State Significant Development (SSD) for the purposes of assessment under the relevant NSW planning legislation as it falls within the requirements of Clause 10, Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP S&RD).

Specifically the Project falls within the category of chemical industry that would manufacture, store and use dangerous goods in such quantities that constitute the development as a major hazard facility. As such, this EIS has been prepared under the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to support Caltex's application for planning approval.

ES 1.2 Project Need and Alternatives

The need for the Project and the alternatives by which that need could be addressed have been considered within this EIS. The Project need and the alternatives are described below.

Project Need

Following a review of refining operations which was initiated in 2011, Caltex concluded that the Kurnell Refinery was no longer financially viable under its current configuration. The viability of the refinery had been eroded by increased competition from Asian refineries, and exacerbated by a high Australian dollar. Critically, the Kurnell Refinery is smaller and less efficient than the more modern, and larger, refineries in the Asian region.

Notwithstanding this, the Site is at the heart of Caltex's supply chain for NSW and the ACT. It is the only Caltex location in NSW and the ACT that can import petroleum products, and so is key to supplying these products to the NSW and ACT markets.

Project Objective

Given the need outlined above, the objective of the Project is to ensure that Caltex's operations within Australia remain viable, whilst ensuring that the company can assure a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.

Project Alternatives

Alternatives considered within this EIS include:

- maintaining the status quo (i.e. the 'do nothing' option);
- expanding the Kurnell Refinery to a scale that could compete with Asian competitors;
- closing the Site entirely; and
- converting the refinery to a terminal.

In assessing these options, a range of criteria were considered. These included financial metrics, the business risks involved in the alternatives, the impact on the marketing operations, the company's competitive position, Caltex's funding capacity and the feasibility to execute works (including Caltex's internal capabilities and resourcing constraints).

Maintaining the status quo or expanding the existing refining operations at Kurnell would not be financially viable for Caltex in the current market. Potentially expanding or improving the Kurnell Refinery would involve a larger cost than a similar style of investment at the Lytton Refinery in Queensland. Lytton Refinery is in a superior location and in better condition than the Kurnell Refinery.

Caltex considered that closing the Kurnell Refinery entirely could weaken its market position in NSW, and could also jeopardise the safe, reliable and sustainable supply of petroleum fuels to the NSW and ACT markets.

Therefore, the option of converting the Kurnell Refinery into a finished product terminal emerged as the only viable alternative. It is therefore the preferred alternative and so the Project for which Caltex is seeking approval.

ES 1.3 Project Location and Existing Environment

Kurnell Refinery is located on the Kurnell Peninsula. The peninsula is located to the south of Botany Bay in the south eastern part of Metropolitan Sydney, approximately 15 km from Sydney CBD. The peninsula was the location of Captain Cook's first landing in Australia, however, the lack of a suitable environment in the area for European farming methods meant that the area was not home to a permanent settlement until 1815. The village of Kurnell was first proclaimed in 1933 and grew in population as workers associated with the refinery construction were accommodated during the 1950s. The Kurnell Peninsula is serviced by Captain Cook Drive, a single lane road that connects the area with the wider road network.

The Project would be located on the existing Caltex Kurnell Refinery site ('the Site'). The Site is located in the eastern portion of the peninsula as shown on **Figure ES-1**. To the east and south of the Site is the southern portion of the Kamay Botany Bay National Park; to the west of the Site is Quibray Bay; the village of Kurnell is located to the north of the Site; and the land to the south of the Site is largely undeveloped and is subject to a range of industrial land use zones as prescribed by the *State Environmental Planning Policy (Kurnell Peninsula)*. The most relevant sensitive receptors for the Project are the various residences, public spaces and schools within the village of Kurnell, the Kamay Botany Bay National Park and the wetland and aquatic environments in Botany Bay, including the Towra Point Nature Reserve (Ramsar Wetland) and the Towra Point Aquatic Reserve.

The Site is legally described under 38 Lot and deposited plan (DP) numbers, these are listed in **Chapter 3 Project Location and Existing Environment**. The Caltex Refinery has been operating since 1956 and currently supplies around 40% of all transport fuels in Australia. The refinery processes crude oil into petrol, diesel and jet fuel. The refinery also operates as a terminal where product is stored temporarily before being distributed via trucks, ships and pipeline. The Project Area within the Site is predominantly located within the eastern and western portions of the Site. The works associated with the Project would occur within this area. The Site contains few environmental receptors due to its disturbed nature, however the refinery operation is considered to have some local heritage value.

Figure ES-1 Site and Project Area Location



ES 1.4 Project Description

The Project would require the conversion of tanks and installation of pipelines, pumps and infrastructure within the Project Area to allow for the expansion of existing terminal operations for the storage and distribution of petroleum products.

During initial conversion activities, the Site would operate as both a refinery and terminal. Cessation of refinery operations is planned to occur in the second half of 2014. Cessation would be followed by conversion of some tanks in the Project Area to store finished petroleum product. The Project would eventually result in the Site operating wholly as a terminal. The proposed terminal would manage the following products:

- Gasoline – Unleaded Petrol (ULP), Premium Unleaded Petrol (PULP) and Super Premium Unleaded Petrol (SPULP);
- Diesel;
- Jet Fuel; and
- Fuel Oil.

The terminal would also manage the following by-products:

- Slop¹; and
- Wastewater.

Construction

Construction works are proposed to begin in the second half of 2013. An indicative schedule for conversion activities is shown in **Table ES-1**.

Table ES 1 Proposed Construction Schedule

Task	Date
Detailed Engineering & Design Start	Mid 2012
Engineering & Design Completed	Quarter 2 2013
Tank Conversions Start	Second half 2013
Installation of Piping, Pumps and Associated Infrastructure	Second half 2013
Construction on Piping Completed	Quarter 2 2014
Kurnell Refinery Shutdown	Second half 2014
Continued Tank Conversions	End 2014 – end 2016
CONVERSION TO TERMINAL COMPLETED	December 2016

The majority of the conversion works would take place between 7.00am to 10.00pm, across a seven day a week program. Some works, consistent with Caltex's existing maintenance procedures, would need to occur over a 24 hour period. Work would comply with the requirements of the relevant Environmental Protection Licence (EPL) (No. 837).

Traffic generated by the Project would incorporate a mix of construction plant vehicles, delivery vehicles and construction personnel movements. During the peak construction year (2014) the proposed works would require a workforce of up to 140 construction workers.

¹ Slop or slop oil is a petrochemical industry term for recovered petroleum hydrocarbons in a refinery or terminal, which requires further processing to make it suitable for sale and use.

Operation

Once the conversion is complete, Caltex would only import finished products (gasoline, jet fuel, diesel and fuel oil) through the two fixed berths at the existing wharf and the sub berth located in Botany Bay. This product would be stored in existing and converted tanks. The major product distribution systems would continue to operate as they do currently, i.e. product would be pumped under Botany Bay to the Banksmeadow Terminal, the Sydney/Newcastle pipeline or the Joint User Hydrant Installation (JUHI) at Sydney Airport for further distribution. Under typical operation, road transport of products from the Site would cease. However, in exceptional circumstances some road transport of product may be required.

With the cessation of the refining operation at the Site and the high levels of automation of the terminal, the number of employees on Site would reduce. Employees would operate in a shift arrangement 24 hours a day, 7 days a week.

ES 1.5 Legislation and Planning Policy

Due to the classification of the Site as a major hazard facility, the development associated with the Project is classified as SSD under section 89C of the EP&A Act and Section 10, Schedule 1 of SEPP S&RD. On 14 September 2012 the NSW Department of Planning and Infrastructure (DP&I) issued Director General's Environmental Assessment Requirements (DGRs) for the Project.

The Minister for Planning and Infrastructure is the determining authority for SSD projects such as this Project. However, if more than 25 objections to the application are received, if a proponent has made a political donation, or if the local government objects to the development, these powers are delegated to a Planning Assessment Commission (PAC).

In order to comply with the requirements for assessing this type of SSD development, an EIS must be prepared and submitted alongside the Development Application (DA).

The *Protection of the Environment Operations Act 1997* (PoEO Act) provides for the issue of an Environment Protection Licence (EPL) for certain scheduled activities. Caltex holds an existing EPL (No. 837) for the Site. This EPL licences a number of activities on Site and provides certain agreed limits (e.g. for noise) or monitoring measures (e.g. observing stormwater) in relation to those activities. As the Site is currently operational, the EPL is actively managed by Caltex and the EPA, and includes requirements for a number of Pollution Reduction Plans (PRPs). Where relevant, the provisions of the EPL and PRPs would continue to be implemented and adhered to during the conversion works.

A complete account of relevant Commonwealth, State and local government legislation and policy is provided in **Chapter 5 Legislation and Planning Policy**.

ES 1.6 Consultation

Consultation has continued throughout the preparation of this EIS and will continue during exhibition, following approval of the Project, during construction and once the new terminal is operational.

The objective of consultation to date, both with statutory agencies and the wider community, has been to provide information to, and understand the concerns of, Project stakeholders.

The Project specific consultation effort has included:

- a series of public meetings;
- liaison with government agencies, including those identified within the DGRs; and
- targeted consultation with relevant landowners.

The key methods used to consult (and inform this EIS) have included meetings, public presentations, letters, telephone calls and data requests.

Chapter 6 Consultation presents a list of the key comments raised during the consultation process and identifies where issues have been addressed in this EIS.

ES 1.7 Environmental Scoping Assessment

In order to assess the environmental impact of the Project, a number of key environmental issues have been identified through consultation with regulators and the community.

A qualitative risk assessment has been undertaken based on the recognition that a more detailed assessment would be required for the biophysical, environmental, economic and social aspects with the highest potential likelihood and greatest potential consequences. A qualitative risk assessment has been conducted based upon the guidelines outlined in AS/NZS 4360:2004 and AS/NZS ISO 31000:2009. This assessment, combined with the DGRs for the Project, guided the assessments undertaken for the EIS.

Although the DGRs require that a visual assessment be undertaken as part of the EIS, this assessment has not been included as the Project and associated plant and equipment would be of a similar nature and located adjacent to existing structures on Site. No demolition of the major structures on Site is included as part of this Project, hence visual impacts are expected to be negligible and a visual impact assessment was not considered necessary for this Project.

ES 1.8 Hazard and Risk

A Hazard and Risk Assessment for the Project was conducted in line with the provisions of the NSW Hazardous Industry Planning Advisory Papers (HIPAPs). As part of the assessment existing and proposed scenarios were examined in order to compare the risk profile of the Site under refinery operation against the proposed risk profile of the Site under terminal operation.

The assessment drew information from a specific Project Quantitative Risk Assessment; the Major Hazard Facility Report for the Kurnell Refinery; Process Hazard Analysis for the Terminal Conversion and the Caltex Port and Berthing Project (SSD-5353); the Kurnell Peninsula Land Use Safety Study; and the Preliminary Hazard Analysis of the Proposed Kurnell Port and Berthing Project.

Overall the assessment concludes that the Project is not expected to result in additional risk for the residents at Kurnell, for the following reasons:

- The terminal would no longer store or handle significant quantities of materials with Dangerous Goods classification of 2.1 (flammable gas) and 2.3 (toxic gas). It would also store significantly fewer types of materials compared with the existing refinery, indicating a simplification of the management processes required to maintain safety.
- A significantly lower number of truck loading / unloading activities associated with dangerous goods would also occur during the operation of the Project as the majority of truck movements would cease and most material would arrive on Site via bulk ship transfers. This would result in a significant lowering of the risk associated with road transport in and out of the Site.

The Hazard and Risk Assessment also contains a cumulative assessment of the Project alongside other potentially hazardous developments in the area. The cumulative impact of the proposed terminal incorporating consideration of surrounding potentially hazardous developments in the area does not increase the cumulative risks within the area beyond acceptable levels. In fact, the proposed terminal would significantly reduce the cumulative risk levels on the Kurnell Peninsula.



Caltex have a continuous improvement program and commitments in place for the Site. The assessment shows that Caltex have appropriate and effective safety management systems in place for the Project. Provided these standards and systems are maintained, the assessment concluded that the Project was compliant with the criteria contained within the DP&I's *Hazardous Industry Planning Advisory Paper (HIPAP) No.4 – Criteria for Land Use Safety Planning*, *HIPAP No.6 – Guidelines for Hazard Analysis* and *HIPAP No.10 – Land Use Safety Planning*.

ES 1.9 Soil, Groundwater and Contamination

This assessment was conducted as a desktop investigation and involved a review of existing literature available about the Site. That literature included previous investigations, historic information, records of contamination and contamination management, as well as a review of publicly available information relevant to the location.

Existing contaminants of concern for soils at the refinery are those associated with the fuel refining process. The primary Contaminants of Potential Concern (COPC) are: petroleum hydrocarbons; benzene, toluene, ethylbenzene and xylene (BTEX); polycyclic aromatic hydrocarbons (PAH); phenols; and lead. Residual asbestos contamination is of relevance to areas of historical spoil stockpiling and for the pipeway easements.

A number of discreet incident based remediation projects have been carried out at different times across the Site. The Project would not affect the continuation of existing groundwater remediation or monitoring programs on Site.

Construction Impacts

Ground disturbance resulting from the construction phase of the Project would mainly involve small scale shallow excavations to 1 m to establish foundations, install pipes under roadways or the resurfacing of areas already covered with hardstand surfacing. It is unlikely that groundwater would be intercepted and unlikely that any dewatering of excavations would need to take place. An estimated 180 m³ of soil would be excavated across the Project Area.

According to available Acid Sulfate Soil Mapping, the probability of occurrence of Acid Sulfate Soils is very low. Should Acid Sulfate Soils (ASS) be encountered during construction, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).

Adverse potential impacts related to erosion, sedimentation and Acid Sulfate Soils would be negligible provided they are managed in accordance measures within the Construction Environment Management Plan (CEMP). These measures include: managing the excavation, testing, stockpiling, reuse and rehabilitation of soils; implementing appropriate measures from *'The Blue Book' Managing Urban Stormwater - Soils and Construction Volume 1 and 2* (Landcom, 2004); managing soils or groundwater in line with *NSW (2009) Waste Classification Guidelines*; and implementing measures to test, dewater, store, move and treat groundwater during the construction phase.

Risks associated with exposure to contamination within the soil would also be managed through the provisions of the CEMP.

Operational Impacts

The Project would have the potential to impact on soils and groundwater through leaks and spills during the transfer and storage of finished product on Site. This does not represent a new potential impact and is the continuation of an inherent risk associated with the existing operations.

When operational, the Project would result in significant infrastructure improvement throughout the Site, including upgrades to the tank internals, roofs, floors and manifolds; and upgrading of safeguard systems. Refurbished and upgraded infrastructure would reduce the overall inherent risk of contamination to the underlying soils and groundwater.

Mitigation

Management plans (e.g. a Soils and Erosion Management Plan) would be incorporated into the CEMP to manage potential impacts to soil and groundwater arising from construction of the Project. During operation, regular maintenance and inspection of equipment, pipes, tanks and protective bunding would be undertaken to minimise the risk of leaks. **Chapter 9 Soils, Groundwater and Contamination** contains a more comprehensive outline of the proposed mitigation and management measures.

ES 1.10 Human Health and Ecological Risk

The EIS has assessed the potential risk to human and ecological health during the construction operational stages of the Project.

A qualitative Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) was undertaken to address the DGRs for the Project. Potential contamination pathways to the on-site and surrounding human and ecological sensitive receptors were identified. Relevant receptors included:

- Caltex facilities;
- Kurnell Village including residences, public places and schools;
- Botany Bay;
- Oyster farming in Quibray Bay and Botany Bay;
- Towra Point Nature Reserve (Ramsar wetland);
- Towra Point Aquatic Reserve;
- Marton Park Wetland; and
- Kamay Botany Bay National Park.

The assessment was based on a desktop review of previous investigations including site assessments, groundwater modelling assessments, flora and fauna assessments, air quality assessments and wastewater management assessments. The assessment also used the conclusions of a number of technical assessments within this EIS.

As per **Section ES 1.9**, the primary Contaminants of Potential Concern (COPC) for the Project in relation to human health and ecological risk are: petroleum hydrocarbons; BTEX; PAH; phenols; and lead. In addition, asbestos may also be present in soil, mainly from old pipes and historic waste storage. Additional COPC may also be present (based on knowledge of general refining processes).

For the HHRA, a tier 1 risk assessment was undertaken to compare the concentrations of contaminants on the Site against appropriate investigation levels to assess whether concentrations comply or exceed established levels. The contamination characteristics identified for the soil and groundwater on the Site indicate that there is unlikely to be any risk to workers on-site from direct contact with the shallow soil, or from vapour inhalation while working in shallow trenches above impacted soil at depth or impacted groundwater.

Asbestos risks require controls on-site to prevent unnecessary or excessive soil disturbance and potential liberation of fibres into the air.

The HHRA concluded that as the Project would involve only shallow soil works during construction, that contamination would be unlikely to cause a hazard as planned excavation would not create an enclosed space. The proposed excavation works in any particular location would also be of limited time duration and would not be expected to involve workers spending long periods in one area. It is therefore unlikely that the proposed works would give rise to vapour risk to workers on-site, or to risks related to ingestion or direct contact.

Results of the ERA indicate that due to the minor nature of the intrusive works, the potential impacts from the Project on ecological receptors would be limited. There is not expected to be significant adverse risks on the surrounding environment.

Due to the upgrading of infrastructure and the cessation of refining activities, the operation phase of the Project would likely result in an overall reduction of risk to human and ecological health.

ES 1.11 Surface Water, Wastewater and Flooding

A desktop assessment was undertaken of surface water, wastewater and flooding issues associated with the Project.

Stormwater captured on-site would continue to be managed through the existing systems and would continue to be separated into clean or contaminated streams as required. The existing Site stormwater management system has been identified as adequate for treatment and discharge of stormwater under 'usual' operating and weather conditions. The Project would continue to discharge treated wastewater and stormwater to Botany Bay, Quibray Bay and Marton Park Wetland and Yena Gap to the Tasman Sea from the Project Area. Whilst the Site would still discharge stormwater into the same off-site areas, the quality of the stormwater discharge is likely to be improved following the cessation of refining at the Site. Overall, the Project would be expected to have the following impacts in relation to stormwater:

- no significant change in the volume of stormwater discharged from the Project Area to Quibray Bay; and
- consequential reduction in the overall contaminant load from the Site following the cessation of refining operations, which would reduce the cumulative impact, if any, of the discharges to the respective receiving environments.

Caltex has recently agreed a Stormwater Management Plan (SMP) for the Site with the EPA in response to EPL 837 Pollution Reduction Plan U24.1: *Stormwater Catchment and Management Plan*. This plan involves implementing a stormwater management strategy at the Site and completing a number of stormwater management measures in a staged manner over the coming years.

Whilst no significant stormwater impacts are expected as a result of the Project, Caltex has recognised that the stormwater system at the Site requires improvement. Therefore the key measure to manage and mitigate future stormwater impacts on the Site would be the successful implementation of the SMP in consultation with EPA.

The Project is not expected to change the flood risk profile in the Project Area nor would it change the ability to accommodate high rainfall events and/or broader flooding events from that which currently exists.

During the construction phase of the Project, potential stormwater impacts would relate to erosion, sedimentation and possible interaction of stormwater with hydrocarbon impacted soils. These potential

impacts would be managed by, amongst other things, implementing appropriate measures from *'The Blue Book' Managing Urban Stormwater - Soils and Construction Volume 1 and 2* (Landcom, 2004) and the use of soil erosion and sedimentation devices as discussed in **ES 1.9**.

ES 1.12 Noise and Vibration

A Noise and Vibration assessment was undertaken for the construction and operational phases of the Project. The EIS includes a cumulative assessment of noise that considered the Project in relation to other relevant projects from the surrounding area.

The current background noise level for the Site was determined from published data contained in recent monitoring on the Kurnell Peninsula. Noise modelling was undertaken to assess the expected change in noise levels during the construction and operation stages of the Project.

The modelling showed that noise generated by Project construction would be likely to remain within the limits established by the Site's EPL at identified receptor locations. Given the small amount of additional traffic likely to be generated by the Project, the assessment concluded that traffic noise impact would be likely to be imperceptible and that the noise contribution from the construction phase of the Project would be negligible at residences on Captain Cook Drive.

The operational noise levels from the Project are predicted to comply with daytime, evening and night time operational noise criteria at receptors. No impacts are expected at identified receptors as a result of Project. Given the reduction in the number of employees on the Site under terminal operation and the cessation of road haulage to and from the Site, the number of vehicles and associated vehicle noise generated by the operation on-site would also decrease.

The Project would have a beneficial noise impact on sensitive receptors along Captain Cook Drive when compared to the existing refinery operations. As a result of this, no cumulative noise impact is predicted to occur during the construction or operation of the Project.

As the Project is not expected to adversely impact the acoustic amenity of surrounding receptors, no specific mitigation measures are required. However, precautionary mitigation measures proposed for the construction phase include the preparation of a Noise Management Plan (NMP). This NMP would be included in the CEMP for the Project and would include measures to ensure workers are aware of sensitive noise receptors close to the Site, minimising the use of horns, avoiding the creation of unnecessary noise etc.

ES 1.13 Air Quality and Odour

The assessment of Air Quality and Odour impacts involved a review of proposed construction and operational activities of the Project and the identification of key pollutants and emission profile/sources associated with these activities.

The review of the key pollutants and emissions profile identified that for the operation of the Project there would be a large reduction in the quantity of combustion pollutants emitted, due to the retirement of refinery combustion sources. The cessation of refining at the Site would also result in a significant reduction in sulphur emissions, and Total VOC emissions would be reduced to around one half of 2010/2011 levels, primarily due to the removal of crude oil and intermediate refinery products. The overall reduction in emissions of VOCs and combustion pollutants to air would be a beneficial outcome of the Project.

Dispersion modelling was undertaken using the EPA approved AUSPLUME model to assess the potential operational impacts of the Project. Results of the dispersion modelling were compared against OEH impact assessment criteria and NEPM criteria. Results of the dispersion modelling show that the emissions from identified key pollution sources do not exceed OEH and National Environment Protection Measure (NEPM) criteria.

Given the change in emissions profile, the odour sensitivity of nearby receptors may also be modified. Whilst a significant reduction in odour emissions is expected, odour would still need to be managed through the odour reduction programs for the Site.

Given the minor scale of the construction phase of the Project, there is a low potential for construction activities to adversely impact air quality, hence a quantitative assessment of air and odour impacts from construction activities was not considered necessary.

Mitigation and management measures include the preparation of an Air Quality Management Plan (AQMP) which would be included in the CEMP.

ES 1.14 Greenhouse Gas

A review of the Greenhouse Gas (GHG) emissions under current refinery operation was undertaken and compared to the anticipated emissions under terminal operation. The assessment was undertaken in accordance with the Commonwealth *Clean Energy Legislation Amendment Act 2012* (CELA) and *National Greenhouse and Energy Reporting Act 2007* (NGER).

The emissions estimates focused on Scope 1, Scope 2 and Scope 3 emissions. GHG estimates for the Project were based on the *Australian National Greenhouse Accounts Factors* (DCCEE, 2012a) and Project specific activity data.

Using the above information, it was concluded that under the construction phase of the Project, the greenhouse gas emissions are considered immaterial when compared to current refining operations (a known energy intensive operation). GHG emissions during the construction phase were therefore not quantified.

Following a comparison of the GHG emissions for refinery and terminal operations, it was assessed that there would be a significant decrease in emissions for the proposed operation of the Project. The decrease would involve a reduction in emissions from 965.2 kilo tonnes to 23.6 kilo tonnes of CO_{2-e} and would be mainly attributed to the cessation of refining activities. This presents a beneficial impact from the Project.

ES 1.15 Socio-Economic

The socio-economic assessment involved a review of baseline conditions, a summary of potential Project impacts on the local/state economy and an outline of actions to mitigate negative impacts. The assessment was undertaken in accordance with *Draft Economic Evaluation in Environmental Impact Assessment* (Planning NSW, 2003).

During the construction phase for the Project, local economic benefits are estimated approximately \$274 million, resulting in short term, positive impacts for the local community through the creation of employment and direct spending at local services and businesses.

Following the shutdown of the refinery there would be a loss of approximately 949 full time equivalent positions and an annual salary loss of some \$111 million. The impact of this reduction is estimated to be \$172 million annually for the NSW economy. The ongoing benefit of retained employment expenditure to the NSW economy, during operation of the Project is approximately of \$21.7 million per annum.

Caltex is committed to the implementation of an employee program named “Stay, Focus & Develop”. This program would provide transitional support for staff impacted by redundancies or redeployment in different work areas.

ES 1.16 Transport and Access

The impact of the Project on local roads was assessed within the EIS in a Traffic Impact Assessment provided in **Chapter 16 Transport and Access**. Traffic count data for relevant road locations was obtained from the New South Wales Roads and Maritime Service (RMS) and Sutherland Shire Council (SSC) databases. As required by RMS the assessment was completed in line with the guidance *Guide to Traffic Generating Developments* (RTA, 2002).

Traffic generation during the construction and operation phases of the Project was estimated from construction vehicle volumes and anticipated operational activities provided by Caltex. These traffic volumes were applied to forecasts of the background traffic volumes to assess the proportional change arising as a result of the Project.

The peak construction year for the proposed Project is 2014. The number of trips generated by construction activities would be minor when compared to background volumes on Captain Cook Drive. No loss in the Level of Service along Captain Cook Drive is expected, therefore the Project traffic impact during the construction phase would be negligible.

During the operation phase of the Project, an improvement to the local traffic environment and a beneficial transport impact would be likely. Due to the reduction in employees and road haulage at the Site, the total number of vehicles using the local road network would decline considerably.

A Traffic Management Plan would be prepared for the construction phase of the Project to manage construction vehicle movements. This plan would be developed in consultation with RMS and SSC.

ES 1.17 Waste Management

The EIS has assessed the waste management issues relating to the construction and operational phases of the Project. This involved identifying, quantifying and classifying potential sources of liquid and non-liquid waste generated from the construction and operation of the Project. Recommendations on the preferred management strategies for effective storage, reuse/recovery, treatment and/or disposal were identified in accordance with DECCW, NSW (2009) *Waste Classification Guidelines*.

During the construction phase of the Project, waste would include contaminated excavated soils, surplus metals from installation and construction, concrete, asbestos cement products, wash water, excavated road base and asphalt, domestic water and general waste.

Over the operational life of the Project, waste streams would be generated from industrial activities including maintenance of the Site (i.e. tank, pipeline and pump maintenance), administration activities and associated services (e.g. water treatment). Waste would include trade wastewater, fuel oil and diesel slops, oily waters and sludge, garnet grit, used absorbent, oily rags and gloves and general waste. The Project would result in a significant reduction in operational waste generation compared to the existing refinery activities, due to reduced staffing and ceasing of refinery operations.



Caltex's existing procedures for the management of waste would be appropriately modified and adopted for the Project. This would include the development of a Waste and Resource Management Plan (WRMP) for the CEMP and as part of the Site's Environment Management Plan (EMP).

ES 1.18 Heritage

A Heritage Impact Assessment was undertaken as part of this EIS to assess the likely impacts of the construction and operation of the Project on Indigenous (Aboriginal) and non-Indigenous (historic) heritage values. The assessment involved a detailed desktop review of numerous historical texts, reports, maps and photographs, along with various heritage registers that exist at a Commonwealth, State, local and non-statutory level in order to understand of the history of the Site within the context of the Kurnell Peninsula. A site inspection was conducted by a professional heritage consultant in order to confirm the location and condition of known and potential Aboriginal and historic heritage items, places and archaeological sites.

The assessment was undertaken in accordance with the relevant state and federal legislation, policies and guidelines including the *Draft Guidelines For Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005) and the *Significant Impact Guidelines 1.1 Relating to Matters of National Environmental Significance* (Department of Environment, Water, Heritage and the Arts, 2009).

Initial consultation was undertaken with the La Perouse Local Aboriginal Land Council (LALC), and included a representative attending the site inspection as well as the opportunity to comment on the Draft Heritage Impact Assessment. As Aboriginal cultural heritage values are not likely to be affected by the proposed works further Aboriginal consultation or assessment was not considered necessary.

Aboriginal Heritage Impacts

Using the information collected throughout the desktop study and site inspection, it was concluded that no Aboriginal archaeological sites, objects or places, or areas of archaeological potential or Aboriginal sensitivity, were identified within the Project Area. Due to the extensive level of disturbance to the area, the Project is likely to have no impacts on Aboriginal heritage on the Site and a neutral impact on known Aboriginal heritage sites or values in the surrounding area.

Historic Heritage Impacts

The Project has the potential to impact three historic heritage items. These are:

- Australian Oil Refinery;
- Four-wheel drive track (Captain Cook Drive); and
- Kurnell Peninsula Headland – incorporating a number of historic heritage items.

The proposed works would not impact on significant fabric of the former four wheel drive track or the historic significance of the local heritage item. Similarly, the proposed works would not impact the Kurnell Peninsula Headland, as the works would not alter the existing landscape setting of the Kurnell Peninsula Headland or otherwise impact on the existing view corridors associated with the national heritage values of the area. Caltex is therefore not required to submit a referral to Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for an assessment and approval by the Minister under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project would have an adverse impact on the technical and scientific values of the locally listed Australian Oil Refinery site. Decommissioning the refinery would diminish ability of the Site to demonstrate its technological significance and its historical contribution to the development of an oil refining industry in NSW in the mid-twentieth century.

In order to mitigate for the adverse effect of the Project on the Australian Oil Refinery site an archival photographic record of the existing fabric and operations of the Site would be documented prior to the commencement of works. This record would become part of the history of the place and would be maintained for the appreciation of present and future generations.

A Heritage Management Strategy would also be prepared for the Australian Oil Refinery site prior to shut-down of the refinery plant to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works on the Site.

Other historic heritage items on the Kurnell Peninsula are at least 300 m from the Site and would therefore not be affected by the Project.

ES 1.19 Ecology

As part of the flora and fauna assessment for the Project a literature review and a search of the State and Commonwealth databases was conducted to assess presence or absence of threatened NSW and Commonwealth listed threatened biota. A visit to the Site was conducted by a suitably qualified ecologist to verify the findings of the desktop literature and database review.

Following the completion of the desktop review and Site investigation, an assessment of the potential habitats present within the Project Area was undertaken for those threatened species, populations and ecological communities predicted to occur in the area. Threatened biota were ruled out from the assessment if suitable habitat did not exist within the Project Area.

No adverse impacts from the construction and operation phases of the Project on identified biota were identified within these assessments, and consequently Commonwealth referral under the EPBC Act is not required.

As part of the CEMP, a Biodiversity and Weed Management Plan (BWMP) would be developed to manage and mitigate the impacts of the construction of the Project. Provided that the provisions of this BWMP are maintained throughout the construction phase of the Project significant impacts on surrounding flora, fauna, ecosystems of habitats as a result of the Project are not expected.

ES 1.20 Cumulative Impact Assessment

A cumulative impact assessment was undertaken to assess impacts of the Project during construction and operation, along with neighbouring projects, on the surrounding environment. A cumulative impact assessment is a receptor based assessment. A cumulative impact can only occur when two or more impacts affect the same receptor. Multiple project impacts could originate from the same project or from separate projects within the same geographical area.

A cumulative impact for any one environmental aspect cannot occur unless residual environmental effects are expected for that aspect. A residual impact is the impact remaining following the application of management and mitigation measures.

Following this logic, a cumulative impact assessment has been only been conducted for environmental aspects with a residual impact and/or if specifically requested by the DGRs. Therefore cumulative impacts have been conducted for the following technical studies:

- Hazard and Risk;
- Noise and Vibration;
- Socioeconomics;
- Transport and Access; and
- Heritage.

In order to identify projects with the potential to cause a cumulative impact two databases were reviewed, these were:

- Major Project Assessments register on the DP&I website; and
- Public notices and invitations to comment register on the DSEWPaC website.

The review of relevant projects from the local area concluded that only the Port and Berthing Project (SSD-5353) could affect the same noise and traffic sensitive receptors as the Project. The cumulative noise and traffic assessments concluded that the Project is unlikely to result in a significant adverse cumulative impact on the surrounding community or environmental receptors.

ES 1.21 Management and Mitigation Measures

Throughout the EIS process, management and mitigation measures have been identified to address potential risks associated with the construction and operation of the Project. These measures are derived from **Chapter 8** through to **Chapter 20** and presented as a compilation in **Chapter 21 Management and Mitigation Measures**. The chapter also outlines how these measures would be implemented and monitored by Caltex through the CEMP and incorporated into existing management plans and operating procedures currently in place at the Site.

ES 1.22 Project Evaluation and Justification

Caltex conducted a review of their refining operations in May 2011, the existing refining operations on the Site were found to be uneconomical due to increasing competition from more modern and efficient Asian refineries and a strong Australian dollar. Converting the refinery to a terminal would provide a reliable supply of fuel to Caltex's marketing operation and provide a reliable supply of petroleum fuels to the NSW and ACT economies.

Caltex considered a number of alternatives to address the Project need. The Project was selected from amongst the alternatives as the most environmentally and economically effective method of achieving a continued reliable supply of fuel to NSW and the ACT.

This EIS has demonstrated that the cessation of refining activities associated with the Project would directly result in a number of beneficial environmental outcomes including a significant reduction in greenhouse gas emissions and a large reduction in the quantity of combustion pollutants emitted from the Site, currently associated with the refining process. Potential adverse impacts have been assessed and strategies to avoid, minimise and mitigate those impacts form a key part of the EIS. The Project includes a number of commitments to manage environmental impacts during its construction and operation.

ES 1.23 Conclusion

The EIS document provides a comprehensive assessment of the Project and includes investigations into all relevant technical, social, planning and environmental issues.

Potential adverse impacts resulting from the Project have been identified in a variety of ways and then assessed. A key part of the EIS process is to develop strategies to ensure Caltex can avoid, minimise and mitigate impacts that have been identified during the construction and operation phases of the Project.

The Project has, to the extent feasible, been designed to address the issues of concern to the community and Government. Caltex has also considered impacts on the surrounding environment and community of Kurnell. Caltex firmly believes it can undertake the conversion and operate in a manner which would provide beneficial improvement to the local environment and public amenity in the area. This EIS has concluded that the Project should proceed because of the following four key reasons:

1. the Project would result in no long term adverse impacts to the environment or local community and would result in some beneficial outcomes including reduced air emissions; a reduction in greenhouse gas emissions, traffic movements, noise emissions and water usage on-site;
2. the Project would allow for the continued use of the Site following the closure of the refining facility;
3. the Project would facilitate the continued employment of local people (although it is recognised that employment would be at a reduced level); and
4. the Project would satisfy the principle of Ecologically Sustainable Development as described in the EP&A Act.

On the basis of the findings detailed within this Environmental Impact Statement, the Project is considered to be justified.

1 Introduction

1.1 Project Outline

Caltex Refineries (NSW) Pty Ltd ACN 000 108 725 (hereafter referred to as Caltex) announced in July 2012 that it would progress with converting Kurnell Refinery (the 'Site') to a finished fuel terminal facility (the 'Project'). This Project is being proposed in response to increased competition from refineries in Asia, and the balance of supply and demand in Australia.

Kurnell Refinery is located on the Kurnell Peninsula within the Sutherland Shire Local Government Area (SS LGA), approximately 15 km south of Sydney's CBD. The refinery was commissioned in 1956 and is currently used to receive and store crude oil and some refined products as well as for refining crude oil into refined products. The crude oil is delivered to the refinery via ships that dock at Kurnell Wharf in Botany Bay. These materials are transferred via pipeline to storage tanks on the Site. The crude oil is then piped from the storage tanks to the crude distillation units for processing into fuels to supply the NSW and ACT markets. **Figure 1-1** shows the location of the Site.

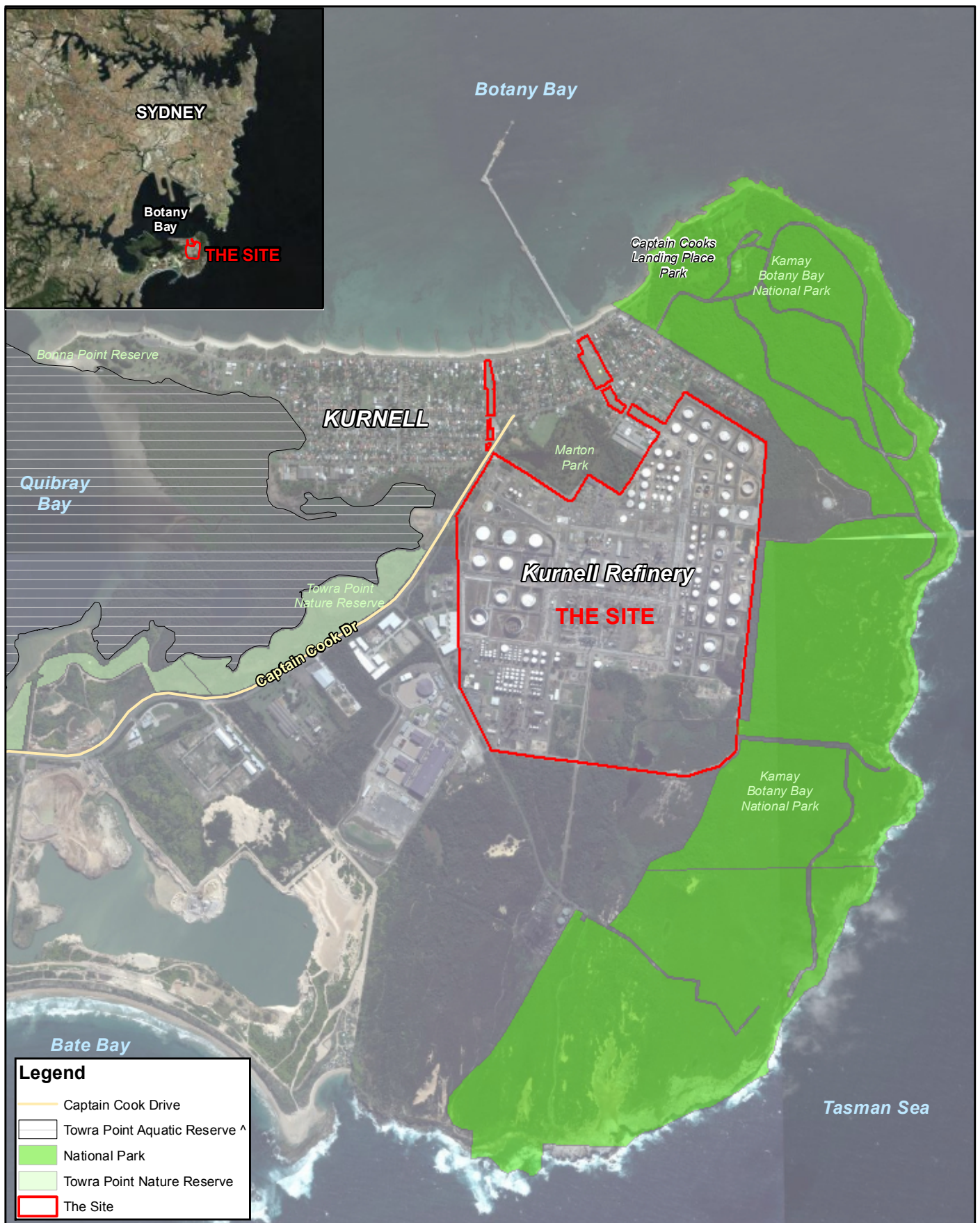
The Project would comprise:

- continued use of parts of the Site in a manner similar to that currently in place for the storage and distribution of petroleum product;
- cleaning and modification of some of the existing tanks on Site to store refined product (i.e. finished product tanks); and
- a range of ancillary works to improve efficiency and capability across the Site for its conversion and use as a terminal.

It is expected that the proposed works would be carried out over a 54 month period.

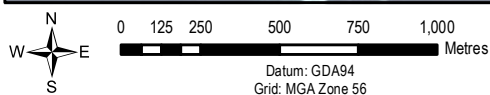
This Project is considered to be State Significant Development (SSD) for the purposes of the relevant NSW planning legislation as it falls within the requirements of Clause 10, Schedule 1 of the State Environmental Planning Policy on State and Regional Development. Specifically the Project falls within the category of chemical industry that would manufacture, store and use dangerous goods in such quantities that constitute the development as a major hazard facility. As such, this EIS has been prepared under the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to support Caltex's application for planning approval.

This Environmental Impact Statement (EIS) considers a range of environmental, safety, legal, social and economic impacts related to the Project. It assesses and describes the methods by which those impacts would be controlled, mitigated or offset to levels and standards which would ensure compliance with applicable legislative controls and which would be acceptable to regulators, and enable the proposed terminal to operate sustainably within the broader Kurnell and Sutherland Shire communities.



Legend

- Captain Cook Drive
- Towra Point Aquatic Reserve ^
- National Park
- Towra Point Nature Reserve
- The Site



Source: Aerial Imagery from Bing Maps © 2010 Microsoft Corporation and its data suppliers.
 ^ Office of Environment and Heritage (OEH)

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CALTEX
 (REFINERIES)
 PTY LTD

KURNELL REFINERY CONVERSION

SITE LOCATION

URS

File No: 43177836.003.mxd

Drawn: SB/STB Approved: RO

Date: 04/12/2012

Figure: **1-1**

Rev. **A** **A4**



This drawing is subject to COP YRIGHT.

1.2 Proponent and Team

The proponent for the works is Caltex Refineries (NSW) Pty Ltd, 2 Solander Street, Kurnell, NSW 2231. The proponent contact is Lauren Engel, Caltex Project Manager.

This report has been prepared by URS Australia Pty Ltd ACN 000 691 690 (URS), c/o 407 Pacific Highway, Artarmon, NSW 2064, Tel: (02) 8925 5500. The environmental planning and assessment coordinator is William Miles, Senior Associate Environmental Planner.

1.3 Proposed Works and Overview

Caltex is proposing to use approximately 60% of the tanks currently on Site for the storage of finished fuel product, product mixes and Site related effluent water. Many of the nominated tanks would remain in their current service. Some tanks would change service to store materials other than their current service. Where certain tanks change service, some minor works may be required. The proposed works would also require associated pipeline, pump and other infrastructure upgrade work.

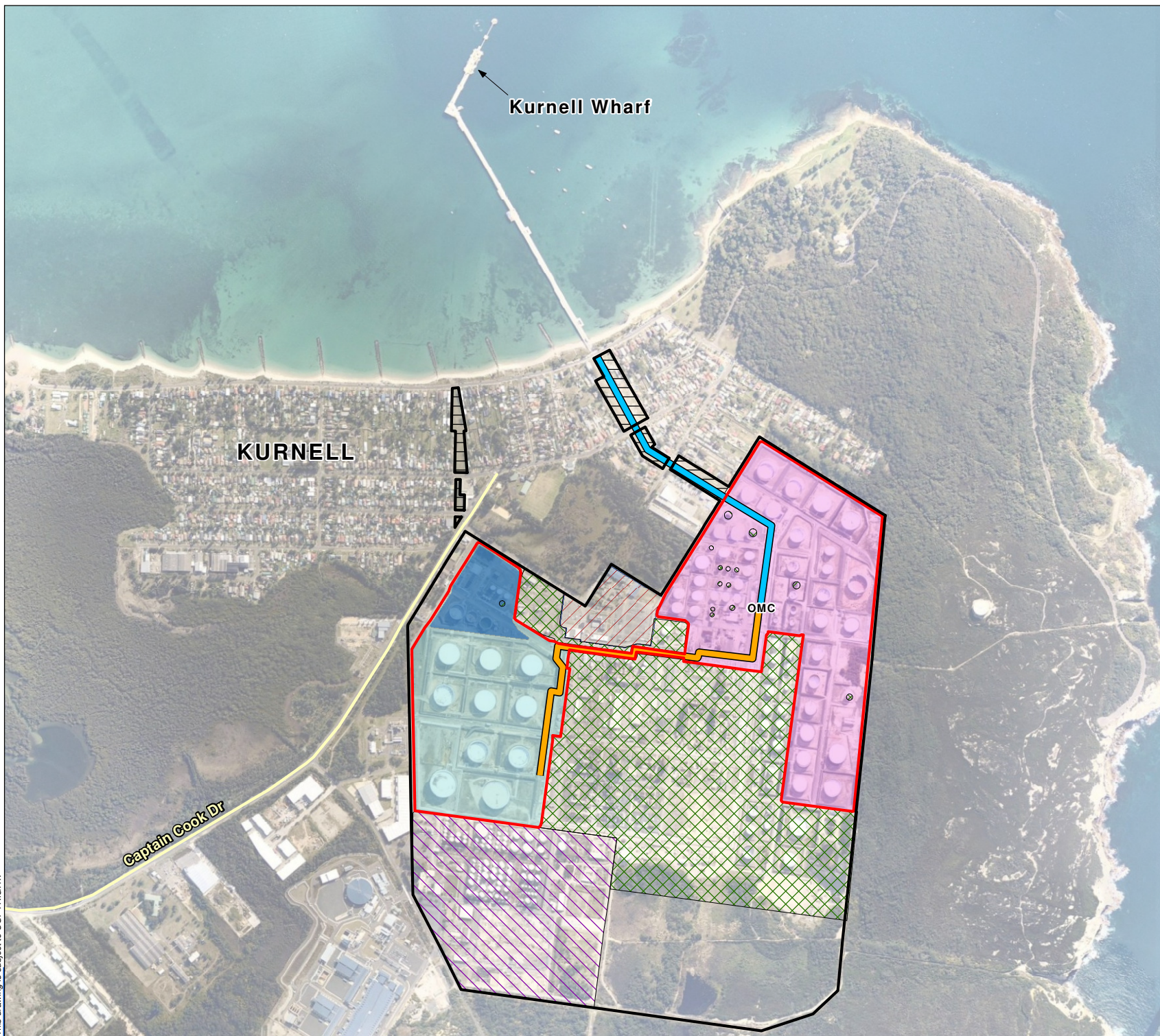
The ultimate aim of the proposed works is to allow the Site to be utilised as a terminal where finished products would be received by ship, stored in tanks before leaving the Site, predominantly by pipeline to the Caltex Banksmeadow Terminal, Silverwater Terminal, Joint User Facility at Sydney Airport, or to the Caltex Newcastle Terminal via the Newcastle Pipeline. The current capability for out loading via the wharf would be retained, but would be used infrequently. Under typical operation, road transport of products from the Site would cease. However in exceptional circumstances some road transport of product may be required. The Site would have a maximum storage capacity of 925 megalitres (ML) of refined product and by products.

1.4 Terms and Definitions

Table 1-1 provides a summary of the terms used throughout this EIS.

Table 1-1 Summary of Key Terms and Definitions

Terminology used in this EIS	Definition
the Project	The conversion of the Caltex Refinery in Kurnell for future use as a terminal to receive and distribute refined petroleum product. This Project does not include any demolition or remediation works.
the proposed works	Actions relating specifically to the construction of the Project.
the Site	The Caltex Refinery on the Kurnell Peninsula, land owned and occupied by Caltex Refineries (NSW) Pty Ltd, described primarily as Lot 25 of Deposited Plan (DP) 776328, Lot 570 DP752064, Lot 283 DP752064, Lot 1 DP132055 in the Sutherland Shire Local Government Area (refer to Figure 1-1). A full list of the lots that make up the Site is provided in Chapter 3 Project Location and Existing Environment . Caltex's landownership extends past the boundary of the 'Site' for a number of lots to the north and south. However, as they are outside the refinery fenceline they are not relevant to this EIS and have not been included in the definition of the 'Site'.
the Project Area	The part of the Site where all of the proposed works would take place (refer to Figure 1-2).
Eastern Tank Area	The Eastern Tank Area contains existing finished product tanks, some of which would need minor conversion works as part of the Project. It also contains the Oil Movements Centre (OMC) (refer to Figure 1-2).
Refinery Infrastructure	The refinery infrastructure would remain <i>in situ</i> and largely does not form part of the Project. The infrastructure would be depressurised, cleaned in line with standard maintenance procedures and then deinventoried following the refinery shut down (refer to Figure 1-2 for the location of the refinery infrastructure).
Western Tank Area	The Western Tank Area is primarily made up of the existing Crude Oil Tanks and the Waste Water Treatment Plant. All the Crude Oil Tanks would require conversion as part of the Project. It is proposed that the area would also include the new product pumps area and the new slops pumps area. (refer to Figure 1-2 for the location of the Western Tank Area).
Pipeline Easement 1	Pipeline Easement 1 joins the OMC and the wharf. There would be no works undertaken within this easement or the pipeline 'Right of Way' through Kurnell (refer to Figure 1-2) under the Project.
Pipeline Easement 2	Pipeline Easement 2 connects the Eastern and Western Tanks. This easement contains the new above ground pipelines and joins into the OMC (refer to Figure 1-2).
the study area	The area in which environmental studies have been undertaken to assist in determining the impacts of the Project. The parameters of any study area will vary depending on the environmental study being completed.
the proponent	Caltex Refineries (NSW) Pty Ltd ACN 000 108 725 (Caltex).



Legend

— Captain Cook Drive

▬ The Site

▬ Project Area

Pipeline

— Pipeline Easement 1

— Pipeline Easement 2

Tank Areas

— Eastern Tanks Area

— Western Tanks Area

▨ Office Buildings

▨ Refinery Infrastructure and Redundant Tanks

▨ Caltex Lubricating Oil Refinery (CLOR)

▨ Pipeline Right of Way

▨ Waste Water Treatment Plant (WWTP)

Coordinate System: GDA 1994 MGA Zone 56

Projection: Transverse Mercator

Datum: GDA 1994

Units: Meter



Source: Aerial Imagery - Nearmap Hypertiles 2012

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CALTEX (REFINERIES)
NSW PTY LTD

KURNELL REFINERY
CONVERSION

SITE LAYOUT

URS

Figure: **1-2**
Rev. A A4



1.5 State Significant Development Process

1.5.1 The Scope of this EIS

As a State Significant Development (SSD) (refer to **Chapter 5 Legislation and Planning Policy**), the Project is subject to the provisions of Part 4 of the EP&A Act, and accordingly, will be subject to assessment by the Department of Planning and Infrastructure (DP&I) and determination by the Minister for Planning and Infrastructure. The Minister may delegate this determination to the NSW Planning Assessment Commission (PAC).

On 14 September 2012 the DP&I issued Director General's Environmental Assessment Requirements (DGRs) for the Project pursuant to section 78A (8A) of the EP&A Act and in line with Section 51 and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). Those DGRs are provided in **Appendix A1** and a table cross referencing the DGRs and where they are addressed in this EIS can be found in **Appendix A2**. The DGRs identified both general requirements and key issues which needed to be addressed in the EIS. The key issues comprised:

- Hazards & Risks;
- Noise & Vibration;
- Contamination;
- Soil & Water;
- Heritage;
- Air Quality & Odour;
- Transport and Access;
- Greenhouse Gases;
- Waste;
- Visual;
- Biodiversity; and
- Social and Economic.

These key issues were investigated by Caltex through targeted assessments by specialists in their fields in line with relevant guidelines and assessment requirements.

The Project team also identified other issues (refer to **Chapter 7 Environmental Scoping Assessment**) that could be considered important in the context of the Project and completed assessments of these issues accordingly. These technical assessments are presented and/or summarised in **Chapters 8 – 20** of **Volume 1** of this EIS. Where necessary the conclusions in these chapters are supported by a number of detailed assessments provided in **Appendices C – I** of **Volume 2** of this EIS.

The outcomes of these assessments have then been used to formulate the proposed management and mitigation measures (refer to **Chapter 21 Management and Mitigation Measures**) and to justify why the Project is needed and should be approved (refer to **Chapter 22 Project Evaluation and Justification**).

1.5.2 EIS Preparation and Exhibition

The objectives of this EIS are to:

- comply with the requirements of the EP&A Act and EP&A Regulation as formalised in the DGRs;
- provide the Minister for Planning and Infrastructure and the Minister's delegates at the PAC with sufficient information to assess the potential environmental impacts, confirm the mitigation measures required and understand the benefits of the Project; and
- inform the community about the Project. A full account of this process is included in **Chapter 6 Consultation**.

Schedule 2, Part 3 (6) and (7) of the EP&A Regulation states that certain information must be included within the EIS. This information, and where it can be found within this EIS, is shown below in **Table 1-2**.

Table 1-2 EIS Statutory Requirements

Requirement	EIS Location
The name, address and professional qualifications of the person by whom the statement is prepared.	Statement of Validity.
The name and address of the responsible person.	Statement of Validity.
The address of the land: - in respect of which the development application is to be made, or - on which the activity or infrastructure to which the statement relates is to be carried out.	Statement of Validity. Chapter 3 Project Location and Existing Environment.
A description of the development, activity or infrastructure to which the statement relates.	Chapter 4 Project Description.
An assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule.	Chapter 22 Project Evaluation and Justification.
A declaration by the person by whom the statement is prepared to the effect that: - the statement has been prepared in accordance with this Schedule; - the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates; and - that the information contained in the statement is neither false nor misleading.	Statement of Validity.
A summary of the findings of the environmental assessment process.	Executive Summary.
A statement of the objectives of the proposed activity.	Chapter 2 Project Need and Alternatives. Chapter 5 Legislation and Planning Policy.
An analysis of any feasible alternatives to the carrying out of the proposed activity, having regard to its' objectives, including the consequences of not carrying out the proposed activity.	Chapter 2 Project Need and Alternatives.
An analysis of the proposed activity, including a full description of the proposed activity.	Chapter 4 Project Description.
A general description of the environment likely to be affected by the proposed activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected.	Chapter 3 Project Location and Existing Environment and relevant sections of Chapters 8 to 19.
The likely impact on the environment resulting from undertaking the proposed activity.	Relevant sections of Chapters 8 to 19.
A full description of the measures proposed to mitigate any adverse effects of the activity on the environment.	Chapter 21 Management and Mitigation Measures.
A list of any approvals that must be obtained under any other Act or law before the proposed activity may lawfully be carried out.	Chapter 5 Legislation and Planning Policy.

Requirement	EIS Location
The reasons justifying the carrying out of the activity in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development (ESD) relating to: - the adoption of precaution in instances of uncertainty (the precautionary principle); - the preservation of the environment as a resource between generations (inter-generational equity); - the conservation of biological diversity and ecological integrity; and - the improved valuation of environmental assets and services based mechanisms such as the polluter pays principle, lifecycle costing and establishing environmental goals.	Chapter 22 Project Evaluation and Justification.

The EIS will be placed on exhibition for public review for a minimum period of 30 days, in accordance with Section 89F of the EP&A Act.

1.5.3 Assessment and Determination

Following exhibition of this EIS, DP&I will provide Caltex with submissions, or a summary of the submissions, received during the exhibition period. Caltex may then be required to provide a written response to the submissions that have been received.

DP&I will make the following documents publically available:

- the Director General's Requirements;
- the development application, including any accompanying documents or information and any amendments made to the development application;
- any submissions received during the submission period and any response provided under Clause 85A;
- any environmental assessment report prepared by the Director-General;
- any development consent or modification to a development consent;
- any application made for a modification to development consent, including any accompanying documents or information; and
- any documents or information provided to the Director-General by the applicant in response to submissions.

The Director-General will then prepare an Assessment Report for the Project that will take into account comments from relevant Government authorities as well as other stakeholders and the community. The Assessment Report will be provided to the Minister for Planning and Infrastructure, or their delegate, who will determine whether to recommend project approval. If granted, the project approval may include a number of recommended conditions of consent to which the proponent and Project would need to adhere.

1.6 Document Structure

Volume 1	<i>Executive Summary</i>	This summarises the key issues and findings detailed in the other parts of the EIS.
	<i>Introduction</i>	Chapter 1 provides an outline of the Project, briefly outlines the environmental impact assessment process and introduces the various terms used throughout the EIS.
	<i>Project Need and Alternatives</i>	Chapter 2 details the Project need and Project alternatives.
	<i>Project Location and Existing Environment</i>	Chapter 3 provides a description of the location of the Lot and the Site and describes the existing environment.
	<i>Project Description</i>	Chapter 4 provides a detailed description of the Project.
	<i>Legislation and Planning Policy</i>	Chapter 5 includes the relevant controlling Commonwealth and State legislation and State and local policies. It identifies the licences and approvals required to enable the Project to proceed.
	<i>Consultation</i>	Chapter 6 summarises the issues raised during consultation with the statutory authorities, other relevant Stakeholders, and the local community. The issues raised during the consultation process are addressed in the subsequent specialist chapters of the EIS.
	<i>Environmental Scoping Assessment</i>	Chapter 7 provides an assessment of the potential environmental impacts of the Project and identifies the key issues for further assessment.
	<i>Environmental Assessment</i>	Chapters 8 - 20 provide an assessment of the potential impacts of the Project, including potential cumulative impacts, and the identification of appropriate mitigation measures to safeguard the environment.
	<i>Management and Mitigation Measures</i>	Chapter 21 details proposed environmental management and mitigation measures to safeguard against or minimise potential impacts.
	<i>Project Evaluation and Justification</i>	Chapter 22 addresses the principles of Ecologically Sustainable Development (ESD) and the objects of the EP&A Act as well as providing a justification for the Project.

Volume 2 *DGRs*

Appendix A contains the DGRs for the Project and a DGR response table outlining where each requirement has been addressed in this EIS.

*Environmental
Protection Licence*

Appendix B presents the relevant Environmental Protection Licence (EPL) for the Site.

Technical Appendices

Appendices C – I contain technical appendices for the preliminary hazard analysis (PHA), human health and ecological risk assessment, water management report, noise and vibration impact assessment, air quality and odour assessment, heritage impact assessment and ecological impact assessment.

2 Project Need and Alternatives

2.1 Introduction

The *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) requires that this EIS identifies the objectives of the Project and provides an analysis of any feasible alternatives for the Project, including the consequences of not carrying out the Project. To meet this requirement, this chapter will outline the need for and objectives of the Project and discuss the alternatives that were investigated in arriving at the preferred Project.

2.2 Project Need

Kurnell Refinery has the capacity to produce 135,000 barrels of refined petroleum product per day (approximately 21.5 million litres per day or 7.8 billion litres per annum). This production is supplemented by 650 million litres of refined petroleum product imports per annum.

The refinery is an important processing and distribution point. It supplies approximately 40-50% of the overall fuel supplied to New South Wales (NSW) and Australian Capital Territory (ACT) markets. This includes a significant amount of transport fuel. The refinery also supplies a range of other fuel and speciality petroleum products to domestic and international markets whilst being a leading supplier of jet fuel to Sydney (Kingsford-Smith) Airport.

Caltex initiated a review of its refining operations in May 2011, as refineries throughout Australia were facing increased competition from Asian refineries and were increasingly challenged to remain economically viable. The Caltex Kurnell and Lytton refineries in their current configuration are relatively small and are disadvantaged compared to the modern, larger scale and more efficient refineries in the Asian region. This disadvantage has been exacerbated by the impact of the on-going strength of the Australian dollar, lower Caltex refining margins and increasing costs on the 'as is' refining business.

As a result of the refining review, Caltex is proposing to close the Kurnell Refinery and convert the Site to a petroleum fuels import (finished product) terminal (the Project).

As a storage and distribution facility, Kurnell would continue to be a critical link in the transport fuel supply chain thereby meeting demand at Caltex's current market share. It would also be the intention for Caltex to participate in the expected growth in demand for petroleum products in NSW. This growth is anticipated to be approximately 4-5% per annum.

It is important to note that whether as a refinery or an import terminal, Kurnell is at the hub of Caltex's entire supply chain for NSW and the ACT. Radiating out from this hub is the extensive network of pipelines that supply bulk fuel to strategically located terminals (fuel distribution centres) at Banksmeadow (servicing much of Sydney and southern NSW), Silverwater (servicing western Sydney and NSW) and Newcastle (servicing the Hunter region and Northern NSW). These terminals do not have the capability to import finished product by ship and are not capable of being converted to import facilities in the future. They are, and would continue to be, reliant on the facility at Kurnell as the principal fuel supply source.

The nearest alternative import centres are Caltex's facilities in Brisbane and Melbourne, but they would both require extensive capital investment to increase import capability. Even then, distribution from there to the NSW market would require an enormous and unsustainable increase in tanker truck traffic both interstate and around the Banksmeadow, Silverwater and Newcastle terminals. Therefore the conversion of Kurnell Refinery to a terminal is required to support the safe, reliable supply of fuel to Caltex's marketing operations, and more broadly to ensure supply reliability of petroleum fuels to the NSW and ACT economies.

2.3 Project Objective

Given the need outlined above, the objective of the Project is to ensure that Caltex's operations within Australia remain viable whilst ensuring that the company can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.

2.4 Project Alternatives

Caltex considered a number of alternatives before identifying the Project as the preferred option. These alternatives included but were not limited to:

- Maintaining the status quo (i.e. the 'do nothing' option);
- Expanding Kurnell Refinery to a scale that could compete with Asian rivals;
- Converting the refinery to a terminal; and
- Closing the Site entirely.

In assessing these options a wide range of criteria were considered. These included: financial metrics, the level of risks involved in the alternatives, the impact on the marketing operations, the company's competitive position, Caltex's funding capacity and the feasibility to execute (including Caltex's internal capabilities and resourcing constraints).

Maintaining the status quo or expanding the existing refining operations at Kurnell would not have been financially viable for Caltex in the current market. Potentially expanding or improving the Kurnell Refinery would also involve a larger cost than a similar investment at the Lytton Refinery in Queensland. After a review of the options against the criteria noted above, Caltex decided that any investment would be better spent at the Lytton site given its superior hardware and recent investment.

However, closing the Kurnell site entirely could weaken Caltex's position in NSW and could jeopardise the safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.

Therefore the option of converting the Kurnell Refinery into a finished product terminal was considered to be the only viable alternative and it is now the Project for which Caltex is seeking approval.

3 Project Location and Existing Environment

3.1 Introduction

This chapter provides a brief description of the location and history of the Site and outlines the key environment features of the surrounding area.

3.2 The Site

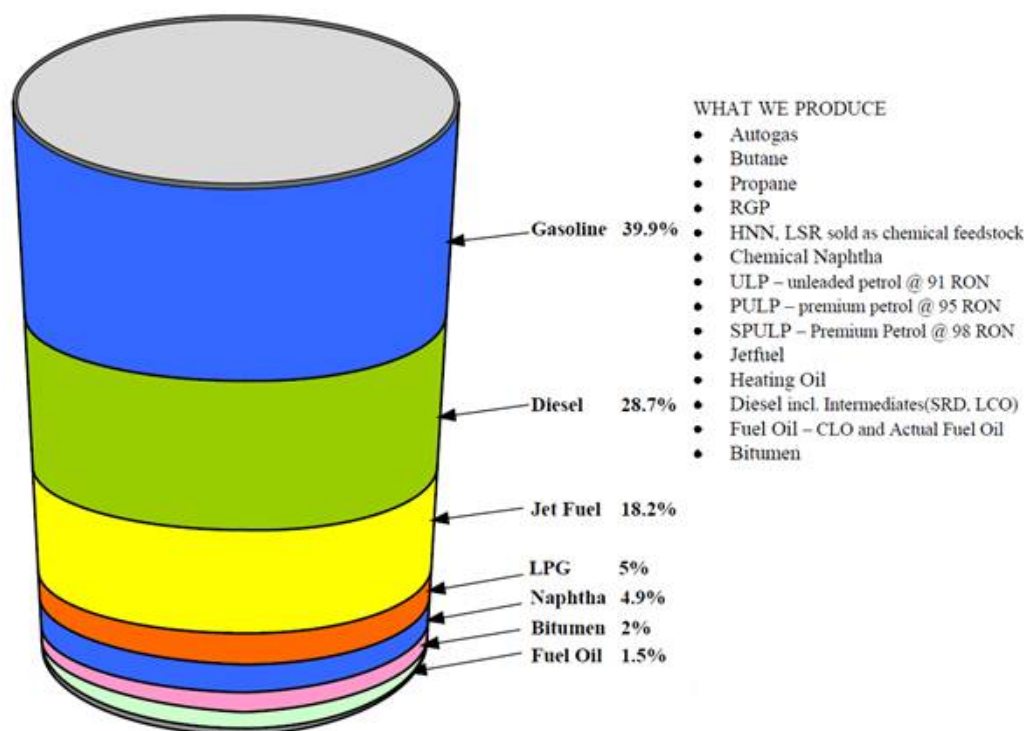
3.2.1 Site Context

The Caltex Kurnell Refinery (the 'Site') is located on Kurnell Peninsula within Sutherland Shire, approximately 15 km south of Sydney's Central Business District (CBD). The Site location is provided in **Figure 1-1**.

Kurnell Refinery is the largest oil refinery in NSW and the second largest of the seven oil refineries in Australia, based on crude oil processing capacity. The refinery currently produces a range of fuels as depicted in **Figure 3-1**. The volumes of the different products vary from year to year depending on the type of crude oil processed in the refinery and changes in product demand.

In addition to refining activities, the Site also currently acts as a terminal, receiving, storing and distributing finished petroleum products that have been refined elsewhere. Under current operations, the facility receives both pre-processed refined product and crude oil. More details on the current operation and capacity of the Site are contained in **Section 3.4**.

Figure 3-1 Caltex Kurnell Refinery Existing Fuel Production



3.2.2 Site History

Caltex requested permission to establish a major oil refinery in NSW in 1951. Permission was granted by Cumberland County Council in June 1952 and the facility was commissioned in 1956. The Site is legally described under the following lot and deposited plan (DP) numbers:

- Lot 56/ DP 908
- Lot 62/ DP 908
- Part Lot 12/ DP 7632
- Lot 190/ DP 7632
- Lot 44/ DP 8135
- Lot 46/ DP 8135
- Lot 78/ DP 8135
- Part Lot 122/ DP 8135
- Part Lot 124/ DP 8135
- Lot 48/ DP 9564
- Lot 78/ DP 9564
- Part Lot 1/ DP 215818
- Lot 1/ DP 215819
- Lot D/ DP 361103
- Lot G/ DP 361103
- Lot K/ DP 362655
- Lot 570/ DP 752064
- Lot 1/ DP 1044690
- Lot 283 / DP 752064
- Lot 57/ DP 908
- Part Lot 11/ DP 7632
- Lot 189/ DP 7632
- Lot 43/ DP 8135
- Lot 45/ DP 8135
- Part Lot 77/ DP 8135
- Lot 79/ DP 8135
- Part Lot 123/ DP 8135
- Part Lot 125/ DP 8135
- Lot 77/ DP 9564
- Lot 81/ DP 9564
- Part Lot 2/ DP 215818
- Lot B/ DP 338897
- Part Lot F/ DP 361103
- Lot J/ DP 362655
- Lot H/ DP 362655
- Lot 24/DP 776328
- Lot 25 / DP 776328
- Lot 1 / DP 132055

Since commissioning, the Site has been subject to various development applications (DAs). There are a number of DAs that are currently relevant to the works undertaken on the Site. DP&I have proposed that these DAs would be consolidated into the consent conditions for this Project (if approved) and subsequently the previous DAs would be surrendered. These DAs have been provided to DP&I to allow them to decide which consent conditions would need to be retained for this Project (if approved) in consultation with Caltex. A number of the DAs would not be relevant to the ongoing operation of the Project.

The DAs provided to DP&I consist of the following:

- Furnance Replacement 45F-100X (DA02/2151)
- Clean Fuels Project (DA 30-2-2004) (and 4 modifications);
- Decommissioning, Dismantling and Replacement of the Stand-by Flare (DA04/0554);
- Continental Carbon HPS Line;
- Construction of a Diesel Storage Tank (DA06/0873);
- Crude Oil Storage Tank 634 (06-0160);
- Extended Hours of Existing Laboratory (DA09/0480);
- Installation and Operation of a Remediation Program (DA09/0840);
- Erection of New Building (DA09/0835);
- Right of Way Contractor Facilities (DA10/0690);
- Remedation of Limestone Pits (DA11/1090);
- SEPP 55 Category 1 Remediation of a Service Station (DA11/1135)
- Jet Fuel Pipeline Upgrade Project (MP 11_0004);
- Site Electrical Supply Upgrade Project (DA 12/0238);
- Replacement of an Existing Motor Control Centre (12/0880); and
- Port and berthing upgrade (SSD-5353) (in progress).

The Site currently operates as a terminal as well as a refinery. The terminal component of the Site is considered to be a subordinate use that has been operating in conjunction with the refinery since 1956. The following development consents highlight the continued operation of this use throughout the Site's history:

- Consent No. 139/79 for the construction of two storage tanks approved on 5 December 1978;
- Development Application 849/93 for the installation of facilities for the production, storage and tanker loading of propylene rich Liquid Petroleum Gas (LPG) material approved on 4 January 1994;
- Development Application 991816 for storage tanks approved on 10 March 1999;
- Development Application 05/0241 for the construction of a new 2.66 ML bitumen tank approved on 26 April 2005; and
- Development Application 06/0873 for the construction of a diesel storage tank with a capacity of approximately 18 ML approved on 24 November 2006.

The Site is also subject to the *Australian Oil Refining Agreements Act 1954* (AORA Act) which enabled the procurement of land, construction and use of the Site (refer to **Chapter 5 Legislation and Planning Policy**).

The consents as mentioned above confirm that the Site has historically been used as a terminal for the storage of refined petroleum products (copies of the above approvals can be provided on request). The Project and approval, if granted, seek to make this the dominant future land use following cessation of refining activities on the Site.

3.2.3 Existing Operations

Context

The Site is approximately 187 ha in size and comprises storage and processing tanks, import and export pipelines as well as refining infrastructure including hydrocarbon crackers and associated pipework. The Site has over 100 tanks used for storing crude oil, refined or finished product, other petroleum intermediate products and effluent water. A summary of the operation of the refinery is provided in the following section.

Import and Process

The Kurnell Refinery has a production capacity of 135,000 barrels per day (b/d). Caltex (Kurnell) supplies around 40% of all transport fuels in NSW. Of the total amount of product that is currently imported into the Site, the Site currently receives approximately 75% crude oil and 25% pre-processed petroleum products. Both crude oil and refined product are delivered by ship into Botany Bay. From here it is delivered by pipeline along the wharf and onto the Site. Here, the crude oil is processed into a range of fuels (refer to **Figure 3-1**) including primarily gasoline (39.9%), diesel (28.7%) and jet fuel (18.2%).

Storage, Export and Distribution

As discussed in **Section 3.2.2**, the Site currently operates as a terminal as well as a refinery. The 25% of product that is received pre-processed is stored temporarily before being distributed. The 75% of the total import that arrives as crude oil is processed and stored temporarily on Site before being distributed.

Distribution from the Site is currently undertaken in three different ways:

- by road via trucks;
- by sea via ships docked at the wharf in Botany Bay; and
- by pipeline.

Jet fuel is distributed via an undersea pipeline to Sydney Airport.

Environmental Management

The Site currently operates in compliance with the conditions of its Environment Protection Licence (EPL) No 837. It is issued under Section 55 of the *Protection of the Environment Operations Act 1997* (PoEO Act) and is administered by the NSW Environment Protection Authority (EPA).

The EPL sets out conditions regulating a range of aspects of Site operations with potential to impact the environment. It also nominates environmental monitoring and/or permissible discharge, defines treatment/monitoring requirements and/or nominates limits for discharges from air, noise and water from the Site. The relevant EPL is provided in full in **Appendix B**.

A number of amendments to the EPL would be required to reflect proposed changes to the storage capacities and operational capabilities of the Site. A review would also be undertaken of the Shipping in Bulk Scheduled Activity on the EPL. The existing EPL would be amended in line with the new requirements. These amendments would be carried out in a staged manner as agreed with NSW EPA (refer to **Chapter 6 Consultation**).

The PoEO Act also provides for the management of water, air and noise pollution and the control of wastes. The Site has existing Environmental Management Plans (EMPs) for the management of environmental aspects on the Site. Following approval of the Project, the proposed management and mitigation measures outlined in **Chapter 21 Management and Mitigation Measures** would be implemented through a Construction Environmental Management Plan (CEMP) or modified EMPs to minimise the potential of the construction and on-going operation of the Project resulting in pollution of the environment.

Caltex Lubricating Oil Refinery

The south western corner of the Site is occupied by the Caltex Lubricating Oil Refinery (CLOR) (refer to **Figure 1-2**) which has been decommissioned and demolished.

Wastewater treatment plant

The wastewater treatment plant (WWTP) is in the north western section of the Site (refer to **Figure 1-2**). Rainwater that falls within tank bund areas or within the refinery infrastructure area (including the former CLOR oily water sewer system), and which would potentially be contaminated, is directed to the Site oily water sewer system, for treatment in the WWTP. The treated wastewater from the WWTP is then discharged via an outfall to the ocean in accordance with the Site's EPL. This process is discussed further in **Chapter 11 Surfacewater, Wastewater and Flooding** and **Appendix E Water Management Report**.

3.2.4 Existing Site Environment

The State Environmental Planning Policy (*Kurnell Peninsula*) (1989) (SEPP (Kurnell Peninsula)) provides for the land use and zoning in the area. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone). The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. As the Project would continue the use of the land as a liquid fuel depot, the Project is deemed permissible under the land use zones in this SEPP.

The refinery has been in operation since 1956. The Site has been highly disturbed during that time, and there are few areas of environmental significance within the Site boundary.

The Site is listed as a heritage item on the SEPP (Kurnell Peninsula) as the Australia Oil Refinery. A more complete history of the Site is included as part of the heritage assessment contained in **Appendix H Heritage Impact Assessment** and in **Chapter 18 Heritage**.

3.3 The Surrounding Area

3.3.1 Surrounding Land Uses

Since European settlement, land use on the Kurnell Peninsula has been limited by the sandy soil and the exposed location. Despite being the location of Cook's landing point, Kurnell was not settled until 1815. Traditional European agricultural practices struggled to succeed on the peninsula leading to the establishment of industrial practices, such as sand extraction.



In order to maintain the character of the area and in recognition of the unique role that the Kurnell Peninsula plays in NSW, the land use and planning framework on the peninsula is governed under the SEPP (Kurnell Peninsula). A more complete account of the statutory planning framework is included in **Chapter 5 Legislation and Planning Policy**. The SEPP (Kurnell Peninsula) functions as a Local Environmental Plan (LEP) for the area and as such all development on the peninsula is assessed against its provisions.

Land uses surrounding the Site are as follows:

- to the east and south of the Site is the southern portion of the Kamay Botany Bay National Park;
- to the north-west of the Site, there is the village of Kurnell;
- to the west of the Site is Quibray Bay; and
- land to the south west has the following land use zonings:
 - General Industrial;
 - Light Industrial;
 - Special Industrial; and
 - Special development.

The interface of industrial and residential land in this area was examined by the *Kurnell Peninsula Land Use Safety Study* (Department of Planning, 2007).

3.3.2 Residential Areas

The village of Kurnell was proclaimed in 1933 and began to flourish following the construction of the Kurnell Refinery as many of the workmen employed to construct the facility took up residence. Many of the men who were employed to construct the refinery elected to stay in the area following the project's completion.

The Site is immediately to the south of the Kurnell Village and the Kurnell Village lies immediately to the south of Botany Bay. In the 2011 census Kurnell was recorded to have a population of 2,213¹.

3.3.3 The Existing Road Network

The Kurnell Peninsula is serviced by Captain Cook Drive. Captain Cook Drive has one lane (for the majority of its length) travelling in each direction and is the only route of access and egress from the peninsula. This is discussed further in **Chapter 16 Transport and Access**.

3.3.4 Existing Environment Surrounding the Site

The general Site context in relation to Botany Bay and the wider area of Kurnell is shown in **Figure 1-1** in **Chapter 1 Introduction**.

¹ <http://www.censusdata.abs.gov.au> – accessed 22 November 2012

The Site is located at the eastern end of Kurnell Peninsula. The Site is bounded by the Kamay Botany Bay National Park to the south and east, Captain Cook Drive to the north west and St Joseph Banks Drive to the south west. The northern Site boundary is bordered by Solander Street, a small southern section of Cook Street, undeveloped land, light industry and residences off the eastern side of Cook Street, and undeveloped land on the southern side of Reserve Road. Additional residences are located on the north side of Reserve Road. The Kurnell residential area is generally located to the immediate north and north west of the Site. Cronulla residential areas are located approximately 5 km to the south west.

Marton Park, comprising a developed recreational park area and an undeveloped wetland area, is located on the northern side of Solander Road. Kurnell Substation is located on the western side of Captain Cook Drive opposite the Site. Kurnell Desalination Plant is located opposite the refinery on the western side of Sir Joseph Banks Drive. Continental Carbon Australia facility is located approximately 800 m due south of the southern Site boundary, surrounded by the National Park.

In addition to the Kamay Botany Bay National Park and Marton Park, there are a number of other reserves within proximity of the Site. Captain Cook's Landing Place Park is located approximately 500 m to the north of the Site, while Bonna Point Reserve is located approximately 1.4 km to the north west of the Site. Towra Point Nature Reserve (on Towra Point Peninsula) is a Ramsar Site and is predominately located on the other side of Quibray and Weeney Bays which are located west of the Site. Some of the Towra Point Nature Reserve extends as a vegetated fringe around the edge of Quibray Bay to an area close to the Site, north of Captain Cook Drive. Quibray Bay also includes Towra Point Aquatic Reserve which, whilst not part of Towra Point Nature Reserve and the Ramsar Site, forms a wider ecosystem with it.

To the north of Kurnell is Botany Bay, a large bay with a diverse number of uses and habitats and where the George's and Cooks Rivers meet before joining the Pacific Ocean.

3.3.5 Other Proposed Developments

In addition to the Project, there are a number of pending and approved developments that have been considered as part of the cumulative impact assessment (refer to **Chapter 20 Cumulative Impact Assessment**). These include the proposed works to the Caltex Kurnell port and berthing facility (SSD-5353). Caltex (the applicant) is seeking approval for the upgrade, continued operation and ongoing maintenance of its existing port and berthing facility located off Silver Beach in Botany Bay. There are two main elements that form the proposed works; firstly the requirement to dredge parts of the seabed; and secondly the requirement to upgrade existing elements of the berthing infrastructure.

As described in **Chapter 20 Cumulative Impact Assessment** there is no cumulative impacts resulting from both projects. There are no links, or implications of the port and berthing project on this Project.

4 Project Description

4.1 Introduction

This Chapter of the EIS provides an overview of the key components of the Project and a description of the associated construction activities. The chapter also describes:

- the proposed Project;
- the program of conversion and construction works;
- Project operation; and
- Project decommissioning.

Caltex is seeking development approval to convert the existing Kurnell Refinery into a Finished Product Terminal (the 'Project'). The conversion would involve the continued use of parts of the Project Area, in a manner similar to that currently in place, for the storage and distribution of petroleum products. A number of existing crude oil tanks would be cleaned and modified to allow for the storage of refined product (i.e. conversion to finished product tanks). A small number of other tanks already storing one type of refined product would be converted to store another. New pumps, pipes and electrical infrastructure would be installed within the Project Area. A range of ancillary works would also be undertaken to improve efficiency and to facilitate the conversion of the refinery into a terminal. These ancillary works include upgrades to and consolidation of the utilities, transportation and management systems on the Site. The Project is expected to be undertaken over a 54 month period and would cost approximately \$230 million.

The refinery plant would also be shut down, depressurised, de-inventoried and left in situ. Caltex shut down, depressurise and de-inventory the refinery plant during routine maintenance activities as part of the existing operation. Therefore approval is not being sought or required to complete this action as these works would be completed in line with the Environment Protection Licence (EPL) for the Site.

No demolition, dismantling or remediation works would be undertaken on the Site as part of this Project. Should it be required, this work would be subject to separate approvals at a later stage.

4.2 Proposed Works

4.2.1 Overview

The Project would include modifications to the existing Kurnell Refinery (the 'Site') to convert it to a working finished product terminal. The Site would have a nominal maximum storage capacity of 925 Ml of refined product and by products. The proposed terminal would manage the following products:

- Gasoline – Unleaded Petrol (ULP), Premium Unleaded Petrol (PULP) and Super Premium Unleaded Petrol (SPULP);
- Diesel;
- Jet Fuel; and
- Fuel Oil.

The terminal would also manage the following by-products:

- Slop¹; and
- Wastewater.

The Project would involve the conversion of tanks and installation of pumps and associated pipelines within the Project Area to allow for the expansion of terminal operations. These works would all occur within the Project Area outlined on **Figure 4-1**.

No works are proposed within the pipeline right of way (refer to **Figure 4-1**).

During the initial conversion activities the Site would still operate in its current mode as both a refinery and a terminal. Cessation of refinery operations would occur in the second half of 2014 and would be followed by the continued conversion of some tanks within the Project Area to hold finished products. Eventually the Site would operate wholly as a terminal. Construction staging is described in greater detail in **Section 4.3.1**.

An overview of the modifications required for the Project are summarised below.

Gasoline

Gasoline Products, including ULP, PULP and SPULP, would be stored within tanks in the Eastern Tank Area. Two existing dedicated gasoline pipelines extend from the Kurnell Wharf to the Eastern Tank Area along Pipeline Easement 1 (refer to **Figure 4-1**). Gasoline products would be distributed along these pipelines to a total of sixteen existing finished product tanks within the Eastern Tank Area. Twelve of these tanks are currently in use for storage of gasoline or similar service. Four tanks would be converted from other services to ULP/PULP/SPULP service.

Diesel

Two existing dedicated diesel pipelines extend from the wharf to the Eastern Tank Area within Pipeline Easement 1 (refer to **Figure 4-1**). Diesel product would be distributed along these lines to twelve finished product tanks within the Eastern Tank Area. At present all of these tanks already store diesel, excluding one that is currently used for fuel oil.

The two existing diesel pipelines would be extended from the Oil Movements Centre (OMC) (refer to **Figure 4-1**) along Pipeline Easement 2 to supply four large tanks within the Western Tank Area that would be converted from crude oil storage to the storage of diesel products. These pipelines would be installed low to the ground, along pipe racks in line with the existing pipework on the Site.

The existing diesel additives injection system at the OMC manifold would be duplicated at a new location within the Western Tank Area (refer to **Figure 4-1**). This system would be used to dose diesel as it is received into the terminal from the wharf to ensure that the finished product meets the required specification.

¹ Slop or slop oil is a petrochemical industry term for recovered petroleum hydrocarbons in a refinery or terminal, which requires further processing to make it suitable for sale and use. It is a product which Caltex would either reprocess at a separate facility or sell to a customer.

Jet Fuel

Two existing dedicated jet fuel pipelines extend from the wharf to the Eastern Tank Area within Pipeline Easement 1. Jet fuel would be distributed to six existing finished product tanks within the Eastern Tanks Area.

The two existing jet fuel pipelines would be extended from the OMC along Pipeline Easement 2 to supply four large tanks within the Western Tank Area that would be converted from crude oil to jet fuel service. These pipelines would be installed low to the ground, along pipe racks as per the existing pipework on the Site.

A small chemical drum and dosing pump would be installed at Gate 5 (refer to **Figure 4-1**). This system would be attached to the jet fuel pipeline and used for dosing an additive into the jet fuel as it is received into the Site from the wharf.

Fuel Oil

Two existing dedicated fuel oil pipelines extend from the wharf to the Project Area within Pipeline Easement 1. Fuel oil product would be distributed to four existing finished product tanks within the Eastern Tank Area. No proposed conversion works would be associated with these tanks as they are already used for fuel oil storage.

Slop Oil

An existing pipeline within Pipeline Easement 1 would be transferred from its current usage to transfer Slop oil. This would involve flushing the existing pipeline. No intrusive works would occur within Pipeline Easement 1. Slop produced from normal terminal transfers would be stored within five existing tanks within the Eastern Tank Area. Two of these tanks require minor piping and tank nozzle modifications to change their service to storage of slop.

It is proposed that a tank within the Western Tank Area would be changed from crude oil into slop service. No changes are required to this tank to facilitate this change of service. The existing pipelines that connect this tank to the existing slop tanks would be replaced in kind.

Wastewater

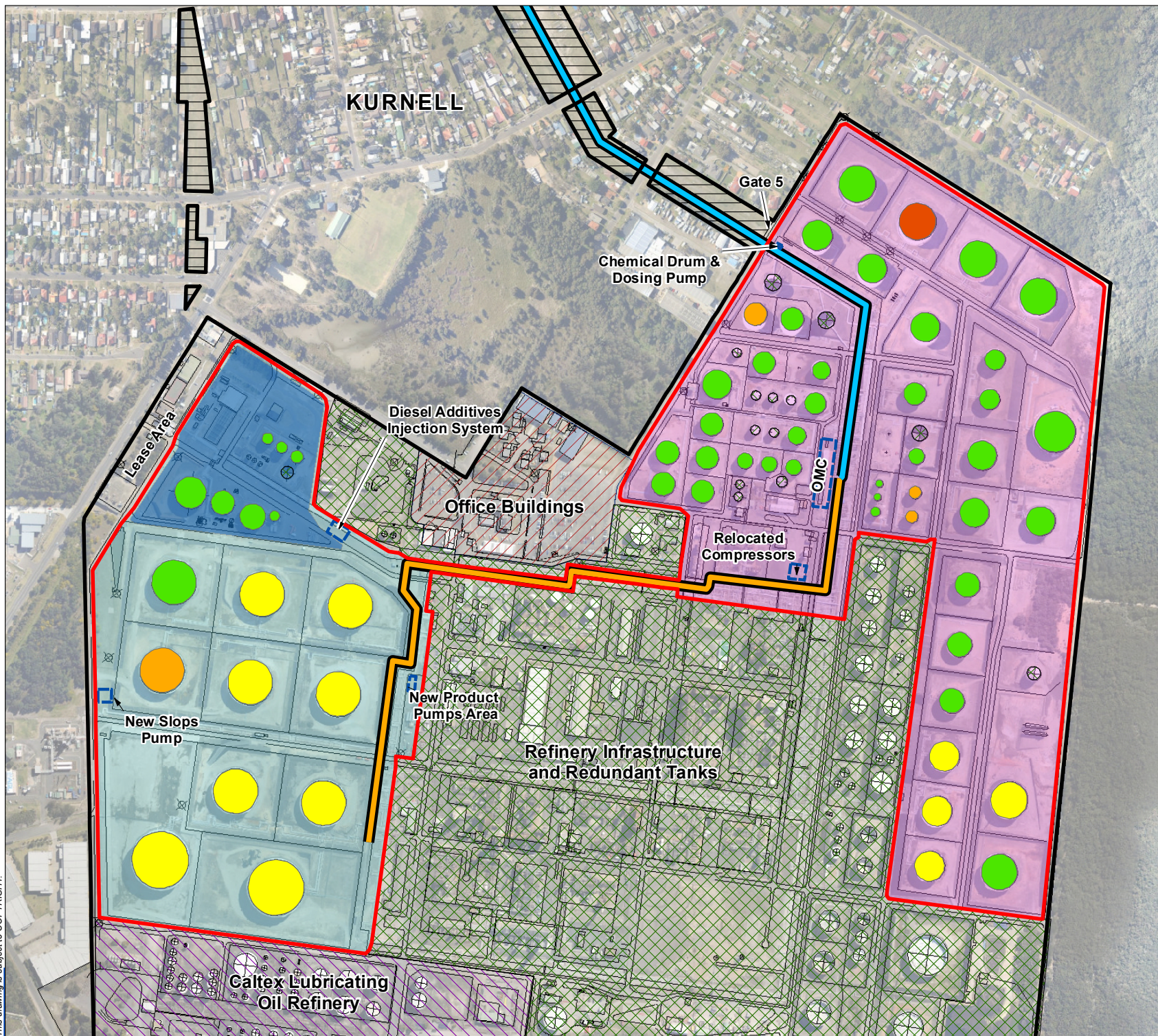
The existing Oily Water Management System (OWMS) at the Site collects process effluent and stormwater from areas of the Site where there is potential for interaction of water flows with petroleum products. Oily water from a range of sources is collected in the Site's oily water sewer system and is transferred to the wastewater treatment plant (WWTP) (refer to **Figure 4-1**).

Oily water is treated in the WWTP. The treatment process utilises physical, chemical and biological treatment to treat the oily water. Treated effluent is discharged to the Tasman Sea via the Yena Gap outfall under conditions of the Site EPL.

The WWTP would remain in service as part of the Project, operating in line with the EPL for the Site.

Utilities

The existing air, potable water, firewater, natural gas and nitrogen utilities would remain in place on the Site. Demand for these utilities would significantly decrease as a result of the Project. Some minor relocation and consolidation of utilities equipment would be required. These relocation works would include moving certain compressors and pipework within the Project Area (refer to **Figure 4-1**).



Legend

- The Site
- Project Area
- New Infrastructure

Pipeline

- Pipeline Easement 1
- Pipeline Easement 2

Tank Conversion

- Conversion Required
- No Works Required
- Change of Service
- Restore in Kind

Tank Areas

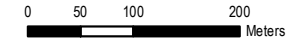
- Eastern Tanks Area
- Western Tanks Area
- Office Buildings
- Refinery Infrastructure and Redundant Tanks
- Caltex Lubricating Oil Refinery (CLOR)
- Pipeline Right of Way
- Waste Water Treatment Plant (WWTP)

Coordinate System: GDA 1994 MGA Zone 56

Projection: Transverse Mercator

Datum: GDA 1994

Units: Meter



Source: Aerial Imagery - Nearmap Hypertiles 2012

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CALTEX (REFINERIES)
NSW PTY LTD

KURNELL REFINERY
CONVERSION

**SITE LAYOUT AND
PROPOSED WORKS**

URS

Figure: **4-1**
Rev. A A4



4.2.2 Tanks

Overview

The existing Site has over 100 tanks used for storing crude oil, refined or finished product, other petroleum intermediate products and effluent water. Some of these tanks would remain in current service, some would change service with no modifications required and some would be modified to contain finished product when the refinery is converted to a terminal.

Tanks that do not require modification in order to change service would have the tank levels drawn down to minimum and, in cases where product specifications would not be compromised, the new product would be added to the tanks. In cases where product specifications could be compromised, the tank heel would be safely emptied using a vacuum truck. The material removed would be relocated to another product tank and the tank would be filled with new material.

For tanks which require modification in order to change service or have reached their statutory inspection date (Turnaround and Inspection (T&I)) the works may involve some or all the following activities:

- shutdown of the tanks and associated infrastructure;
- removal of the existing product from the tanks;
- draining the excess product from the pipes connecting to the tanks;
- isolating and making safe any infrastructure and instrumentation that is no longer required;
- upgrading control systems to improve efficiency; and
- modifications to the tanks including upgrades to the tank internals, roofs, nozzles, floors, manifolds and finished product distribution pipework where required.

Other works associated with the tank modifications (where required) include:

- installation of additional product quality controls; and
- upgrading safeguard systems.

The specific works required for those tanks that would be converted to contain gasoline, diesel and jet fuel are outlined below.

Gasoline

The changes required for the conversion of heavy oil tanks to gasoline tanks involve the following works:

- The water draw-off system for the tank would be evaluated and where required replaced.
- Installation of an internal floating roof (with air scoops, hinged covers and stainless mesh screens) and an external cone roof. These would be installed where required. This arrangement protects gasoline from external contaminants, e.g. water, and ensures safer operation.
- Internal painting would be undertaken for entire floor and shell up to the first strake² only unless additional protection is required. The external side of the tank would be painted where required.

² Section of the cylindrical "shell" of the tank/vessel formed by rolling a piece of steel and joining at the seam.

- Vent systems would be designed and installed on the gasoline tanks in line with API 2000, API1650 and API1653.
- A sleeve on the slotted guide pole would be installed on all converted EFRTs.
- Fire systems would be modified as required to meet fire foam and water volume requirements.
- New power and signal cables, cable ladders, switchgear, instrumentation and electrical motors would be installed where required.

No new mixers would be installed in these tanks. Tank mixers would be modified or replaced to meet requirements.

Diesel

The changes required for the conversion of crude oil tanks to diesel tanks involve the following works:

- The water draw-off system for the tank would be evaluated and where required replaced.
- The tank floor would be evaluated and where required repaired or replaced.
- Vent systems would be designed and installed on the diesel tanks in line with API 2000.
- Internal painting would be undertaken for the entire floor up to 600 mm. The external side of the tank would be painted where required.
- New power and signal cables, cable ladders, switchgear, instrumentation and electrical motors would be installed where required.

No new mixers would be installed in these tanks. The existing mixers would be retained.

The roofs of all the tanks would remain as an external floating roof.

Jet Fuel

The changes required for the conversion of crude oil tanks to jet fuel tanks involve the following works:

- The tank floor would be replaced with a cone down floor.
- A fast flush system³ would be installed to remove free water from the Jet Fuel.
- The tanks would be fully painted internally to minimise the possibility of product contaminations due to shell/floor corrosion.
- New power and signal cables, cable ladders, switchgear, instrumentation and electrical motors would be installed where required.
- Fire systems would be modified as required to meet foam and water volume requirements.

No new mixers would be installed in these tanks. The existing mixers would be retained.

The fixed roof would be retained on all of the tanks.

³ A sampling and quality monitoring system.

Tank Replacement

A tank in the Eastern Tank Area (refer to **Figure 4-1**) is due for routine inspection and would be restored in kind for service. This tank currently sits at ground level on a concrete ring beam pad. The restoration would involve:

- dismantling the existing tank; and
- preparing a foundation for the new tank (which would be the same size and shape as the existing tank) in the same location as the current base. This would be prepared for a cone up tank floor. This type of tank floor does not require major excavation works. Excavation depth would not extend past half a metre below ground level.

Tank Conversion Summary

The tank conversion works described above would commence in advance of recommissioning the tanks to receive imported finished product. These works would be conducted throughout the construction phase. At the end of the conversion works there would be a reduction in the total number of tanks required for the storage of finished product imports and terminal operations when compared to the number currently required for refinery operations. The tanks that are not required for terminal operations are shown on **Figure 4-1**. These tanks would be emptied, isolated, cleaned and left with all manhole covers removed. The dismantling and remediation of the redundant tanks, if required, would be subject to a separate approval process in consultation with Sutherland Shire Council and the NSW Environmental Protection Authority.

Table 4-1 provides a summary of the final tankage use within the Project Area.

Table 4-1 Terminal Tank Changes Summary

Proposed Tank Service	No. of Tanks Requiring Conversion*	No. of Tanks Requiring Change of Service
Gasoline	5	-
Diesel	4	1
Jet Fuel	4	-
Fuel Oil	0	0
Waste Water and SLOP	0	3
Total	13	4

*One tank in the Eastern Tank Area would be restored in kind

Where it has been identified that either a change of service or no works are required for a tank, a T&I would be carried out for remaining tanks at a date which complies with statutory requirements for that tank. This is a normal operating procedure at the Site. A T&I involves the following high level activities:

- removing the tank out of service and moving the product to another location;
- internally cleaning the tank to allow accurate inspection of the tank walls, floor and roof;
- preparing a scope of works based on the results of the inspection and taking into account the service period since the last tank T&I;
- undertaking repair works as required which may include tank repair, painting or further testing; and
- returning the tank to service with the proposed finished product.



4.2.3 Bunding

Bund Capacity

Caltex has committed that the bunding capacity for tanks retained in service would comply with the requirements of AS1940.

The current inspection programs at the Site monitor external bund walls and identify if repairs are required. The routine tank T&I program (refer to **Section 4.2.2**) would continue through the conversion phase and into the operational phase of the Project. This program includes inspections of and repairs to tank internal bund walls. The current tank T&I program results in the inspection and required repairs of approximately 8 - 10 tanks per year.

Tank and Bund Floors

Of the tanks which would remain in hydrocarbon service, there are some bund areas which are of natural ground construction.

Any tank floors that are rebuilt during the Project and during the ongoing operation of the terminal would incorporate a tank underfloor liner. Four tanks are currently scheduled as part of the Project to include new installation of tank underfloor liners.

Protection Measures

Caltex's focus during the construction and operation of the Project would be on inspections, maintenance and spill prevention within the tank and tank bund areas. Extensive spill prevention measures would continue to be incorporated into the operation of the Project.

The measures for tanks containing low flash materials⁴ include:

- explosive vapour detectors within the bunds;
- triple infrared scanners on tank roofs; and
- CCTV in conjunction with infrared cameras as a confirmation for alarms.

All tanks on-site would be subject to:

- an automated high level shut off system⁵; and
- continuance of a comprehensive inspection/repair program.

In addition, in the unlikely event of a spill, the Site has significant contingency arrangements, including tertiary containment capacity available within the oily wastewater system.

⁴ The flash point of a chemical is the lowest temperature where it will evaporate enough fluid to form a combustible concentration of gas. The flash point is an indication of how easy a chemical may burn.

⁵ This includes multiple high level detection instruments wired to an automatic valve which closes the tank inlet after a defined fill height has been reached.

4.2.4 Pumps

Five new product transfer pumps would be installed in the Western Tank Area. These pumps would service the newly converted large diesel and jet fuel product tanks (refer to **Figure 4-1**). The product transfer pumps would consist of three jet fuel product pumps and two diesel pumps. They would be located on the eastern side of the Western Tank Area (refer to **Figure 4-1**).

One new product transfer pump would be located within the Western Tank Area to transfer Slop Oil. This pump would be located on the western side of the Western Tank Area (refer to **Figure 4-1**).

Two new product transfer pumps would be installed at the OMC to transfer slop oil and jet fuel respectively across the Site.

For each set of pumps new concrete foundations would be installed.

4.2.5 Electrical / Instrumental Facilities

The instrumentation within the Project Area would be upgraded as part of the Project. This work would include upgrades to the:

- wharf and tank instrumentation and control systems to enable remote and automated control;
- electrical tracing would be implemented to maintain fuel oil temperatures;
- oil movements manifold systems and remote valves with segregated product distribution piping to respective tanks;
- power supplies to new pumps; and
- consolidated site electrical systems.

These works would all occur within the existing Site footprint.

4.2.6 Refinery Infrastructure and Redundant Tanks

The Project would not include the plant associated with the refining process. The tanks and refining infrastructure (in the area marked *Refinery Infrastructure and Redundant Tanks* shown on **Figure 4-1**) would be shut down, depressurised, de-inventoried and left *in situ* in a staged manner.

The shut down, depressurisation, emptying, isolating and cleaning of the refinery plant is a process that occurs as part of the T&I program on a continuous rotating basis as part of the maintenance program for the Site. Caltex has extensive documented procedures which are used routinely during T&I activities. These procedures enable all safety and environmental aspects (for example, air and noise emissions) of this process to be monitored and managed in compliance with the EPL. Therefore it is Caltex's understanding that they do not require approval to shut down, depressurise and de-inventory the refinery. The refinery infrastructure would be shut down, depressurised, de-inventoried and left *in situ* in the second half of 2014.

The tanks that are not required (i.e. the tanks located in the area marked *Refinery Infrastructure and Redundant Tanks* shown on **Figure 4-1**) would be emptied, isolated, cleaned and left *in situ* with all manhole covers removed. As above, this process already occurs as part of the T&I program on a continuous rotating basis as part of the maintenance program for the Site. This work would start in the second half of 2013 and be completed by the end of 2016.

The dismantling and remediation of the refinery infrastructure, redundant tanks (and any redundant ancillary infrastructure), if required, would be subject to a separate approval process in consultation with Sutherland Shire Council and the NSW Environmental Protection Authority.

4.3 Construction Staging and Programme

4.3.1 Construction Programme

Following Project Approval, construction works are proposed to begin in Q3 2013. During the construction phase, the Site would still operate as both a refinery and a terminal. Cessation of refinery operations would occur in the second half of 2014. This would be followed by continued conversion of some tanks and associated piping within the Project Area to hold finished products.

A high level schedule for conversion activities is shown in **Table 4-2** below.

Table 4-2 Proposed Construction Schedule

Task	Date
Detailed Engineering & Design Start	Mid 2012
Engineering & Design Completed	Q2 2013
Tank Conversions Start	Second half 2013
Installation of Piping, Pumps and Associated Infrastructure	Second half 2013
Construction on Piping Completed	Q2 2014
Kurnell Refinery Shutdown	Second half 2014
Continued Tank Conversions	End 2014 – end 2016
CONVERSION TO TERMINAL COMPLETED	December 2016

4.3.2 Working Hours

The majority of the conversion works would be typically completed between 7.00 am to 10.00 pm seven days a week. However some works consistent with Caltex's existing maintenance procedures would need to occur over a 24 hour period.

The nature of the proposed works are the same as the activities that Caltex carries out as part of their ongoing maintenance and T&I work. For the latter, the Site's existing Environmental Protection Licence (No. 837) (EPL) asks that Caltex ensure that any operational or maintenance activities on Site do not exceed 70 dB (A) between 7.00am and 10.00pm, and do not exceed 65 dB (A) between 10.00 pm and 7.00 am. The working hours for any construction works that are the same as ongoing maintenance activities would be governed by the noise limits presented in the relevant EPL for the Site.

Potential noise impacts related to the Project are discussed further in **Chapter 12 Noise and Vibration** and **Appendix F Noise and Vibration Impact Assessment**.

4.3.3 Construction Traffic

The traffic generated by the Project would incorporate a mix of construction plant vehicles, delivery vehicles and construction personnel movements. A summary of the construction vehicles and associated staff numbers that would be required during the construction of the Project is summarised in **Table 4-3**. Further detail is provided in **Chapter 16 Transport and Access**.

Table 4-3 Staff and Plant Requirements for Construction

Description		Daily Movements (return trips)	Peak Hour Trips ¹
Heavy Vehicles	Construction Vehicles (Cranes/semi-trailers etc.)	10	2
	Equipment/Material Delivery Vehicles	10	2
Private Vehicles	Construction Personnel*	140	140
TOTAL		160	144
<i>Heavy Vehicle Proportion</i>		13%	3%

1. Assumptions

- All personnel would arrive to site during the AM Peak Hour and depart during the PM Peak Hour;
- Personnel would utilise their own private vehicle with no use of car-pooling or public transport;
- Heavy vehicle movements would 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.

*Max number of construction staff (refer to Table 4-4).

4.4 Workforce

Table 4-4 provides the workforce profile for the Project, including current and projected numbers during the construction and operation of the Project.

The current workforce, including Caltex employees and contractors is approximately 885. This increases by up to 500 people during maintenance shutdown periods. These periods range from 8-12 weeks in duration.

During the peak construction year of the Project (2014), the workforce would include up to an additional 140 people on Site.

Following all construction works, and when the Project is fully operational, there would be approximately 100 people on Site, with an addition 90 people during maintenance shutdown periods.

Table 4-4 Workforce Numbers (Current and Projected)

Workforce Numbers (Current and Projected)						
	2012 ²	2013	2014 ³	2015	2016	2017
Caltex Employees	410	400	450 ⁴	40	45	45
Contractors	475	475	475	40	55	55
Project Construction	-	140	140	100	90	-
Total	885	1,015	1,065	180⁵	190	100
Maintenance Shutdown Periods ¹	500	0 ⁶	0 ⁶	0 ⁶	90	90
Total including Maintenance Activities	1,385	1,015	1,065	180	280	190

¹ Maintenance shutdown periods are periodic and for short time frames (8-12 weeks).

² Current employee numbers at the Site.

³ 2014 would be the peak construction period. Additional personnel brought to the Site for the Project construction would be a maximum of 140 personnel.

⁴ Additional Caltex Employees in 2014 would be staff hired for terminal operations.

⁵ The large reduction in numbers between 2014 and 2015 follows the cessation of refining at the Site. The increase in workforce numbers between 2015 and 2016 represents a gradual stabilisation of the terminal operational workforce.

⁶ No maintenance shutdown periods will occur during 2013 and 2015.

4.5 Operation

4.5.1 Operation as a Terminal

Once the conversion is complete, Caltex would import finished products (gasoline, jet fuel, diesel and fuel oil) through the two fixed berths at the existing wharf and the additional sub berth located in Botany Bay. These products would be stored in existing and converted tanks.

The major product distribution systems would continue to operate in line with current practice, i.e. product would be pumped under Botany Bay to the Banksmeadow Terminal, the Sydney/Newcastle pipeline or the Joint User Hydrant Installation (JUHI) at Sydney Airport for further distribution. Slop would be out loaded to the wharf and transported via ship to be sold for reprocessing. Under typical operation, road transport of products from the Site would cease. However, in exceptional circumstances some road transport of product may be required.

With the cessation of the refining operation at the Site and the high levels of automation of the terminal, the number of employees on Site would reduce (as described in **Section 4.4**). These employees would operate in a shift arrangement 24 hours a day, 7 days a week.

Ongoing operational activities would be undertaken on the Site. As described in **Section 4.2.2** this would include Tank T&Is.

4.6 Ancillary Facilities and Infrastructure

4.6.1 Electricity

The existing electricity infrastructure on Site would be used to service the new terminal. Electricity usage would reduce significantly following the shutdown of the refinery operations. However, some power would still be required for operation of the terminal assets and general amenities.

4.6.2 Water and Stormwater / Wastewater management

The current Site operations consume approximately 6 megalitres (ML) of potable water per day. Approximately 90% of this consumption would cease following shutdown of the refinery operations at the Site.

A further 1 ML of potable water per day is consumed for amenities. This volume would reduce over time as the work force declines. The long term demand at the Site following the completion of the Project is expected to reduce the overall potable water consumption by approximately 90%.

The drainage arrangements for the existing process plants would be kept in service during the Project. Storm water runoff from paved areas would continue to be routed to the Waste Water Treatment Plant (WWTP) on Site. No changes are proposed to this system. Tank bunded areas and tank water draws would remain unchanged and flow from these sources would continue to be processed through the WWTP.

Issues regarding water management on Site are discussed further in **Chapter 11 Surface Water, Wastewater and Flooding**.

4.6.3 Sewers

Existing sewerage infrastructure would continue to be used. It is expected that the amount of sewerage generated by the Site would decrease significantly.

4.6.4 Road Access

Road access to the Site would remain unchanged. Vehicle (car and truck) usage may increase marginally during initial conversion activities (2013-2014), but would decrease following the termination of refining. Vehicle movements to and from the Site would continue to decrease until full terminal operation is established reflecting reduced employees, service groups, deliveries and tanker loading activities on Site. The changes to traffic movements are discussed further in **Chapter 16 Transport and Access**.

4.6.5 Shipping Movements

The upgrade to the Port and Berthing Facility (SSD-5353) would allow flexibility in the size of the ships able to berth at the Kurnell Wharf. This flexibility would see an anticipated reduction in ships arriving at the facility by approximately 40% in 2020 (compared to 2011 figures). This reduction would occur progressively over the life of the Project.

4.7 Decommissioning

At this stage the Project is unlikely to be decommissioned whilst there is still a demand for finished petroleum products.

Continued maintenance and upgrade works are likely to occur over the coming years which would mean that the Project would remain viable into the future. These upgrade works would be subject to relevant approvals and permits which would be applied for prior to the works being undertaken as required.

In the event that the terminal is no longer required, all decommissioning and restoration activities would be in accordance with applicable federal, state, and local permits, approvals and regulatory requirements and would be completed in accordance with existing licences and the relevant legislation and safeguards at the time. These works are subject to certain environmental approvals and safeguards, which would help ensure that any related work would be completed in a safe and appropriate manner.

5 Legislation and Planning Policy

5.1 Introduction

This chapter reviews the key Commonwealth and State legislation as well as the State, regional and local planning policies that apply to the Project in order to determine the approvals that would be required to allow the Project to proceed.

The key approval required for the Project is consent under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). As the Project constitutes 'development' it requires consent under Part 4 of the EP&A Act. Under Section 79C, Part 4 of the EP&A Act, the Project must be evaluated against a range of considerations including environmental planning instruments, NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), the likely environmental, social and economic impacts of that development, the suitability of the Site, and the public interest.

Due to the nature of the Project as a major hazard facility (MHF), it is classified as State Significant Development (SSD) under section 89C of the EP&A Act and Section 10, Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP S&RD). In order to comply with the requirements for assessing this type of SSD development, an Environmental Impact Statement (EIS) must be prepared and submitted alongside the Development Application (DA).

The SSD provisions were put into place to ensure that projects of State significance were assessed and determined at a State level. The Minister for Planning and Infrastructure is the determining authority for SSD projects such as this Project. However, if more than 25 objections to the application are received, if a proponent has made a political donation, or if the local government objects to the development, these powers are delegated to a Planning Assessment Commission (PAC).

In order to assist in the preparation and development of the EIS, an Environmental Scoping Assessment (ESA) was prepared by Caltex and URS and this was submitted to the Department of Planning and Infrastructure (DP&I) on 14 August 2012.

In addition to development approval under the EP&A Act, there are a number of other approvals that may be required. This chapter reviews Commonwealth and State legislation as well as the State, regional and local planning policies that apply to the Project, to determine the approvals that would be required to allow the Project to proceed.

5.2 Commonwealth Legislation

5.2.1 Environmental Protection and Biodiversity Conservation Act 1999

Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) states that an action which has, will have or is likely to have a significant impact on a matter of national environmental significance may not be undertaken without prior approval of the Commonwealth Minister for Environment and Heritage, as provided for under the provisions of Part 9 of the EPBC Act. The Act identifies the following as matters of national environmental significance for which Ministerial approval is required:

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (including Ramsar Wetlands);

- Listed threatened species and ecological communities;
- Listed migratory species protected under international agreements (e.g. CAMBA and JAMBA);
- Protection of the environment from nuclear actions; and
- Commonwealth marine areas.

The Act also protects the environment within which any action is proposed to be undertaken, or where an action will affect Commonwealth land.

The Project would not involve a nuclear action, is not expected to have a significant effect upon the health and viability of any migratory species listed under provisions of the Act, would not affect any World Heritage property, and would not affect any Commonwealth land or its environment.

Kurnell Refinery is located within two kilometres of the Towra Point Nature Reserve, a listed Ramsar Wetland of international significance. The Kurnell Peninsula Headland is included in the National Heritage List (NHL) established under the EPBC Act.

The NHL was established to protect places that have outstanding value to the nation. Approval from the Minister is required under the EPBC Act for controlled actions which are deemed will have a significant impact on items and places listed under the NHL. The Kurnell Peninsula Headland is listed on the NHL (Listing No. 105812). An assessment of the anticipated impacts of the Project on the Kurnell Peninsula Headland is included in **Chapter 10 Human Health and Ecological Risk** and **Chapter 19 Ecology**.

It is not anticipated that the Project would have a significant impact on any Matter of National Environmental Significance (MNES). Therefore it does not need to be referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for Commonwealth approval.

5.2.2 Australian Heritage Council Act 2003

The Australian Heritage Council Act 2003 (AHC Act) establishes the Australian Heritage Council as an independent advisory body regarding National/Commonwealth heritage places and mandates the Council to maintain the Register of the National Estate (RNE) to promote the assessment and conservation of heritage items.

No items listed under the RNE are located on or adjacent to the Site (refer to **Chapter 18 Heritage**).

5.3 NSW State Legislation

5.3.1 Environmental Planning and Assessment Act 1979

A project can be declared SSD under Section 89C, Part 4 of the EP&A Act, if it meets relevant criteria within the Schedules of the SEPP S&RD or is declared as such by order of the Minister for Planning in the Government Gazette. This Project meets the requirements for a SSD under Clause 10 (3), Schedule 1 of SEPP S&RD and therefore is classified as SSD.

The provisions of the EP&A Act and the EP&A Regulation set out the requirements of assessment placed on an applicant wishing to submit a DA under Part 4 of the Act as SSD.

Section 78(A) (8A) of the EP&A Act states that a ‘*development application for State significant development is to be accompanied by an environmental impact statement prepared by or on behalf of the applicant in the form prescribed by the regulations.*’ Schedule 2 of the EP&A Regulation sets out the requirements of an EIS and requires that the content of an EIS is ‘*subject to the environmental assessment requirements that relate to the EIS*’. Accordingly, this EIS has been prepared in line with the DGRs and Schedule 2 – Environmental Impact Statements of the EP&A Regulation.

Sections 89J and 89K of the EP&A Act identify authorisations that are not required for a SSD approved by a development consent, and authorisations that cannot be refused if necessary for carrying out a SSD that is approved by a development consent. Section 89J lists the Acts or sections of Acts relating to approvals which do not apply to SSD projects. These comprise:

- the concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act;
- a permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*;
- an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*;
- an Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*;
- an authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land;
- a bush fire safety authority under section 100B of the *Rural Fires Act 1997*; and
- a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

Section 89K states that approvals under the following Acts and sections of Acts must be applied consistently and cannot be refused when carrying out a project designated as SSD:

- an aquaculture permit under section 144 of the *Fisheries Management Act 1994*;
- an approval under section 15 of the *Mine Subsidence Compensation Act 1961*;
- a mining lease under the *Mining Act 1992*;
- a production lease under the *Petroleum (Onshore) Act 1991*;
- an environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in section 43 of that Act);
- a consent under section 138 of the *Roads Act 1993*; and
- a licence under the *Pipelines Act 1967*.

The requirements of other legislation that are applicable to the Project are discussed in more detail below.

5.3.2 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) complement the EP&A Act and set out planning policies for various geographies and project types within NSW. The relevant SEPPs for this Project, and their requirements, are outlined below. These SEPPs operate under the jurisdiction of the EP&A Act.

State Environmental Planning Policy (State and Regional Development) 2011

Clause 8, Part 2 SEPP S&RD states that a project is to be determined as SSD if it is listed in Schedule 1 or 2. Clause 10 (3) of Schedule 1 relates to chemical, manufacturing and related industries and includes development for the purpose of the manufacture, storage or use of dangerous goods in such quantities that constitute the development as a major hazard facility.

This Project meets the requirements of Clause 10, Schedule 1 of the SEPP S&RD as it relates to a site that would store or use dangerous goods in such quantities that constitute the development as a major hazard facility. The Kurnell Refinery is currently a registered MHF, this will remain unchanged following conversion of the refinery to a terminal.

The provisions of the SEPP S&RD support the Project being assessed as SSD.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) outlines the approach used in NSW for planning and assessing the risks and hazards associated with industrial development proposals. Through the policy, the permissibility of an industrial proposal is linked to its safety and pollution control performance. SEPP 33 applies to proposals that fall under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'. The policy states:

- 1) *"potentially hazardous industry means a development for the purposes of any industry which, if the development were to operate without employing any measures to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality to (a) human health, life or property, or (b) the biophysical environment; and includes a hazardous industry and a hazardous storage establishment.*
- 2) *potentially offensive industry means a development for the purposes of an industry which, if the development were to operate without employing any measures to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment."*

Chapter 8 Hazards & Risks and **Appendix C Hazards and Risks** summarise the hazards and risks assessments undertaken for the Project to date. These conclude that the Project would not contravene any NSW land-use safety criteria from within the Hazardous Industry Planning Advisory Papers and would therefore be acceptable under the provisions of SEPP 33.

State Environmental Planning Policy No. 14 - Coastal Wetlands

State Environmental Planning Policy No 14 – Coastal Wetlands (SEPP 14) aims to ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the State. The Project would not directly affect any SEPP 14 wetlands as this SEPP does not apply to wetlands within the Sydney Metropolitan Region.

State Environmental Planning Policy No. 55 - Remediation of Land

State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55) provides a state wide planning approach to the remediation of contaminated land. SEPP 55 aims to promote the remediation of contaminated land with the objective of reducing the risk of harm to human health or other aspects of the environment. Section 7 of the SEPP specifies that:

'A consent authority must not consent to the carrying out of any development on land unless:

- (a) it has considered whether the land is contaminated, and*
- (b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*
- (c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.'*

Any contamination issues are discussed within **Chapter 9 Soil, Groundwater and Contamination** and **Chapter 10 Human Health and Ecological Risk**. Contamination issues during construction would be managed through specific Construction Environmental Management Plans (CEMP) and any relevant existing Environment Management Plans (EMPs).

Demolition of existing infrastructure and any associated remediation, should it be required, would be assessed as part of a separate approval process. Any remediation strategy would be developed in consultation with the NSW Environment Protection Agency (EPA) and the Sutherland Shire Council (SSC).

As no change of use proposed as part of the Project, the land would continue to be suitable for use in its current state therefore the provisions to SEPP 55 do not prevent consent being granted for the Project.

State Environmental Planning Policy 71 - Coastal Protection

State Environmental Planning Policy No. 71 - Coastal Protection (SEPP 71) commenced on 1 November 2002. The policy was made under the EP&A Act to ensure:

- development in the NSW coastal zone is appropriate and suitably located;
- there is a consistent and strategic approach to coastal planning and management; and
- there is a clear development assessment framework for the Coastal Zone.

Part 4 of the SEPP specifies provisions relating to development control for development within the Coastal Zone including public access, effluent disposal and storm water. This Project does not fall within the Coastal Zone.

State Environmental Planning Policy – Kurnell Peninsula

State Environmental Planning Policy (Kurnell Peninsula) 1989 (SEPP (Kurnell Peninsula)) aims to conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation, State, region and locality. SEPP (Kurnell Peninsula) applies to the land within the Sutherland Shire, known as Kurnell Peninsula, and adjacent waterways. The provisions of the SEPP (Kurnell Peninsula) cover a number of issues that are outlined below.

Zoning of Land

The SEPP (Kurnell Peninsula) provides for the land use and zoning in the area. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone). The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. As the Project would continue the use of the land as a liquid fuel depot, the Project is deemed permissible under the land use zones in this SEPP.

Land Use Conflict

SEPP (Kurnell Peninsula) seeks to mitigate land use conflicts in the area and to ensure that adequate provision is made for the supply of water and the disposal of all wastes and stormwater from the land. All Project surface water impacts would be managed using the management and mitigation measures laid out in **Chapter 11 Surface water, Wastewater and Flooding**. Project waste impact would be managed using the management and mitigation measures laid out in **Chapter 17 Waste Management**. Should all the measures within this chapter be implemented during construction and operation, impacts relating to surface water and waste would be mitigated.

Heritage Protection

Clauses 23A to 23D, SEPP (Kurnell Peninsula) prescribe the protection of items and places of Aboriginal and historic heritage. Schedule 2 'Archaeological Items' and Schedule 3 'Heritage Items' include a number of items that are in close proximity to the Project. This includes the listing of the 'Australian Oil Refinery'.

Schedule 2 Clause 23B (2) states:

(2) The Council may consent to the carrying out of development on an archaeological site or potential archaeological site that has non-Aboriginal heritage significance only if:

- (a) it has considered a conservation assessment of the impact of the proposed development on the site, and*
- (b) it has notified the Heritage Council of its intention to do so and taken into consideration any comments received from the Heritage Council within 28 days after the notice was sent, and*
- (c) it is satisfied that any necessary excavation permit required by the Heritage Act 1977 has been granted.*

A heritage assessment has been undertaken for the Project. A report documenting this assessment is included in **Appendix H Heritage Impact Assessment** and summarised in **Chapter 18 Heritage**. This assessment has included management and mitigation measures that would be implemented to ensure that the provisions of the SEPP (Kurnell Peninsula) relating to the protection of heritage assets are managed throughout the lifecycle of the Project.

5.3.3 Other NSW State Legislation

While the EP&A Act provides the framework for the planning and development approvals system in NSW, there are a number of other Acts, Regulations and Environmental Planning Instruments (EPIs) of relevance to the Project. The relevant Acts, Regulations and EPIs are discussed below.

Australian Oil Refining Agreements Act 1954

The *Australian Oil Refining Agreements Act 1954* (AORA Act) was gazetted to facilitate the construction and operation of the Kurnell Refinery. The Act also allows for Caltex to maintain its asset at the Kurnell Site.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (PoEO Act) provides for the issue of an Environment Protection Licence (EPL) for scheduled activities pursuant to Section 48 of the PoEO Act, in relation to pollution and waste disposal caused by development or operation of developments. Activities requiring an EPL are listed in Schedule 1 of the Act.

Activities relating to chemical storage are listed in clause 9 of Schedule 1. These include Petroleum Products Storage with a capacity to store more than 200 tonnes (liquefied gases) or 2,000 tonnes (chemicals in any other form). The proponent has an existing EPL (No. 837) that licenses a number of activities for Kurnell, including Petroleum Products Storage. A number of amendments to the exiting EPL would be required in order to account for the changes to the storage capacities and operational capabilities of the Site. The existing EPL would be amended in line with the new requirements. These amendments would be carried out in a staged manner as agreed with EPA. As per Section 89K of the EP&A Act, any necessary EPL modifications under the PoEO Act would be applied consistently with any approval as SSD in a manner approved by EPA.

The PoEO Act also provides for the management of water, air and noise pollution and the control of wastes. The proposed management and mitigation measures outlined in **Chapter 21 Management and Mitigation Measures** would be implemented through a CEMP or modified EMPs to minimise the potential of the Project resulting in pollution of the environment.

Contaminated Land Management Act 1997

The primary objective of the *Contaminated Land Management Act 1997* (CLM Act) is to establish a process for investigating and remediating land where contamination presents a significant risk of harm to human health or another aspect of the environment. Where land is identified as potentially contaminated, consultation with the NSW EPA should be undertaken.

The Site is listed as a NSW Contaminated Site under the CLM Act. In June 2003 the EPA issued an Agreement to the Voluntary Investigation Proposal for the Kurnell Refinery and right of way. This agreement is detailed on the Section 149 Planning Certificates.

As part of this agreement, the EPA stated that three areas were to be investigated, namely the area of Tank 101, the right of way and the Caltex Lubricating Oil Refinery (CLOR) area (refer to **Figure 4-1**). The EPA stated that soil and groundwater within the Site was contaminated and that the contaminants present a significant risk of harm to human health and environmental receptors. Contaminants of concern in groundwater in the Tank 101 and the right of way were identified by the EPA as total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylene (BTEX), and Naphthalene. Investigation works were carried out following receipt of the agreement. On 1 July 2005 the EPA gave notice that the terms of the Voluntary Proposal had been satisfactorily completed.

Demolition of existing infrastructure, should it be required, would be assessed as part of a separate approval process. Following the completion of any demolition works, remediation, where required, would be undertaken. Any remediation strategy would be developed in consultation with the EPA and SSC.

Environmentally Hazardous Chemicals Act 1985

The *Environmentally Hazardous Chemicals Act 1985* regulates chemical wastes in NSW. Under the Act, Chemical Control Orders (CCO) can be declared for specific wastes types. CCOs can set controls on activities throughout the chemical's lifecycle through general requirements and by requiring that certain activities be subject to particular licence conditions. The EPA currently has five CCOs in place in NSW, which includes Polychlorinated Biphenyl (PCB) wastes.

Condition L8.1 of the Site's EPL 837 notes that the licensee must comply with the "*Chemical Control Order in Relation to Materials and Wastes Containing Polychlorinated Biphenyl, 1997*" This CCO outlines controls on the generation, processing, storing, conveying and disposal of PCB materials or wastes (depending on the concentration of PCB).

Any wastes generated as part of the Project would need to be managed in accordance with the *Environmentally Hazardous Chemicals Act 1985* and EPL 837.

Work Health and Safety Act

The *Work Health and Safety Act 2011* (WH&S Act) and its supporting Regulation 2011 (WH&S Regulation) includes measures to prevent accidents occurring at MHFs.

The Site is classified as a MHF. Any works to or modifications of a MHF require the consent and approval of WorkCover NSW as the administrators of this Act.

WorkCover NSW has been informed of the Project. In consultation with the Major Hazard Facilities Unit of WorkCover NSW, Caltex has agreed to a number of commitments for the management of the Project. These are outlined in **Chapter 6 Consultation** and addressed in **Chapter 8 Hazards and Risks**.

Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates a range of activities undertaken on public roads. Section 138 of the Roads Act requires that a person obtain the consent of the appropriate roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a public road.

The Project would not require any of the works listed above. Accordingly an approval under section 138 of the Roads Act would not be required for the Project.

Water Management Act 2000

The *Water Management Act 2000* (WM Act) establishes a framework for managing water in NSW. The Act creates:

- mechanisms for protecting and restoring water sources and their dependent ecosystems;
- improved access rights to water; and
- partnership arrangements between the community and the Government for water management.

No increased impacts to aquifers or other water sources are anticipated as a result of the Project. Excavation from the proposed works would be limited to 1 m below ground level (mbgl), while groundwater is at approximately 2 mbgl. This is discussed in **Chapter 9 Soil, Groundwater and Contamination** and **Chapter 11 Surface Water, Wastewater and Flooding**. Therefore no approvals would be required under the WM Act.

Water Act 1912

The WM Act is gradually replacing the planning and management frameworks within the *Water Act 1912*. Surface water allocation for the Project is administered under Part 2 of the *Water Act 1912* and groundwater is administered under Part 5 of the *Water Act 1912*.

Where the Project is likely to intercept groundwater, a licence under Part 5 of the *Water Act 1912* would be required. Groundwater is likely to be encountered in excavations deeper than 1.4 m. Previous civil works at Kurnell showed that groundwater was almost always encountered in excavations greater than 1 m depth (refer to **Chapter 9 Soils, Groundwater and Contamination**).

Project excavations are not expected to exceed 1.0 m in depth. Therefore groundwater is not expected to be encountered. A licence under Part 2 of the *Water Act 1912* is therefore not expected to be required.

Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides legal status for biota of conservation significance in NSW. The Act aims to 'conserve biological diversity and promote ecologically sustainable development'.

Chapter 19 Ecology and **Appendix I Ecology Impact Assessment** provide the ecological impact assessment for the Project. The requirements of the TSC Act have been incorporated into this assessment. The assessment of potential impacts of the Project on species, populations and communities listed under the TSC Act is in line with the requirements of this Act. This assessment has concluded that the Project would result in no significant impacts to the values protected by the TSC Act.

Fisheries Management Act 1994

Part 7a, section 220A of the *Fisheries Management Act 1994* (FM Act) provides for the conservation of all biological diversity of aquatic and marine vegetation. It also ensures that the impact of any 'action' affecting threatened species, populations or ecological communities is appropriately assessed.

Section 89J of the EP&A Act outlines approvals and legislation that do not apply to SSD such as this Project, including seeking a permit under sections 201, 205 or 219 of the FM Act.

The potential for the Project to impact on the ecological values protected by the FM Act has been assessed in **Chapter 10 Human Health and Ecological Risk** and **Chapter 19 Ecology**. These assessments have concluded that no significant impacts on the values protected by the FM Act are expected as a result of the Project.

Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* provides for the identification and control of noxious weeds and specifies the duties of public and private landholders to control noxious weeds. The Act stipulates that an occupier of land must take steps to control noxious weeds on their land. The Act also provides for the monitoring of and reporting on the effectiveness of the management of weeds in NSW. Appropriate methods for controlling noxious weed species are defined under the control category or categories for particular species of weeds.

The impact of the Project on noxious weeds and their management on the Site has been assessed within **Chapter 19 Ecology**. Management of noxious weeds on the Site would continue to be subject to Caltex's existing Weed Management Plan (WMP).

Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) provides for the conservation of environmental heritage defined as places, buildings, works, relics, moveable objects, and precincts, of State or local heritage significance that are at least 50 years old. The Act provides for the listing of heritage structures on the State Heritage Register and Orders can be made under the Act to protect relics from removal or alteration. This Act applies to non-Aboriginal relics only. Aboriginal relics are protected under the *National Parks and Wildlife Act 1974* (see below).

Section 89J of the EP&A Act outlines approvals and legislation that do not apply to SSD such as this Project. This includes an approval under Part 4, or an excavation permit under Section 139 of the Heritage Act.

Nevertheless an assessment of the potential impacts of the Project on heritage items in the area is provided in **Chapter 18 Heritage**. That assessment concludes that the Project is unlikely to have an adverse impact on any heritage features in NSW.

National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974* (NP&W Act) the NSW National Parks and Wildlife Service (NPWS) (part of the Office of Environment and Heritage (OEH)) is responsible for the care, control and management of all national parks, historic sites, nature reserves, Aboriginal areas, state conservation areas and regional parks. Two relevant aspects of this Act that relate to the Project are discussed below.

Protection of Flora and Fauna

The NP&W Act administers the protection of flora and fauna. It makes it an offense to harm any animal, threatened species, population or community that is protected under this Act within a licence or development consent. It also enables the creation of State-protected sites of ecological value. The relevant provisions of this Act and relevant State-protected sites of ecological value have been considered within **Chapter 19 Ecology**. This chapter concluded that the Project would not have a significant impact on any threatened species, population or community protected under this Act.

Protection of Aboriginal Heritage

NP&W Act also provides for the conservation of objects, places or features of cultural value. It makes it an offence to knowingly destroy, deface or damage, or cause or permit the destruction or defacement of or damage to, an Aboriginal object or place without the necessary consent. Aboriginal places and objects protected under this Act are registered on the Aboriginal Heritage Information System (AHIMS). The Aboriginal heritage provisions of the NP&W Act have been considered in **Appendix H Heritage Impact Assessment** and summarised in **Chapter 18 Heritage**. As the proposed works are SSD there is no requirement to apply for approval under the NP&W Act.

Pipelines Act 1967

The *Pipelines Act 1967* (Pipelines Act) specifies provisions relating to the construction, operation and maintenance of pipelines and purposes connected therewith. Pursuant to clause 5(1)(a) of the Pipelines Act, subject to section 5A, a licence is not required to be held in respect of a pipeline constructed or to be constructed under, or under an approval or other authority granted under, any Act, other than this Act or the EP&A Act. Accordingly, the Project does not require a licence pursuant to the Pipelines Act for the minor pipeline works to be undertaken.

5.4 Local Planning Policies and Instruments

The Project will be assessed in accordance with Section 79C(i) of the EP&A Act. This Act states that Environmental Planning Instruments (EPIs) need to be considered during the EIS process.

The Site and the wider Kurnell Peninsula, as discussed in **Section 5.3.2**, is pursuant to SEPP (Kurnell Peninsula). The Site is zoned pursuant to SEPP (Kurnell Peninsula). Therefore, the local zoning provisions of the *Sutherland Shire Local Environment Plan 2006* (SSLEP) are not applicable to the Project. However the overall outcomes of the SSLEP should be considered.

The SSLEP aims to promote an appropriate balance of development and management of the environment that will be ecologically sustainable, socially equitable and economically viable.

5.5 Strategic Planning Framework

The EIS has also assessed the Project against all relevant strategic planning documents, including those outlined below.

Land Use Safety Study (Kurnell Peninsula) 2007

The Land Use Safety Study assesses the current risks from Caltex Refinery operations to existing and future residential land uses and provides recommendations for risk reduction and development control. The Land Use Safety Study identifies three main sources of risk from the refinery:

- 1) fires from large crude oil and refined petroleum product storage tanks and associated transfer pipelines;
- 2) fires, explosions or toxic gas releases from processing areas; and
- 3) fires and explosions from large liquefied petroleum gas (LPG) storage.

The Preliminary Hazards Analysis (PHA) for the Project examines the current and future operations of the facility and is contained within **Chapter 8 Hazards and Risks** and **Appendix C Hazards and Risks Assessment**.

NSW Coastal Policy 1997

The *NSW Coastal Policy 1997* provides the strategic direction for coastal management in NSW. By using the principles of ecologically sustainable development, the NSW Coastal Policy aims to facilitate the development of the coastal zone in a way that protects and conserves its values. One of the policy's objectives is to recognise and consider the potential effects of climate change in the planning and management of coastal development.

A greenhouse gas assessment, including a consideration of climate change, has been undertaken as part of the EIS and is contained in **Chapter 14 Greenhouse Gas**.

A consideration of sea level rise has been provided in **Chapter 11 Surface Water, Wastewater and Flooding**.

NSW Coastal Planning Guideline: Adapting to Sea Level Rise

The *NSW Coastal Planning Guideline: Adapting to Sea Level Rise* (DoP 2010) aims to ensure that the risks of sea level rise and enhanced coastal risks and hazards are recognised. It applies to all coastal areas of NSW, including the NSW Coastal Zone, as well as Sydney Harbour and Botany Bay. 'Coastal areas' is defined broadly in the guideline to include the coastline, beaches, coastal lakes and estuaries, as well as the tidal reaches of coastal rivers. It also includes other low-lying land surrounding these areas that may be subject to coastal processes in the future as a consequence of sea level rise.

A consideration of sea level rise has been provided in **Chapter 11 Surface Water, Wastewater and Flooding**.

The Metropolitan Plan for Sydney 2036

The Metropolitan Plan for Sydney 2036 (Metropolitan Plan) integrates land use, urban and funded–transport planning together for the first time, providing a framework for sustainable growth and development across the city to 2036.

The Project aligns with the Metropolitan Plan as it allows for the continuation of an existing land use.

The Project also aligns with the Metropolitan Plans goal of tackling climate change, in particular to "*reduce greenhouse gas emissions from the manufacturing and commercial sectors*". This is discussed further in **Chapter 14 Greenhouse Gas**.

6 Consultation

6.1 Introduction

The following chapter documents the consultation effort undertaken to date for the Project. The Director General's Requirements (DGRs) for the Project place the responsibility of consultation with the applicant.

The DGRs require Caltex to:

'consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.'

The DGRs also outline a number of key governmental stakeholders that should be consulted. These are identified in **Section 6.5**.

The DGRs require that the EIS outline the issues that have been raised during the Project specific consultation process and indicate where in the EIS these issues are addressed. This summary is contained within **Table 6-2**.

A summary of the DGRs and where they have been addressed are presented in **Appendix A DGRs**.

6.2 Overall Approach

Consultation between the refinery management and various stakeholders is an ongoing process. Caltex maintains an open dialogue between the personnel responsible for the refinery and those residents with whom it shares the Kurnell Peninsula. Regular community meetings, announcements and feedback sessions with the residents are part of the ongoing consultation process. The Project specific consultation for this EIS was undertaken as part of this existing process.

The Project specific consultation has included:

- a series of public meetings;
- liaison with government agencies, including those identified within the DGRs; and
- targeted consultation with relevant landowners.

6.3 Objectives of Consultation

The aim of the consultation for the Project has been, and remains, to:

- identify relevant stakeholders;
- identify key issues, latent issues and sensitivities surrounding the Project;
- improve awareness of the proposed works and understand concerns;
- maintain accurate and timely communication concerning the Project and approvals process; and
- ensure that Government agencies are engaged in the planning and approvals process.

6.4 Stakeholder Identification

Stakeholders relevant to the Project have been identified as part of Caltex's ongoing community and stakeholder liaison strategy, and in line with the Project specific consultation strategy developed by Caltex prior to Project announcement.



6.5 Government Agency Identification

In addition to consultation with NSW DP&I, the DGRs for the Project (refer to **Appendix A**) stated that Caltex must engage in consultation with the following government agencies:

- Environment Protection Authority;
- Fire and Rescue NSW;
- NSW Department of Primary Industries (Office of Water and NSW Fisheries);
- NSW Heritage Council;
- NSW Office of Environment and Heritage;
- NSW Transport (Roads and Maritime Services);
- Sutherland Shire Council;
- Sydney Metropolitan Catchment Management Authority;
- Sydney Ports; and
- WorkCover NSW.

To meet the requirements of the DGRs, letters have been sent to these agencies to provide information regarding the Project and to provide each agency with the opportunity to submit comments on the assessment process.

This letter outlined the Project and provided contact details for URS if any further comments or requirements wished to be forwarded for the EIS.

Consultation undertaken with government stakeholders is outlined in **Table 6-1**. A summary of any responses is provided in **Table 6-2**.

Table 6-1 Consulted State Government Agencies and Authorities

Department	Consultation Method	Response Provided
NSW Environment Protection Authority (EPA)	Meetings	Yes. Summary provided in Table 6-2 .
NSW Fire and Rescue	Letter, email and meetings	Yes. Summary provided in Table 6-2 .
NSW Department of Primary industries (Office of Water and NSW Fisheries)	Letter and phone call	Yes. Summary provided in Table 6-2 .
Heritage Council of NSW	Letter, phone call and meeting	Yes. Summary provided in Table 6-2 .
NSW Office of Environment and Heritage (OEH)	Letter and phone call	Yes. Summary provided in Table 6-2 .
NSW Transport (Roads and Maritime Services)	Letter and phone call	Yes. Summary provided in Table 6-2 .
Sydney Metropolitan Catchment Management Agency	Letter	No. Extensive consultation has been undertaken in relation to the Kurnell Port and Berthing Project (SSD-5353).
Sutherland Shire Council	Meeting	Yes. Summary Provided in Table 6-2 .
NSW Sydney Ports Corporation	Letter	No. Extensive consultation has been undertaken in relation to the Kurnell Port and Berthing Project (SSD-5353).
WorkCover NSW	Email	Yes. Summary Provided in Table 6-2 .

6.6 Additional Government Meetings

In addition to the consultation specified in the DGRs, other government stakeholders were also contacted during the Project specific consultation effort.

Meetings have been held with the following representatives of Commonwealth, State and local government:

- Former Mayor of SSC; Carol Provan;
- SSC General Manager; John Rayner;
- Federal Member for Cook; Scott Morrison;
- State Member for Cronulla; Mark Speakman; and
- Mayor of SSC; Kent Johns

The purpose of these meetings was to keep key government representatives up to date on the progress of the Project. Where required, the issues discussed at these meetings are summarised in **Table 6-2**.

6.7 Indigenous Groups

Consultation with the local indigenous group has been undertaken as part of the indigenous heritage assessment (La Perouse Local Aboriginal Land Council (LALC)). This is detailed in **Chapter 18 Heritage**. In summary, consultation was undertaken in accordance with Step 1 of the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Draft Guidelines) (DEC 2005). Consultation was undertaken to:

- provide La Perouse LALC, as statutory representatives of the local Aboriginal community, with the opportunity to comment on the Aboriginal cultural heritage values of the Project Area and be involved in the heritage assessment process;
- identify potential Aboriginal cultural heritage values of the Project Area;
- integrate potential Aboriginal heritage values and recommendations for management into the assessment report; and
- provide an opportunity for the local Aboriginal community to comment on the outcomes and recommendations of Heritage Impact Assessment reporting.

Initial consultation was undertaken with La Perouse LALC, which was advised of the Project on 18 October 2012. The draft preliminary Aboriginal heritage assessment was provided to La Perouse LALC for review and comment prior to finalisation of the report. No comments were received on the draft report for incorporation into the final document.

6.8 Public Consultation

Caltex maintains an on-going dialogue with the local community regarding its operations on the Kurnell Peninsula. Quarterly meetings are held for the community in Kurnell. This consultation is advertised and well-attended by a core group from the local community.

The Project was first announced to the Kurnell community by a letter drop on the 26 July 2012.

An initial presentation regarding the Project was made to the group on 15 August 2012. The purpose of the meeting was to set out the principles behind the Project, the wider context and longer-term economic drivers behind the decision to cease refinery operations and convert the refinery to a terminal. A summary of the questions raised by the community at this meeting is provided in **Table 6-2** in **Section 6.10**.

Caltex intends to use upcoming meetings to keep the attendees continually updated on the progress of the Project.

In addition to the quarterly Kurnell Community Meeting, Caltex also engages with the local Kurnell community at the following events:

- Kurnell Progress Residents Association (monthly) Meeting; and
- Printed reports in Kurnell Village News (bi-monthly).

The public consultation effort would intensify closer to commencing the Project if approval is granted. This would be consistent with Caltex's approach to undertaking works on the Site, and would involve letter drops to the closest residents and other interested parties to outline the nature of the proposed works and to offer the opportunity for feedback via a 24-hour hotline number. This number forms part of an established community feedback process where comments and concerns are relayed back to the refinery Manager, Community Relations Manager and the Head of the Environmental Group, depending on their nature. Any comments would fall under the established governance process whereby they would be logged, tracked and responded to promptly.

The process of regular community meetings, the use of the hotline and providing further information to the community via letter drops would be used throughout the proposed works.

6.9 Exhibition

The EIS will be placed on public exhibition by the DP&I for a minimum of 30 days. Submissions made during the exhibition of the EIS would be addressed with the Submissions report to be prepared as part of the assessment process for the Project. This process provides further opportunity for public and government agency involvement and participation in the environmental planning and assessment process for this Project.

6.10 Summary of Issues and Responses

Appendix A2 provides a summary the DGRs, and includes a reference to where the corresponding issues have been addressed, discussed, considered and either accommodated or discounted.

Table 6-2 summarises additional comments raised in the consultations outside of the preparation of the DGRs along with questions raised at the community meetings.

Table 6-2 General Issues Raised Through the Consultation Process

Issue	Addressed In
Government Authority issues raised	
NSW DP&I	
<u>Consistency Review Comments – 8.4.13, and meeting discussions – 12.4.13</u>	
Following consistency review, DP&I made a number of minor comments. The main comments consisted of: • Some additional details regarding the existing operation on the Site; • Information of relevant previous development applications; • Some clarifications regarding the Project description; • Additional detail regarding certain environmental planning instruments; and • Additional details regarding the Hazard and Risk Assessment.	Chapter 3 Existing Environment & Project Location, Chapter 4 Project Description, Chapter 5 Legislation and Planning Policy, Chapter 8 Hazards & Risks, Chapter 18 Heritage, Appendix C Hazards & Risks Assessment
NSW EPA	
<u>Meeting Outcomes – 5.11.12</u>	
The ongoing management of the Waste Water Treatment Plant - The EIS for the conversion works will state that Caltex has an 'in principal' agreement with the EPA on this issue. This agreement includes that a Pollution Reduction Program condition would be included in the terminal EPL to apply when the terminal is operational.	Chapter 11 Surface Water, Wastewater and Flooding and Appendix E Water Management Report
Tank bunding, including future capacity and upgrades to existing bund floors - Caltex and EPA have an 'in principal' agreement on an approach focusing on maintenance, inspection and spill prevention. The EIS will include information on safety measures to be implemented including monitoring and management.	Chapter 11 Surface Water, Wastewater and Flooding and Appendix E Water Management Report
EPA requested that changes in air emission characteristics be quantified as part of a Level 1 or Level 2 assessment, and Caltex agreed that USEPA TANKS modelling and dispersion modelling would be undertaken as part of the EIS.	Chapter 13 Air Quality and Odour and Appendix G Air Quality Impact Assessment
<u>Consistency Review Comments – 8.4.13, and meeting discussions - 12.4.13</u>	
Following consistency review, EPA made a number of minor comments. The main comments consisted of: • Some additional details regarding the existing operation on the Site; • Some clarifications regarding the Project description and closure of the refinery; • Confirmation that certain parts of the Site are no longer in use; • Clarifications regarding the noise limits for the Site during the conversion works and operation and other minor noise assessment clarifications; and • Further detail on the assumptions used in the air quality impact assessment.	Chapter 3 Existing Environment & Project Location, Chapter 4 Project Description, Chapter 11 Surface Water, Wastewater and Flooding, Chapter 12 Noise and Vibration, Chapter 13 Air Quality and Odour, and Appendices E, F and G
Fire and Rescue NSW	
<u>Overview of Consultation – 17.7.12 – 29.1.13</u>	
Initial meeting and Site visit with Fire and Rescue NSW and Caltex representatives (17.2.12 and 20.2.12 respectively). An overview of the Project was provided.	
Following the receipt of the DGRs by Caltex, a meeting was held with Fire and Rescue NSW to discuss DGR response requirements and nature of the proposed works.	Appendix A DGRs
Caltex received email correspondence from Fire and Rescue NSW (24.10.12) indicating satisfaction with the broad principles surrounding post conversion fire protection at Kurnell.	Chapter 8 Hazards and Risks

Issue	Addressed In
<u>RMS</u>	
<u>Phone consultation regarding Transport and Access Chapter – 11.10.12 and 12.10.12</u>	
URS requested information regarding the most up to date traffic volume data for Captain Cook Drive and for 5 year accident history data. RMS supplied the 5 year accident history data for Captain Cook Drive and all intersections along its length.	Chapter 16 Transport and Access
URS consulted with RMS to determine whether there are any projects within the vicinity of the development that RMS required to be included within a cumulative assessment. The RMS officer advised that they were not aware of any projects within the vicinity of the Project that would be required to be included within the assessment.	Chapter 16 Transport and Access and Chapter 20 Cumulative Impacts
<u>Sutherland Shire Council</u>	
<u>Phone consultation regarding Transport and Access Chapter – 9.10.12 and 10.10.12</u>	
URS requested information regarding the most up to date traffic volume data within the region. SSC informed us that they did not hold any more up to date data than had already been provided by RMS.	Chapter 16 Transport and Access
URS consulted with SSC to determine whether there are any projects within the vicinity of the development that SSC required to be included within a cumulative assessment. SSC were not aware of any projects that should be included.	Chapter 16 Transport and Access and Chapter 20 Cumulative Impacts
<u>Meeting Outcomes - 2.11.12</u>	
No significant issues came out of the meeting with the SSC. An overview of the Project was provided and ongoing plans for the Site, contaminated land provision, Ecology, acid sulphate soils, residential amenity and community concerns regarding the risk profile were the main points discussed. SSC were assured that these issues would be dealt with in the EIS.	Requirements of SSC addressed throughout the EIS and Appendices
<u>Consistency Review Comments – 8.4.13, and meeting discussions - 12.4.13</u>	
SSC asked for further information regarding the potential flood risk associated with the Site, for further information regarding the changes in water streams through the Site and for more detail regarding future water management.	Chapter 11 Surface Water, Wastewater and Flooding and Appendix E Water Management Report
<u>NSW DPI</u>	
<u>Phone consultation regarding DPI requirements – 12.12.12</u>	
URS discussed with the DPI their requirements for the EIS with the DPI planning contact. She outlined that the letter provided by the DPI as part of the DGRs was a guide. Where certain requirements do not apply to the assessment, they can be discounted.	Appendix A DGRs, Appendix E Water Management Report and Appendix I Ecology Impact Assessment
<u>NSW OEH</u>	
<u>Phone consultation regarding OEH requirements – 9.10.12</u>	
An 'in principal' agreement was given that URS' approach to the environmental assessments specific to OEH's interests was adequate.	Appendix A DGRs, Appendix H Heritage Impact Assessment and Appendix I Ecology Impact Assessment
<u>Heritage Council of NSW</u>	
<u>Response letter – 23.10.12</u>	
A letter was received from the Heritage Council of NSW noting that URS and Caltex are required to consult further with the Council regarding the approach to the Heritage Assessment for the Site. It also noted that that the Site is listed on the SEPP (Kurnell Peninsula) as an 'Archaeological Item'. A contact at the Council was provided.	Chapter 18 Heritage and Appendix H Heritage Impact Assessment

Issue	Addressed In
Meeting Outcomes – 10.01.13	
Approaches to the Heritage Report for the Project were discussed. It was agreed that Caltex had a lot of existing archive information gathered about the Site. For the purposes of the EIS it was agreed that a commitment to completing a Heritage Management Strategy for the Site following Project Approval should be included. This would provide Caltex with a framework for the ongoing management of the Site heritage and would help inform other works moving forward. This would include a review of the overall heritage significance of the Site.	Chapter 18 Heritage and Appendix H Heritage Impact Assessment
WorkCover NSW	
Meeting Outcomes – 10.12.12	
In consultation with the Major Hazard Facilities Unit of WorkCover NSW, Caltex has agreed that: • Caltex Australia Petroleum Pty Ltd ACN 000 032 128 would submit a notification under clause 548 of the WH&S Regulation 2011, within 3 months of becoming aware of the requirement to notify or such longer period approved by WorkCover; • Caltex Australia Petroleum Pty Ltd would submit a Safety Case outline to WorkCover within 3 months after the facility is determined; • Caltex Refineries (NSW) Pty Ltd would continue to operate under and maintain its existing Safety Case and associated management system controls until transition to the new operating company; • Within 24 months after the facility is determined Caltex Australia Petroleum Pty Ltd would submit to WorkCover, a licence application under clause 549 of the WH&S Regulation 2011, together with a fully revised Safety Case; • Caltex Australia Petroleum Pty Ltd will ensure the recommendations from the official investigation into the Buncefield Fuels Terminal incident¹ are specifically addressed in the submitted Safety Case; and • Caltex and Workcover NSW would continue to meet on a quarterly basis to ensure regulatory requirements with respect the compliance with the NSW Work Health and Safety legislation are met.	Chapter 8 Hazards and Risks and Appendix C Hazards and Risks Assessment
Community issues raised	
Kurnell Community Briefing 15.08.2012	
The following outlines relevant questions relating to the EIS that were raised by the community during the Project briefing:	
What are the future shipping movements and types of ships to be used under the proposed works?	Chapter 4 Project Description
Is there a greater risk of spills, and has Caltex had any spills?	Chapter 11 Surface Water, Wastewater and Flooding
General questions regarding the nature of the proposed works, (e.g. storage of tanks on Captain Cook Drive and areas of the refining Site to be dismantled).	Chapter 4 Project Description
What will be the current and future land ownership of the Site and its future use?	Chapter 3 Project Location and Existing Environment
Concern regarding contamination on the Site and plans to remediate.	Chapter 9 Soils, Groundwater and Contamination
Request for an outline on the economic return from the decision to convert the refinery.	Chapter 15 Socio-Economic

¹ The Buncefield Incident was a major conflagration caused by a series of explosions on 11 December 2005 at the Hertfordshire Oil Storage Terminal, UK.

Issue	Addressed In
Request of further information regarding the environmental assessment process and community consultation process.	Chapter 1 Introduction and Chapter 6 Consultation
Concern regarding the amount of information made available to the public, in particular information surrounding any state/local government environmental and development approvals lodged on internet for review.	Chapter 6 Consultation and the Exhibition Process
Quarterly Community Meeting 28.11.2012	
The following outlines relevant questions relating to the EIS that were raised by the community during the Project Community Meeting:	
Will the distribution pipelines (to airport, Banksmeadow, Silverwater) remain the same?	Chapter 4 Project Description

7 Environmental Scoping Assessment

7.1 Scope of Potential Impacts

The environmental assessment process will assess relevant biophysical, environmental, economic and social impacts that could arise during the construction or operation of the Project. In order to effectively undertake the assessment, any potential impacts must be identified and appropriate methodologies must be employed in the assessment. These methodologies should be appropriate to the magnitude of potential impact.

The identification of potential impacts, and confirmation of appropriate assessment methodologies, is determined through a scoping process. This scoping process for this environmental impact statement (EIS) has been based on:

- a review of available information and documents relating to the existing environment;
- site visits and appraisals; an Environmental Scoping Assessment (ESA), submitted to the NSW Department of Planning and Infrastructure (DP&I);
- receipt of the Director General's Requirements (DGRs) for the Project (refer to **Chapter 1 Introduction** and **Appendix A1 DGRs**);
- consultation with agencies, community groups and other stakeholders (refer to **Chapter 6 Consultation**);
- a review of relevant legislation and planning policy (refer to **Chapter 5 Legislation and Planning Policy**); identifying the sensitivities of the local environment (refer to **Chapter 3 Project Location and Existing Environment**);
- understanding the characteristics of the Project (refer to **Chapter 4 Project Description**); and
- an identification of other projects or actions that may cumulatively add to any perceived impact from the Project.

7.2 Summary of Potential Issues Identified

Following the scoping process, the environmental aspects that could potentially be subject to adverse impacts are listed alphabetically below:

- Air Quality & Odour;
- Ecology;
- Greenhouse Gas;
- Hazards & Risks;
- Heritage;
- Human Health and Ecological Risk;
- Noise & Vibration;
- Soil & Water;
- Socio Economics;
- Surface Water & Wastewater;
- Traffic & Transport; and
- Waste.

7.3 Prioritisation of Potential Issues

The risk assessment conducted for the Project has been based on recognition that a more detailed assessment would be required for the biophysical, environmental, economic and social aspects with the highest potential likelihood and greatest potential consequences. A qualitative risk assessment has been conducted based upon the guidelines outlined in AS/NZS 4360:2004 and AS/NZS ISO 31000:2009. This assessment and the assessment methodology used are outlined in **Section 22.1 of Chapter 22 Project Evaluation and Justification**. This risk assessment has been refined since the risk assessment undertaken for the ESA based on the information outlined in **Section 7.1**.

Table 7-1 outlines the key environmental issues in relation to the Project. This process has been used to help prioritise the scope of work for each environmental aspect.

Table 7-1 Prioritisation of Environmental Issues

High Priority Issues	Medium Priority Issues	Low Priority Issues
- Hazards and Risks (Chapter 8) - Soils, Groundwater and Contamination (Chapter 9) - Human Health and Ecological Risk (Chapter 10)	- Surface Water, Wastewater and Flooding (Chapter 11) - Noise and Vibration (Chapter 12) - Air Quality and Odour (Chapter 13) - Greenhouse Gas (Chapter 14) - Socio-economic (Chapter 15)	- Transport and Access (Chapter 16) - Waste Management (Chapter 17) - Heritage (Chapter 18) - Ecology (Chapter 19)

Although the DGRs ask that a visual impact assessment be undertaken as part of the EIS, this assessment has not been included as the Project and associated plant and equipment would be of a similar industrial nature, and located adjacent to, existing structures at the Site. No demolition of the major structures on Site is included as part of this Project. Therefore, all works associated with the Project are considered to be negligible in terms of visual impacts and as such a visual impact assessment was not considered necessary for this Project.

7.4 Format of the Assessment Chapters

A common format has been adopted for reporting each of the assessment chapters. This is outlined below.

7.4.1 Introduction

This section provides an overview of the environmental aspect under consideration. It also provides cross-reference to other technical assessments or relevant appendices that have been used to inform the assessment chapter.

7.4.2 Scope of the Assessment

This section outlines the relevant Director General's Requirements (DGRs) for the particular environmental aspect and explains where certain parts of the DGRs have been excluded along with the reason for the exclusion.

7.4.3 Legislation and Planning Policy

This section outlines legislation, policies and plans relevant to the environmental aspect. Where appropriate certain guidance may also be discussed. This section is only included where specific legislation or policy applies to a particular aspect. A separate review of legislation and policy relevant to the Project as a whole is considered in **Chapter 5 Legislation and Planning Policy**.

7.4.4 Method of Assessment

This section outlines the guidance and methods used to:

- understand the existing environment relevant to the particular environmental aspect;
- complete an assessment of the potential impacts of the Project on the particular environmental aspect; and
- assess whether these impacts are significant.

7.4.5 Existing Environment

For each environmental assessment there is an explanation of the approach to identifying impacts and assessing whether a potential impact is likely to be considered significant. Assessments can either be quantitative (relying on criteria, standards and thresholds) or qualitative (using certain scientific material, but ultimately making decisions based on professional judgement).

The section describes the key components, characteristics and the status of the existing environment relevant to the environmental aspect. It also considers any changes to the existing environment over the period of time where the proposed works are to take place. The key receptors for each assessment will be identified and described in this section.

7.4.6 Impact Assessment

This section identifies potential impacts of the Project on the sensitive receptors for the particular environmental aspect and evaluates the significance of the impact in accordance with the criteria detailed in the Method of Assessment.

Impacts may be referred to either prior to (potential impact) or following mitigation (residual impact). In the 'Impact Assessment' section all impacts are potential impacts.

Impacts can be considered:

- direct or indirect;
- adverse or beneficial; and
- significant, non-significant (negligible) or neutral.

Where existing criteria, guidance, environmental standards or assessment methodologies exist, the significance of an impact will be based on that information. Where possible and/or necessary quantitative judgements about the significance of an impact will be made using this information. Where no explicit guidance or information exist qualitative judgements on the significance of an impact will be made. Where qualitative judgements are required, some or all of the following impact characteristics will be considered to understand its potential magnitude:

- extent - the area potentially affected by the impact;
- magnitude – the size or amount of the impact;
- duration – how long the impact is likely to last;
- frequency – whether the impact is continuous, brief or intermittent;
- timing –if the impact occurs at a particularly sensitive time; and
- permanence – whether the impact is permanent or temporary.

The judgement as to whether an impact is significant will depend on the importance or sensitivity of the receptor (e.g. as defined by legislation, policy, standards or guidance) and the magnitude of the impact affecting it (as decided by quantitative or qualitative means). For the purposes of the 'Impact Assessment' section of each technical chapter all impacts are considered 'alone' and not cumulatively.

7.4.7 Mitigation

This section describes the management and mitigation measures that have been identified to avoid, reduce or compensate for the effects of any significant impacts on the environment.

The mitigation hierarchy has been used to help identify management and mitigation measures for each of the technical assessments. Wherever possible, impacts have been firstly avoided where possible, then either reduced at source or at receptor where avoidance cannot be achieved, and finally either compensated or offset where avoidance or reduction is not possible or would not achieve practicable or acceptable levels of mitigation.

If management and mitigation measures are to be implemented through particular environmental management plans, then these will also be discussed.

Once all of the mitigation measures are identified and described, this section will also consider any residual impacts that would remain following the application of the management and mitigation measures.

7.4.8 Cumulative Impact Assessment

Any residual impacts may need to be considered in a cumulative impact assessment (CIA). A CIA considers the potential cumulative impact of this Project with other projects or actions on a specific receptor or group of receptors. It is a receptor focused assessment, therefore if the Project is not affecting a receptor or group of receptors 'alone' then it cannot have a cumulative effect with another project or action. The only exception to this rule is if one of the potential cumulative projects weakens a management or mitigation measure to the point where a Project residual impact becomes significant again. Only where necessary will a cumulative effects assessment be included in a technical chapter. A summary of all of the CIAs is provided in **Chapter 20 Cumulative Impacts**.

7.4.9 Summary

At the end of each assessment chapter a summary is provided. This summary will note any residual impacts and any other relevant permits or licences that are required. It will also provide a table summarising the management and mitigation measures for the particular assessment. This table will show whether a particular measure should be implemented during the design, construction or operational stage of the Project.

The management and mitigation tables from all of the technical assessments are collated into a single table within **Chapter 21 Management and Mitigation Measures**.

8 Hazards and Risk

8.1 Introduction

This chapter has been prepared in response to the Director General Requirements (DGRs) for the Project (refer to **Appendix A DGRs**) which require that the EIS include, “A summary of the results of a Preliminary Hazard Analysis (PHA) undertaken for the proposed development. The PHA should be prepared in accordance with Hazardous industry Planning Advisory Paper No. 6 – Hazard Analysis (HIPAP No. 6)¹.”

This chapter is a summary of the PHA (provided in **Appendix C-1**) and Buncefield Review (provided in **Appendix C-2**) and other risk information drawn from both historical risk studies for the Kurnell Refinery and more recent hazard studies for the Project. It focuses on hazards and risks to people and property from potentially significant incidents.

8.2 Scope of Assessment

This chapter along with the information provided in **Appendix C Hazards and Risk Assessment** provide:

- a summary of the significant hazards associated with the existing Site and with the operational phase of the Project, as well as any external hazards (i.e. natural hazards) to determine the potential for off-site impacts;
- information showing that the proposed terminal and associated operations would be operated and maintained at acceptable levels of safety and that effective safety management systems would be applied both for the final terminal arrangement as well as during the transition period from refinery to terminal;
- the results of the assessment of consequences, likelihoods and risk to demonstrate the Project complies with criteria set out in *Hazardous Industry Planning Advisory Paper No 4 - Risk Criteria for Land Use Safety Planning*²;
- an assessment of the cumulative impact of the whole Site and the surrounding potentially hazardous developments in the area, demonstrating that the Project does not increase the cumulative risks of the area to unacceptable levels;
- the basis of the failure rates used in the hazard and risk assessment, appropriate to the age and condition of the components of the proposed terminal;
- a review of the Buncefield recommendations relevant to the Project; and
- a review of the recommendations in the DP&I's Kurnell Peninsula Land Use Safety Study relevant to the Project.

¹ *Guidelines for hazard analysis*, NSW Department of Planning, January 2011

² *Hazardous Industry Planning Advisory Paper No. 4 (HIPAP No. 4): Risk Criteria for Land Use Safety Planning*, January 2011

8.3 Legislation and Planning Policy

State Environmental Planning Policy No. 33 (Hazardous and Offensive Development) 1992

This SEPP defines the approach used in NSW for planning and assessing industrial development proposals that include hazards or offensive components. Through this policy, the permissibility of an industrial proposal is linked to its safety and pollution control performance.

This SEPP applies to any proposals that fall under the policy's definition for potentially hazardous or offensive industry. As the proposed works relate to the conversion of the refinery into a terminal to store finished product, the Project qualifies under the SEPP as potentially hazardous industry.

For such proposals, this SEPP establishes a comprehensive test by way of a hazard and risk assessment to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls (mitigation).

Hazardous Industry Planning Advisory Papers 2011

The NSW Government recognises that the risks associated with the storage and handling of hazardous materials can never be eliminated entirely. Industry and the Government have a responsibility to ensure that these risks are negligible compared to the risks faced during the course of everyday life and a number of requirements need to be fulfilled to allow a site to be developed and to operate within NSW.

A rigorous assessment process has been developed by DP&I (as the Department of Urban Affairs and Planning (DUAP) in 1992) with regard to approvals for potentially hazardous industries in NSW. The process follows a number of steps that provide assurances that the risks imposed by a development upon surrounding land uses would be within acceptable limits, and that this would continue to be the case throughout the life of the development.

The first part of this process is an assessment of hazards and risks at the development application stage. This assessment is to form part of the EIS process. The hazard and risk assessment provides a rigorous investigation of the elements of the proposed operation that have the potential to conflict with surrounding land uses, in terms of risks to people, property or the biophysical environment. Two Advisory Papers are relevant to the proposed works. They are discussed below.

- **HIPAP No.4: Risk Criteria for Land Use Planning 2008** - This HIPAP includes suggested risk assessment criteria that are to be considered when assessing the land use safety implications of potentially hazardous industrial development. The suggested criteria are equally relevant and applicable to the consideration of land use planning and development in the vicinity of potentially hazardous facilities. These criteria have formed the basis of assessment for this chapter.
- **HIPAP No.6: Guidelines for Hazard Analysis 2011** - This HIPAP provides advice on the general approach recommended for hazard analysis. This approach has been adopted in this EIS. This analysis can be applied to proposed or existing development.

Work Health and Safety Act 2011

The finished product terminal would be managed in compliance to the requirements of the *Work Health and Safety Act 2011* and its supporting Regulation. The Regulation sets the general requirements for workplace health and safety risk management. These requirements include the duty to identify hazards, manage risks to health and safety, apply the hierarchy of control measures, and maintain and review the effectiveness of control measures.

Caltex's finished product terminal would be classified as a Major Hazard Facility (MHF) in accordance with Chapter 9 of the *Work Health and Safety Regulations (2011)* (WHS Regs). As such Caltex would be required to prepare a Safety Case for the finished product terminal. This would include providing a written presentation of technical, management and operational information about the hazards and risks that may lead to a major accident and justifying the control measures that have been taken, or would be taken, to ensure the safe operation of the finished product terminal.

By focusing attention on major accident prevention, the Safety Case facilitates a continuous improvement model for safety at the facility.

The Project would result in a downscaling of operations at the existing Site and therefore a reduction in the overall complexity and risk associated with the Site, Caltex is committed to continue to operate and maintain under its existing Safety Case and associated management system controls in anticipation of the classification of the proposed terminal as a MHF.

8.4 Consultation

A requirement of the DGRs was that during the preparation of the EIS, Caltex was to consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and potentially affected landowners. The EIS was required to describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.

Of relevance to Hazards and Risk is the consultation that Caltex has undertaken with the following agencies:

- WorkCover NSW; and
- Fire & Rescue NSW.

8.4.1 WorkCover NSW

Caltex has consulted with the Major Hazard Facilities Unit of WorkCover NSW with regard to matters that need to be addressed in the EIS to demonstrate that compliance with the requirements of the Work Health and Safety legislation would be achieved.

It has been agreed that:

- Caltex will submit a notification under clause 548 of the WHS Regulations, within three months of becoming aware of the requirement to notify or such longer period approved by WorkCover;
- Caltex will submit a Safety Case outline to WorkCover within three months after the proposed terminal is determined as a major hazard facility;
- Caltex will continue to operate under and maintain its existing Kurnell Refinery Safety Case and associated management system controls until transition to the new operating company;
- within 24 months after the facility is determined Caltex will submit, a licence application to WorkCover under clause 549 of the WHS Regulations, together with a fully revised Safety Case;
- Caltex will ensure the recommendations from the official investigation into the Buncefield Fuels Terminal incident are specifically addressed in the submitted Safety Case; and
- Caltex and Workcover NSW will continue to meet on a quarterly basis to ensure regulatory requirements with respect the compliance with the NSW Work Health and Safety legislation are met.



8.4.2 Fire & Rescue NSW

Caltex have met with officers of Fire & Rescue NSW Building Fire Safety Branch to provide a general description of the Project and, consistent with the DGRs, to identify particular issues that should be addressed in the EIS.

In a communication dated 15th October 2012 Fire & Rescue NSW, in response to a request for comment on the Project, raised three specific issues for consideration and/or inclusion in any forthcoming EIS. The three issues and Caltex's response to each, is described below.

i. Any future studies, such as, an EIS, PHS or PHA should provide sufficient detail regarding a tank bund fire scenario.

Caltex has included worst case events in the PHA for the Project (refer to **Appendix C Hazards and Risk Assessment**). These worst case events include full surface bund fire scenarios for each of the combustible and flammable liquid storage tanks. These have been modelled as pool fire scenarios utilising material properties for diesel, jet fuel or gasoline. Pool diameter has been limited to the longest dimension of the tank compound. Consequence modelling and quantitative risk assessment included in the PHA output incorporates these bund fire scenarios.

Based upon the output of the PHA quantitative risk assessment Caltex is of the view that the likelihood of a full surface bund fire is an extremely unlikely event. Industry likelihood data has been applied in the QRA.

Consistent with the hierarchy of risk control, and reducing risk to as low as reasonably practicable, Caltex has historically invested in risk reduction measures which act to prevent, or limit the consequences, of bund fire scenarios. A consistent philosophy has been applied for risk management of bund fire scenarios. The design principles for tank farm risk management (including bund fire) are summarised in **Table 8-1**.

Caltex does recognise the potential for spills to occur to tank compounds and hence would maintain equipment, procedures and resource capability to respond to these pool fire incidents. Capability to respond to a spill or pool fire in a bund would be maintained but response to a full surface bund fire does not formulate the design case. Consistent with this approach Caltex would maintain the following mitigating controls:

- capability to respond in a timely manner to apply vapour suppression (foam) for a spill to a bund; and
- procedures and pre-fire plans for responding to a spill to a bund.

Table 8-1 Summary of Design Principles for Tank Farm Fire Protection

	High Flash Point Products (Diesel, Jet, Fuel Oil)	Low Flash Point Products (Gasoline, SLOP)
Inherent Controls	• NEW : Allocation of lower hazard products to the larger tanks & compounds • Where possible, minimise tank appurtenances.	• Where possible, minimise tank appurtenances.
Prevention controls	• Design & maintenance program (API and AS1940) • Proven primary level indication & high level alarm • Proven COMMATs tank management system • NEW : Independent LAHH & trip	• Design & maintenance program (API and AS1940) • Proven primary level indication & high level alarm • Proven COMMATs tank management system • NEW : Independent LAHH & trip
Detection	• Routine operator surveillance of tank farm • COMMATs monitoring & alarming of 'dead' tank levels.	• NEW : LEL detection in tank bunds to detect spills. • NEW : Tank top infra red fire detection • NEW : CCTV monitoring of tank top and compound • Routine operator surveillance of tank farm
Isolation	• NEW : Remote actuated fire rated tank inlet / outlet valves	• NEW : Remote actuated fire rated tank inlet / outlet valves
Spill Response	• UPGRADE : Tank bund & drainage improvements to AS1940 requirements • Caltex primary response to apply foam to worst case spills	• UPGRADE : Tank bund & drainage improvements to AS1940 requirements • Caltex primary response to apply foam to worst case spills
Fire Response	• Caltex primary response to rim seal fire. • Caltex resources (firewater/foam/appliances/knowledge) to combat worst case tank top fires and bund spills.	• Automated detection & suppression on '100' gasoline tanks. • Caltex resources (firewater/foam/appliances/knowledge) to combat worst case tank top fires and bund spills. • UPGRADE : improved hydrant capacity & accessibility.

- ii. A fire on-site has the potential to cause off-site risks, particularly during the conversion process, therefore any disruption or degradation of the installed fire fighting services should be detailed in the forthcoming EIS, PHS or PHA.**

Caltex acknowledges the WHS Regulations and specifically Clause 359 which details requirements around maintenance of fire protection and fire fighting equipment.

Caltex would maintain current risk mitigation processes and would ensure off site risk is not increased as a result of the Project. As mentioned previously it is envisaged that the current risk profile at the Site would be reduced once the conversion is completed.

During the Project it is expected that there would be no increase in risk to the community. Controls that would be in place specifically to address this include:

- Additional (to existing) safety, environmental and risk management specialists on Site during conversion.
- The existing refinery safety management system would be maintained throughout transitional activity. This includes:
 - Robust Management of Change processes for transitional activity; including organisational change;
 - All work carried out under permit control;
 - Maintenance of current emergency response capability including sufficient trained personnel; and
 - Maintenance of existing fire response equipment.

- iii. Due to the proposed decrease in utilities, including firewater, FRNSW recommends that any future studies, such as an EIS, PHS or PHA should include detail regarding the capacity of firewater to meet the demands of a credible on site fire scenario.**

Caltex would maintain current fixed and semi-fixed fire equipment along with current mobile equipment. This would include the ability to boost fire water capacity with salt water until the process plant cooling water system is decommissioned. It is the intention to remove the ability to augment fresh fire water capacity with salt water once process plant cooling is no longer required.

The existing Kurnell fresh firewater system has the following capacity:

- existing fire water storage tank capacity is two 8ML firewater storage tanks;
- fill rate from the towns mains is currently up to a maximum of 56,000 KL/min;
- existing fire system design case is 48KL/min of firewater for response to the largest crude tank full surface tank fire; and
- fire water is supplied by six 12KL/min firewater pumps resulting in 50% redundancy.

These existing arrangements would be maintained for terminal operation.

8.5 Caltex Internal Drivers for Hazard and Risk Management

The principal design objective for the Project is to safely transition the existing refinery facility to a finished product terminal that is safe, reliable and efficient and which satisfies all regulatory requirements.

Hazards to people, property and the biophysical environment would be managed through the application of engineering controls during design, supplemented by procedural, organisational and behavioural controls for the operating terminal and its workforce. The finished product terminal would be designed to maintain integrity during all foreseeable operating conditions (e.g. start-up, shut down, and normal operation) to prevent an uncontrolled loss of containment of fuel products. To minimise impacts associated with a loss of containment during an incident, the design would provide adequate sectioning and local containment as well as emergency response capability for mitigation. Further information on the design and key risk controls to be applied is provided in **Section 8.8**.

The refinery currently operates under a Safety Management System (SMS) that is fit for purpose and applicable to all phases of the facility's lifecycle including design, construction, fabrication, commissioning and start-up, operation, maintenance, modification, shut-down and decommissioning. The Caltex SMS is discussed further in **Section 8.7.2**.

Caltex have an Operational Excellence Management System Process (MSP) to drive progress toward world class performance. The MSP sets the framework of the Operational Excellence Management System (OEMS). The OEMS comprises 13 elements (or topics). The elements are structured around the key areas required to achieve operational excellence whilst minimising unacceptable risks to people, property, the environment and the community.

The Caltex SMS is specifically integrated into the OEMS and includes processes such as Process Hazard Analysis and Health, Environment and Safety (HES) Risk Assessment practices (RiskMan2³). These processes have been in-place for the existing refinery operation for a number of years and are being applied effectively during the design of the finished product terminal.

Consistent with the requirements for Caltex's Management of Change process, a framework of risk identification, risk mitigation and risk reporting has been implemented to support the transition and final terminal operations. This is described in further detail in **Section 8.12**.

8.6 Method of Assessment

8.6.1 Overview

The hazard and risk assessment for the Project has been undertaken in accordance with the policy guidance set out in **Section 8.3**. The hazard and risk assessment has involved five key steps:

- identification and review of all potential hazards, including potential initiating events;
- estimation of the consequences and likelihood of significant incidents;
- identification of existing, and proposed, risk prevention and mitigation controls;

³ RiskMan2 is an integrated set of tools which provide clear direction to OE & Risk line managers and support personnel in the application of risk assessment for the purpose of HES risk management of Caltex operated facilities, activities and new projects.

- assessment of the residual hazards with the existing, and proposed, prevention and mitigation controls in place; and
- identification of further risk reduction recommendations to reduce risk in a reasonably practicable manner.

The risks associated with the existing operation and Project, as well as any external hazards (i.e. natural hazards) have been assessed by a combination of qualitative and quantitative risk assessment processes.

Consistent with the potential for a high consequence event to occur at Site boundaries and the anticipated classification of the proposed terminal as a MHF, quantitative risk assessment (QRA) methodology has been applied for the purpose of risk determination and comparison to HIPAP No. 4 criteria. This is reported separately in the PHA Report (refer to **Appendix C Hazards and Risk Assessment**).

In addition to the QRA, Caltex has also undertaken a number of detailed Process Hazard Analysis studies in support of the proposed design. These studies are qualitative in nature and consider hazards to safety and health, the biophysical environment and to property. They have been a significant source of hazard scenario identification for the Preliminary Hazard Analysis as they represent Caltex's collective knowledge of the nature and type of hazards associated with existing and proposed operations. These studies have also provided the means by which specific improvements have been incorporated into the design.

Qualitative Risk Assessment

Qualitative risk assessment has been used by the Caltex project team to assess the adequacy of initial proposed design for acceptable risk to human health, environmental harm and risk of damage to property. This has comprised a number of detailed Process Hazard Analyses. Caltex has completed the Process Hazard Analysis studies for the Project using the RiskMan2³ HES risk identification and assessment process led by Caltex's internal study leaders. Each potential identified risk scenario has been qualitatively evaluated for HES impacts using the RiskMan2³ methodology and *Chevron Integrated Risk Prioritisation Matrix*.

The Process Hazard Analysis brings together an experienced team to identify hazard scenarios, estimate potential consequences and discuss the effectiveness of installed risk controls. The team then assign qualitative descriptors of Likelihood and Consequence and determine a Risk Level (1 to 10) using the *Chevron Integrated Risk Prioritization Matrix* (refer to **Figure 8-1**). The requirement for further risk improvement is prioritised based upon this assigned risk.

Figure 8-1 Chevron Integrated Risk Prioritisation Matrix

Chevron Integrated Risk Prioritization Matrix

For the Assessment of HES & Asset Risks from Event or Activity

Likelihood Descriptions & Index (with confirmed safeguards)			Legend	Legend applies to identified HES risks (see guidance documents for additional explanations)						
Likelihood Descriptions				1, 2, 3, 4 - Short-term, interim risk reduction required. Long term risk reduction plan must be developed and implemented. 5 - Additional long term risk reduction required. If no further action can be reasonably taken, SBU management approval must be sought to continue the activity. 6 - Risk is tolerable if reasonable safeguards / management systems are confirmed to be in place and consistent with relevant requirements of the Risk Mitigation Closure Guidelines. 7, 8, 9, 10 - Manage risk. No further risk reduction required. Risk reduction at management / team discretion.						
Likelihood Descriptions	Likelihood Indices		Decreasing Likelihood ↓	6	5	4	3	2	1	
	Consequences can reasonably be expected to occur in life of facility	1 Likely		6	5	4	3	2	1	
	Conditions may allow the consequences to occur at the facility during its lifetime, or the event has occurred within the Business Unit	2 Occasional		7	6	5	4	3	2	
	Exceptional conditions may allow consequences to occur within the facility lifetime, or has occurred within the OPGO	3 Seldom		8	7	6	5	4	3	
	Reasonable to expect that the consequences will not occur at this facility. Has occurred several times in the industry, but not in the OPGO	4 Unlikely		9	8	7	6	5	4	
	Has occurred once or twice within industry	5 Remote		10	9	8	7	6	5	
	Rare or unheard of	6 Rare		10	10	9	8	7	6	
Consequence Descriptions & Index (without safeguards)	Consequence Indices		Decreasing Consequence/Impact →	6	5	4	3	2	1	
				Incidental	Minor	Moderate	Major	Severe	Catastrophic	
	Consequence Descriptions	Safety		Workforce: Minor injury such as a first-aid AND Public: No impact	Workforce: One or more injuries, not severe. OR Public: One or more minor injuries such as a first-aid.	Workforce: One or more severe injuries including permanently disabling injuries. OR Public: One or more injuries, not severe.	Workforce: (1-4) Facilities OR Public: One or more severe injuries including permanently disabling injuries.	Workforce: Multiple fatalities (5-60) OR Public: multiple fatalities (1-10)	Workforce: Multiple fatalities (>60) OR Public: multiple fatalities (>10)	
		Health (Adverse effects resulting from chronic chemical or physical exposures or exposure to biological agents)		Workforce: Minor illness or effect with limited or no impacts on ability to function and treatment is very limited or not necessary AND Public: No impact	Workforce: Mild to moderate illness or effect with some treatment and/or functional impairment but is medically manageable OR Public: Illness or adverse effect with limited or no impacts on ability to function and medical treatment is limited or not necessary	Workforce: Serious illness or severe adverse health effect requiring a high level of medical treatment or management OR Public: Illness or adverse effects with mild to moderate functional impairment requiring medical treatment	Workforce (1-4): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR Public: Serious illness or severe adverse health effect requiring a high level of medical treatment or management	Workforce (5-60): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR Public (1-10): Serious illness or chronic exposure resulting in fatality or significant life shortening effects	Workforce (>60): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR Public (>10): Serious illness or chronic exposure resulting in fatality or significant life shortening effects	
		Environment		Impacts such as localized or short term effects on habitat, species or environmental media	Impacts such as localized, long term degradation of sensitive habitat or widespread, short-term impacts to habitat, species or environmental media	Impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species or environmental media	Impacts such as significant, widespread and persistent changes in habitat, species or environmental media (e.g. widespread habitat degradation)	Impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species	Loss of a significant portion of a valued species or loss of effective ecosystem function on a landscape scale	
		The above legend applies only to HES risks, where risk levels 1-6 are actionable and mandatory. For risks that may result in facility damage, business interruption, loss of product, the "Assets" category below should be used. Asset risk reduction is at the discretion of management. Under no circumstances may a direct or indirect translation of Asset loss to HES consequences, or between any discrete categories of HES consequences be inferred.								
	Consequence Indices			6	5	4	3	2	1	
Consequence Descriptions & Index (without safeguards)				Incidental	Minor	Moderate	Major	Severe	Catastrophic	
	Consequences	Assets (Facility Damage, Business Interruption, Loss of Product)		Minimal damage, negligible downtime or asset loss. Costs < \$100,000.	Some asset loss, damage and/or downtime. Costs \$100,000 to \$1 Million.	Serious asset loss, damage to facility and/or downtime. Costs of \$1-10 Million.	Major asset loss, damage to facility and/or downtime. Cost >\$10 Million but <\$100 Million.	Severe asset loss or damage to facility. Significant downtime, with appreciable economic impact. Cost >\$100MM but <\$1 billion.	Total destruction or damage. Potential for permanent loss of production. Costs >\$1 billion.	
This matrix is endorsed for use across the Company. It is not a substitute for, and does not override any relevant legal obligations. Under no circumstances should any part of this matrix be changed or modified, adapted or customized. This matrix identifies health, safety, environmental and asset risks and is to be used only by qualified and competent personnel. Where applicable it is to be used within the Riskman2 structure and governance of an OE Risk Management Process. If applied outside of these Processes, it is also mandatory to manage identified intolerable risks and comply with the Risk Mitigation Closure Guidelines.										

Quantitative Risk Assessment

Quantitative Risk Assessment (QRA) for the Project has involved the application of generally accepted methodologies for consequence assessment, frequency estimations and risk calculation. The QRA has compared the resulting risk levels with the DP&I risk criteria in HIPAP No 4. Caltex has historically utilised external consultants to perform QRA on an 'as needs' basis for the purpose of assessing risk for specific needs. A number of specific QRA studies have been undertaken in the past, for example, covering the risk of operations to refinery personnel within occupied buildings. A "whole of site" QRA was completed to quantitatively assess the risk that the existing (Kurnell Refinery) operation imposes on refinery personnel as well as on the neighbouring land uses. A QRA for the proposed terminal has been performed and is reported in detail in the Preliminary Hazard Analysis Report (refer to **Appendix C-1 Hazards and Risks Assessment**).

Both individual and societal risk results have been generated to define the risk profile for the proposed terminal operation. These results were produced by combining the frequency and consequence estimates for each of the hazardous scenarios identified for the proposed terminal. The following risk measures were generated:

- Individual risk contours for fatality, injury and propagation - a graphical representation of "individual risk" that uses the risk values at each point to construct iso-risk contours. The contours are presented on a map showing the risk relative to the refinery and surrounding land-uses.
- Societal risk F-N curve for off-site population - a "societal risk" measure that communicates the potential for hazardous scenarios to cause multiple fatalities by plotting the frequency of "N or more fatalities" (F) against the number of fatalities (N).

The QRA results have been evaluated against applicable HIPAP No. 4 risk criteria², as detailed in **Table 8-2**, **Table 8-3** and **Figure 8-2**.

The HIPAP No. 4 risk criteria in **Table 8-2** and **Table 8-3** are based on a 'risk in a million per year'. A one-in-a-million chance of an individual death occurring at a particular location is the globally accepted benchmark for the additional risk that industry imposes on a residential area. The results are often expressed as 1×10^{-6} per annum, which translates to one-in-a-million chance of that activity causing an individual death at that particular location in a given year, or one chance of fatality per million person years. This benchmark is very low when compared to other risks that the public are exposed to every day in their normal lives.

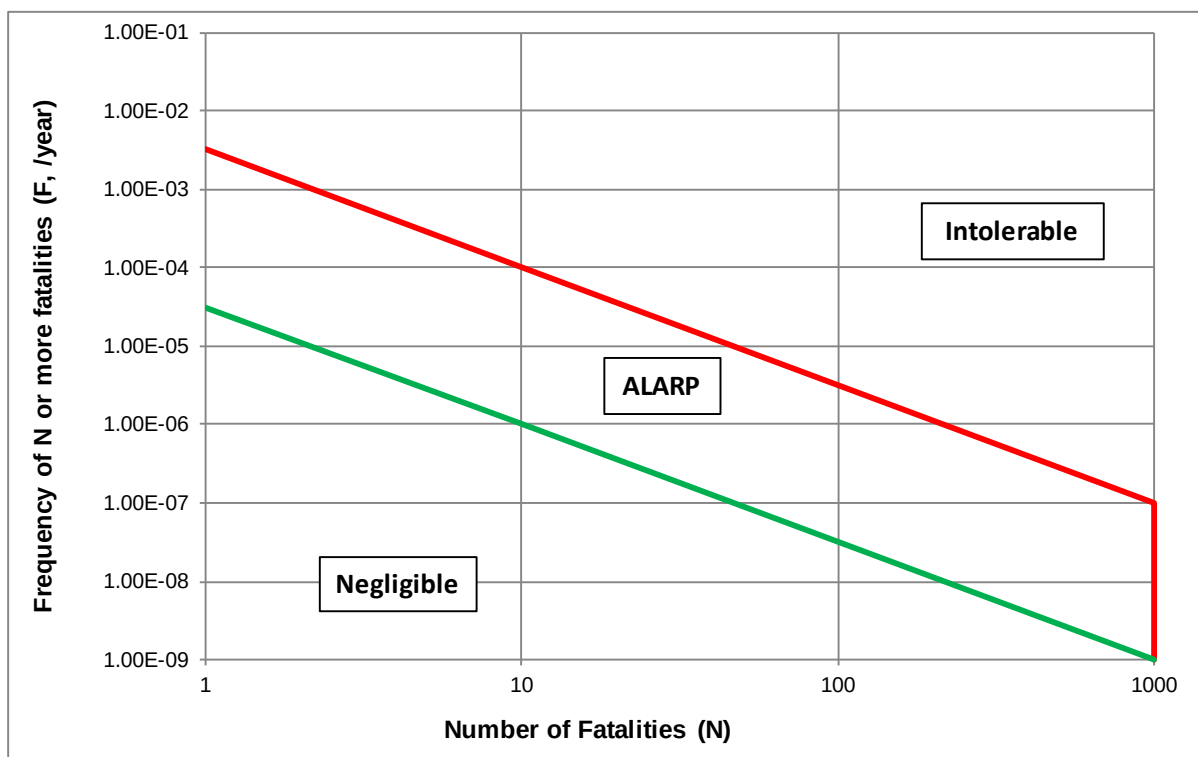
Table 8-2 HIPAP No. 4 Off-Site Risk of Fatality Criteria

Land Use	Criteria (Risk in a Million per Year)
Hospitals, schools, child care facilities, old age housing	0.5
Residential, hotels, motels, tourist resorts	1
Commercial developments including retail centres, offices and entertainment centres	5
Sporting complexes and active open space	10
Industrial	50

Table 8-3 HIPAP No. 4 Off-Site Injury and Propagation Risk Criteria

Consequence	Criteria
Injury	
Heat radiation	Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m ² at a frequency of more than 50 chances in a million per year.
Explosion overpressure	Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year.
Toxic exposure – injury	Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure at a maximum frequency of 10 in a million per year.
Toxic exposure – irritation	Toxic concentrations in residential and sensitive areas should not cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.
Propagation	
Heat radiation	Incident heat flux radiation at neighbouring potentially hazardous installations or at land zoned to accommodate such installations should not exceed 23 kW/m ² at a frequency of more than 50 chances in a million per year.
Explosion overpressure	Incident explosion overpressure at neighbouring potentially hazardous installations or at land zoned to accommodate such installations should not exceed 14 kPa at a frequency of more than 50 chances in a million per year.

Figure 8-2 HIPAP No. 4 Societal Risk Criteria



8.6.2 Hazard Identification

Hazard identification for the Project has drawn upon the following hazard identification activities:

- systematic hazard identification from historical Process Hazard Analysis studies for those refinery areas which would continue to operate as part of the proposed terminal; and
- systematic hazard identification from the 2012 Process Hazard Analysis studies for the proposed changes associated with the terminal conversion.

Each hazard identification activity has involved the identification of possible causes for potential incidents followed by a team based assessment of the consequences to onsite or public safety (in terms of injury or fatality), damage to property and/or harm or impact to the biophysical environment. The Process Hazard Analysis has further outlined the proposed operational and organisational safety controls that are either in-place, already proposed or recommended to mitigate the likelihood of the hazard events occurring.

Since 2002, Caltex has undertaken 24 process hazard analyses covering all aspects of the existing operation and generating many thousands of individual scenarios for the refinery. As well as documenting the organisational knowledge of hazards, hazard scenarios and key risk controls, the output of these studies have been a fundamental input to Caltex's risk reduction process and capital planning.

In addition to the historical process hazard analysis data, in 2012 Caltex undertook a number of detailed process hazard analysis studies examining all aspects of the proposed Project. Five process hazard analysis studies were also performed for the Kurnell Port and Berthing Project. These studies identified several hundred individual scenarios with individual initiating events.

Each Process Hazard Analysis has been conducted in accordance with *RiskMan2* procedures and has been led by a Caltex accredited study leader. Team membership has included experienced representatives from process design, operations, major project management and engineering. The teams have reviewed the potential identified hazards and risk management strategies as well as developed the relevant risk profiles.

A preliminary hazard identification (HAZID) word diagram summarising the output from the various hazard identification activities has been included as **Table 8-5**. The HAZID word diagram is based on the output from the process hazard analyses as well as the results from the 2007 DP&I Kurnell Peninsula Land Use Safety Study. The 2007 DP&I Kurnell Peninsula Land Use Safety Study will be discussed in more detail in **Section 8.11**.

The hazard identification process for the QRA has focussed on scenarios involving the release/spill of flammable, or combustible, liquids with potential to result in a fire or explosion when ignited or to a threat to the biophysical environment. These hazard scenarios were analysed based on relevant material properties and storage/transfer operations. To determine the amount of material that could potentially be released, factors such as inventory, leak detection and isolation strategies were considered. Event trees were developed for each potential release scenario.

Data required to perform the QRA was collated using information from the following:

- engineering drawings (e.g. process flow diagrams, piping and instrumentation diagrams etc.);
- site layout plans;
- area plans;
- major inventories of flammable and toxic substances stored / handled;

- release detection and isolation strategies and systems;
- release containment systems; and
- description of surrounding land use and estimates of population densities.

A summary of the results of the hazard identification process undertaken for the existing operation and the proposed terminal operation, as well as external hazards, is presented in **Section 8.8.1**.

8.6.3 Consequence, Likelihood and Risk Analysis

The identified hazard scenarios have been subject to a process of qualitative and quantitative consequence, likelihood and risk assessment.

The process hazard analyses performed historically for the Kurnell Refinery, as well as more recently for the proposed terminal operation, have ranked identified hazard scenarios using the *Chevron Integrated Risk Prioritisation Matrix*. This matrix assigns risk priority rankings from 1 to 10. This ranking has been performed for all scenarios identified during the process hazard analyses undertaken both for the existing operation and the proposed terminal. These rankings have defined risk as a product of the impact severity of the *Consequence* of the hazardous incident should it occur, and the *Likelihood* that such a consequence would occur. The basis for Consequence and Likelihood rating is described in **Figure 8-1** which shows the Chevron Integrated Risk Prioritization Matrix.

The QRAs performed historically for the Kurnell Refinery, as well as for the proposed terminal operation, have used generally accepted practices to quantify Consequences and Likelihood for individual scenarios and combined these to produce an estimate of the cumulative risk associated with the facility.

The *Likelihood* assessment has involved the following steps:

- i. defining the potential hazard scenarios (release sources). Detailed knowledge of scenario types (developed during process hazard analysis studies) were combined with a “parts count” of failure items (developed from the available engineering drawings for the facility) to define hazard scenarios.
- ii. evaluating the hazard scenario *frequency*. Failure rates based on historical industry failure frequency data were utilised to estimate the frequency of the various hazard scenarios. The failure frequency rate data for storage tanks, piping, valves, and other relevant equipment items was sourced from published references. These references are described in Appendix B, of **Appendix C-1**.
- iii. where appropriate, event trees were developed to estimate the *Likelihood* of the range of potential consequences that may result from a given release scenario. This analysis incorporated the effectiveness of existing, and proposed, detection and isolation systems when assessing consequence events that are most influenced by time. The basis for the failure rates used in the QRAs is presented in **Section 8.8.3**.

The *Consequence* assessment for each scenario has considered the nature of the release, including the release rate, discharge velocity and duration.

The risk assessment results were produced by combining the *Likelihood* and *Consequence* estimates for each of the hazardous scenarios, as follows:

$$\text{Risk} = \text{Consequence} \times \text{Likelihood}.$$

The results from the quantitative risk assessment are discussed in **Sections 8.8.4** and **8.8.5**.



A discussion of the cumulative impact of the overall operation and the surrounding potentially hazardous developments in the area is provided in **Section 8.9**.

8.6.4 Assessment of Significance, Risk Reduction and Tolerability

The Process Hazard Analysis studies have utilised the *Chevron Integrated Risk Prioritisation Matrix* to qualitatively rank individual risk scenarios from 1 (highest risk) to 10 (lowest risk).

As per the *RiskMan2* process, recommendations are provided for risk priority rankings 5 and above, as well as for events or conditions with low likelihood and high consequence that may require further risk evaluation. Further, recommendations are also provided voluntarily for low ranked risks where they would eliminate or mitigate the potential causes and / or consequences predicted for the scenario.

Where the risk ranking is such that further risk treatment is required, further commitments to continuous improvement of existing risk controls, or introduction of new risk controls, have typically been provided. This detailed assessment of several thousand scenarios is an important element of developing a safe & reliable design for the proposed terminal. **Table 8-5** contains a summary of risk recommendations for each hazard grouping.

Quantitative risk assessments for the project have determined a portfolio of consequence and likelihood data for each scenario. Cumulative consequence and risk information has been determined for the proposed terminal. This has allowed assessment to regulatory offsite risk criteria for hazardous industry developments (i.e. HIPAP No. 4) as well as Caltex's own risk criteria for onsite personnel.

QRA studies have determined a list of risk contributors at specific locations. This allows the major contributors to the cumulative risk to be identified, as well as the most influential hazard scenarios. From this information, targeted risk reduction actions can be readily identified that would deliver the most effective risk reduction outcome (i.e. the greatest reduction in risk).

The results of lessons learnt from incidents such as those which occurred at BP Texas City Refinery, Buncefield, and Esso Longford have historically resulted in several specific safety studies to identify gaps and propose improvements to existing refinery design and operations. These have typically included participation by external subject matter experts. Global process safety events and incidents are treated as opportunities to test the adequacy of Caltex's knowledge of major hazard mechanisms, re-visit the effectiveness of existing controls and to determine the requirement for further risk reduction measures. The monitoring and implementing of lessons learned from emergent learning following the Buncefield incident is one particular example of on-going risk assessment activity by Caltex risk specialists. The manner in which the proposed terminal design and management systems address all relevant recommendations arising from the Buncefield incident is provided in full in **Appendix C Hazards and Risk Assessment** and summarised in **Section 8.10**.

In relation to monitoring, reporting and acting upon key learning from global process safety incidents Caltex have subject matter experts who routinely review global data sources and extract learning from relevant events. Outcomes include appropriate briefings to senior leadership, re-visit of historical risk assessments and assessment of the requirement for additional risk treatment actions.

8.7 Existing Risk Environment and Proposed Works

8.7.1 Existing and Proposed Risk Environment

The Kurnell Refinery currently produces refined products from crude oil, which is a material consisting of hydrocarbons which boil in a range from below room temperature to 650°C and higher. Crude distillation is a process which separates various components or fractions as defined by their boiling range. The lightest fractions, at lowest boiling point, are known as liquefied petroleum gases (including LPG, butane etc.). Flammable liquids such as jet and gasoline, as well as combustible liquids such as diesel, are produced, stored and transferred from the refinery. Distillation and downstream processing units operate at elevated temperatures and pressure.

The terminal conversion would result in the process units being shutdown, depressurised, de-inventoried and left *in situ*. This would include cessation of all high temperature and high pressure processes on Site. In addition, the proposed terminal would no longer store or handle any significant quantities of materials with Dangerous Goods classification of 2.1 (flammable gas) and 2.3 (toxic gas). These actions reduce the on-site and, at certain locations, also reduce the off-site risk profile.

Overall, the Project results in a downscaling of the operations conducted at the existing Site, and hence a reduction in the complexity and risk associated with the Site.

The Site currently receives crude oil and distributes products by ship. Large tankers anchor at the submarine berth, north east of the wharf, to unload crude oil. On the northern side of the wharf, rows of pipelines connect the refinery's tanks to three berths, the Banksmeadow Terminal and, via the Sydney-Newcastle Pipeline, to the Silverwater and Newcastle terminals. The wharf also serves to support the cooling water pump house providing part of the refinery's cooling water.

The Project would result in cessation of crude ships and LPG/butane ships. Chlorine, currently used for cooling water treatment, would cease to be stored at the wharf. These actions reduce the risk environment at the wharf. Note, the risk associated with shipping is discussed in a separate EIS for Port and Berthing Project (SSD-5353).

Figure 8-3 presents the surrounding land use and internal Site layout. The existing refining process overview is shown in **Figure 8-4**.

8.7.2 Existing and Proposed Safety Management Systems

Caltex has a commitment to meet the intent and specific requirements of the NSW *Work Health and Safety Act 2011* (WH&S) and the NSW *Work Health and Safety Regulations 2011*. Caltex has numerous policies and procedures to create a safe workplace which would be reviewed, modified as necessary and incorporated into the safety management system for the Terminal. Many of these are already in place for the existing refinery and would transition to the proposed terminal.

The proposed works would interface with elements of the existing major hazard facility that has a number of intrinsic hazards as a result of current operations. In order to manage these, Caltex has implemented a Safety Management System as discussed below.

The Project would comply with current and relevant safety codes and statutory requirements with respect to safe working conditions. There would be no changes to the existing precautions observed at the Site. In particular, this would include standards and requirements relating to the handling and management of flammable liquids. All personnel required to work with these substances would be trained in their safe use and handling and would be provided with all the relevant safety equipment.



Emergency procedures have been developed for the existing Site. These would be reviewed for the proposed terminal. The emergency procedures include responses to emergency evacuation, injury, major asset damage or failure, critical failures, spillages, major fire, and threats.

The Kurnell Refinery has a manager with overall responsibility for safety, who is supported by experienced personnel trained in the operation and support of the plant and associated facilities.

A Permit to Work (PTW) system, including Hot Work Permit, and a Management of Change system are currently in use and would be extended to include the Project.

Procedures are currently in place to manage incidents and injuries. This includes an established incident reporting and response process. This process, along with its adoption for use for the Project, is discussed further in **Chapter 21 Management and Mitigation Measures**.

The existing facility includes a range of safety equipment (alarms, detectors, relief devices etc.) along with other protection systems, which are routinely tested. This equipment would be used during the construction and operation of the Project wherever applicable.

All persons involved in current operations would be provided with appropriate personal protective equipment (PPE) suitable for use with the specific hazardous substances.

Personnel who are first-aid trained are listed on company noticeboards across the Site.

Figure 8-3 Existing Site Neighbourhood Layout

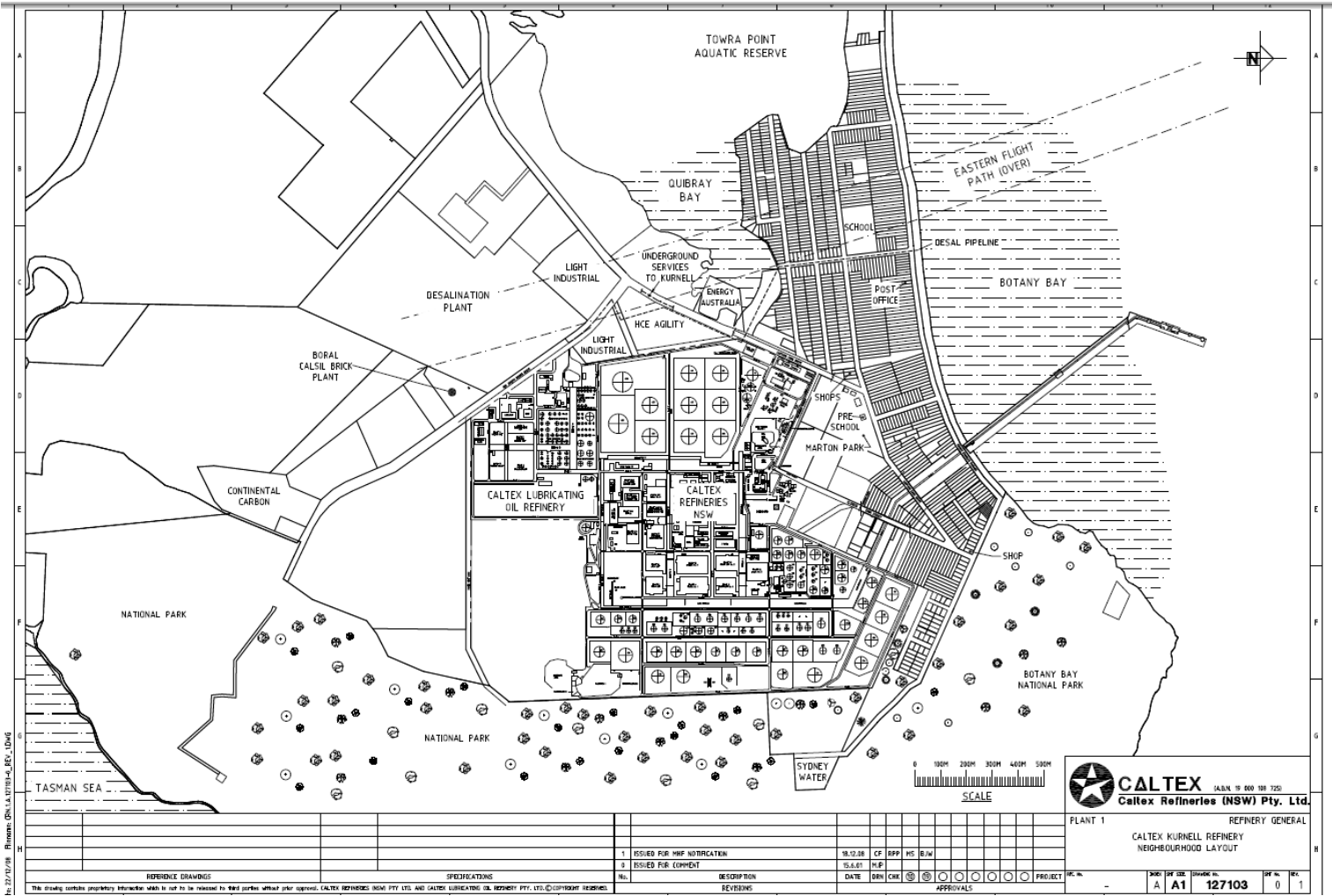
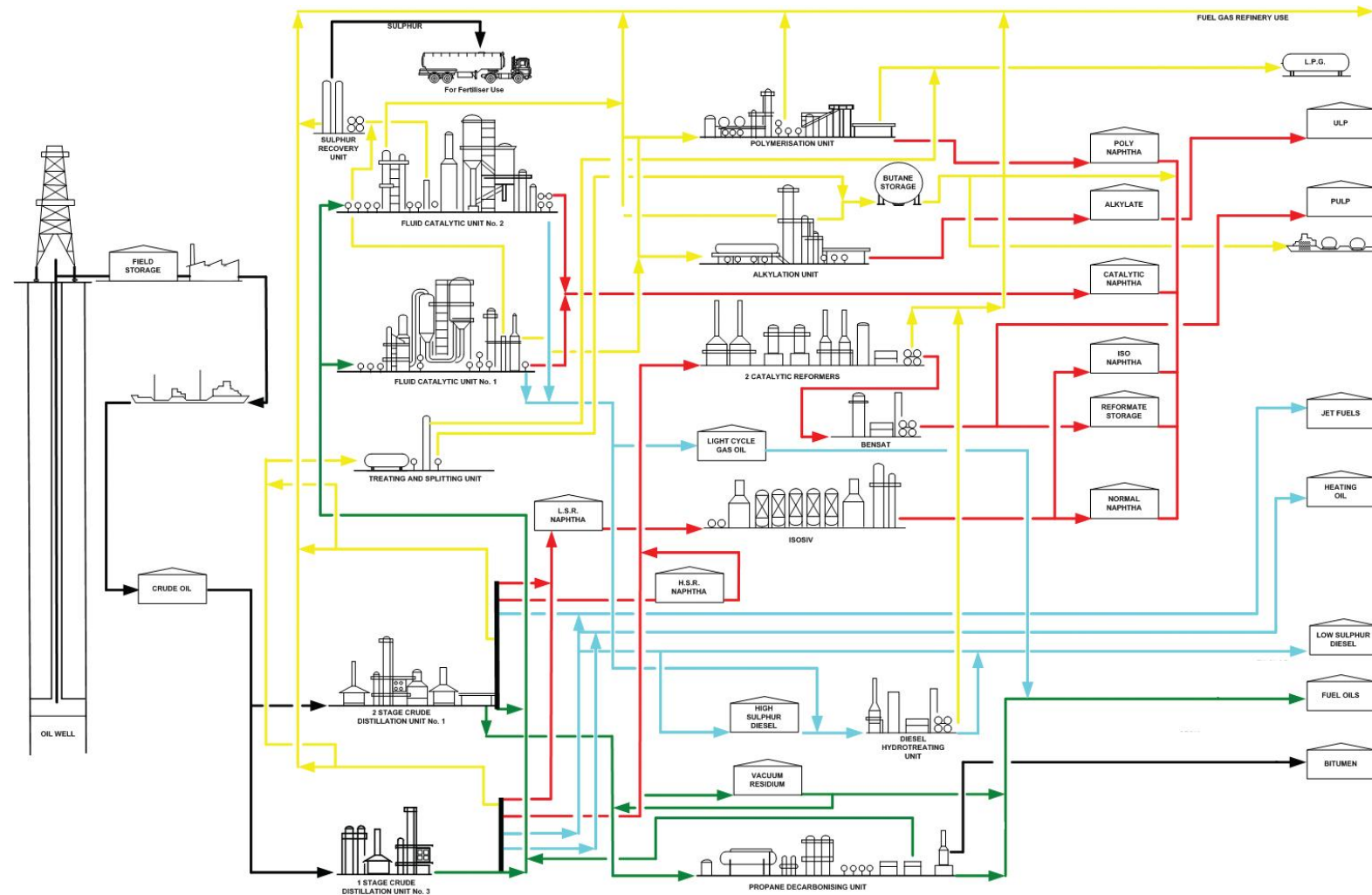


Figure 8-4 Existing Site Refining Process Overview



8.8 Impact Assessment

8.8.1 Hazard Identification

Hazardous Material

The nature of the hazardous materials identified in the hazard and risk assessment was reviewed from information contained in the Material Safety Data Sheets (MSDSs) supplied by Caltex, as reported in the PHA for the Project (refer to **Appendix C Hazards and Risk Assessment**) and in the Safety Case for the existing operation. The materials that are handled, produced and stored at the existing Site, and that are to be stored and handled at the proposed terminal, are detailed in **Table 8-4** below.

Table 8-4 Hazardous Materials (Raw Materials, Products, By-products)

Material	Present on Existing Site [Yes/No]	Present on Proposed Terminal Site [Yes/No]	Dangerous Goods Code
Bitumen	YES	NO	3
Crude Oil	YES	NO	3
Diesel and Deasphalted Oil	YES	YES	C1
Fuel Oil	YES	YES	C1
Gasoline	YES	YES	3
Heavy Vacuum Gas Oil, Light Vacuum Gas Oil	YES	NO	9
Jet Fuel	YES	YES	3
Liquefied Petroleum Gas (LPG) - Propane, Automix, and Butane	YES	NO	2.1
Naptha	YES	NO	3
Sulphurous compounds (from the Sulphur Recovery Unit), including hydrogen sulphide (gas)	YES	NO	2.3 (Sub 2.1)
Slop (as mixture of diesel and gasoline)	YES	YES	3
Chlorine	YES	NO	2.3

The terminal would no longer store or handle any significant⁴ quantities of materials with Dangerous Goods classification of 2.1 (flammable gas) and 2.3 (toxic gas).

The proposed terminal would also carry significantly fewer types of materials compared with the existing refinery, indicating a simplification of the management processes required to maintain safety.

A significantly lower number of truck loading / unloading activities associated with dangerous goods would also occur when the refinery is converted to a terminal as the majority of truck movements would cease and most products would arrive on Site via bulk ship transfers. This would result in a significant lowering of the risk associated with road transport in and out of the Site. Note that the risk associated with shipping is reflected in the separate EIS for Port and Berthing Project (SSD-5353).

⁴ There may be a need to handle relatively small quantities of DG 2.1 / 2.3 as part of maintenance activities, laboratory or cleaning.

Incident Scenarios

The scenarios identified during the Process Hazard Analysis studies discussed in **Section 8.6.2** have been grouped to provide a high level overview of the hazards and risks associated with the existing and proposed operation. In total, ten major hazards have been identified that could arise as a result of the existing operations. **Table 8-5** provides a list of these hazards and their associated risk to on-site or public health and safety, property and to the biophysical environment. Eight of these would also remain for the proposed terminal facility.

The list of hazards below is focused on those that may affect neighbouring land use, including people using adjacent waterways. The exception is scenario 6 which discusses process related injury potential to Site personnel. These scenarios incorporate those that were listed in the DP&I Kurnell Peninsula Land Use Study.

Scenarios 8 and 9 have already been reported in the PHA for the Proposed Kurnell Port and Berthing Project, Botany Bay.

Where indicated, risk reduction recommendations are summarised in **Table 8-5**.

The PHA Report (refer to **Appendix C Hazards and Risk Assessment**) contains details of the hazard scenarios analysed in the quantitative risk assessment.

Table 8-5 Hazard Identification Word Diagram

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
1	Loss of containment from large crude oil and refined petroleum product storage tanks and associated transfer pipelines and pumps within the terminal / refinery leading to threat to the biophysical environment if not contained or, if ignited, to fires.	Prevention: - Tanks designed & maintained to API standards. - Reliable level indication with high level alarm. - Independent extra high level alarm & secondary level indication (<i>planned</i>). - Routine calibration checks of level devices. - Deviation alarm between primary and secondary level indication. - Transfer planning activities (COMMATS) to check available ullage prior to commencing transfers / ship unloading. - Automated trip of tank inlet valve upon extra high level (<i>planned</i>). - Remote actuated tank inlet / outlet valves (<i>planned</i>). - Various permissives through SCADA prior to start of pumps. - Various trips would shut down transfer pumps on operational upset conditions. - Operating procedures. - Operator training. - Routine operator tank farm surveillance. Protection: - Tank vents designed for the maximum transfer rate (<i>existing but will be upgraded</i>). - Fixed tank roofs have frangible joints. - Pump discharge pressure significantly below PSV setting. - Routine PSV inspection. Detection: - Hydrocarbon Lower Explosive Limit (LEL) detectors on all low flash point tanks (<i>planned</i>). - Closed circuit camera system for all low flash point tanks (<i>planned</i>).	C: Severe L: Remote Risk: 6	No Greater Than Risk Level 6	RISK IS UNCHANGED OR DECREASED

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
		Control of ignition source: - Design of electrical equipment to limit potential ignition sources as per AS2381. - Bonding, earthing. - Use of additives to limit static accumulation. - Shipping procedure includes max tank filling rate to limit static accumulation. Emergency response: - Emergency shutdown button which stops pumps and shuts valves. - Firewater system, portable appliances (<i>existing but will be upgraded as required by design case</i>). - Foam systems on each DG Class 3 tank sized for full surface tank fire case. - Enhanced tank top fire detection & suppression for '100 series' gasoline tanks. - Bund design and construction equivalent compliance to AS1940 s5.8.3. - Fire equipment maintained & tested in accordance with AS1851. - Oil spill response Commitment to Continuous Improvement 1: Develop a program of routine testing, inspection and maintenance for each new piece of equipment or function of instrumentation to be added to the preventative maintenance program already established for existing plant and equipment. Commitment to Continuous Improvement 2: Review adequacy of existing fire water deluge on transfer pumps and determine need for additional deluges. Commitment to Continuous Improvement 3: Review existing trips on transfer pumps and determine need for any additional trips on exceeding safe operational limits (e.g. pressures, flows). Commitment to Continuous Improvement 4: Review existing line of flow interlocks and determine the need for any additional interlocks. Commitment to Continuous Improvement 5: Review need for additional flammable gas detection which would alarm and alert operators to a leak of flammable material. Commitment to Continuous Improvement 6: Review spill response plan for the proposed terminal.			

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
2	Airborne environmental impact including smoke and fume impact on the community and the biophysical environment and potential for environmental pollution from fire water and/or foam contamination of Botany Bay if not adequately contained.	Prevention: - Primary containment provided by tank compounds which have isolation valves kept in the closed position unless during supervised draining. - Secondary containment provided by Separators and Waste Water Treatment Plant. - Tertiary containment provided by ability to divert contaminated fire water to a containment tank (Tk601). - System capable of providing a minimum 90 minutes of firewater runoff for worst case fire scenario. Emergency response: - Emergency response plan & procedures include monitoring & minimising potential for environmental harm. - Caltex oil spill response team maintain capability to respond to spills through integrated response with SPC.	C: Incidental L: Unlikely Risk: 9	C: Incidental L: Unlikely Risk: 9	NO CHANGE
3	Fires, explosions or toxic gas releases from processing areas.	Not applicable for the Project.	C: Severe L: Unlikely Risk: 5	NO LONGER APPLICABLE	RISK ELIMINATED
4	Fires and explosions from large liquefied petroleum gas (LPG) storages and transfer operations.	Not applicable for the Project.	C: Severe L: Unlikely Risk: 5	NO LONGER APPLICABLE	RISK ELIMINATED

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
5	Loss of containment from large crude oil and refined petroleum transfer pipelines and pumps between the wharf and the proposed terminal and on the ship leading to environmental pollution to Botany Bay if not contained or, if ignited, to fires.	Prevention: • Only pre-certified tankers used for product shipping. • Modern tanker design includes high pressure pump trip. • Ship/Shore operational checklists. • Loading Master on duty, ship's crew monitor transfer. • Two way communication with wharf and ship. • Line of flow is apparent to control operators (planned). • Patrol of pipelines under tank head pressure. • Drain & vent valves plugged. • Ship overfill protection (ship calculates ullage prior to commencing loading arm, level alarm including high level alarm). • Routine change out of hoses. • Pressure testing and inspection of hoses. • Routine diver inspection of hoses at ocean floor. • Routine hydrotest of wharf and shipping lines.	C: Severe L: Remote Risk: 6	No Greater Than Risk Level 6	RISK IS UNCHANGED OR DECREASED

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
		Protection: • Routine PSV inspection. • Thermal PSVs protect each isolatable section on transfer line from wharf to terminal. • If ship moves out of berth, loading arm would act to trip pump. • Dry break connections on loading arms limit inventory which could be released. Detection: • Permanently occupied marine control room during shipping activities. • Alarms on marine loading arms. Control of ignition: • Inert gas systems for vessels. • Control of ignition sources at the wharf and terminal through signage, induction training, supervision. • Design of electrical equipment to limit potential ignition sources as per AS2381. • Bonding, earthing. Emergency response: • Wharf emergency isolation valves isolate wharf and trip pumps. • Ability to isolate tanks remotely in the field and to isolate power supply to pump (planned). Oil spill response • Ship board fire fighting system. • Wharf fire fighting system (upgrade will be performed). Commitment to Continuous Improvement 7: Perform surge study to verify blocked in pressure and impact on line between shore and terminal. Commitment to Continuous Improvement 8: Review line of flow alarms and determine appropriate and viable alarms for blocked in scenario. Commitment to Continuous Improvement 9: Review hardware protection in place and proposed to ensure the risk of filling low flash point material into tanks designed for high flash point usage is minimised. Particular attention to human factors issues at manifolds.			

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
6	Injury to on site personnel.	- Engineering controls include various process related trips and alarms and permissives required to allow start-up of pumping operations etc. - A number of critical administrative controls, including procedures and training of personnel. - Facility SMS includes controls for confined space entry, asbestos precautions etc. - Separation of personnel from hazardous energy. - PPE would be worn which includes safety glasses, fire retardant clothing and impervious gloves as required. Commitment to Continuous Improvement 10: Determine need for additional means of communication, e.g. for lone worker on the proposed terminal facility. Commitment to Continuous Improvement 11: Review procedures used for potentially hazardous manual operation to ensure they are appropriate and sufficient for any increased frequency of use.	C: Severe L: Unlikely Risk: 5	No Greater Than Risk Level 6	DECREASE IN RISK

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
7	Natural event, including earthquake, bushfire, hurricane, lightning, and floods.	Prevention lightning: - Equipment earthed. - Tank separation distances. Prevention tsunami / flood: - The Site is located on gently sloping ground with elevations ranging from approximately 15 metres above mean sea level in the tank farm areas near the National Park, to ~2 m at the wharf. - No storm surge exposure or tsunami potential is identified for this area. Prevention bush fire: - The Site is bounded by the Botany Bay National Park. - Distance in general and a perimeter road provide a firebreak between the Site and the park where it is close to the refinery. Prevention earthquake: - The Site is built on marsh/reclaimed land; seismic activity in the area is considered low. Protection: - Secondary and Tertiary containment system available in the event of bund failure. Detection: - LEL detectors installed in the compounds of all low flash point tanks (<i>planned</i>). - Closed circuit camera system for tank top surveillance of all low flash point tanks (<i>planned</i>). Emergency response: - Emergency shut down of terminal transfer operations. - Containment of spill on-site. - Fire fighting and emergency response. - Oil spill response.	C: Severe L: Rare Risk: 7	No Greater Than Existing Risk	RISK IS UNCHANGED OR DECREASED

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
8	Oil spill with consequential marine pollution and/or personnel injury due to hazardous interaction between moored ships and the sub berth equipment (including manifolds), wharf equipment (including risers) and the hydraulic loading arms.	Prevention: - Marine ships are secured at fixed berths through the use of port anchor and tug. - Bow, Stern and Quarter lines would be used to ensure that the ship remains secure (subject of an upgrade). - Ships are only berthed during the run-in tide requiring a clearance of about 700 mm at sub berth. - Pilots provide an independent assessment of the berth safety. Detection: - The provision of a sub berth warning system provides information to pilots of berthed ships when hazardous interactions with other water craft are likely. - A Spar buoy would be positioned relative to the crude riser and would allow pilots to be provided with an indirect indication of the location of the sub berth riser. Emergency response: - Emergency shutdown (ESD) system. - Fire-fighting system at the wharf and the ship (subject of an upgrade). - A port and berthing facility oil spill emergency response plan. - Emergency plan relating to the hazardous interaction between marine ship and commercial/recreational ships is managed by the Master of the ship. - Oil spill response.	C: Major L: Unlikely Risk: 6	No Greater Than Risk Level 6	RISK IS UNCHANGED OR DECREASED ⁵

⁵ Slight increase in potential consequences due to the increased quantity of fuel available to fuel a fire with the new loading arms design. The new sub berth design should reduce the likelihood of the event. Result is a marginal decrease in risk levels

No	Hazard	Safeguards – Critical Control Measures	Risk Prior to Upgrade	Targeted Risk After Upgrade	Increase / Decrease of Risk Level
9	Potential for personnel injury or the loss of personnel overboard due to hazardous interaction between commercial and recreational ships and either moored ships or ships that are in transit to and from the port and berthing facility.	Prevention: - A speed limit of < 4 knots is set in place when within 200 m of maritime activities at the port and berthing facility. - Ships are lit at night to increase the visibility and reduce the likelihood of a hazardous interaction between marine ship and commercial/ recreational ships. - Appropriate lighting of buoys and dolphins. Emergency response: - Sydney Ports radio communications. - Access to Svitser fleet. Commitment to Continuous Improvement 13: A review of operational requirements for the berths during mooring activities. This would involve the visibility of pimple buoys at night.	C: Major L: Unlikely Risk: 6	No Greater Than Risk Level 6	May be a slight increase in risk levels due to the marginal increase in the number of marine vessels travelling through Botany Bay.
10	External threat from aircraft crash, sabotage, neighbouring facility leading to threat to people, property and the biophysical environment	Prevention aircraft crash: - Aviation authority controls for approach / departure. Prevention Sabotage - Site security risk management plan. - Security access controls.	C: Severe L: Remote Risk: 6	No Greater Than Risk Level 6	NO CHANGE

Note:

1. C = Consequence, L = Likelihood

2. These risk rankings are the highest reported from the subset of PHA scenarios grouped for that scenario

8.8.2 Consequence Analysis

In order to understand the impacts of the hazards within the proposed terminal, the quantitative risk assessment (QRA) identified and assessed in detail the consequences that could eventuate as a result of each hazard scenario. This includes worst case events (e.g. full surface bund fires, vapour cloud explosion) which, should they occur, have the potential for off-site impacts. The frequencies of these events are low, as reflected by the low level of risk beyond the Site boundary.

Several pool fire events were considered to have the potential for a fatal off-site impact, as listed in **Table 8-6**. These events were identified from the aggregate consequence results from the quantitative risk assessment.

Table 8-6 Consequence Events with Off-site Fatality Impact

Location	Consequence Description
Storage tanks adjacent the North-Eastern, Eastern and Western boundaries	Full surface bund fire.
Transfer pipelines between wharf and terminal pipeway	Fire following a large release from the pipeline between the wharf and the terminal.
Storage tanks near the North-Eastern and Eastern boundaries	Vapour Cloud Explosion (VCE) following a tank overfill event.

Independent of their Likelihood, **Table 8-7** shows the events that have the potential to affect a number of off-site locations adjacent to the facility. Of these locations, only those positions adjacent to storage tanks are impacted by the scenarios considered in the QRA model.

Table 8-7 List of Incident Scenarios with Off-site Impact

Location	Event Type
Intersection of Silver Beach Road and Captain Cook Drive	Not impacted
Kurnell Social Club	Not impacted
Cook Street Boundary	Full surface bund fire
	VCE following a tank overfill event
Reserve Road Boundary	Full surface bund fire
	VCE following a tank overfill event
National Park Boundary (adjacent to Tank 512)	VCE following a tank overfill event
Chisholm Road Commercial Premises (adjacent to Tank 634)	Full surface bund fire
Sir Joseph Banks Boundary	Not impacted
HCE Boundary	Full surface bund fire

To provide a summary of the impact experienced from different fire events, the downwind impact distance for a number of consequences are presented in **Table 8-8**. These are measured from the centre point of the storage.

Table 8-8: Typical Impact Distances for Fire Scenarios

Event	Distance to fatality (approx 12.6 kW/m ²)	Distance to injury (approx 4.7 kW/m ²)
Full surface tank fire – up to 50m diameter	Typically Not Reached at Ground Level Outside of Bund	Typically Not Reached at Ground Level Outside of Bund
Full surface tank fire – up to 78m diameter	Typically Not Reached at Ground Level Outside of Bund	Typically Not Reached at Ground Level Outside of Bund
Full bund fire – up to 8000m ²	62m	130m
Full bund fire – up to 25,500m ²	101m	194m
Fire from catastrophic failure of any transfer pipeline	26m	60m
Fire from catastrophic failure of any loading arm	20 m	35 m

Due to the relative height of the storage tanks and the observer, the heat flux radiation experienced from a full-surface tank fire does not exceed injury levels under average weather conditions.

8.8.3 Likelihood Estimation

The failure rates used in the quantitative risk assessment for the proposed terminal were based on available historical failure rate data from the following public sources:

- UK HSE - Failure Rate used for Land Use Planning Risk Assessments;
- International Association of Oil & Gas Producers - Storage Incident Frequencies; and
- E & P Forum - Hydrocarbon Leak and Ignition Data Base.

For each equipment item, the failure frequency data for a range of failure modes was obtained from historical industry data. The failure modes are represented through a range of hole sizes. The use of failure frequency from historical industry data without adjustment was considered appropriate for this analysis. The UK HSE advises that adjustments should be made where, for example, an assessed process design has particularly arduous operating conditions or, alternatively, provides increased reliability. However, no particular characteristics of the proposed terminal operations were identified that justified adjusting the failure frequency data.

Event trees were used to estimate the likelihood of a consequence event for a given release scenario. Event tree analysis provides a systematic means of determining which factors would influence the release, in addition to the probability associated with each of those factors. The following parameters are generally considered in event tree analysis:

- probabilities of release detection and isolation;
- time taken to detect and isolate the release; and
- probability of ignition (immediate ignition and delayed ignition).

Consistent with the learning from the Buncefield incident, a detailed assessment was conducted to determine the frequency of an explosion following an overfill of a storage tank containing a flammable material (e.g. unleaded petrol). This analysis involved using a fault tree to assess the overfill frequency and an event tree to quantify the explosion event frequency.

The analysis considered the following factors:

- the number of filling operations;
- the probability of operator error; and
- the controls in place to prevent overfill and their effectiveness.

The analysis considered controls that either act to prevent the tank overfill (e.g. tank level indicator with high level alarm, automated trip) or limit the amount of material released (e.g. gas detector linked to an alarm). For each control, the effectiveness was determined by quantifying the reliability of individual components. Where controls relied on human intervention, the derived effectiveness accounted for the probability of operator error within the time required to respond.

The event tree analysis determined the frequency of an explosion resulting from the ignition of a significantly large vapour cloud formed following overfill. In assessing the outcome frequency, the following factors were considered:

- ignition probability;
- the probability of stable weather conditions; and
- the probability of a low wind speed that would result in the formation of a significantly large vapour cloud.

8.8.4 Risk Assessment

A summary of the results from the quantitative risk assessment together with a demonstration that the Project complies with the criteria set out in HIPAP No. 4 is provided in **Section 8.8.5** below. Further detail is provided in the Preliminary Hazard Analysis (refer to **Appendix C Hazards and Risk Assessment**).

As discussed previously, individual risk was determined by combining the frequency and consequence results for each hazardous scenario. Individual risk contours were developed by plotting lines that connect different locations experiencing the same levels of risk (iso-risk).

The off-site injury risk criteria published in HIPAP No. 4 were used to evaluate the off-site fatality, injury and property risk posed by the proposed terminal.

The risk of explosion calculated for a tank overfill event was below the injury risk criteria and consequently this aspect of the criteria is satisfied.

The injury risk criterion for toxic exposure was not applicable, as the PHA did not identify scenarios which could result in these types of events.

The societal risk exposure for the off-site population was assessed using an F-N curve and the indicative societal risk criteria described in HIPAP No. 4.

8.8.5 Conclusions and Adherence to Risk Criteria

The off-site risk of fatality and injury was evaluated against the criteria set out in HIPAP No. 4, as discussed below.

Individual Risk of Fatality

In summary, the following points detail the Project's adherence to HIPAP No. 4 risk criteria for risk of fatality:

- The risk contour for sensitive areas (0.5×10^{-6} per year) extends marginally off-site at four locations in the eastern tank farm area, but does not extend to sensitive areas such as the pre-school, which is located to the north of the Site boundary on Captain Cook Drive. This aspect of the HIPAP No. 4 criteria is therefore satisfied.
- The risk contour for residential areas (1×10^{-6} per year) marginally extends off-site at one location but does not extend to residential areas. This aspect of the HIPAP No. 4 criteria is therefore satisfied.
- The risk contour for commercial developments (5×10^{-6} per year) marginally extends off-site at one location but does not extend to commercial developments. This aspect of the HIPAP No. 4 criteria is therefore satisfied.
- The risk contour for active open space (10×10^{-6} per year) marginally extends off-site at one location into an undeveloped section of the national park. It does not extend to active open space such as the Kurnell Recreational Club, which is located to the west of the Site boundary on Captain Cook Drive. This aspect of the HIPAP No. 4 criteria is therefore satisfied.
- The risk contour for industrial development (50×10^{-6} per year) does not exceed the Site boundary. This aspect of the HIPAP No. 4 criteria is therefore satisfied.

Individual Risk of Injury

In summary, the following points detail the Project's adherence to HIPAP No. 4 risk criteria for risk of injury:

- The individual risk of injury risk contour for heat flux radiation (of 50×10^{-6} per year) is mostly contained on-site, only extending beyond the boundary in the north-east section of the Site. However, it does not reach sensitive areas such as the pre-school, which is located to the north of the Site on Captain Cook Drive. This aspect of the HIPAP No. 4 criteria is therefore satisfied.
- The risk of explosion calculated for a tank overfill event was below the individual risk of injury risk contour for explosion overpressure (of 50×10^{-6} per year). Consequently, an injury risk plot for explosion overpressure is not presented as the risk does not reach the criteria level. This aspect of the HIPAP No. 4 criteria is therefore satisfied.
- The injury risk criterion for toxic exposure was not applicable, as the QRA did not involve scenarios which could result in these types of events. This risk, present in the existing refinery, would hence be eliminated in the proposed terminal.

Societal Risk of Fatality

In summary, the following point details the Project's adherence to HIPAP No. 4 risk criteria for societal risk of fatality:

- the F-N curve lies below the "negligible" line. Therefore the societal risk is not considered significant, provided other individual risk criteria are met. As described in the preceding sections, the individual risk criteria for fatality and injury are satisfied and therefore the societal risk is also considered tolerable.



Risk of Property Damage and Accident Propagation

In summary, the following points detail the Project's adherence to HIPAP No. 4 risk criteria for risk of property damage and accident propagation:

- The risk contours (50×10^{-6} per year) for >23 KW/m² heat radiation and >14 kpa blast overpressure do not extend to off-site areas. This aspect of the HIPAP No. 4 criteria is therefore satisfied.

Risk to the Biophysical Environment

The risk to the biophysical environment was assessed by examining the potential for identified accidental release scenarios to impact on the long-term viability of the surrounding ecosystems. This was assessed in the detailed Process Hazard Analysis studies using RiskMan2 methodology, as summarised in the hazard identification table in **Table 8-5**. The refinery also maintains a detailed aspects and impacts register of potential accidental release scenarios and potential consequences for ISO 14001 compliance.

For different sections of the facility, the assessment considered the key controls that would prevent, or mitigate, the impact of a release. The analysis demonstrated controls would be in place that would either minimise the potential for a release or contain product if a release did occur. Therefore, a release of product from the proposed terminal would not pose a threat to the long-term viability of the ecosystem. This aspect of the HIPAP No. 4 criteria is therefore satisfied.

8.9 Cumulative Impact Assessment

Comprehensive cumulative risk assessment studies of the Kurnell Peninsula were conducted by the former Department of Environment and Planning in the late 1980s, as discussed in the Kurnell Peninsula Land Use Safety Study. These studies were used to assist state and local planning authorities in their consideration of land use safety aspects of residential and industrial development.

Key findings from the 2007 Kurnell Peninsula Land Use Safety Study were:

Public Risk

- *Both individual fatality and injury risks meet current Department of Planning criteria:*
 - *no residential areas are exposed to a fatality risk higher than five in a million chances per year (also well within the 10 in a million risk criterion for existing industry); and*
 - *no residential areas are exposed to an injury risk higher than 50 in a million chances per year (risk criterion for new industry).*
- *Societal risk is negligible.*
- *Notwithstanding the low level of risk, there are still opportunities for technical improvements, particularly in the areas of detection and containment of leaks of flammable material and fire fighting system integrity. These may further reduce the consequences and/or frequency of a major accident.*

A number of technical improvements were implemented by Caltex following the 2007 Land Use Study which reflect key learning from the Buncefield incident and continuous risk reduction where it was assessed as reasonably practicable to do so. This is discussed further in **Section 8.10** and **Section 8.11**.

The quantitative risk assessment of the proposed terminal has demonstrated that the risk levels would be significantly reduced following conversion of the refinery to a terminal. The one in a million cumulative risk level (for residential development) would remain on Site with the small exception around one tank in the eastern tank area which extends a short distance into the adjacent national park.

8.10 Buncefield Review & Recommendations

In 2005, a major conflagration initiated by a series of vapour cloud explosions occurred at the Buncefield oil storage facility in Hertfordshire, UK. It took several days for emergency services to bring the fire under control. The incident resulted in the evacuation of thousands of residents, major disruption to transport, damage and disruption to businesses operating in adjacent industrial facilities, and contamination of groundwater from toxic components of fire fighting foam.

Following the incident, the Health and Safety Commission set up an independently chaired Major Incident Investigation Board (MIIB). The Board was given a wide-ranging set of objectives within its terms of reference and published a series of eight reports before its final report in 2008.

The recommendations of the report address measures for controlling major incident risks and address:

- equipment integrity levels at major hazard sites in relation to containment of dangerous goods and process safety;
- mitigation against the effect of a major incident on off-site populations and buildings;
- preparedness for emergency response to limit the escalation of potential major incidents;
- land use planning and the control of societal risk; and
- the regulatory system for inspection and enforcement at major hazard industrial areas.

The Caltex Kurnell Refinery is currently a major hazard facility and would remain so when converted to a finished product terminal. As such the facility is required to maintain a safety case which demonstrates that the control measures are fully integrated and adequate with respect to the management of major hazards risks. This includes for events such as that which occurred at Buncefield.

A number of reviews of the Buncefield incident and its recommendations were undertaken by Caltex during the preparation of its current safety case. This had resulted in a number of additional control measures, as well as strengthening of existing controls, in the refinery tank farm.

The Project design team for the proposed terminal have detailed knowledge of the Buncefield recommendations and have extended previously identified risk improvements to all other flammables storage and in significant part, to bulk combustible storage. These controls are summarised in **Table 8-9**. A number of listed controls are already in place with the others to be implemented during the terminal transition.

Table 8-8 Summary of Design Principles for Tank Farm Fire Protection

Type of Control	Controls
Prevention controls	• Primary level indication with high level alarm (radar gauge). • Independent level indication with high-high level alarm. • Independent SIL-rated trip of tank inlet valve on high-high-high level alarm. • Tank design and maintenance program in accordance with industry good practice. • Continuous monitoring of tank inventory from a centralised control room . • Operating procedures controlling quantity of material transferred. • Classification of hazardous areas and selection of equipment and protective systems is conducted in accordance with Australian Standards HB13-2007 and AS2381. • All tanks have installed earthing & maintenance program.
Detection	• Flammable gas detectors and control room alarms for tank compounds of low flashpoint flammable liquids. • Remote CCTV monitoring for tank compounds of low flashpoint flammable liquids. • Tank top infra-red flame detection for low flash point flammable liquid storage tanks. • Routine operator tank farm inspections.
Isolation	• Remote-actuated fire-rated tank inlet / outlet valves.
Spill Response	• Bund capacity, design and construction equivalent compliance to AS1940. • Primary response capability to apply foam up to, and including, full bund surface area of largest tank compound. • Tank bund drainage isolation valves operable external to bund.
Fire Response	• Tank separation distances compliant to s5.7 of AS1940. • Caltex personnel trained in advanced fire fighting techniques, specific Caltex equipment and incident management approach common to Fire & Rescue NSW. • Facility Emergency Plan & Pre-incident plans.

With respect to land use planning, Caltex actively participates in land use planning management around its refineries and terminals. This acts to ensure that decisions made by local authorities relating to land use in potentially affected zones are properly informed by Caltex. Caltex also continues to work closely and proactively with planning authorities and state WorkCover and Environment Protection authorities to ensure planning decisions take into account major hazards risks.

A more comprehensive assessment of Caltex's response to the Buncefield Recommendations is provided in **Appendix C Hazards and Risk Assessment**.

Further, Caltex has consulted with NSW WorkCover in relation to the ongoing maintenance and continuous improvement of the Kurnell Refinery Safety Case. Whilst the submitted safety case has not yet been formally assessed by NSW WorkCover, Caltex is committed to:

- ensuring that it continues to comply with all requirements throughout the transition of the refinery to a terminal only operation; and
- that the controls adopted continue to eliminate risk where reasonably practicable; or
- where not reasonably practicable to eliminate the risk, reduce risk so far as is reasonably practicable.

In the adoption and/or modification of controls, consideration has been given, and would continue to be given, to the Buncefield investigation recommendations and of all other major investigation recommendations pertinent to the Site.

Caltex has committed to meeting quarterly with NSW WorkCover to ensure all obligations continue to be met.

8.11 2007 Kurnell Land Use Safety Study & Recommendations

The manner in which DP&I recommendations in the 2007 Kurnell Peninsula Land Use Safety Study have been historically addressed, and would be addressed in the Project design, are discussed in **Table 8-10..**

Table 8-9 Project Response to Kurnell Peninsula Land Use Safety Study Recommendations

2007 Kurnell Peninsula Land Use Safety Study Recommendations		Comments
4.2.1 Risk Reduction.		
4.2.1.1	Moving the common bund sewer outside of the bund area and providing individual bund isolation for the '100 series' gasoline tanks. In sewer redesign consideration should be given to other improvements such as fire traps and siphon systems that would improve fire combat capacity.	In 2007 new bund isolation valves and pits were installed to segregate each of the '100 series' gasoline storage tanks. For the proposed terminal all gasoline tanks would have: - individual bund conforming to requirements in AS1940-2004 s5.8.2; - a single isolating valve for bund outflow, external to the bund; and - a physical break to prevent reverse flow of liquids from sources external to the bund.
4.2.1.2	Installing fire protection systems to critical pipe systems such as motor operated valves, that are located inside the tank bund for the '100 series' gasoline tanks.	In 2007 new fire safe actuators were installed to tank inlet and outlet valves for each of the '100 series' gasoline storage tanks. For the proposed terminal all retained product tanks (diesel, jet, gasoline) would have: - motor operated inlet and outlet isolation valves; and - each of these valves would be fire safe rated and fireproofed. All new product pumping stations would have: - motor operated isolation valves to isolate in the event of fire; and - each of these valves would be fire safe rated and fireproofed. NOTE: Fire Safe is being capable of maintaining its pressure containing ability during and after a certain period of fire as required by API 650. All valves being purchased for hydrocarbon service are to be fire safe and would be insulated.
4.2.1.3	Installing a fixed/semi-fixed foam delivery system to combat a rim seal fire on the '100 series' gasoline tanks with remote line up and activation from a manned location.	In 2007 rim seal fire detection and automated foam suppression was installed to each of the '100 series' gasoline storage tanks on the Site's north east perimeter. Foam suppression can also be initiated manually from the OMC control room and local foam station. Foam pourer design and capacity is as per AS1940-2004 s11.16. For the proposed terminal: - existing gasoline storage tanks on the Site's north east perimeter would retain the existing fire detection and fixed foam delivery systems for rim seal fire; - other gasoline storage tanks (not on the Site's north east perimeter) would have semi-fixed foam systems and terminal resourcing (appliances, manning) to respond to a rim seal fire event; and - existing crude tank farm fixed foam delivery system would be retained for crude tanks converted to diesel and jet service.

2007 Kurnell Peninsula Land Use Safety Study Recommendations		Comments
4.2.1.4	Installing a fixed foam monitor/system along the main pipe way between Gate 5 and near the transfer pumps.	In 2007 four new foam monitors with 1000 litre bulkbins of FP70 foam concentrate were installed in the vicinity of the pipe way and pumping stations at Gate 5. For the proposed terminal product pumping stations would have: - gas detection on low flash product; and - foam deluge systems on low flash tanks.
4.2.1.5	Installing leak, heat or smoke detectors in tank bunds and along pipe ways, where fires could have an off-site impact.	In 2007, the following was completed: - Five gas detectors were installed in each compound for each of the '100 series' gasoline storage tanks on mixer flanges and tank inlet/outlet manifolds. These tanks also have fire wire fire detection on the rim seal. - A, C and D sub lines have coriolis meters for leak detection - Gas leak detection was installed at Gate 5 in vicinity of valves and manifolds. The above measures at Gate 5 would be retained for the Project.
4.2.1.6	Examining and further improving the effectiveness and integrity of condition monitoring, inspection, leak detection and water deluge systems on the LPG (both propane and butane) storage vessels.	For the proposed terminal LPG and butane storages would be de-inventoried and de-commissioned.
4.2.2 Safety Management System.		
4.2.2.2	Should the introduction of the proposed Major Hazard Facilities regulatory framework in NSW be delayed more than one year from the time of the publication of this report, CALTEX should be required to undertake a comprehensive audit of the Refinery's Safety Management System. The audit should be carried out by an independent auditor approved by the Department of Planning.	This Recommendation was not actioned due to the timeframe of introduction of MHF legislation in 2008 and Caltex / Department of Planning (DoP) communications meeting the primary intent of the Recommendation. Of note; - Kurnell LUSS was published February 2007. OHS Amendment (MHF) Regulation 2008 was gazetted on 4 July 2008. - Caltex provided routine monthly action progress reports to WorkCover and DoP up until January 2008 when all engineering improvements were completed. - On 23 January 2008 a verification audit was performed at Kurnell Refinery. Officers of Workcover and DoP attended. - In September 2007 the Hazard Audit for the Kurnell Clean Fuels Project was provided to DoP. This included commentary on elements of the safety management system.

8.12 Management of Risk during the Conversion from Refinery to Finished Product Terminal

The Kurnell Refinery is a major hazard facility and operates under the requirements of the Work Health and Safety (WHS) Regulation 2011. This requires the facility to have suitable risk management processes, including a safety management system, in place and for on-going monitoring of the effectiveness of risk controls. It also requires a suitable emergency plan and security plan, with commensurate resources, be maintained.

Caltex would manage the conversion in accordance with existing requirements as a major hazard facility. It is anticipated that the proposed terminal would also be a major hazard facility and that a modification to the existing safety case would be required. A number of meetings with WorkCover NSW MHF Team have been conducted, and will continue to occur, to ensure that this safety case transition is managed effectively in compliance with the requirements of the WHS Regulation.

The Project would be completed over an estimated 54 month period. It comprises >20 individual projects which are of a scale that Caltex has extensive experience in managing.

Of particular note:

- The Caltex organisation has extensive knowledge and experience in the shutdown, isolation and de-inventory of the refinery process units. This has typically been performed on at least a five year cycle for each of the existing refinery process units. Existing shutdown and decontamination procedures, shutdown safety management plans and experienced refinery team members would allow this work to be undertaken in a safe and efficient manner.
- Recent experience with the closure and demolition of the Caltex Lubricating Oil Refinery (CLOR) has provided Caltex with experience in:
 - management of safe operations in the lead up to refinery closure;
 - decontamination of process units following final shutdown; and
 - supervision of specialist contractors to underpin a safe and efficient outcome to demolition activities.
- All elements of the existing refinery safety management system would remain in-place during the transition period. This includes safe systems of work (e.g. permit to work, lockout/tag out of equipment, management of confined space entry, management of hot work).
- Existing systems for emergency response and security management would remain in-place during the transition period.
- Existing refinery OEMS processes for monitoring the effectiveness of risk controls would remain in-place during the transition period.
- A dedicated project team with oversight from senior management, as well as involvement of senior Caltex WHS and environmental specialists, has been in-place since the development stages of the Project.
- The existing Caltex Management of Change process facilitates the identification of potential adverse impacts for proposed changes to operating equipment and procedures or proposed organisational change. This would remain in-place during the transition period.
- An additional Management of Change process has been specifically designed and implemented for the proactive management of key Project execution risks. This includes the potential risk to safe and reliable operations from various human and organisational factors during the transition period.

8.13 Summary

The proposed terminal would comply to all risk criteria specified by the DP&I in HIPAP No. 4. Key conclusions are summarised below and in **Tables 8-11, 8-12 and 8-13**.

Table 8-10 Assessment to HIPAP No. 4 Criteria for Individual Risk of Fatality

Land Use	Criteria (Risk in a Million per Year)	Conclusion
Hospitals, schools, child care facilities, old age housing	0.5	Criterion satisfied
Residential, hotels, motels, tourist resorts	1	Criterion satisfied
Commercial developments including retail centres, offices and entertainment centres	5	Criterion satisfied
Sporting complexes and active open space	10	Criterion satisfied
Industrial	50	Criterion satisfied

Table 8-11 Assessment to HIPAP No. 4 Criteria for Individual Risk of Injury

Consequence	Criteria	Conclusion
Heat radiation	Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m^2 at a frequency of more than 50 chances in a million per year.	Criterion satisfied
Explosion overpressure	Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year.	Criterion satisfied
Toxic exposure – injury	Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure at a maximum frequency of 10 in a million per year.	Criterion satisfied (risk no longer present at proposed terminal)

Table 8-12 Assessment to HIPAP No. 4 Criteria for Property Damage and Accident Propagation

Consequence	Criteria	Conclusion
Potential property damage, or accident escalation, due to incident radiant heat flux.	Incident heat flux radiation at neighbouring potentially hazardous installations, or at land zoned to accommodate such installations for the 23 kW/m^2 heat flux, shall not exceed a frequency of more than 50 chances in a million per year.	Criterion satisfied
Potential property damage, or accident escalation, due to incident explosion overpressure	Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings for the 14 kPa explosion overpressure level, shall not exceed a frequency of more than 50 chances in a million per year.	Criterion satisfied

The societal risk curve lies within the negligible zone of the HIPAP No. 4 listed interim societal risk criteria and hence societal risk can be regarded as tolerable.

The risk to the biophysical environment was assessed qualitatively by examining the potential for identified release scenarios to impact on the long-term viability of the surrounding ecosystems. For different sections of the Site, the assessment considered the key controls that would prevent, or mitigate, the impact of a release. The analysis demonstrated controls would be in place that would either minimise the potential for a release or contain product if a release did occur. Therefore, a release of product from the proposed terminal would not pose a threat to the long-term viability of the ecosystem.

These results demonstrate that the Project and associated operations are able to be operated and maintained at acceptable levels of risk, and that appropriate effective safety management systems have been recognised in the design.

The results of the risk assessment demonstrate that the cumulative impact of the proposed terminal and the surrounding potentially hazardous developments in the area would not increase the cumulative risks of the area to unacceptable levels. In fact, the proposed terminal would significantly reduce the existing cumulative risk levels on the Kurnell Peninsula.

Further, Caltex's commitment to address Buncefield recommendations as well as the recommendations under the Kurnell Peninsula Land Use Safety Study has been demonstrated through their continuous improvement programs and commitments in place, both while operating as a refinery and during the conversion of the refinery to a finished product terminal.

In order to meet Caltex's commitments to continuous improvement, the management and mitigation measures presented in **Table 8-14** would be implemented as part of the Project.

Table 8-13 Management and Mitigation Measures – Hazards and Risk

Management and Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
A program of routine testing, inspection and maintenance would be developed for each new piece of equipment or function of instrumentation to be added to the preventative maintenance program already established for existing plant and equipment.		✓	✓
The recommendations of the Fire Safety Study would be implemented for the design and operation of the terminal.	✓	✓	
The Process Hazard Analysis Recommendations would be implemented for the design and operation of the terminal.	✓	✓	
The spill response plan for the Site would be updated for the proposed terminal.		✓	
Caltex would review hardware protection in place and proposed to ensure the risk of filling low flash point material into tanks designed for high flash point usage is minimised. Particular attention to human factors issues at manifolds.	✓	✓	
Caltex would determine need for additional means of communication, e.g. for lone worker on the proposed terminal.		✓	
Caltex would review the procedures used for potentially hazardous manual operation to ensure they are appropriate and sufficient for any increased frequency of use.		✓	

9 Soils, Groundwater and Contamination

9.1 Introduction

The following chapter assesses soil, groundwater and contamination management issues relating to the Project.

9.2 Scope of the Assessment

This chapter presents a baseline description of the soil, groundwater and contamination status of the Project Area, based on a desktop review of existing information about the Site. Further to this, the potential impacts of the proposed works are identified, and an assessment of the potential impacts during construction and operation is presented. Mitigation measures are identified to reduce the potential impacts of the Project on soils, groundwater and contamination.

The Director General's Requirements (DGRs) (refer to **Appendix A DGRs**) identify the following requirements with relation to contamination:

- *An assessment of any potential contamination and details of all potential contamination sources;*
- *How ecological and human health risks posed by contamination on the Site would be mitigated and managed;*
- *Identification of any contaminated soil likely to be impacted by the development;*
- *Proposed measures implemented in the event that soil contamination is encountered;*
- *Demonstration that the development will not impact on other remediation activities being undertaken in the vicinity; and*
- *How site contamination will be remediated and managed for potential future uses.*

With regards to soil and water:

- *an assessment of the potential soil and groundwater impacts of the development; and*
- *A detailed description of the mitigation and management controls that would be put in place to manage erosion and sediment, stormwater, spills and acid sulphate soil (if present).*

Potential human health risks are addressed in **Chapter 10 Human Health and Ecological Risk** and **Appendix D Human Health and Ecological Risk Assessment**.

Potential surface water, flooding and wastewater impacts are discussed in **Chapter 11 Surface Water Wastewater and Flooding**. Links between issues discussed in this assessment and the assessment in **Chapter 11** have been noted.

9.3 Legislation and Planning Policy

9.3.1 Commonwealth Guidelines

The National Water Quality Management Strategy (NWQMS) is a joint national approach to improving water quality in Australian and New Zealand waterways. The NWQMS process involves development and implementation of a management plan for each catchment, aquifer, estuary, coastal water or other water body, by community and government. These plans focus on the reduction of pollution released into coastal pollution hotspots and other aquatic ecosystems around the country. Local government, community organisations and other agencies carry out these plans using the NWQMS to maintain agreed environmental values.

Commonwealth guidelines relevant to the management of groundwater include the National Water Quality Management Strategy and the *Australian and New Zealand Guidelines for fresh and marine water quality 2000* (ANZECC/ARMCANZ, 2000). These guidelines are discussed below.

National Water Quality Management Strategy

These guidelines have been developed to provide a framework for protecting groundwater from contamination in Australia and are part of the National Water Quality Management Strategy. The protection framework involves the identification of the specific beneficial uses of every major aquifer, with strategies which can be applied to protect those beneficial uses. The refinery exists on the southern side of the Botany Sand Beds aquifer.

Australian and New Zealand Guidelines for fresh and marine water quality 2000 (ANZECC/ ARMCANZ, 2000)

These guidelines provide for the sustainable use of Australia's water resources by protecting and enhancing their quality, while maintaining economic and social development. These guidelines contain a number of trigger limits relating to the protection of aquatic ecosystems, primary industries, recreational water quality and aesthetics. These guidelines should apply to the quality both of surface water and of groundwater since the environmental values which they protect relate to above-ground uses (e.g. irrigation, drinking water, farm animal or fish production and maintenance of aquatic ecosystems). Groundwater should be managed in such a way that when it comes to the surface, whether from natural seepages or from bores, it will not cause the established water quality objectives for these waters to be exceeded, nor compromise their designated environmental values.

9.3.2 NSW Legislation and Guidelines

Protection of the Environment Operations Act 1997

Prevention of soil and groundwater pollution is a key objective of the *Protection of Environment Operations Act 1997* (PoEO Act) and pollution of groundwater is an offence under the Act. Operation and maintenance activities at the Site are required to be managed so as to ensure that Caltex complies with Section 120 of the PoEO Act 1997, which prohibits the pollution of waters, including any underground or artesian water.

Contaminated Land Management Act 1997

Heavily contaminated land in NSW is regulated under the *Contaminated Land Management Act 1997* (CLM Act). This legislation seeks to apply the principle of "polluter-pays" by imposing the obligation and cost of remediating contaminated land on the person or company responsible for the pollution, rather than the community. The general objective of the Act is to establish a process for investigating, and where appropriate, remediating land that is considered to pose a significant risk to human health or the environment.

Water Management Act 2000

The *Water Management Act 2000* (WM Act) establishes a framework for managing water in NSW. The component of the Act relevant to the proposed works is the requirement to obtain an aquifer interference approval where there is:

- a penetration of an aquifer;
- interference of water in an aquifer; and/or
- obstruction of the flow of water in an aquifer.

It is an offence to either carry out works without such an approval or cause harm to an aquifer. Relevant guidance on the issue of aquifer interference is provided in the NSW Aquifer Interference Policy (DPI, 2012). This policy sets out the NSW government's approach to assessing an activity's potential impact on aquifers.

Acid Sulfate Soil Manual

The *Acid Sulfate Soils Assessment Guidelines* (Acid Sulfate Soils Management Advisory Committee, 1998) provide guidance in assessing the impacts of proposed works in areas likely to contain acid sulfate soils. The Assessment Guidelines have been developed primarily for proponents of activities that are likely to disturb acid sulfate soils, and for councils and government authorities responsible for assessing these proposals. The guidelines outline a stepwise process for site assessment and management of proposals in areas containing acid sulfate soils.

The Blue Book

Managing Urban Stormwater: Soils and Construction (Landcom 2004), also known as the "Blue Book", this guidance document provides methods and techniques to minimise land degradation and water pollution at development sites in NSW. The guidelines focus on minimising erosion and preventing sediment moving off site during the construction phase of development. These measures are, however, also applicable to operation and maintenance activities.

9.4 Method of Assessment

This assessment has been conducted as a desktop investigation, involving the review of existing literature available about the Site. It has included previous investigations, historic information, records of contamination and contamination management, as well as a review of publicly available information relevant to the Site.

This assessment has also involved a review of online resources including geological maps, Groundwater Dependant Ecosystems databases, acid sulphate and soil maps of the area, as well as a walkover site inspection to understand the Site's soil, contamination and known groundwater characteristics.

9.5 Existing Environment

9.5.1 Regional Topography, Geology and Soils

The Kurnell Peninsula, including the area beneath the Site, is an elevated plateau of Hawkesbury Sandstone, approximately 18 km in length (URS 2004). The sandstone is described as medium- to coarse-grained, composed predominantly of quartz with minor lithic fragments, feldspar, mica and clay pellets. The sandstone is overlain by Quaternary (Pleistocene) wind-blown medium- to fine-grained well-sorted marine quartz sand (URS 2004, 2010).

The Site lies on the aeolian Kurnell landscape unit, composed of gently undulating to rolling coastal dunefield and relict dunes (NSW Soil Conservation Service Soil Landscape Series, Wollongong-Port Hacking, in URS 2011).

The elevation on and around the Site is generally in region of 5 m Australian Height Datum (AHD). Land to the east of the Site in Kamay Botany Bay National Park rises to approximately 30 m AHD (Port Hacking 9129-4N Topographic Map, Third Edition, Land and Property Information NSW, 2001).

The depth to bedrock beneath the Site varies between 2 m to 20 m. Bedrock surface elevation rises toward the east and south of the Site, with sandstone outcrops mapped at the northeast and southeast boundaries (URS, 2006).

Acid Sulphate Soils

A review of the NSW Acid Sulfate map (Department of Infrastructure, Planning and Natural Resources (DIPNR)) and previous reports, indicate that the proposed works are on ground classified as 'Low Probability' of containing Potential Acid Sulfate Soils (PASS) (URS 2011).

The Section 149 (2) and (5) Planning Certificates provided by Sutherland Shire Council state that the Project Area in the Kurnell Refinery has been classified as Class 4 with respect to ASS. Sutherland Shire Council has provided the following definition of Class 4 areas:

'Acid sulphate soils in a Class 4 area are likely to be found beyond 2 metres below the natural ground surface. Any works that extend beyond 2 metres below the natural ground surface, or works which are likely to lower the water table beyond 2 metres below the natural ground surface, will trigger the requirement for assessment and may require management (Sutherland Shire Council 2010).'

Environmental problems associated with PASS occur as a result of development works which expose soil with the potential to undergo oxidation reactions on contact with oxygen and water. The result of the oxidation reactions typically produces low pH runoff which in turn acidifies soil, groundwater and surface waters.

9.5.2 Hydrogeology

The Site is underlain by Quaternary sands, silts and clays over Hawkesbury Sandstone.

A *Voluntary Investigation Final Report* by Coffey (2003) indicates that groundwater at the Site is contained within an unconfined aquifer in Quaternary sands. The depth to groundwater is approximately 2 m below ground level (mbgl). The investigation suggested that groundwater flow is generally in a north-westerly direction and is largely influenced by the strike and dip of the underlying sandstone bedrock. **Figure 9-1** illustrates the groundwater flow across the Site and Project Area.

The *Soil and Groundwater Contamination Assessment, Classification and Risk Ranking Report* by Coffey (2007) reports that the receiving water for groundwater migrating from the Site is Botany Bay to the north, and Quibray Bay to the west. The ecosystem within Quibray Bay is considered sensitive and different parts of it comprise either Towra Point Nature Reserve or Towra Point Aquatic Reserve (refer to **Chapter 19 Ecology** and **Chapter 10 Human Health and Ecological Risk**). It is also recognised that a number of Kurnell residents have groundwater bores generally used for watering gardens.

A boundary groundwater monitoring program is implemented at the Site as a protection system to identify the potential for migration of hydrocarbon contaminated groundwater before it leaves the Site. There are various monitoring wells installed along the northern and western boundaries of the Site corresponding to the down gradient direction of groundwater flow (Coffey 2003). These wells are regularly monitored for the presence of hydrocarbons (refer to **Figure 9-1**).

In addition to boundary monitoring wells on Site, groundwater monitoring includes the sampling of a number of other monitoring wells on the Site on a quarterly basis. During community groundwater monitoring conducted in relation to the Sites voluntary investigation agreement with DEC, Coffey (2003) reported that “*The community groundwater monitoring did not show evidence of migration of contaminated groundwater from the Refinery.*”

9.5.3 Groundwater Dependant Ecosystems

The online Groundwater Dependent Ecosystems Atlas (launched in September 2012 funded by the National Water Commission and hosted by the Bureau of Meteorology) was consulted to determine the proximity of the Project to potential Groundwater Dependent Ecosystems (GDEs). As shown in **Figure 9-2**, a vegetation GDE, noted as ‘previously identified within a previous desktop study’ is located partially on Caltex owned land (adjacent to the north-west refinery boundary). This GDE is the Marton Park Wetland (shown in **Figure 9-1**), a freshwater wetland which includes woodland communities.

According to the Marton Park Wetland Management Plan (Molino Stewart Pty Ltd 2009) the wetland is currently a freshwater wetland with limited tidal influence. The catchment area draining to the Marton Park Wetland is approximately 0.96 km². The wetland plays an important role in the drainage of the surrounding area, including the eastern portion of Kurnell, part of the Site and some Caltex owned land adjacent to the Site and Marton Park and the Kamay Botany Bay National Park.

The management plan notes that much of the Site is bunded and surface runoff from potentially contaminated areas, including process plant areas and tank farms, is treated at the refinery before being discharged to the Yena Gap ocean outfall (as per Environment Protection Licence (EPL) 837). Runoff from the non-industrial components of the Site (e.g. the six houses now used as offices and the Employees Car Park in the north of the Site) discharges into the Marton Park wetland whether directly or via infiltration through Caltex owned land adjacent to Marton Park (refer to **Appendix E Water Management Report**).

Although the wetland management plan does not directly discuss the status of this wetland as a GDE, the report discusses that the interaction between the groundwater and surface water is likely to be high given the sandy nature of the soil. It also notes that the wetland is recharged by groundwater seepage through the sandy bed during dry periods. Threats to the groundwater quality include the large number of horses in the area, the area not being sewered for a long time (historical threat), and potential infiltration from industrial sites (including the Site) (Molino Stewart Pty Ltd 2009).

Further information about this GDE is also presented in **Chapter 19 Ecology**.

9.5.4 Contamination

Based on the historical land use and reported activities carried out across the Site, investigations have been conducted to determine key contaminants of potential concern (COPC) for the Site (Coffey, 2007 and Coffey, 2011). Due to its size, the Site was divided into Contamination Management Zones (CMZs) to assist with classifying and managing the types of contaminants that may be found within each zone (refer to **Figure 9-3**).

Table 9-1 presents a summary of COPC within the CMZs that have the potential to be affected by the proposed works¹) (refer to **Section 9.6**). As demonstrated in **Table 9-1**, Caltex have a number of processes and monitoring programs in place on the Site to manage existing COPC. The information provided in **Table 9-1** has been sourced from Coffey 2007 and Caltex 2012.

¹ Contamination Management Zone (CMZ): a part of the Site associated with a particular activity and with an identifiable and limited group of contaminants associated with that activity. The entire Site is divided into 22 separate CMZs (Zone A to Zone V).



Source: Coffey Environments, Feb 2007 (Figure 3, project number ENVILCOV00290AQ)

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KURNELL REFINERY CONVERSION

COFFEY (2007) GROUNDWATER FLOW DIRECTION
AND GROUNDWATER MONITORING WELLS

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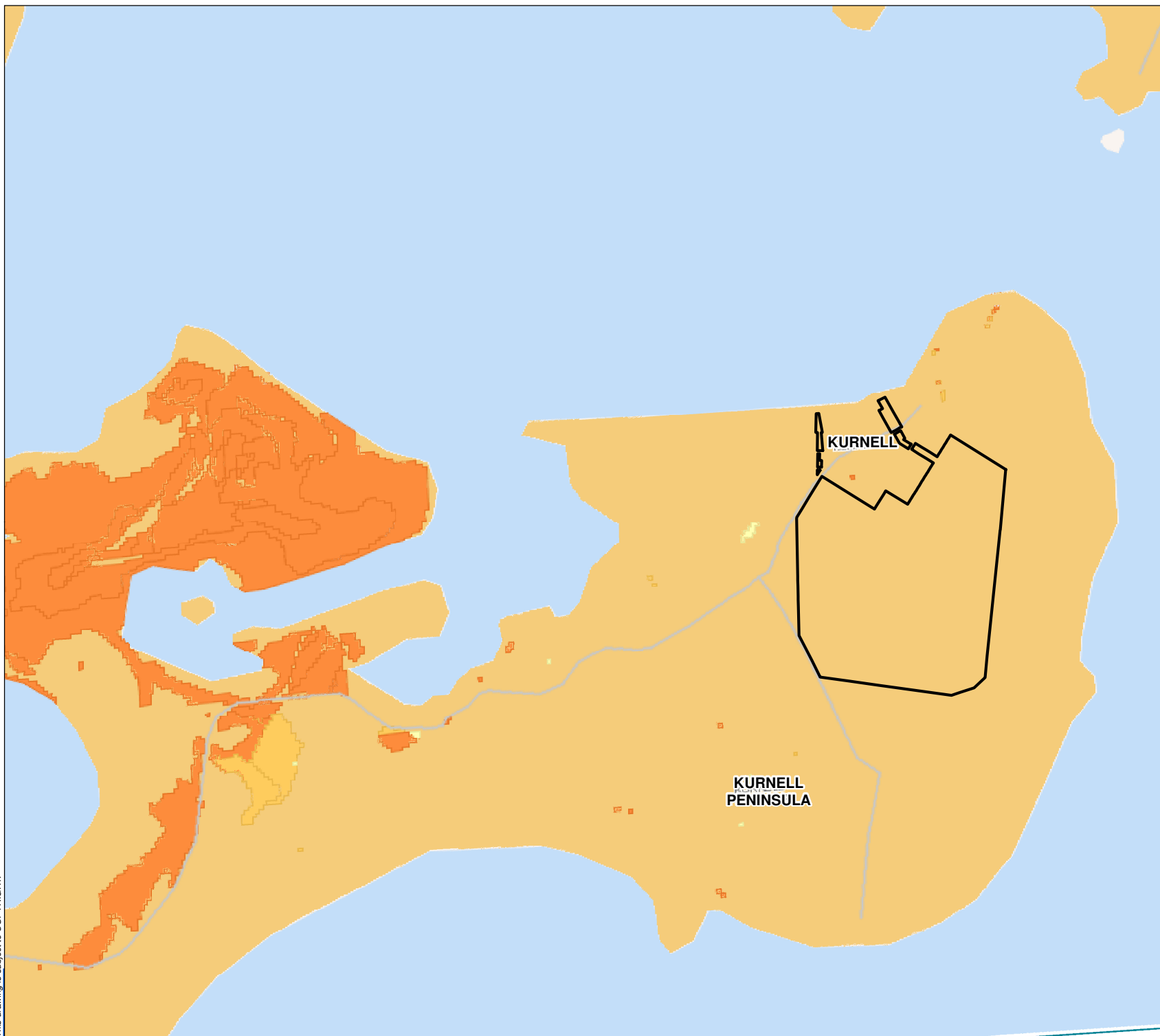
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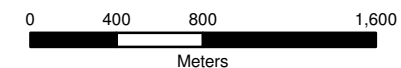


LEGEND

The Site

GDE, Reliant on subsurface groundwater (vegetation)

- Identified in previous study: fieldwork
- Identified in previous study: desktop
- High potential for groundwater interaction
- Moderate potential for groundwater interaction
- Low potential for groundwater interaction
- No ecosystem analysed



Source: Australian Government, Bureau of Meteorology [Dec 2012]

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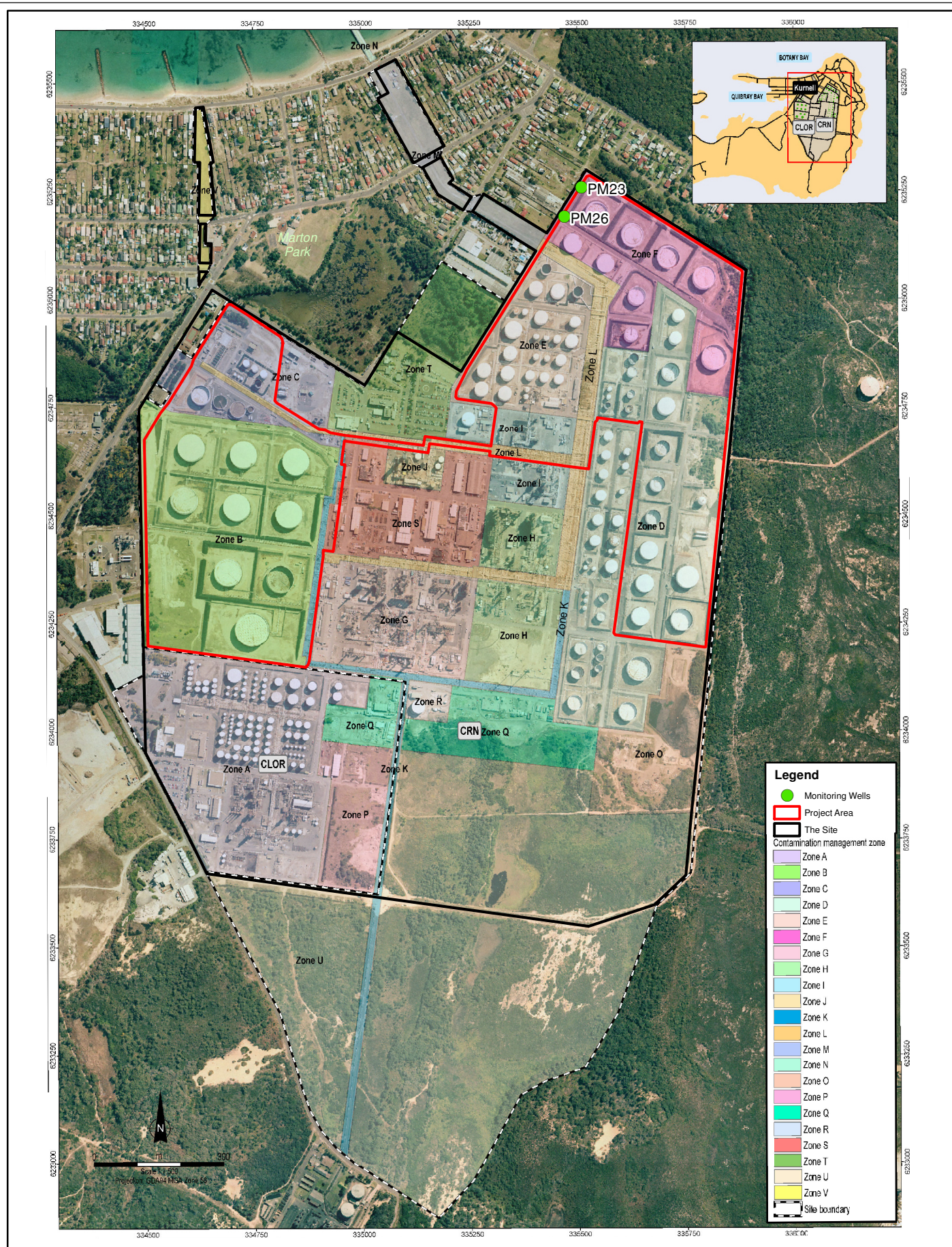
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**GROUNDWATER DEPENDANT
ECOSYSTEM MAP**

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Figure: **9-2**
Rev. A A4





Source: Coffey Environments, Feb 2007 (Figure 7, project number ENVILCOV00290AQ)

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COFFEY (2007) CONTAMINATION
MANAGEMENT ZONES

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Figure: 9-3

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Table 9-1 Baseline Contamination Data for Project Area Contamination Management Zones (CMZs)

CMZ	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations*	Soil Considerations*
Zone B Crude oil tanks	Quarterly groundwater monitoring is conducted from three in-bound monitoring wells in Zone B. Refer to Figure 9-1 for monitoring well locations.	TPH, PAHs, BTEX Potentially Asbestos (from building wastes in temporary soil stockpiles), and contaminants from off-site transported by the oily water sewer system (OWSS) and stormwater network.	TPH (>C15) groundwater contamination. Benzene has also been detected at elevated concentrations at one location.	No known soil contamination was reported as present from soil assessments completed to date.
Zone C Water treatment plant and LPG storage.	Quarterly groundwater monitoring is conducted from four boundary and one in-bound monitoring wells in Zone C. Refer to Figure 9-1 for monitoring well locations.	TPH, PAHs, BTEX Potentially metals and contaminants from off-site transported by the OWSS and stormwater network.	Elevated groundwater TPH has been periodically measured in two boundary monitoring wells. Isolated elevated Benzene concentrations have also been recorded.	No on-site contamination source assessments involving soil sampling have been conducted in Zone C.
Zone D Feed stock tanks	Quarterly groundwater monitoring of monitoring wells hydraulically downgradient from Zone D. Refer to Figure 9-1 for monitoring well locations. Monitoring and recovery wells were installed following a PSH contamination event 1994.	TPH, PAHs, BTEX Potentially mercaptans and Pb (and possibly TEL) and contaminants from off-site transported by the OWSS and stormwater network.	PSHs were identified in the western portion of Zone D in the early 1990s. Although the PSHs were recovered, it is possible that affected groundwater may be present.	PSHs were identified in the western portion of Zone D in the early 1990s. Assessment of parts of this CMZ have not indicated significant soil contamination related to refinery operations.
Zone E Diesel, Jet fuel, Fuel oil tanks	Quarterly groundwater monitoring includes two boundary monitoring wells within Zone E. Refer to Figure 9-1 for monitoring well locations. No on-site contamination source assessments involving soil sampling have been conducted.	TPH, PAHs, BTEX Potentially Chromium (Cr), Lead (inorganic and TEL) and contaminants from off-site transported by the OWSS and stormwater network.	TPH and benzene have exceeded the investigation level since 1998. The concentrations of chromium and lead have not exceeded the investigation levels in the boundary wells.	No on-site contamination source assessments involving soil sampling have been conducted in Zone E.
Zone F Gasoline tanks	Quarterly groundwater monitoring includes four boundary monitoring wells and three wells inbound wells. Refer to Figure 9-1 for monitoring well locations. Zone F has been the subject of a voluntary investigation program requiring sampling of the on-site groundwater monitoring wells and on-site and off-site soil sampling.	TPH, PAHs, BTEX, Lead (inorganic and TEL).	Historical monitoring has shown elevated concentrations of TPH and BTEX in groundwater on-site and at the boundary. Remediation measures operating in Zone F (e.g. bioventing system, PSH recovery) have contributed to the significant reduction in groundwater contaminant concentrations.	Elevated concentrations of TPH, BTEX, naphthalene and lead have been measured in soil beneath Road B. PSH has also been detected in monitoring wells along Road B (Caltex 2012).

CMZ	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations*	Soil Considerations*
Zone I Crude oil distillation unit 2 Bitumen/asphalt unit	Quarterly groundwater monitoring includes one in-bound monitoring well within Zone I. Refer to Figure 9-1 for monitoring well locations. Soil contamination study was undertaken by Woodward Clyde Pty. Ltd. (1996) in conjunction with the proposed co-generation plant site.	TPH, PAHs, BTEX Potentially metals and Asbestos from product storage and transfer and contaminants from off-site transported by the OWSS and stormwater network.	Monitoring indicates major exceedances for TPH and minor exceedances of naphthalene (PAH). PSH has been encountered during excavation on the south-western corner of this CMZ. Remediation has since been undertaken.	The 1996 soil contamination study identified contamination adjacent to the crude receiving line in Zone I following a leak. The results indicated significant adsorbed phase TPH and BTEX contamination at a depth of about 2 m, and dissolved phase benzene, xylene, and TPH contamination. PSH was identified near the leak and extending into the south-eastern corner of Zone T. Water level gauging in 2007 detected the presence of PSHs at in-bound monitoring well PMW20 (Caltex 2012).
Zone K Product pipe racks (Crude oil)	No regular environmental monitoring is conducted. However, soil, groundwater, and surface water sampling has been conducted following remediation of a pipeline leakage which occurred in September 2004. No soil assessment has been undertaken other than the soil validation for remediation of the pipeline leak. The leak and impacted soils have been remediated and validated.	TPH, PAHs, BTEX, Potentially Phenols and Asbestos from product storage and transfer and contaminants from off-site transported by the OWSS and stormwater network.	Regular quarterly groundwater monitoring in monitoring well PMW13 (Zone S) has previously detected elevated groundwater concentrations of TPH and naphthalene. PSH was detected in monitoring well PMW13 (Zone S) between February 2000 and November 2002. A product recovery pump was installed in this well and Coffey reported no detection of PSH in 2006. Subsequent environmental data indicated that the remediation successfully removed secondary sources of groundwater and surface water contamination.	The impacted soils were deemed to have been remediated following validation sampling after the pipeline leakage. The potential for asbestos to be present as a soil contaminant was identified.
Zone L Main pipeways (Diesel, jet fuel, naphtha, gasoline)	Quarterly groundwater monitoring is not currently conducted in Zone L. Environmental assessments (comprising PSH assessments and asbestos assessments of the sand bedding material under the pipeways) have been conducted. One contamination source assessment following a series of leaks and an asbestos assessment have been undertaken.	TPH, PAHs, BTEX Phenols; Metals; Asbestos and contaminants from off-site transported by the OWSS and stormwater network.	PSH contamination (sourced from Zone D) was identified in the early 1990s in the vicinity of Pipeline Easement 1. This contamination has the potential to still be present in this area.	PSH contamination and affected subsurface soils (sourced from Zone D) were identified in the early 1990s in the vicinity of Pipeline Easement 1. Asbestos contamination has been identified in surface soils within Pipeline Easement 1.

* Maximum contaminant concentrations reported are provided in summary form in **Table D-3** within **Appendix D Human Health and Ecological Risk Assessment**.



9.5.5 Remediation and Validation

Caltex has completed a number of discrete incident based remediation efforts at the Site. There is also a risk reduction program on the Site which aims to reduce the off-site human health and environmental risks in relation to dissolved TPH and BTEX in groundwater.

Condition R4.4 of EPL 837 requires Caltex to prepare a Contaminated Sites Risk Reduction Plan for the Site to establish a program for the reduction of risk to human health or any other aspect of the environment associated with contaminated soil and/or groundwater. A report documenting progress against this plan must be submitted to the EPA on or before 31 December each year. The purpose of this progress report is to summarise the measures and/or programs implemented over the previous 12 month period and provide a review/update of planned works to track project milestones as well as commenting on additional risks which may be identified.

URS has reviewed the Caltex (2011) *Contaminated Site Risk Reduction Program Progress Report 2011*. It states that Caltex completed a risk assessment for the 22 CMZs and ranked the risks associated with soil and groundwater contamination at the Site. Three levels of risk were adopted for the risk reduction plan:

- Acceptable (3e);
- Risk Reduction Suggested (2c and 2d); and
- Priority for Risk Reduction (1a and 1b).

Risks not deemed acceptable were identified for the following CMZs:

- Zone A - Risk level 2d;
- Zone F - Risk level 2d;
- Zone I - Risk level 1b; and
- Zone O - Risk level 2c.

In accordance with its existing EPL and various relevant development consent conditions from previous project approvals on the Site, Caltex will continue to conduct Phase Separated Hydrocarbon (PSH) removal and quarterly groundwater monitoring as reported in the Progress Report (Caltex 2012). The proposed works associated with the Project would not result in the removal of any monitoring wells and would not affect the ongoing remediation program at the Site.

Both Zone F and I are of relevance to the proposed works given that the Project Area occurs across parts of these zones (refer to **Figure 9-3**).

Zone F

As reported by Caltex (2011), elevated concentrations of TPH, BTEX, naphthalene and lead have been measured in soil and groundwater beneath the road in Zone F. Petroleum hydrocarbon product (referred to as PSH) has also been detected in monitoring wells in this area. Historical records for Zone F indicate that the contamination is most likely to have been sourced from historical leaks/spills from storage tanks and product transfer pipes.

PSH removal was undertaken at two wells (PMW34 and PMW36). A bio-venting system was installed down-gradient from the PSH source to remediate and restrict off-site movement of groundwater contamination.

The main goals for CMZ F which would be upheld throughout the construction and operation of the Project are to:

- remediate PSH in Zone F;
- reduce potential for contaminant exposure to on-site workers; and
- reduce the potential for off-site migration and exposure of off-site receptors (people and aquatic environments) to impacted groundwater.

Zone I

As reported in Caltex (2011), water level gauging in 2007 detected the presence of PSH at in-bound monitoring well PMW20 (refer to **Figure 9-1**). The presence of PSH in PMW20 is a potential risk to off-site sensitive areas. It is also considered that the PSH may present a risk to on-site workers, through inhalation or dermal contact pathways. There are currently controls at the Site which reduce the likelihood of worker exposure to this contamination, including the permit to work system and mandatory PPE for Site works. The PSH is actively being remediated using a series of skimmer pumps and total fluid pumps and remediation will continue while product continues to be removed.

9.6 Impact Assessment

9.6.1 Overview

As described within **Chapter 4 Project Description**, the Project would include modifications to the existing Kurnell Refinery to convert it to a working finished product terminal. The Project would involve the conversion of tanks and installation of pipelines within the Project Area to allow for the expansion of terminal operations. A diesel additives injection system would be installed at a new location within the Western Tank Area to dose diesel as it is received into the Site from the wharf to ensure on-specification product. The finished product terminal would utilise existing pipe work and new pipe work to transfer product across the Site to store in tanks. There would also be additional pump infrastructure required. A small chemical drum and dosing pump would be installed at Gate 5.

The tank conversion process would involve the following activities:

- shutdown of the tanks and associated infrastructure;
- removal of the existing product from the tanks;
- draining the excess product from the pipes connecting the tanks;
- isolating and making safe any infrastructure and instrumentation that is no longer required;
- upgrading finished product pumps and control systems to improve efficiency; and
- modifications to the tanks including upgrades to the tank internals, roofs, nozzles, floors, manifolds and finished product distribution pipework where required.

Tank modifications may involve minor physical changes to the tanks including resurfacing and installation of additional product lines, most of which would occur atop of existing hardstand surfaces.

Other works associated with the tank conversions (where required) include:

- installation of additional product quality controls; and
- upgrading safeguard systems (e.g. additional spill detection measures to be installed in bunds) as detailed in the Loss Control system description (refer Section 10, **Appendix E, Water Management Report**).

9.6.2 Construction Impacts

Ground Disturbance

Figure 9-4 shows where minor ground disturbance may occur during the construction phase.

Potential ground-disturbing works include:

- modification to pipelines;
- tank refurbishment; and
- pump installation activities.

Ground disturbance would mainly involve small scale excavations to 1.0 m to establish foundations, or the resurfacing of areas already covered with hardstand surfacing. An estimated 180 m³ of soil would likely require excavation across the Project Area from within the areas of potential disturbance shown in **Figure 9-4**. Any adverse potential impacts related to erosion and sedimentation are likely to be minor.

The probability of occurrence of acid sulfate soils across the Project Area is considered to be low according to available Acid Sulfate Soil Mapping (refer to **Section 9.5.1**). Any excavation during construction is not expected to be deeper than 1 m, and acid sulfate soils are considered unlikely to occur within the upper 2 m of soil strata at the Site. Therefore it is unlikely that the Project would result in any impacts relating to acid sulphate soils.

As the excavation works are limited in extent and duration, the risk posed to groundwater and, as a result, surface water, by the proposed works is limited. Whilst any potential impacts relating to ground disturbance works would be minor, certain measures would be required to minimise the potential for adverse effects. These measures are discussed in **Section 9.7**.

Infiltration and Groundwater

An increase in impermeable surfaces and changes to the Site drainage has the potential to reduce groundwater recharge capacities and to concentrate surface water runoff. This impact could potentially affect the nearest located identified vegetation GDE referred to as Marton Park Wetland (refer to **Figure 9-2**). However, the proposed works would not result in any change to rainfall infiltration rates or increase impermeable surfaces. The catchment area would remain the same, with the majority of water continuing to enter the wetland from the non-operational areas of the Site, e.g. the administration buildings and car park.

Construction of the Project and stormwater improvement works related to the implementation of the Stormwater Management Plan for the Site (refer to **Appendix E Water Management Report**) would be expected to improve drainage across the Site to allow for more effective surface water channelling than occurs at present. Surface water drainage is discussed in detail in **Chapter 11 Surface Water, Wastewater & Flooding**, however for the purposes of this groundwater assessment, these improvements would not result in any net change in infiltration to groundwater.

Therefore it can be concluded that construction of the Project would not result in any changes to infiltration rates at the Site and would not affect the groundwater flows to any GDEs.

Dewatering Activities

As discussed in **Section 9.5**, the Project Area is located on Hawkesbury sandstone overlain by Quaternary (Pleistocene) wind-blown medium- to fine-grained well-sorted marine quartz sand to a depth of approximately 2 m. Excavations would extend to a maximum of 1.0 m in depth within the Project Area (refer to **Figure 9-4**) and groundwater is not expected to be encountered within the first 2 m of the sand/soil strata. Therefore it is highly unlikely that any dewatering of the minor excavations would need to take place and aquifer interference approval would not be required.

Although it is considered unlikely that groundwater would be intercepted during the construction phase, in the event that water accumulates in an excavation (e.g. following a rainfall event) and dewatering is required, the accumulated water, would be collected and disposed of in the wastewater treatment plant.

As described in **Section 9.7**, management strategies and procedures for dewatering and for the disposal of wastewater would be included in the CEMP.

Contamination

Contamination impacts during construction may result from:

- disturbance of contaminated land or groundwater;
- contaminants leaking to the ground surface; and
- accidents or spills involving construction equipment.

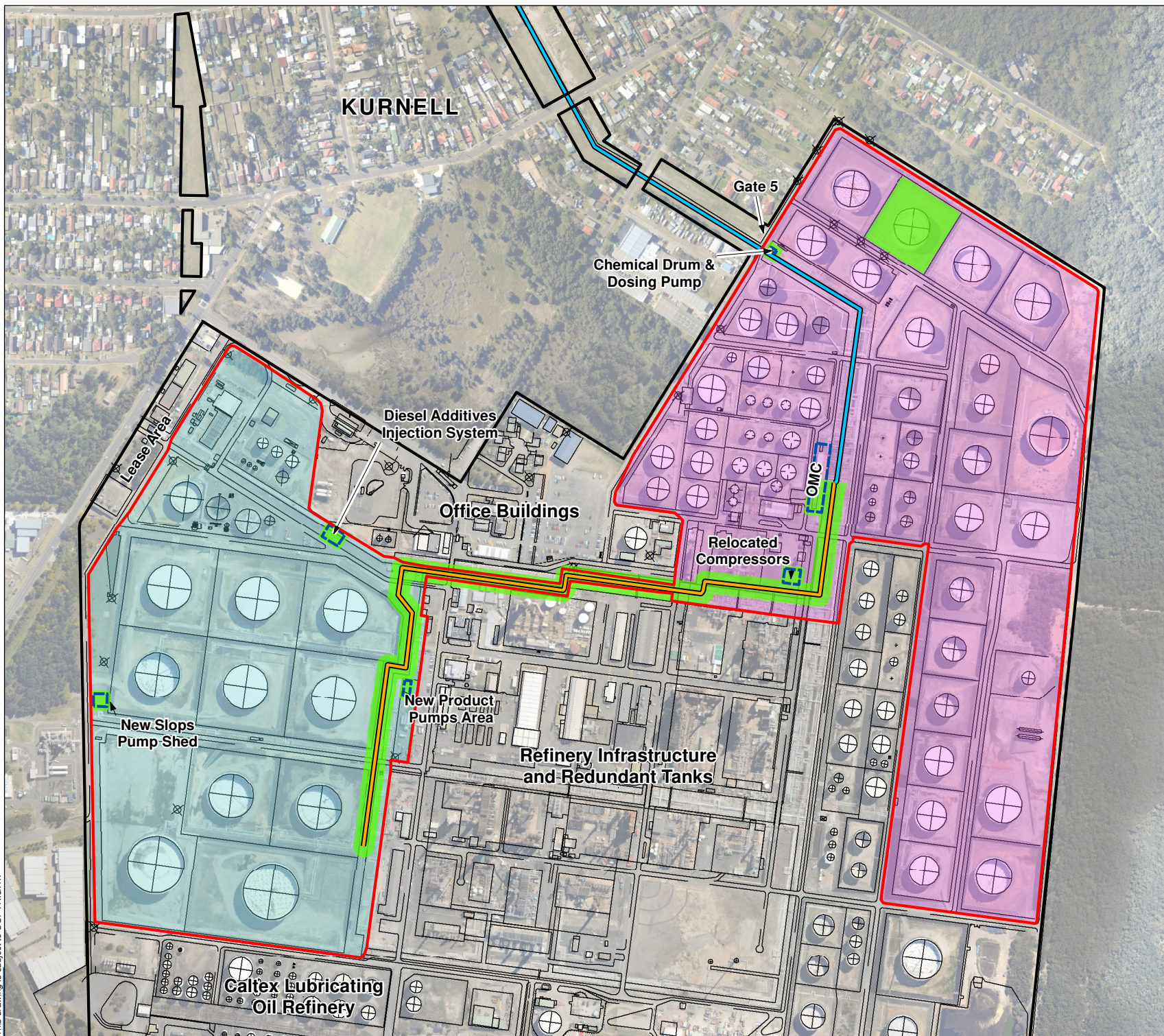
In the event that contaminated soils are disturbed, or contaminated groundwater is intercepted during construction there is potential that workers could be exposed. **Chapter 10 Human Health and Ecological Risk** provides a human health risk assessment for the various contaminants of concern potentially present within soils across the Project Area.

As noted in **Sections 9.5.4** and **9.5.5** above, contamination across the Site has been characterised through a variety of investigations and an ongoing monitoring program. Whilst only a very limited amount of excavated material (up to 180 m³) would be removed during construction phase, the potential for this material to adversely affect construction workers or contaminate other areas remains. Therefore, in order to manage this potential impact a number of management and mitigation measures have been identified. These are discussed in **Section 9.7** below.

In addition, during the cleaning of the existing tanks there is a potential for impact to soils or groundwater if not managed correctly. Caltex regularly undertakes a 'Turnaround and Inspection' process with the tanks on Site. During the construction phase the techniques/management measures used in this process would be implemented across the Project Area. Relevant management and mitigation measures are discussed further in **Section 9.7** below.

The Project would not affect the continuation of the existing remediation programs across the Site. Caltex would continue to conduct quarterly groundwater monitoring to monitor potential migration of contaminants.

This drawing is subject to COPYRIGHT.



Legend

- The Site
- Project Area
- New Infrastructure

Pipeline

- Pipeline Easement 1
- Pipeline Easement 2

Tank Areas

- Eastern Tanks Area
- Western Tanks Area
- Location of Potential Ground Disturbing Activities



0 50 100 200
Meters

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

Source: Aerial Imagery - Nearmap Hypertiles 2012

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CALTEX (REFINERIES)
NSW PTY LTD

KURNELL REFINERY
CONVERSION

LOCATION OF GROUND
DISTURBANCE ACTIVITIES

URS

Figure: 9-4
Rev. A A4



9.6.3 Operation Impacts

Process Water

The operation of the Project would have the potential to impact on soils and groundwater if oily process water (e.g. water from tank cleaning, hydrotesting etc.) overflowed or leaked as a result of pipe or valve failure.

However, as discussed and assessed within **Appendix E Water Management Report** and **Chapter 11 Surface Water, Wastewater and Flooding**, the Project would significantly improve the management of process water through the significant reduction of wastewater volume and contaminant load associated with the cessation of refining activities.

Fuel and Chemical Storage and Handling

The Project would have the potential to impact on soils and groundwater through leaks and spills during the transfer and storage of finished product on Site. This does not represent a new potential impact, and is the continuation of an inherent risk associated with the existing operations.

Some tanks would also be modified where required including upgrades to the tank internals, roofs, floors and manifolds; and upgrading safeguard systems. Refurbished and upgraded infrastructure would reduce the overall inherent risk of chemical contamination to the underlying soils and groundwater.

The Project includes the upgrade of finished product pumps and control systems to improve efficiency and reliability and would involve an upgrade to safeguard systems, significantly improving the capacity to detect and correct any leaks into the future.

Operations would be carried out in accordance with applicable federal, state, and local permits, approvals and regulatory requirements as managed through the existing environmental management system at the Site. Commissioning and operation of the Project would be subject to environmental approvals and safeguards, which would help ensure that operations would be carried out in a safe and appropriate manner in accordance with the revised EPL and the relevant legislation. As such no additional adverse impacts are expected as a result of the Project, indeed as improvements are made across the Site the future terminal is likely to result in less contamination impacts.

9.7 Mitigation

9.7.1 Construction

In order to mitigate any adverse impacts or contamination risks the following mitigation measures would be implemented.

Soil Management

- A Soils and Erosion Management Plan would form part of the CEMP for the Project. This plan would outline management measures for any soils that are excavated or stored on-site during the construction works. It would identify:
 - the areas where soil disturbance is likely;
 - soil testing procedures;
 - soil handling procedures;

- locations where soil would be stockpiled on-site for either removal, treatment or reuse;
 - procedures to reduce erosion and the spread of dust;
 - restricting traffic to defined roads or tracks where necessary; and
 - the rehabilitation of bare soil following completion of the construction works.
- All materials would be stockpiled in accordance with 'The Blue Book' *Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004). Principal controls would include the following:
 - silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary;
 - silt and sediment traps would be installed across stormwater drains in proximity to excavation areas;
 - stockpiles would be restricted to cleared areas and not impact any vegetation;
 - stockpiles would be placed on impermeable sheeting to prevent any infiltration;
 - stockpiles would be covered and wetted down in order to reduce dust creation; and
 - stockpiles would not be located in close proximity to any stormwater drainage systems.
 - The Soils and Erosion Management Plan would also outline the inspection program for any erosion control structures and bunded areas.
 - A Contamination Management Plan would form part of the Construction Environmental Management Plan (CEMP) for the Project. This plan would outline measures for testing, handling, storing and managing contaminated soils and contaminated groundwater.
 - Soils would be tested for both for contaminants and odour using standard practices (e.g. soil vapour and soil sampling).
 - Clean materials would be separated from contaminated materials for reuse as backfill where required.
 - Suspected contaminated materials would then be classified in accordance with EPL condition O5.1 which requires "any liquid and/or non-liquid waste generated and stored [at the Site] is assessed and classified in accordance with" the *NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste*, batched, further tested (where required, for example Toxicity Characteristics Leaching Procedure (TCLP) testing) and either stored on the Site or disposed of in a timely manner.
 - The method of disposal would be in line with the materials' classification in accordance with specifications set out in a Waste Management Plan (WMP). This would include disposal of any contaminated materials to appropriately licensed facilities in accordance with the above classification guidance and the *Contaminated Land Management Act 1997*. Disposal of any contaminated soils would be in accordance with *NSW (2009) Waste Classification Guidelines*.

Acid Sulphate Soils (ASS)

ASS are not likely to be encountered. However, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998) if ASSs were encountered during the construction phase of the Project. This ASS management plan would include developing management and disposal options for acid sulphate soils and, if necessary, monitoring any surface water discharges from the Site to ensure any stormwater discharge has not been affected.

Prevention of Impacts to Groundwater

It is unlikely that groundwater would be encountered during construction due to the depth of the excavations and the greater depth of the groundwater. As discussed in **Section 9.6.2**, dewatering activities could be required in certain circumstances. Therefore the following management strategies would be employed:

- A Groundwater Management Plan (GWMP) would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the testing, dewatering, storage, movement and treatment of any groundwater during the construction phase.
- The GWMP would recommend measures to prevent the infiltration of contaminated run off to groundwater due to construction activities. Measures would include:
 - the use of appropriate drip trays and interception techniques for any construction specific liquids stored on the Site;
 - bunding of any fuel or chemical storage area at the construction Site;
 - regular inspection of construction equipment to ensure any leaks are minimised and rectified;
 - management of vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system;
 - appropriate and timely assessment, classification and disposal of any contaminated soil, water or waste generated during construction in accordance with *NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste*;
 - regular inspection of erosion control structures and bunded areas; and
 - regular inspection and testing of containment areas, drainage lines and process pipe work.
- Any runoff that may accumulate in excavations, would be periodically tested for elevated levels of contamination. Water that is found to have elevated levels of contaminants, would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established refinery wastewater management procedures.
- Runoff entering any excavations would be limited by using bunds or similar structures as required.

Tank Cleaning

During the cleaning of the crude and finished fuel tanks, measures would be implemented to contain and collect any potentially contaminating product for appropriate disposal either to the on-site waste system or the landfarm. The process involved in capturing, storing, transporting and disposing of this material is already undertaken as part of the existing operation at the Site, however it would also be detailed within the CEMP for completeness.

Work Permits

Where there is a potential for the interception of contaminated soils during ground disturbing activities, Caltex would maintain the existing risk reduction measures in place across the Site. As outlined in **Chapter 10 Human Health & Ecological Risk**, a work permit is required for work in the areas where potential soil and groundwater contamination exists (such as within tank bunds or for any works that can potentially expose groundwater). The work permit includes requirements (such as monitoring) and PPE.

These reduce the likelihood of worker exposure to contaminated soils and groundwater. No unauthorised entry into these areas is permitted, therefore the likelihood of worker exposure is reduced. In addition Excavation Permits are required prior to any excavation and this permit needs to consider the potential for contamination and include PPE requirements and waste management.

9.7.2 Operation

To avoid a loss of containment, all of the Project components would be closely monitored and subjected to:

- regular inspection and maintenance of equipment, pipes, tanks and protective bunding to minimise the risk of leaks; and
- expedited repair or replacement of any Project components that are found to be faulty to ensure public safety, EPL compliance and to maintain high levels of system reliability.

This work would fall within the inspection, assessment, maintenance and repair programmes that would be implemented as part of the operation of the Project to allow for the Site to be operated properly and efficiently. These safeguards would be incorporated into the updated management plans for the proposed terminal. Operation activities within the Project Area, would be the same as the existing operations. The Project would be appropriately licenced under the *Protection of the Environment Operations Act 1997* and would be managed in accordance with EPL requirements.

9.8 Summary

This chapter has considered a number of potential impacts which could arise from both the construction and operation of the Project. The assessment concludes that the Project would be likely to have negligible impacts on the soil and groundwater environment beneath and around the Site provided the management and mitigation measures outlined in **Section 9.7.1** are implemented.

The management and mitigation measures outlined above are summarised below in **Table 9-2**.

Table 9-2 Management and Mitigation Measures – Soils, Groundwater and Contamination

Management and Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
A Soils and Erosion Management Plan would be developed as part of the CEMP to manage the excavation, testing, stockpiling, reuse and rehabilitation of soils. This plan would outline: • the areas where soil disturbance is likely; • soil testing procedures; • soil handling procedures; • locations where soil would be stockpiled on-site for either removal, treatment or reuse; • procedures to reduce erosion and the spread of dust; • restricting traffic to defined roads or tracks where necessary; and • the rehabilitation of bare soil following completion of the construction works.		✓	

Management and Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
All materials would be stockpiled in accordance with 'The Blue Book' Managing Urban Stormwater - Soils and Construction Volume 1 and 2 (Landcom, 2004). Principal controls would include the following: • silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary; • silt and sediment traps would be installed across stormwater drains in proximity to excavation areas; • stockpiles would be restricted to cleared areas and not impact any vegetation; • stockpiles would be placed on impermeable sheeting; • stockpiles would be covered and wetted down in order to reduce dust creation; and • stockpiles would not be located in close proximity to any stormwater drainage systems.		✓	
The Soils and Erosion Management Plan would also outline the inspection program for any erosion control structures and bunded areas.		✓	
Excavated soils would be tested for both contaminants and odour using standard practices (e.g. soil vapour and soil sampling etc.)		✓	
Clean materials would be separated from contaminated materials for reuse as backfill where required.		✓	
A Contamination Management Plan would form part of the CEMP for the Project. This plan would outline measures for testing, classifying, handling, storing and managing contaminated soils and contaminated groundwater.		✓	
Suspected contaminated materials would be assessed and classified in accordance with EPL requirements and NSW (2009) <i>Waste Classification Guidelines: Part 1: Classifying Waste</i> , batched, further tested (where required) and disposed by a licenced contractor.		✓	
Disposal of any contaminated soils or groundwater would be in accordance with EPL requirements and NSW DECCW's <i>Waste Classification Guidelines</i> and the Contamination Management Plan (CMP) for the Project. Contaminated materials would be sent to appropriately licensed facilities in accordance with the <i>Contaminated Land Management Act 1997</i> .		✓	
If Acid Sulfate Soils (ASS) are encountered during construction, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).		✓	

Management and Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
A Groundwater Management Plan (GWMP) would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the testing, dewatering, storage, movement and treatment of any groundwater intercepted during the construction phase. Measures would include: - the use of appropriate drip trays and interception techniques for any construction specific liquids stored on the Site; - bunding of any fuel or chemical storage area at the construction Site; - regular inspection of construction equipment to ensure any leaks are minimised and rectified; - management of vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system; - appropriate and timely disposal of any contaminated soil, water or waste generated during construction; - regular inspection of erosion control structures and bunded areas; and - regular inspection and testing of containment areas, drainage lines and process pipe work.		✓	
Any runoff that may accumulate in excavations, would be periodically tested for elevated levels of contamination. Water that is found to have elevated levels of contaminants would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established refinery wastewater management procedures.		✓	
Runoff entering any excavations would be limited by using bunds or similar structures as required.		✓	
Construction workers would be instructed in appropriate health and safety and handling protocols for minimising human contact with contaminated soils and groundwater.		✓	
During the cleaning of the crude and finished fuel tanks, measures would be implemented in line with Caltex's existing Turnaround and Inspection process to contain and collect any potentially contaminating material for appropriate disposal to the on-site wastewater treatment plant, landfarm or appropriate off-site disposal facilities. This process would be detailed within the CEMP.		✓	
Permits would be required to work in the areas where potential soil and groundwater contamination exists. The work permit includes requirements such as monitoring and PPE. No unauthorised entry into these areas is permitted, without a permit.		✓	
Appropriate inspection, assessment, maintenance and repair programmes that would be implemented as part of the operation of the Project. These safeguards would be incorporated into the updated management plans for the proposed terminal. The Project would be appropriately licenced under the <i>Protection of the Environment Operations Act 1997</i> and would be managed in accordance with EPL requirements.			✓

10 Human Health and Ecological Risk

10.1 Introduction

This chapter provides a summary of the qualitative assessment undertaken to understand the potential risks posed to human health and the environment by the Project. The Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) are provided in full in **Appendix D Human Health and Ecological Risk Assessment** as one consolidated report.

10.2 Scope of the Assessment

A qualitative HHRA and a qualitative ERA were undertaken to address the Director General's Requirements (DGRs) (refer to **Appendix A DGRs**) which required the consideration of contamination, specifically *"how ecological and human health risks posed by contaminants on the site would be mitigated and managed"*. Potential impacts on the surrounding Kamay Botany Bay National Park, Towra Point Nature Reserve, Towra Point Aquatic Reserve and the local oyster industry were also to be considered.

This chapter and **Appendix D Human Health and Ecological Risk Assessment** meet these requirements.

The overall objective of the HHRA and ERA, in line with the DGRs, is to identify aspects of the environment which may pose a risk from the Project. Where risks may be posed, potential mitigation measures have to be identified.

To achieve this objective, the HHRA and ERA comprise the following scope of work (as relevant to each of the risk assessments):

- identification of key Contaminants of Potential Concern (COPC) that may be exposed / released as a result of proposed works;
- receptor identification;
- pathway identification and assessment as to whether the pathways are complete;
- qualitative assessment of the risks posed; and
- measures recommended to mitigate any identified unacceptable risks.

10.3 Legislation and Planning Policy

10.3.1 Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to actions that have the potential to significantly impact on Matters of National Environmental Significance (NES) protected under the Act. The EPBC Act policy statements published by the Australian Government provide guidance on the practical application of the EPBC Act, and include consideration of the following:

- World Heritage properties;
- National Heritage places;

- Wetlands of international importance (including Ramsar Wetlands);
- Listed threatened species and ecological communities;
- Listed migratory species protected under international agreements (e.g. CAMBA and JAMBA);
- Protection of the environment from nuclear actions; and
- Commonwealth marine areas.

National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 and Draft NEPM Variation (2010, 2012)

The primary national framework for assessing risk on potentially contaminated sites is provided in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 1999). The Measure has been adopted by all Australian jurisdictions.

This measure contains Guidelines on Investigation Levels For Soil And Groundwater (Schedule B(1)), Health Risk Assessment Methodology (Schedule B(4)), Ecological Risk Assessment (Schedule B(5)) and Health-Based Investigation Levels (Schedule B(7)).

The NEPM framework builds on the 'ANZECC Guidelines', which were Australian and New Zealand guidelines for the assessment and management of contaminated sites (ANZECC & NHMRC 1992) that have now been repealed. The framework consists of four main phases:

- 1) data collection and evaluation;
- 2) toxicity assessment;
- 3) exposure assessment (phases (2) and (3) are often conducted concurrently); and
- 4) risk characterisation.

A key principle of the NEPM 1999 (Principle 14) describes the recommended risk assessment approaches as follows:

"Risk Assessment: The preliminary assessment of human health risk and ecological risks may be undertaken by comparing levels of contaminants on the site with appropriate investigation levels ... or by undertaking a site specific risk assessment. An investigation level refers to the concentration of a contaminant above which further appropriate investigation and evaluation will be required. The preliminary assessment may lead to a more detailed assessment of health and ecological risks."

The most common approach to risk assessment is a simple comparison of the site data on contaminants present – if there is sufficient information to characterise the site – with the relevant Investigation Levels. In most cases, if the contaminants meet the adopted Investigation Levels, the site is considered to be low risk and acceptable; if the contaminants exceed the adopted Investigation Level, then further evaluation is usually required.

The NEPM framework is currently under revision and the changes are likely to be released in mid-2013. The approach to risk assessment in the Draft NEPM Variation is generally consistent with the previous NEPM (1999).

Health Screening Levels for Petroleum Hydrocarbons, CRC CARE (2011)

The NEPM Variation is expected to include a new section on assessing vapour risks from volatile petroleum hydrocarbons in soil and/or groundwater. It is expected that this new section will adopt the Health Screening Levels (HSLs) for petroleum hydrocarbons developed by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE). In the interim, the CRC CARE series of guidelines on Health Screening Levels for petroleum hydrocarbons in soil and groundwater (CRC CARE 2011) can be used as part of the risk assessment process.

Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)

Human Health and Ecological Risk Assessment in Australia is enhanced by the risk-based hierarchical approach adopted in the Australian and New Zealand guidelines for fresh and marine water quality (ANZECC & ARMCANZ 2000). These guidelines provide advice on relevant water quality standards to protect aquatic environments, aquaculture, and water used for irrigation, recreational use (e.g. swimming) and drinking water catchments.

Australian Drinking Water Guidelines (2011)

Where there is a possibility of groundwater coming in contact with people, the Australian Drinking Water Guidelines (NHMRC 2011) provide additional guidance on assessing the level of contaminants that may cause harm to people, either through ingestion or primary contact (e.g. swimming).

10.3.2 NSW State Guidelines***State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)***

State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55) provides a state wide planning approach to the remediation of contaminated land. SEPP 55 aims to promote the remediation of contaminated land with the objective of reducing the risk of harm to human health or other aspects of the environment.

State Environmental Planning Policy – Kurnell Peninsula

State Environmental Planning Policy (Kurnell Peninsula) 1989 (SEPP (Kurnell Peninsula)) aims to conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation, state, region and locality. SEPP (Kurnell Peninsula) applies to the land within the Sutherland Shire, known as Kurnell Peninsula, and adjacent waterways. The provisions of the SEPP (Kurnell Peninsula) cover a number of issues including zoning of land, land use conflict, and heritage protection.

Contaminated Land Management Act 1997 and Amendment Act 2008

The primary objective of the *Contaminated Land Management Act 1997* (CLM Act) is to establish a process for investigating and remediating land where contamination presents a significant risk of harm to human health or another aspect of the environment.

Service Station Sites: Assessment & Remediation (NSW Office of Environment and Heritage).

Formerly 'Guidelines for Assessing Service Station Sites' NSW EPA 1994, these guidelines provide threshold concentrations for Total Petroleum Hydrocarbons (TPH) in soil and groundwater for sites intending to be used for a sensitive use. While these are not considered appropriate for the Site, as it is an industrial site, they may be appropriate in areas where more sensitive receptors are present.

Additional Ecological Considerations

The following key pieces of biodiversity legislation and policy were reviewed and the implications for the Project were assessed for the Qualitative Ecological Risk Assessment:

- *State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14);*
- *State Environmental Planning Policy No. 26 – Littoral Rainforests (SEPP 26);*
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44);*
- *Threatened Species Conservation Act 1995 (TSC Act);*
- *Fisheries Management Act 1994 (FM Act);*
- *Native Vegetation Act 2003 (NV Act); and*
- *Sutherland Shire Local Environment Plan 2006 – Sutherland Shire LEP.*

10.4 Method of Assessment**10.4.1 Risk Assessment Methodology**

The fundamental concept underpinning the risk assessment methodology for both HHRA and ERA is the Conceptual Site Model (CSM), based on a source-pathway-receptor linkage concept. The CSM includes:

- source of Contaminants of Potential Concern (COPC) – impacted soil and groundwater resulting from recent or historic leaks or spills;
- transport media – migration of COPC in soil, surface water or groundwater (including dissolved phase and free phase liquids (also known as non-aqueous phase liquids or NAPL) such as gasoline and other liquid hydrocarbon fuels);
- exposure point/s – human and ecological receptors such as flora and fauna that may be adversely affected by impacts; and
- exposure route – direct contact with impacts (e.g. contact, ingestion, inhalation and bioaccumulation).

If any one of these steps (i.e. source, transport media, exposure point or route) is absent, then the exposure pathway is incomplete and, hence, further assessment of risks is not required.

Where exposure pathways are complete, or have the potential to be complete, then the pathways can be considered as "significant". The significance of the exposure pathway depends on the nature of the impact present and the likely exposure concentrations that may be associated with the pathway.

The HHRA and ERA have been completed following the above approach in general accordance with the relevant legislation and guidance for risk assessment in Australia outlined in **Section 10.3**.

10.4.2 Environmental Information Sources

The background data used in the identification of potential contamination sources for the HHRA and ERA are based on desktop reviews of existing reports. These include:

- *Soil and Groundwater Contamination Assessment, Classification and Risk Ranking Report* (Coffey 2007); and
- *Annual Groundwater Monitoring, Fourth quarter* (Coffey 2011).

The following reports that form part of this current EIS were also utilised:

- **Appendix E Water Management Report** (summarised in **Chapter 11 Surface Water, Wastewater and Flooding**);
- **Appendix G Air Impact Assessment** (summarised in **Chapter 13 Air Quality and Odour**); and
- **Appendix I Ecology Impact Assessment** (Biosis, 2012) (summarised in **Chapter 19 Ecology**).

This assessment is based on available soil and groundwater data primarily collected between 1998 and 2006, supplemented by the results of the 2011 round of the annual groundwater monitoring program. No additional investigations have been undertaken to ascertain Site contamination status as part of this EIS.

For the purposes of the HHRA and ERA, it has been assumed that the information reviewed is essentially representative of the contamination status of the Project Area.

10.4.3 Assessment of Potential Risk to Receptors

Taking all the available information into account, including site history, contamination incident reporting and the groundwater monitoring program over nearly 20 years, and considering the nature and scale of the proposed Project, it is considered that the Site is sufficiently characterised to enable a qualitative assessment of the risks.

The first step of the assessment is to compare the concentrations of contaminants within the Project Area with appropriate investigation levels and determine whether they comply or exceed (NEPM 1999 and Draft NEPM 2012). The results of this assessment are summarised in **Section 10.6.1**.

Tables D-2 and D-3 in Appendix D, Human Health and Ecological Risk Assessment present a summary of soil and groundwater concentrations detected within the Project Area based on Screening Criteria deemed appropriate to the Site (refer to **Section 3.3 in Appendix D, Human Health and Ecological Risk Assessment**).

10.5 Existing Environment

10.5.1 Sensitive Receptors

Local Context

The Site is adjacent to residential areas and other sensitive environmental receptors. Potential off-site receptors include (refer to **Figure 10-1**):

- Botany Bay;
- Oyster farming in Quibray Bay and Botany Bay;

- Towra Point Nature Reserve (RAMSAR wetland);
- Towra Point Aquatic Reserve;
- Marton Park Wetland;
- Kamay Botany Bay National Park; and
- nearby residential areas (i.e. Kurnell Village including residences, public places and schools).

The Site is located on land that was originally a low lying sandy / swampy area. Prior to the construction of the refinery, the Site was levelled and filled by excavating and spreading local sand dunes across the Site, and supplementing with a significant quantity of sediment from Botany Bay.

As a result of these works and the continued operation of the Site over 50 years, the Project Area has been substantially modified and is of negligible habitat value except for common native and introduced species. There is limited connectivity across the Project Area; however given that the Kamay Botany Bay National Park surrounds a large portion of Project Area, some dispersal across the Site could occur.

Potential on-site receptors are both human receptors (people working on the Site) and three small patches of vegetation identified within the Project Area (refer to **Figure 19-1** in **Chapter 19 Ecology**). While no threatened flora or fauna were found during the Site inspections within the Project Area, the Project Area provides some potential habitats of ecological value:

- North West Corner Planting;
- Eastern Boundary Disturbed Native Vegetation; and
- North East Corner Revegetation.

These three vegetation patches form the primary fauna habitat within the Project Area. These patches of vegetation are discussed further in **Chapter 19 Ecology** and **Appendix I Ecology Impact Assessment**.

The key sensitive environmental aspects that may be affected by the Project are outlined below.

Flora and Fauna

Appendix I Ecology Impact Assessment contains a full summary of the flora and fauna considered during the development of the ERA summarised in this chapter.

Flora that have been considered include the three vegetation patches located within the Project Area, vegetation associated with natural stormwater receiving environments (including wetlands that connect with the Towra Point Nature and Aquatic Reserves), and a stormwater outlet that discharges on Silver Beach, near the Silver Beach Aquaculture (**Figure 10-1**).

While the Site is highly modified, protected species that may potentially be found on the Project Area are the Green and Golden Bell Frog and the Wallum Toadlet.



CALTEX
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KURNELL REFINERY CONVERSION

**SENSITIVE ENVIRONMENTAL
RECEPTORS**

URS

File No: 43177836.022.mxd

Drawn: SB/STB Approved: RO

Date: 04/12/2012

Figure: **10-1**

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Surface Water and Groundwater

Several surface water features comprising both shallow water bodies and swampy areas exist in the southern part of the Site.

Marton Park Wetland (refer to **Figure 10-1**), a Groundwater Dependent Ecosystem, is located adjacent to the north of the Site. It currently receives surface water runoff and infiltration from the non-operational parts of the Site and a section of Caltex owned land between the Site and Marton Park. This vegetation community is a freshwater wetland which includes fringing Swamp Oak Floodplain Forest.

An unconfined aquifer of variable yield is located within the quaternary sands beneath the Site. There is evidence to indicate that there is variable depth to groundwater across the Site, ranging from approximately 1 metre below ground level (mBGL) close to the north-western boundary of the Site, to 15 mBGL in the south-eastern part of the Site. Within the Project Area, the groundwater depth ranges from approximately 1 – 4 mBGL.

The groundwater flow beneath the Site is generally in a north-westerly direction and is largely influenced by the strike and dip of the underlying sandstone bedrock. **Figure 9-1 in Chapter 9 Soils, Groundwater and Contamination** shows the groundwater flow direction across the Site.

Groundwater recharges through infiltration in the Kamay Botany Bay National Park (up-gradient of the Site). The groundwater merges with surface water as it intersects Botany Bay, or localised swampy wetland areas which exist to the south and north (Marton Park) of the Site (Coffey, 2007).

10.5.2 Contaminants of Potential Concern

Based on the historical land use and reported activities carried out across the Site, investigations have been conducted to determine key contaminants of potential concern (COPC) for the Site (Coffey, 2007 and Coffey, 2011). These studies have identified the following primary COPC:

- Total Petroleum Hydrocarbons (TPH) – associated with diesel fuel, gasoline, heating oil, jet fuel, other petroleum-based products and wastes;
- Benzene, toluene, ethyl benzene, xylene (BTEX);
- Polycyclic aromatic hydrocarbons (PAH);
- Phenols;
- Lead; and
- Asbestos.

The COPC identified are generally related to fuels and related products stored or used on the Site. The fuel-based COPCs are composed of a range of mixtures of organic compounds, including a range of volatile and semi-volatile organic compounds (VOC and SVOC) that have potentially adverse impacts on human health and the environment.

Contaminants detected at a petroleum refinery site may arise from a number of sources, including spills, leaks and waste management practices. In addition, there may be impacts due to movement of contaminants from other sections of the refinery (e.g. oily water overflow from the sewer system during intense rainfall periods).

Annual groundwater monitoring is undertaken on the Site. The groundwater monitoring program consists of annual monitoring of all wells for a broad range of COPC and other analytes of interest including nutrients, plus quarterly monitoring of targeted wells for TPH, BTEX, lead and phenols.

There are additional COPC that may be potentially relevant to the Site, based on knowledge of general refining processes. These COPC were not investigated in detail by Coffey 2007 or Coffey 2011.

A preliminary review of these additional COPC indicates that they do not warrant specific assessment at this stage of the Project (refer to **Appendix D Human Health and Ecological Risk Assessment**).

Table 10-1 presents a summary of potential contamination within the Project Area, characterised by the relevant Contamination Management Zone (CMZ¹) (adapted from **Table 9-3** of **Chapter 9 Soils, Groundwater and Contamination** and **Coffey, 2007**). These zones are shown on **Figure 9-3** in **Chapter 9 Soils, Groundwater and Contamination**.

Table 10-1 Potential Sources and Types of Contaminants by Contamination Management Zone

CMZ	Potential Soil and / or Groundwater Contamination Sources	Contaminants of Concern
Zone B Crude oil tanks	- Leaks/spills from above ground storage tanks; - Leaks from above ground pipes (product transfer); - Leaks from below ground pipes (oily water sewer and stormwater); and - Waste disposal (historical stockpiling of soils).	TPH, PAHs, BTEX <i>Potentially Asbestos (from building wastes in temporary soil stockpiles), and contaminants from off-site transported by the oily water sewer system (OWSS) and stormwater network.</i>
Zone C Water treatment plant; and LPG storage. Previously - electricity substation	- Leaks/spills from above ground storage tanks; - Leaks/spills from process units (biotreatment plant); - Leaks from above ground pipes (product transfer); - Leaks from below ground pipes (oily water sewer and stormwater); and - Waste disposal (sludges).	TPH, PAHs, BTEX <i>Potentially metals and contaminants from off-site transported by the OWSS and stormwater network.</i>
Zone D Feed stock tanks (intermediate products, naphtha)	- Leaks/spills from above ground storage tanks; - Leaks from above ground pipes (product transfer); - Leaks from below ground pipes (product transfer, oily water sewer and stormwater); and - Waste disposal.	TPH, PAHs, BTEX <i>Potentially mercaptans and Pb (and possibly TEL) and contaminants from off-site transported by the OWSS and stormwater network.</i>
Zone E Diesel, Jet fuel, Fuel oil tanks	- Leaks/spills from above ground storage tanks; - Leaks from above ground pipes (product transfer); and - Leaks from below ground pipes (product transfer pipes, oily water sewer and stormwater).	TPH, PAHs, BTEX, <i>Potentially metals, Lead (inorganic and TEL) and contaminants from off-site transported by the OWSS and stormwater network.</i>

¹ Contamination Management Zone (CMZ): a part of the Site associated with a particular activity and with an identifiable and limited group of contaminants associated with that activity. The entire Site is divided into 22 separate CMZs (Zone A to Zone V). The proposed works for the Project would be conducted in Zones B, C, D, E, F, I, K and L (refer to **Figure 9-3**).

CMZ	Potential Soil and / or Groundwater Contamination Sources	Contaminants of Concern
Zone F Gasoline tanks	- Leaks/spills from above ground storage tanks; - Leaks from above ground pipes (product transfer); - Leaks from below ground pipes (oily water sewer and stormwater); and - Waste disposal (solid waste).	TPH, PAHs, BTEX, Lead (inorganic and TEL).
Zone I Crude oil distillation unit 2; Bitumen/ asphalt unit	- Leaks/spills from above ground storage tanks; - Leaks/spills from above ground chemical storage; - Leaks/spills from above ground process units; - Leaks from above ground pipes (product transfer); - Leaks from below ground pipes (product transfer pipes, oily water sewer and stormwater); - Waste disposal; and - Potential asbestos contamination from break-up of insulation on product transfer pipes.	TPH, PAHs, BTEX, Asbestos <i>Potentially metals and Asbestos from product storage and transfer and contaminants from off-site transported by the OWSS and stormwater network.</i>
Zone K Product pipe racks (Crude oil)	- Leaks from above ground pipes (product transfer pipes and stormwater); - Leaks from below ground pipes (product transfer pipes, oily water sewer and stormwater); and - Likely asbestos contamination by break-up of insulation of product transfer pipes.	TPH, PAHs, BTEX, Asbestos <i>Potentially Phenols and Asbestos from product storage and transfer and contaminants from off-site transported by the OWSS and stormwater network.</i>
Zone L Main pipeways (Diesel, jet fuel, naphtha, gasoline)	- Leaks from above ground pipes (product transfer pipes) and stormwater spoon drain; - Leaks from below ground pipes (oily water sewer and stormwater); and - Asbestos contamination identified, from break-up of insulation on product pipes.	TPH, PAHs, BTEX, Phenols; Metals (Lead, Chromium); Asbestos <i>Phenols; Metals; Asbestos and contaminants from off-site transported by the OWSS and stormwater network.</i>

The available site characterisation information indicates that, in addition to the major contamination incidents that were identified and remediated, there is the potential that small spills or leaks have occurred at many areas across the Site, and for oily wastes to have been transported across the Site over years. These sources may have contributed to dispersal of contaminants across the Site. As soil sampling across the Site is limited to the Coffey (2007) report, it should be noted that many of the COPC may potentially be encountered on other, un-investigated parts of the Project Area.

However, the available data does not indicate that the Site contains major contamination that would be encountered or disturbed during the Project.

10.6 Impact Assessment

10.6.1 Qualitative Human Health Risk Assessment

Tier 1 Risk Assessments

Introduction

A tier 1 risk assessment has been undertaken to compare the concentrations of contaminants on the Site with appropriate investigation levels and determine whether they comply or exceed (NEPM 1999 and Draft NEPM 2012).

The results of this assessment are summarised below. Conclusions have also been drawn about the potential for impacts to on-site and off-site human receptors during the construction and operation of the Project.

Although soil sampling on the Project Area is limited to Coffey 2007, the available results can be examined in conjunction with the groundwater data (Coffey 2011), the COPC and the knowledge of the proposed works, to form an overall view of the contamination status of the soil in Project Area.

Tier 1 Risk Assessment – Soils

As shown in Table D-2 of **Appendix D Human Health and Ecological Risk Assessment**, all of the measured soil contaminant concentrations in the surface layers (above the water table) within the Project Area are generally less than the adopted Health Investigation Levels or Health Screening Levels for industrial sites.

Some pockets of volatile TPH were found in Zone F in soil at the depth of the water table, associated with groundwater contamination in the area. Even though they are found at depth they may pose a vapour risk for workers spending extended time in enclosed or semi-enclosed areas above the source (e.g. in a building or a deep trench).

The proposed works would involve only shallow soil works, to a depth of up to 1 m, and would not take place in an enclosed space. The proposed excavation works would also be of limited time duration and would not be expected to involve workers spending long periods of time in one area. It is therefore unlikely that the proposed works would give rise to any vapour risk to workers on-site, or to risks related to ingestion or direct contact.

Asbestos has been noted on the Site in various places, mainly associated with pipeline easements and waste areas. It is described as being present in various forms, including small fragments and fibres, and in surface soil layers. The presence of asbestos has the potential to cause a risk to workers working with excavated soil. There is insufficient information available to adequately characterise the risk to on-site workers. However, as the Project Area is protected from gusts of wind with the potential to move asbestos dust, the likelihood of asbestos dust being transported off-site is low. Caltex has procedures in place for identifying the presence of asbestos and for working in those areas. An register of contaminated sites is available on the Site.

Measures would be included in the CEMP for the Project to manage asbestos. These would include measures to ensure workers are informed about the presence of asbestos. The CEMP would also outline steps to prevent major disturbances of the soil that may liberate fibres into the air and the workers breathing zone.

Tier 1 Risk Assessment – Groundwater

A regular groundwater monitoring program across the Site and in the Project Area provides the necessary data to assess the likely COPC exposure to on-site receptors. These results are summarised in **Table D-3 in Appendix D Human Health and Ecological Risk Assessment**.

There are measured groundwater contaminant concentrations above the adopted Health Investigation Levels or Health Screening Levels (Coffey, 2011). In particular, TPH C6-C9 and Benzene concentrations in Zone F are considerably higher than the Health Screening Levels and may pose a vapour risk to construction workers spending extended time in enclosed or semi-enclosed areas above the source (e.g. in a building or a deep trench).

In addition, some Non-Aqueous Phase Liquid (NAPL) has been reported in the Project Area. Coffey (2011) indicate that this has reduced significantly since 2006, being present at a low thickness in one well each in Zones I and F, and as a 'sheen' in one well each in Zone B and Zone F. The intrusive works proposed under the current Project would not be expected to encounter NAPL; however it must be considered within the CEMP. If it is present in test pits and bores, it can have serious consequences for health, environment, fire and explosive risk.

The proposed works would involve only shallow soil works, to a depth of up to 1 m, and would not take place in an enclosed space. The proposed excavation works would also be of limited time duration and would not be expected to involve workers spending long periods of time in one area. It is therefore unlikely that the proposed works would give rise to any vapour risk to workers on-site.

Coffey (2007) reports that, on the basis of the 1994 and 2001 monitoring programs of off-site private bores, plus the Site boundary monitoring program over nearly 20 years, there is no evidence of groundwater contamination migrating off-site (Coffey 2007). This indicates that there is a low likelihood of contaminated groundwater from the Project Area impacting on off-site receptors.

Coffey (2007) notes that the Kurnell Peninsula is on a sand aquifer with a low recharge potential, which would limit the groundwater yield and potential use of off-site bores (including residential wells) however some surrounding residents are known to have private groundwater bores, presumed to be primarily used for garden irrigation.

Air Quality Impacts

The results of the air quality modelling (refer to **Chapter 13 Air Quality and Odour**) show that the predicted short-term and long-term emissions of VOCs comply with the OEH impact assessment criteria and the NEPM (Air Toxics) criteria. The concentrations at the Site boundary, and at sensitive residential receptors outside the boundary, are all below the guideline values.

The proposed cessation of refining operations would be expected to result in a significant decrease in overall emissions and odours from the Site, including reduced emissions of nitrogen (NO_x), carbon monoxide, sulphur dioxide, hydrogen sulphide (which possesses a potent rotten egg-like odour) and particulate matter, as well as VOCs.

Construction

Potentially complete pathways for human health receptors during the construction of the Project include:

- direct contact with soil on-site while working;
- incidental ingestion of soil and dust on-site while working;
- inhalation of vapour on-site from VOCs in the soil;
- inhalation of dust on- and off-site; and
- inhalation of asbestos fibres in the soil, if present in a friable form or in a form that can produce fibres.

There is a low likelihood of contaminated soil and dust moving off-site for the following reasons:

- Infrastructure, buildings, hardstand, etc, on the Site prevents significant soil movement or dust generation.
- The meteorological dataset prepared for the **Appendix G Air Impact Assessment** shows that winds are reasonably distributed in all directions, with slightly more regular north easterly sea breezes, south-south westerly breezes and north-westerly winds, as common to the coastal areas of Sydney. In short, the wind mainly blows from the coast via the residential areas and then onto the Site.
- The Project Area is generally surrounded by bushland and vegetated areas, which would provide a buffer to residents against dust deposition, except from a section at the northern and north-western boundaries, along Reserve Road, Polo Street and Cook St (adjacent to Zone F) and along Tasman St and Bridges St (adjacent to Zone C).
- While there has been limited soil sampling across the Project Area and therefore not full characterisation, all of the soil sampling that has been conducted on the Project Area and adjacent off-site areas shows no significant contamination by petroleum-related products in the surface soil layers (refer to Table D-2 in **Appendix D Human Health and Ecological Risk Assessment**).

The COPC identified are primarily related to fuels and related products stored or used on the Site (i.e. petroleum-related contaminants TPH, BTEX, PAHs, phenols, and lead). Waste asbestos has also been noted on the Site, resulting from pipes and other construction waste. The fuel-based COPCs are composed of a range of mixtures of organic compounds, including volatile and semi-volatile organic compounds (VOC and SVOC) that can pose an inhalation risk.

There is a low risk of contaminants (i.e. contaminated soil, dust or groundwater) from the Site impacting on off-site receptors. There is no evidence of groundwater contamination migrating off-site. There is unlikely to be an unacceptable risk to workers on-site from direct contact with the shallow soil, or from vapour inhalation. Asbestos risks require controls on-site to prevent unnecessary or excessive soil disturbance and potential liberation of fibres into the air. These measures would be included in the CEMP for the Project.

Operation

The proposed works include modifications and upgrading of tanks and other infrastructure across the Site including pumps and control systems, and safeguard systems. These works would be expected to significantly improve the capacity to prevent, detect and correct any leaks from the terminal infrastructure during its operation. The closure of the refinery would be expected to reduce the potential for contaminating activities, especially production of airborne contaminants during the refining process and emission to the atmosphere.

The completed Project would likely result in a reduction of risk of exposure of receptors to COPC; the risks to human health would be expected to be lower than or, in the worst case, equal to the risks currently posed by current operations on the Site.

10.6.2 Qualitative Ecological Risk Assessment

Introduction

Based on the risk assessment methodology in **Section 10.4.1** and the COPC identified in **Section 10.5.2**, **Table 10-2** identifies potentially complete or partially complete exposure pathways for both the construction and operation phases of the Project.



The main pathways of concern is via the infiltration of rainwater or hydrocarbon to groundwater within unsealed areas in the Project Area.

Coffey (2007, 2011) found significant levels of contamination in the soil and groundwater in areas within close proximity to the Project Area, and it is possible that continued infiltration of groundwater would continue to mobilise these COPC during the operational phase of works. However it should be noted that Coffey (2007) also reports that, on the basis of the 1994 and 2001 monitoring programs of off-site private bores, plus the Site boundary monitoring program over nearly 20 years, there is no evidence of groundwater contamination migrating off-site (Coffey 2007). This indicates that there is a low likelihood of contaminated groundwater from the Project Area impacting on off-site receptors.

Table 10-2 Assessment of Ecological Receptors and Potential Exposure Pathways

Source	Receptor	Pathway/s	Complete / Incomplete?
Contaminated Soils	Flora present in Project Area	• Direct contact; and • Active uptake.	Partial: three small stands of vegetation are present in the Project Area.
Contaminated Soils	Fauna present in Project Area	• Direct contact; • Ingestion of COPC; • Vapour inhalation; and • Bioaccumulation.	Incomplete: no fauna are expected to come into contact with the contaminated soils (provided adequate measures are implemented (refer to Section 10.7).
Contaminated Soils	Flora present outside Project Area	Mobility of COPC (from the Site) via stormwater runoff, leading to (further) contamination of / deposition of contaminants onto soils outside the Project Area.	Partial
Contaminated Soils	Fauna present outside Project Area	Direct contact with soils during periods of migration (e.g. frogs being exposed to COPC in trenched areas while moving across the Project Area).	Partial
Contaminated Groundwater	Flora present in Project Area	• Active uptake (especially by deep-rooted species); and • VOC damage to root systems.	Partial: three small stands of vegetation are present in the Project Area.
Contaminated Groundwater	Fauna present in Project Area	Vapour inhalation (burrowing marsupials and frogs).	Partial
Contaminated Groundwater	Flora present outside Project Area	• Active uptake (especially by deep-rooted species); and • VOC damage to root systems.	Partial
Contaminated Groundwater	Fauna present outside Project Area	Vapour inhalation (burrowing marsupials and frogs).	Partial
Discharge to Surface Water Bodies	Aquatic flora and fauna	Direct discharge of impacted groundwater or stormwater to surface water.	Complete

Construction

Construction works would involve very limited excavation of soils across the Project Area, requiring the disposal of approximately 180 m³ of spoil.

Despite the small volumes of excavated soils involved, ground disturbance may potentially impact on off-site receptors if excavation work and spoil management is not appropriately managed. Pathways include surface water run-off, surface water ingress and the mobilisation of contaminants via leaching.

In addition, physical trenching and excavation works may also prove hazardous to wildlife that cross the Site. Key species of concern are amphibians and reptiles.

The ground disturbance activities for the proposed works would be shallow (<1 m in depth) and unlikely to intercept groundwater. Nevertheless, excavation works may increase the potential for groundwater ingress over the short term, and may also increase the risks associated with potential mobilisation of COPC. Potential pathways include surface water ingress, followed by the mobilisation of contaminants via leaching and potential discharge of contaminated groundwater to surface water bodies.

If excavation works were to occur during a rain event there may be a limited window of time when exposed soils may provide a pathway for increased infiltration of rainwater and potential mobilisation of COPC. However, as the excavation works are limited in extent and duration, the risk posed to groundwater and, as a result, surface water, by the proposed works are so limited as to be considered acceptable. Therefore this pathway has not been considered further.

While excavation works are underway, rain events may potentially mobilise COPC in exposed soils. Excavated soils may potentially impact on off-site receptors if they are not appropriately managed. Pathways include surface water run-off, surface water ingress and the mobilisation of contaminants via leaching.

Discharge to surface water bodies (e.g. the Towra Point Nature Reserve, Towra Point Aquatic Reserve and the Aquaculture in Quibray and Botany Bay) is possible, especially during a high rainfall event. However, the potential for mobilisation of contaminants would be managed by implementing appropriate mitigation measures (refer to **Section 10.7**). In addition, the limited nature of the construction works would only ever result in a very limited, short-term discharge to surface water bodies. This is considered an acceptable level of risk to off-site receptors.

Operation

The Project includes the upgrade of finished product pumps and control systems to improve efficiency, and modifications to the tanks including upgrades to the tank internals. The Project would also involve an upgrade to safeguard systems, significantly improving the capacity to detect and correct any leaks into the future. As a result of these works, the Project would likely result in a reduction of risk of exposure of receptors to COPC during the operation of the Project.

The following discharge points would be present at the Site during operation:

- Discharge by open drainage lines to Quibray Bay via a ribbon of the Towra Point Nature Reserve and the mangrove wetland;
- Discharge into Botany Bay (at the wharf); and
- Discharge to Marton Park, primarily by infiltration.

The Site also receives stormwater runoff from off-site, particularly from parts of the Kamay Botany Bay National Park.

The oily water sewer system discharges to a wastewater treatment plant. The treated wastewater is then pumped to the ocean via the Yena Gap ocean outfall.

Potentially contaminated stormwater would continue to be retained and/or treated during the operation of the Project.

There have been some relatively recent stormwater incidents whereby hydrocarbon impacted stormwater had been released from the Site. The circumstances for these releases were varied but they generally arose from on-site flooding of stormwater whereby the oily water sewer system has subsequently overflowed into the cooling water system. Consequently, improvement measures are being developed and implemented to reduce the risk of this occurring in future (refer to **Appendix E Water Management Report** of the EIS).

Infiltration is a significant stormwater disposal route at the Site (including in some of the tanks bunds, which are unlined, and pipeways). Percolation of rainwater to groundwater currently occurs across the Project Area and would continue to occur during the Project. Monitoring of groundwater quality would be ongoing to identify and manage any future contamination risks from this source.

The quality of stormwater arising from the Project Area during the operation of the Project would be expected to be of the same character as is currently the case, as the activities and types of products stored would be similar. The assessment notes however that the shutdown and decommissioning of the refinery would reduce the potential for impact on stormwater quality by petroleum products.

Botany Bay, Quibray Bay and Marton Park wetland would continue to receive stormwater from the Project Area. The existing Site stormwater management system has been identified as adequate for treatment and discharge of stormwater under 'usual' operating and weather conditions.

10.7 Mitigation

Caltex would undertake the conversion works in accordance with a CEMP. A number of the management and mitigation measures outlined in other parts of this EIS are also recommended by the HHRA and ERA.

Waste mitigation measures are presented in **Chapter 17 Waste Management**; groundwater related mitigation measures are presented in **Chapter 9 Soils, Geology and Groundwater**; ecology related mitigation measures are presented in **Chapter 19 Ecology**; and surface water related mitigation measures are presented in **Chapter 11 Surface Water, Wastewater and Flooding**. Additional mitigation measures relating to the Human Health and Ecological Risk Assessment are outlined below. These would be incorporated into the CEMP alongside other measures from the other EIS chapters.

Non-Aqueous Phase Liquids (NAPL)

- There is reference to the presence of NAPL in some areas of the Site. The proposed excavation works would not be expected to encounter NAPL, however Site personnel must be made aware of it.
- The presence of NAPL would be dealt with in accordance with the CEMP.

Health and Safety

- The location of potentially contaminated areas would be noted and provided to construction personnel (especially with regard to certain specific contaminants such as asbestos).
- All construction personnel would be inducted to the Site as part of the Project. This training would help to prevent unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation).
- Safety training, including assessment of PPE requirements, would be provided to construction staff.
- Construction work on Site would continue to operate under the 'permit to work' system. This system includes current practices described in **Chapter 9 Soils, Groundwater and Contamination**

10.8 Summary

The potential exposure pathways for human and ecological receptors from soil and groundwater contamination during the construction stage and the operational stage of the Project were assessed. The assessment was based on a desktop review of previous investigations including site assessments, groundwater modelling assessments, flora and fauna assessments, air quality assessments and wastewater management assessments. Notwithstanding the inherent limitations of relying on a desktop evaluation, it is considered appropriate in view of the limited scope and duration of the Project.

The assessments concluded that, due to the minor nature of the intrusive works during the construction phase, the potential impacts from the construction stage of the Project would be limited and would not be expected to have any significant adverse impact on the surrounding environment. Overall, the Project would likely result in a reduction of risk of exposure of receptors to the identified COPC. The risks to the environment would be expected to be lower than, or in the worst case, equal to, the risks posed by existing operations on the Site. It is assumed that proposed works associated with the Project would be controlled to minimise and / or mitigate any potential impacts that may otherwise affect nearby receptors, in line with the CEMP for the Site.

Some primary COPC (refer to **Tables D-2** and **D-3** within **Appendix D Human and Ecological Risk Assessment**) have been identified at levels that have potential to impact on off-site ecosystems if the contaminants migrate off-site. While the Project is unlikely to increase the mobility of these contaminants, the works must be controlled during both the construction and operational phases of the Project to ensure that these sources are managed appropriately and to minimise and/or mitigate any potential impacts that may otherwise affect nearby receptors.

Mitigation measures that would be implemented specific to the HHRA and ERA are outlined below in **Table 10-3**.

Table 10-3 Management and Mitigation Measures – Human Health and Ecological Risk

Mitigation Measure and Commitment	Implementation		
	Design	Construction	Operation
Construction personnel would be made aware of the potential presence of Non Aqueous Phase Liquids (NAPL) and would be shown how to identify its presence. The CEMP would include management measures to appropriately deal with any NAPL found on Site.		✓	
Construction staff would be inducted and provided with training prior to working with potentially contaminated soil as part of the Project, to prevent unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation).		✓	
The location of potentially contaminated areas would be noted in the CEMP and provided to construction personnel involved in soil excavation and handling. The CEMP would also identify the type of contamination found in each area. Where necessary, safety training and appropriate PPE would be provided.		✓	✓
Caltex would continue to monitor groundwater quality in areas that are known to contain impacts to ensure that significant mobilisation of COPC from groundwater to surface water is not occurring.		✓	✓

11 Surface Water, Wastewater and Flooding

11.1 Introduction

An assessment of the surface water, wastewater and flooding aspects associated with the Project has been conducted. This chapter provides a summary of this assessment which is provided in full in **Appendix E Water Management Report**.

11.2 Scope of the Assessment

The Director General's Requirements (DGRs) (refer to **Appendix A**) requested that consideration be given to surface water, wastewater and flooding, and that the EIS include the following:

- an assessment of the potential soil, groundwater and surface water impacts of the development;
- the identification of any water licencing requirements or other approvals under the *Water Act 1912* and/or the *Water Management Act 2000*;
- a demonstration that water for the development can be obtained from an appropriate authorised and reliable water supply in accordance with the operating rules of the relevant Water Sharing Plans;
- a detailed description of the mitigation and management controls that would be put in place to manage erosion and sediment, stormwater, spills and acid sulphate soil (if present);
- ways to reduce water supply and increase water reuse; and
- potential impacts of flooding, with consideration of climate change and projected sea level rises.

Impacts related to potential soil, groundwater and acid sulfate soils are discussed in **Chapter 9 Soils, Groundwater and Contamination**.

This chapter summarises the findings of a number of technical studies for surface water, wastewater and flooding. These assessments are provided in full in **Appendix E Water Management Report** and summarised in this chapter. They include the following:

- flooding;
- stormwater;
- water supply and usage including;
 - cooling water;
 - amenity and commercial water use; and
 - fire water;
- oily water generation and management; and
- loss control.

11.3 Legislation and Planning Policy

Protection of the Environment Operations Act 1997 (PoEO Act)

The Site operates under Environment Protection Licence (EPL) No 837 (refer to **Appendix B Environment Protection Licence**). The EPL contains conditions regulating a range of Site operations with potential to impact on the environment. These conditions include for the management of impacts on surface waters.

The Site would continue to operate under this EPL during the construction and operation phases of the Project. Upon completion of the construction phase of the Project, in consultation with the EPA, the EPL would be modified to meet the requirements of the finished product terminal.

The EPL licence nominates environmental monitoring and/or permissible discharge points with corresponding identification numbers. The EPL sets treatment/monitoring requirements and may require additional studies and/or investigations to be undertaken. These are periodically implemented through the addition of requirements for Pollution Studies and Reduction Programs (PRP) included as conditions of the EPL by the EPA. Recently Caltex was required to complete a stormwater management plan for the Site (EPL Condition U10.1 PRP U24.1). This was submitted to the EPA in October 2012. This plan committed Caltex to implementing a stormwater management strategy and completing a number of stormwater management measures in a staged manner. This plan and its proposed measures are an important consideration for this assessment.

State Environmental Planning Policy No.71– Coastal Protection

SEPP No. 71 - Coastal Protection (SEPP 71) aims to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast through the preservation of a range of coastal assets. The policy aims to:

- guide development in the NSW coastal zone so that it is appropriate and suitably located;
- ensure that there is a consistent and strategic approach to coastal planning and management; and
- ensure there is a clear development assessment framework for the coastal zone.

The Site is outside the defined 'coastal zone' areas under the SEPP. Although the Site falls outside this area, two of the Site's existing outfalls have the potential to have an impact on land to which SEPP 71 applies. The EIS will consider the aims of the SEPP to ensure that the coastal zone is managed in accordance with the principles of ecologically sustainable development.

Water Quality Objectives

Water Quality Objectives are the environmental values and long-term goals for consideration when assessing and managing the likely impact of activities on waterways. These objectives are set out within the Australian and New Zealand Environment Conservation Council (ANZECC) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000) ('the ANZECC Guidelines'). The water quality objectives have been developed for both fresh and estuarine and marine water. They are not intended to be applied directly as regulatory criteria, limits or conditions, but offer guidance to industry, the community, planning authorities or regulators when making decisions affecting the future of a waterway (DECCW 2009).

The Water Quality Objectives for Estuaries within the Georges River CMA are:

- aquatic ecosystems - to maintain or improve the ecological condition of waters;
- primary contact recreation - to maintain or improve water quality so that it is suitable for activities such as swimming and other direct water contact sports;
- secondary contact recreation - to maintain or improve water quality so it is suitable for activities such as boating and fishing where there is less bodily contact with the waters;
- visual amenity - to maintain or improve water quality so that it looks clean and is free of surface films and debris; and
- aquatic foods (cooked) - to maintain or improve water quality for the production of aquatic foods for human consumption (whether derived from aquaculture or recreational, commercial or indigenous fishing).

The Tasman Sea, to which treated effluent for the Site is discharged, is classified as a marine water environment. The Marine Water Quality Water Objectives/Environmental Values for the Sydney Metropolitan and Hawkesbury-Nepean area which includes the areas under Sutherland Shire Council are:

- Aquatic ecosystem health – to maintain or improve the ecological condition of oceans waters;
- Primary contact recreational – to maintain or improve ocean water quality so that it is suitable for activities such as swimming and other direct water contact sports;
- Secondary contact recreation – to maintain or improve ocean water quality so it is suitable activities such as boating and fishing where there is less bodily contact with the waters;
- Visual amenity – to maintain or improve water quality so that it looks clean and is free of surface films and debris; and
- Aquatic foods – to maintain or improve ocean water quality for the production of aquatic foods for human consumption (whether derived from aquaculture or recreational, commercial or indigenous fishing).

The EPL for the Site does not nominate stormwater discharge quality criteria. Therefore, the water quality objectives for receiving waters, and the potential impact of discharges from the Site, have been considered. This is discussed further in **Section 11.5.3**.

11.4 Method of Assessment

This chapter and the assessments within **Appendix E Water Management Report** have been based on a number of data sources. These included:

- Environment Protection Licence No. 837 and associated Pollution Reduction Programs;
- Design, layout and system information for the Project and Site from Caltex;
- publicly available Catchment Management Authority (CMA) and NSW Government information including information from the Botany Bay Water Quality Improvement Program, Water Quality Objectives and data on surrounding areas;
- Marton Park Wetland Management Plan (Molino Stewart Pty Ltd, 2009);
- Caltex's Stormwater Management Plan (2012) for the Site;



- existing surface water and wastewater studies of the Site (GHD, 1992, 1993);
- Kurnell Township Flood Study Final Report (WMAWater, 2009); and
- aerial and satellite imagery.

A Principal Hydrologist from URS conducted a visual inspection of the Site on 5 November 2012. This inspection was conducted on a clear day with an average temperature of 21 degrees.

To assess the impacts of the Project, the following legislation, guidance and standards were used:

- the statutory planning framework and appropriate legislative context (refer to **Section 11.3** and **Chapter 5 Legislation and Planning Policy**);
- the National Water Quality Management Standards and Guidelines;
- *Floodplain Development Manual – the Management of Flood Liable Land* (DIPNR, 2005); and
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy*, ANZECC 2000.

The assessment is predominantly qualitative in nature; however some quantitative data has been used where applicable.

Flooding impacts on the Site have been projected using available information from a flood study conducted of the Kurnell catchment by WMAWater for the Sutherland Shire Council in 2009 (WMAWater, 2009). While detailed topographic level survey information, sufficient to develop contours, was available for the north western portion of the Site (in the vicinity of the wastewater treatment plant (refer to **Figure 1-2**)), for the remainder of the Site there was not enough topographical information to create a model of the existing surface. However, surveyed spot levels were available to allow consideration of the potential for flooding within the Site. Therefore the Site was divided into two sections for the flood assessment.

11.5 Existing Environment

11.5.1 The Local Catchment

The Site is located on the Kurnell Peninsula surrounded by marine and estuarine surface water bodies, which in addition to land, constitute the receiving environments for surface water discharges from the Site. The main water bodies in proximity to the Site include the Tasman Sea, Botany Bay, Quibray Bay, Weeney Bay, and the Marton Park Wetland area (refer to **Figure 11-1**).

The Site falls within the Botany Bay catchment. The Botany Bay catchment extends across an area of 1,165 km². This catchment lies within Hawkesbury-Nepean Catchment Management Authority (HNCMA) area. The Botany Bay Catchment has four main sub-catchments, based on the major river systems and other areas which drain to it. These are the:

- Georges River catchment;
- Cooks River catchment;
- Woronora catchment; and
- Botany Bay (direct discharge) catchment.

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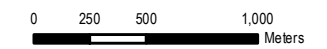


Legend

- Captain Cook Drive
- Minor Roads
- The Site
- Project Area
- Towra Point Aquatic Reserve ^
- National Park
- Towra Point Nature Reserve



Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter



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^ Office of Environment and Heritage (OEH)
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**SITE SETTING AND
SURROUNDING ENVIRONMENT**

The Site is located in the catchment area that drains directly to Botany Bay. A substantial part of the catchment is highly developed with almost 40% of its area being used for urban, industrial or commercial purposes. Pollutants of concern within the catchment area include nitrogen, phosphorus and total suspended solids.

In order to facilitate a more accurate assessment of the Project impacts, the main catchments of Botany Bay have been further divided into sub-catchments, based on smaller drainage areas and drainage lines.

The sub-catchments that apply to the Site are named differently in different documents. Therefore the Site falls within either the Mill Creek sub-catchment or Kurnell sub-catchment. Information from the Kurnell sub-catchment has been used to understand the existing pollutant loads from the area immediately around the Site.

The surface waters and related environments in proximity to the Site have varying environmental values and sensitivities. The Project Area is close to areas of significant ecological value including:

- Botany Bay;
- Quibray Bay;
- Towra Point Nature Reserve (including Ramsar wetland area);
- Towra Point Aquatic Reserve;
- SEPP 71 Coastal Protection Zone;
- Marton Park Wetland (a Groundwater Dependent Ecosystem); and
- Kamay Botany Bay National Park.

11.5.2 Stormwater Management

Stormwater generated on the Site is collected in the Site's stormwater system, treated where necessary and discharged off-site to two receiving water bodies, Quibray Bay and Botany Bay. The key water quality management strategy adopted by the Site has been to prevent, to the extent practicable, interaction between petroleum hydrocarbons and stormwater. Consequently the stormwater system only collects runoff from areas of the Site that have been designated low risk with respect to interaction with petroleum products, such as roadways and building roofs.

The Site has a separate oily water system to handle water that is or may be impacted by petroleum products, including a proportion of stormwater runoff collected from areas where there may be interaction with petroleum products such as tanks bunds and refinery process areas.

Topography within the Site is generally flat, although steeper areas exist on the eastern boundary. Soils within the Site are sandy and overly sandstone bedrock. Stormwater runoff generally flows from the eastern boundary through pipes and open channels towards the northwest into the Quibray Bay, Botany Bay, and some Caltex owned land adjacent to the Site and Marton Park. Some stormwater flows onto the Site across the eastern Site boundary from the Kamay Botany Bay National Park.

There are seven main catchment areas on the existing Site, as shown in **Figure 11-2** and **Table 11-1**.

Table 11-1 Stormwater Drainage System Catchments

Catchment	Location Description
A	Eastern and northern area of the Site which includes the large eastern tank area.
B	Central area of the Site which contains majority of the refinery process areas as well as offices, cafe, workshops and store houses; and western part of the Site which contains wastewater treatment plant, western tank area, LPG loading area and storage plant, the Quibray Bay Stormwater Retention Basin and parking area.
C	Northern corner of the Site which includes main offices, former staff houses, gardens, employee car park and wetland.
D	An area between the CLOR and the refinery which contains a flare stack and concrete channel.
E	South western corner of the Site occupied by the now decommissioned CLOR, and which contains yard office, workshop, laboratory, maintenance, process units and tank compounds.
F	South eastern corner of the Site, which predominately comprises relatively undeveloped land and a small area of tank compound, the landfarm area (which is a bioremediation site), a recycling area, and a sludge lagoon.
G	North eastern undeveloped area mostly outside of the Site boundary, which is part of the Kamay Botany National Park.

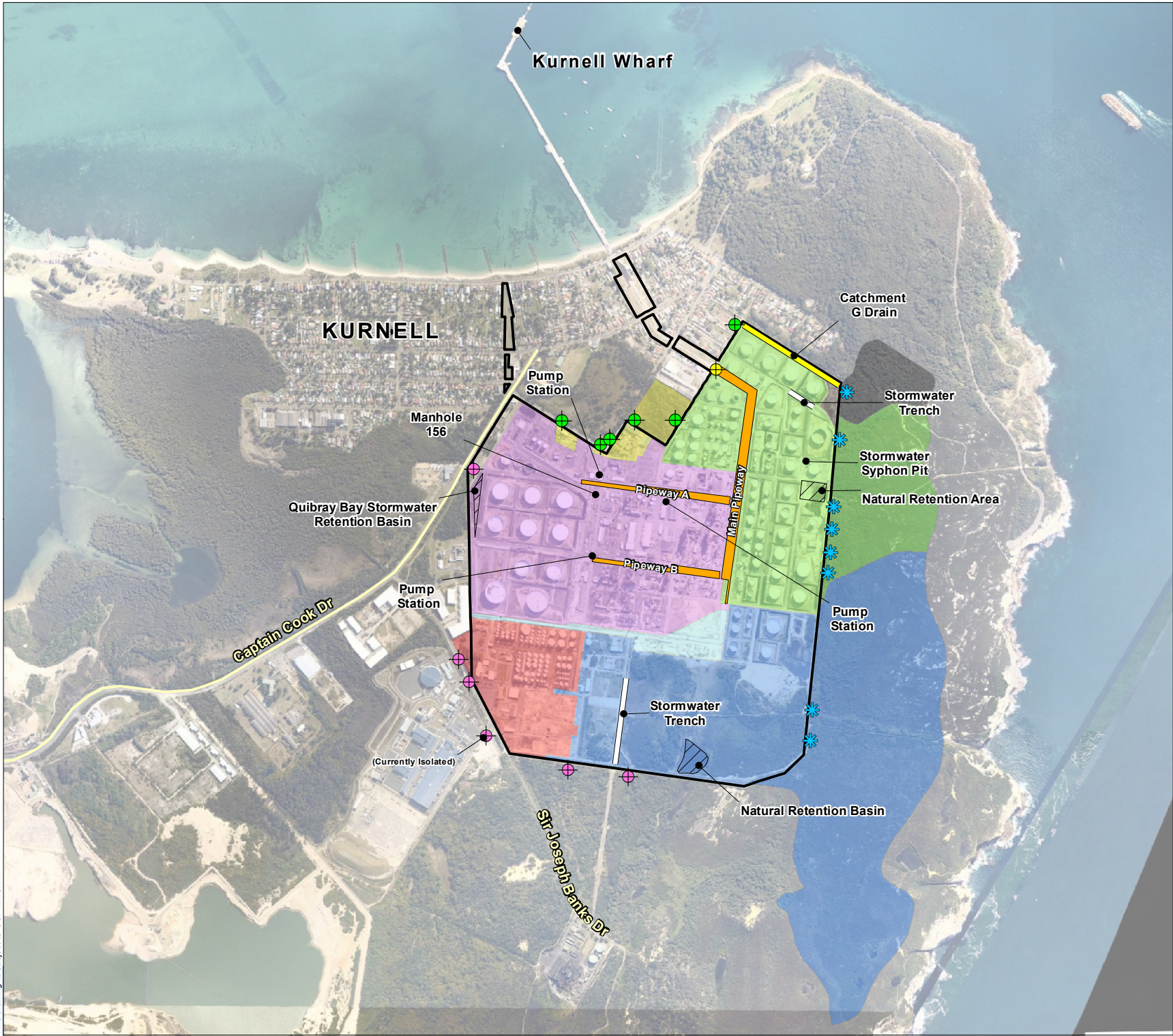
There are various retention, retarding and treatment systems incorporated into the Site's stormwater system. The specific stormwater retention, treatment and disposal systems in each catchment are discussed in detail in **Table 3-3 of Appendix E Water Management Report**.

The main Site catchments with the potential for interaction between petroleum products and stormwater are Catchments A and B, primarily along the pipeways. The systems incorporated into the stormwater system to regulate flow and discharge rates and prevent discharge of impacted stormwater from the Site are as follows:

- provision for isolation of drainage in pipeways;
- installation of manually operated skimmer pumps at pump transfer points (pumping to the oily water sewer system);
- ability to redirect stormwater to the intermediate sewer (Catchment B only);
- retention in an on-site retention basin (Catchment B only);
- discharge via siphon systems; and
- treatment in oil/water/solids separators.

Stormwater from the Site is discharged, ultimately, to three receiving environments. These include:

- discharge by open drainage lines to Quibray Bay through a narrow strip of the Towra Point Nature Reserve and the mangrove wetland;
- discharge into Botany Bay at Silver Beach near the wharf; and
- discharge to Marton Park Wetland primarily by infiltration.



Legend

The Site	Catchments
Pipeway	Catchment A
Inflow Pt	Catchment B
From Kamay Botany Bay National Park	Catchment C
Discharge:	Catchment D
To Botany Bay	Catchment E
To Marton Park	Catchment F
To Quibray Bay	Catchment G
	Stormwater Trench
	Catchment G Drain



Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

0 100 200 400
Meters

Source: Aerial Imagery - Nearmap Hypertiles 2012

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**EXISTING STORMWATER
CATCHMENT AREAS AND
DISCHARGE AND INFLOW POINTS**

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Figure: **11-2**

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A detailed description of the discharge arrangements from each catchment is summarised in **Table 3-3** of **Appendix E Water Management Report**.

Until recently when the CLOR was operating, runoff from parts of this area (Catchment E) was treated in a manner similar to that described above for Catchments A and B. The CLOR has ceased operation and is currently being demolished. Runoff from this area is no longer treated prior to offsite discharge, except any water that collects in the former CLOR oily water sewer system, which is now pumped to the refinery oily water sewer system for treatment in the wastewater treatment plant (WWTP).

Catchments B, D, E & F, comprise in the order of 70% of the total Site catchment area. These catchments all discharge ultimately to Quibray Bay via aboveground drainage lines passing through a narrow strip of the Towra Point Nature Reserve and the mangrove wetland on the northern side of Quibray Bay. Quibray Bay (and surrounds) is therefore the main receiving environment and is also the most environmentally sensitive of the current stormwater receiving environments.

11.5.3 Stormwater Quality

The stormwater discharge quality from the Site is not currently measured, although a daily visual check is conducted. There is, consequently, no data available on the majority of stormwater quality discharged from the Site.

The current stormwater treatment system is designed to address suspended solids (settleable) and phase separated petroleum hydrocarbons. The stormwater treatment systems on Site do not generally address dissolved phase hydrocarbons, or dissolved organics more generally, although some limited removal of volatile dissolved phase species might be expected from retention systems. Some dissolved phase species removal would be expected in wetland systems.

It is expected that when stormwater flows are within the hydraulic and treatment capacity of the Site's systems, the stormwater quality would exhibit similar characteristics to stormwater runoff from urban areas. This assessment is based on:

- the nature of the Site's existing infrastructure, products, and activities within the stormwater system catchments;
- the fact that the Site's stormwater management system separates stormwater and oily water; and
- the reduced risk of discharging impacted stormwater as a result of retention treatment of stormwater for the removal of oil and sediment.

11.5.4 Oily Water Management

The existing Oily Water Management System (OWMS) at the Site collects process effluent and stormwater from areas of the Site where there is potential for interaction of water flows with petroleum products. Oily water from a range of sources is collected in the Site's oily water sewer system and is transferred to the wastewater treatment plant (WWTP).

Oily water is treated in the WWTP. The treatment process utilises physical, chemical and biological treatment to treat the oily water. Section 6.2.3 of **Appendix E Water Management Report** describes the WWTP treatment process.

Treated effluent is discharged to the Tasman Sea via the Yena Gap outfall under conditions of the Site EPL (refer to **Appendix A DGRs**).

Although Tabbigai Gap (EPA Identification No. 3) and the associated monitoring point (EPA Identification No 28) are still listed as licenced discharge and monitoring points, the associated infrastructure was removed as part of the CLOR decommissioning. Therefore it is expected that this EPL identification point will be removed from the EPL in a future amendment.

11.5.5 Flood Risk

The Site lies at the south eastern portion of the Kurnell township catchment. According to the *Kurnell Township Flood Study Final Report* (WMAwater, 2009), prepared on behalf of Sutherland Shire Council, Kurnell is susceptible to flooding from both rainfall and tidal inundation. Kurnell's localised depression and low lying topography can make it vulnerable to extensive flooding (WMAwater, 2009).

Flooding within the Kurnell Catchment may occur as a result of the following factors, which may occur in combination or in isolation:

- high tide or storm surge which causes water levels to elevate in Botany Bay and Quibray Bay;
- intense rainfall which causes water levels to elevate within the open channel that runs beside Captain Cook Drive and along roads and through private property. The rise in water level may also be affected constrictions, e.g. culverts, blockages, fences and buildings;
- local runoff ponding in low lying areas that has limited potential for drainage. Flooding may be exacerbated by inadequate or blocked local drainage provisions and restricted overland flow paths; and
- tsunami impact on the east coast of Australia from a tsunami arising from subduction zone earthquakes in the Pacific.

Since 1958 the largest flood event in the area occurred on 11 March 1975. The area also experienced tidal flooding on 25 May 1974, corresponding to the largest recorded tidal event (Babister and Retallick, 2012).

No flood modelling for the Site has been completed. The *Kurnell Township Flood Study Final Report* (WMAwater, 2009) provided flood modelling for the township of Kurnell but stops short of including the Site. This study concluded that Captain Cook Drive, near the western boundary of the Site will be overtopped during the 1% year (also known as a 1 in 100 year) Annual Exceedance Probability (AEP) flood. Similarly provisional hydraulic hazard mapping of the Kurnell Township indicated that most of the areas which were classified as High risk from flooding are wetlands (including part of the Quibray Bay wetlands and Marton Park wetlands) located near the western boundary of the Site.

The impacts of flood events on the Site were not directly assessed in either the WMAwater 2009 or subsequent 2012 study. The Site is elevated above the surrounding low lying areas on the western and northern boundaries, and the on-site bunding around petroleum products storage areas effectively increases the flood height that would need to be present for any interaction between petroleum products and flood waters to occur.

11.5.6 Stormwater Management Plan

Despite the on-site stormwater management measures, in June 2010, March 2011 and April 2011 oily water was discharged from the Site during periods of exceptionally high rainfall. This occurred due to localised flooding in Catchment B and was inadvertently discharged through the cooling water outfall point. Given the occurrence of these incidents, the ability of the Site's stormwater system to withstand flood events has required assessment.

The flooding incidents of 2010/11 were found to be caused by heavy rainfall resulting in localised flooding at the WWTP and adjacent properties. This resulted in oily water being discharged off-site.

In response the EPA imposed a further requirement for additional stormwater improvement investigations within *PRP U24.1: Stormwater Catchment and Management Plan*.

Caltex have prepared a Stormwater Management Plan (SMP) in response to this PRP to prevent the discharge of contaminated waters from the Site at all times. Given the direct relevance to Caltex's commitment to implementing future improvements, the SMP was considered as part of this assessment.

The SMP prepared for the Site committed Caltex to implementing a stormwater management strategy and completing a number of stormwater management measures in a staged manner.

In summary, the strategy and related actions nominated in the plan were as follows:

1. Ongoing maintenance of the existing stormwater system (ongoing).
2. Implement a number of projects to improve the infrastructure, reduce the potential for the Site to flood, and prevent contaminated stormwater leaving the Site (commenced in 2012).
3. Work with the NSW Office of Environment and Heritage (OEH), NSW EPA and Sutherland Shire Council to divert to flow of stormwater from the National Park away from the Site's stormwater system to the Sutherland Shire Council's stormwater infrastructure (commenced in 2012).
4. Carry out stormwater flow monitoring from 2013 through to 2014.
5. Updating the Site's stormwater system performance model to account for the changes to the stormwater system infrastructure that can then be used as a tool to assess future modifications, as necessary (will commence once Strategy Item 2 has been finished).

Catchments A and B, the main Site catchments in which the review and improvement measures are focussed, are within the Project Area. The Project would be a consideration in relation to the implementation of stormwater system improvements. As implied within Strategy Item 5, the updated hydraulic and Site stormwater model would be utilised as a tool to assess the impact of any proposed stormwater system modifications associated with the Project.

11.5.7 Water Supply and Usage

The Site consumes approximately 6 ML of potable water per day for operations and 1 ML per day for amenities. Currently the water is supplied to the Site by Sydney Water and is potable. The Site currently sources water from the Sydney Water municipal supply, and so is not subject of any water licensing requirements or other approvals under the *Water Act 1912* and/or the *Water Management Act 2000*, including any obligations associated with a Water Sharing Plan.

Industrial water demands represent the majority of the overall Site water demand (approximately 6 ML per day). Most of the water is consumed in the refinery operations. If required, with Sydney Waters' permission, potable water can also be used in the emergency power generator.

Firewater usage on Site represents approximately 6% of the potable water that is currently used for process and amenity purposes. This usage is not normally for actual fire incidents, rather it is the consumption associated with pump, hydrant, monitor and other system testing that is regularly conducted, as well as fire training conducted on fire training ground and elsewhere on the Site. Firewater can also be drawn from the seawater cooling system, however potable water is the primary supply with seawater available as backup.

The Site's cooling water system utilises seawater which is pumped from Botany Bay by any of the five electric driven pumps located at the pumphouse on the Kurnell Wharf. This seawater is pumped to two Saltwater Tanks on-site prior to use. A screen system is installed on the suction side of the pumps to minimise the amount of foreign matter and marine growth entering the saltwater system. Chlorine (gas), an oxidising biocide, is injected into the cooling water at the wharf to minimise the growth of fouling organisms. The cooling water flows from the two saltwater tanks by gravity, by means of pipeways and independent take-offs, to most refinery process units.

Cooling water leaving the refinery process units is separated into two streams – clean and intermediate cooling water effluent, depending on its potential to contain product in the event of a leak or other upset.

The clean cooling water effluent discharges directly into the Botany Bay outfall. Remaining cooling water streams are classified as intermediate effluents. These streams are sent to the intermediate oil/water separators for treatment before discharging to the same location as the clean cooling water outfall.

The Site's EPL requires that cooling water discharge quality monitoring is conducted. Results for Annual Return Periods 2010-2011 and 2011-2012 indicate that the cooling water discharge quality is below the respective EPL concentration limits for chlorine residual and temperature (refer to Section 7.2.4 of **Appendix E Water Management Report**). A study by Underwood *et al.* in 1991 looked at the effect of the cooling water discharge the sandy soft sediments fauna and concluded that the impacts from the cooling water discharge (if any), was small, or had no biological significance. In 2000, a further study by URS concluded that the discharge of cooling water is unlikely to pose an unacceptable risk to the Botany Bay ecosystem.

11.5.8 Domestic Wastewater

Domestic wastewater, also referred to as sewage, sanitary effluent, and septic effluent, comprising grey and black water wastewater streams, is generally derived from toilets and showers and other domestic water. This wastewater stream is currently sent to the Sydney Water sewerage system for treatment at the Cronulla Treatment Plant.

The discharge volume is not generally metered but in 2001 the total annual domestic wastewater load was about 52 ML (determined over the month of November 2001 and extrapolated to approximate annual contributions). The load would have reduced significantly since 2001, as the CLOR is no longer operational and Site staff numbers have reduced. The most recent assessment of quality, conducted in 2001 as part of the Septic Effluent Study, did not indicate variation from typical domestic wastewater quality.

11.5.9 Loss Control

The primary and secondary containment systems to prevent loss of petroleum products at the Site are the tanks and their bunds respectively. Caltex has a programme focussed on the maintenance of integrity of its primary containment systems, i.e. bulk storage tanks, and prevention of loss of containment from these tanks and associated transfer systems.

Some of the bunds present within the existing Site are earthen with bitumen or shotcrete lined bund walls. Caltex is currently undertaking a review of the condition and capacity of the tanks bunds in the Project Area. Caltex has committed that the bunding capacity for tanks retained in service would comply with the requirements of AS1940.

All of the tanks and bunds on the Site are subject to Caltex's existing comprehensive inspection, maintenance and repair program.

In the reasonably unlikely event of a significant spill, the Site has significant contingency arrangements. Initially any spill would be contained in the bunds and normally sent to the oily water system. The oily water system has WWTP diverting capability and supplementary containment capacity to contain spilt product.

Any firewater used in response to an incident would be similarly managed, where impacted firewater would be contained in the bunded area before being manually drained to the oily water treatment system in accordance with standard Site procedures.

In the event that a significant loss of containment occurs and product escapes a bund, or is released in, or enters a pipeway, the spill can still potentially be contained and stormwater treated. In effect, the stormwater system storage capacity (along with the aforementioned storage capacity within the oily water system) represents tertiary containment capacity.

11.6 Impact Assessment

11.6.1 Stormwater

Construction Phase

The construction activities would predominantly occur within Catchment A and Catchment B. The construction phase of the Project is expected to have minimal impact on the quality of stormwater discharged from the Site.

Much of the construction activity that would be undertaken in the Project area would involve upgrades to tanks and pipework, and associated excavation and earthworks activities. Potential impacts on stormwater associated with the construction stage of the Project would be related to erosion, sedimentation impacts and possible interaction of stormwater with hydrocarbon impacted soils. In considering the potential magnitude of these impacts, the minor nature of the ground disturbing activities was considered. However, if these impacts are not managed properly, the construction works could potentially increase sediment loads or contamination in local surface water. **Section 11.7** outlines how these potential impacts could be managed and avoided.

Activities such as tank cleaning would occur in bunded areas and any washwater generated would be directed to the oily water system, in line with existing procedures. There would be no interaction with the stormwater system and therefore no impact on surrounding surface water receptors.

Operational Phase

The Site stormwater catchments that are within the Project Area are (refer to **Figure 11-2**):

- Catchment A – all of the existing catchment except a small area in the south west corner;
- Catchment B – the western part of the catchment comprising the western tanks area; the wastewater treatment plant, as well as Pipeway A and a small area in the north east corner; and
- Catchment G – the part that falls within the Site and excluding the eastern part that falls within Kamay Botany Bay National Park.

Following the completion of the construction phase of the Project, the existing Site stormwater system would remain intact, retaining both the stormwater retention and treatment systems. The Sites stormwater receiving environments would not change, however only Botany Bay, Quibray Bay and Marton Park Wetland would receive stormwater from the Project Area.

Within Catchments A and B, the stormwater system is not likely to change, except where modifications are needed to fulfil the requirements of the SMP. Stormwater arising from the Project Area during the operation of the Project is anticipated to be similar in quality to that currently experienced.

Overall, the Project would be expected to have the following impacts in relation to stormwater:

- No significant change in the volume of stormwater discharged from the Project Area to Quibray Bay from Catchment B. There may be changes in the discharge volume from Catchment B arising from works associated with the eventual demolition and remediation of the refinery infrastructure. This would be addressed as a separate approval at a later stage and does not form a part of this Project (refer to **Chapter 4 Project Description**).
- Consequential reduction in the overall contaminant load from the Catchments A and B, which would reduce the cumulative impact, if any, of the discharges to the respective receiving environments.

The implementation of the SMP would allow for the quantification of the current stormwater systems hydraulic performance and capacity. It would also allow for quantification of the impacts of potential modifications to the system arising from actual and potential improvements to the system.

The SMP modelling would allow assessment of the adequacy of the existing stormwater treatment systems relative to their hydraulic capacity.

Impacts of the Project on stormwater quality would not be quantified as no quality measurement of stormwater has been or is proposed to be conducted. However, as noted above, it is likely that the quality of the stormwater would be improved due the removal of refinery process areas and associated product transfers.

Off-site Stormwater Interceptions and Groundwater Interaction

During the operation of the Project, the interactions between off-site stormwater flows and groundwater flows within the Project Area would be largely unchanged due to limited ground works associated with the Project. Implementation of the SMP could however influence both stormwater inflows and groundwater interactions within the Project Area.

11.6.2 Oily Water Management

The Site's Oily Water Management System (OWMS) collects process effluent and stormwater from areas of the Site where there is potential interaction with petroleum products. This is then transferred to the Waste Water Treatment Plant (WWTP). Treated effluent is discharged to the Tasman Sea via the Yena Gap outfall under conditions of the Site's EPL.

The oily water characteristics and load arising from the Project Area once the Project is operational would not differ significantly from that currently generated from the same area. Tank bunded areas and tank water drains would remain largely unchanged and flow from these areas would continue to be treated in the WWTP. The Site would continue to handle ballast and pipe wash water, though the quantities may vary from those currently handled.

There would be a significant impact on the overall oily water sewer system from the shutdown of the refinery. The overall volume and contaminant load would reduce substantially. Due to significant reduction of wastewater volume and contaminant load, the existing WWTP would need to be reassessed to determine the potential for related changes in efficiency and performance.

Caltex and the EPA have initiated discussions on this issue, and have an 'in principal' agreement with the following approach:

- the existing WWTP would be retained for treatment of oily water for the construction of the Project and the beginning phases of the operation of the Project. It would be operated under the current EPL conditions;
- in consultation with the EPA, a PRP condition, would be developed and included in the terminal EPL, and it would:
 - apply when the terminal is operational;
 - characterise the terminal wastewater streams;
 - identify and assess terminal wastewater management options;
 - recommend preferred options; and
 - confirm applicable EPL conditions, including those related to discharge points, quality and monitoring; and
- continue consultation with the EPA.

The treated wastewater effluent would continue to discharge to Yena Gap in accordance with the current EPL conditions. These conditions may be revised following the process outlined above.

11.6.3 Flooding

Previous studies and reports have indicated that the areas around the Site are susceptible to flooding from both rainfall and tidal inundation, and this would be exacerbated by climate induced sea level rise.

The Site is elevated above the surrounding low lying areas on the western and northern boundaries, and the on-site bunding around petroleum products storage areas effectively increases the flood height (by up to 3 m) that would need to be present for any interaction between petroleum products and flood waters to occur.

As described in **Section 11.4**, the level of flood assessment that can be completed for the Site varies. Therefore in order to enable the most robust assessment possible, the Site was divided into two areas:

- Area 1 – the north west of the Site; and
- Area 2 – the remainder of the Site.

This approach allowed the most accurate data relating to any one section of the Site to be used for the assessment of the flood risk in that area.

Area 1 – North West of the Site

Detailed level survey information was available in the north western portion of the Site in the vicinity of the wastewater treatment plant. Using this available information it was possible to project the adjacent 1% year (also known as a 1 in 100 year) Annual Exceedance Probability (AEP) flood level into this area of the Site.

The results of this assessment for this area of the Site show that there is a relatively shallow depth of flooding within Area 1, near the intersection of Captain Cook Drive and Solander Street (refer to **Figure 11-3**). This is consistent with recent experience of flooding in that area. The area of flooding within this part of the Site is limited and would not overtop any bunds within the surveyed area.

Figure 11-3 Flood Projection (2.82 m AHD) on the North West of the Site



Area 2 – Remainder of the Site

Within Area 2 there was not enough information to create a model of the existing ground surface. Instead, information on flood depths and peak flooding levels from the areas surrounding the Site were projected onto the Site. Along most of the western boundary of the Site, the 1% AEP event peak flood level is about 2.82 m AHD, however, in the north west corner of the Site, near Gate 5, the peak level is about 4.25 m, and even higher in the north east corner. In order to reflect this variation in the recorded peak flood level the Site was divided into three sections (refer to Section 4.2.2.2 in **Appendix E Water Management Report**).

The resulting flooding assessment indicated that while the majority of the Site would remain above the adopted flood levels, there was the possibility of some minor flooding (<0.1 m depth) across the western Site boundary, north of Gate 5 and within the area occupied by the first row of tanks in the north eastern corner of the Site. It is expected that the existing bunding would be sufficient to prevent interaction with flood waters given the predicted depth of <0.1 m).

The Project is not expected to change the flood risk profile in the Project Area nor the ability of the Site to accommodate high rainfall events and/or broader flooding events from that which currently exists. However, due to the coarse nature of the existing information and therefore the assessment, a future review would be completed that focussed on the northern parts of the Site to better understand the actual flood risk.

Flood Risk Category

Sutherland Shire Council (SSC) has planning controls relating to flood risk levels and requires that infrastructure standards and safety measures be suitable for the associated risk level. SSC places limitations on the type of buildings that are allowed in areas of 'medium risk', approximately lower than 3.6 m AHD. In order to assess the Project's compliance with this control, the level of 3.6 m AHD was compared to ground level spot levels within the Site.

The only area of the Site that was identified as 'medium risk' based on available ground level data was in the corner of Captain Cook Drive and Solander Street. A small area immediately near the intersection of Cook Street and Solander Street is also marginally below 3.6 m AHD and therefore in the 'medium risk' category. The remainder of the Site is higher than 3.6 m AHD and therefore not in the 'medium risk' category as defined by SSC. As indicated previously, the product tank bunds in the medium risk area are all of a height well in excess of the nominated risk level.

11.6.4 Water Supply and Usage

Construction

Water supply would be required during the construction phase for a range of uses including:

- construction use;
- tank cleaning; and
- general workforce amenities.

This water would be potable water supplied by Sydney Water. Existing supply infrastructure would be utilised. The overall Site water demand during the construction period would not be expected to exceed that of current Site usage.

Operational Phase

Once operational, the Project would have a much lower overall potable water usage than the current operation as the main refinery processes that utilised potable water would cease. The workforce would also decrease, so the potable water used for amenities would decrease proportionately. Following the shutdown of the refinery operations, potable water consumption would reduce by approximately 90%. The existing potable water distribution infrastructure on the Site would be left largely intact.

Potable water would continue to be supplied from municipal supply by Sydney Water and therefore no licensing requirements or other approvals under the *Water Act 1912* and/or the *Water Management Act 2000*, including any obligations associated with a Water Sharing Plan, would apply.

Options to reduce water consumption through the implementation of efficiency measures, such as usage avoidance, reuse and recycling, have been considered, however to date limited opportunities have been identified. No water efficiency measures have currently been identified to be implemented under the Project. Potential water efficiency measures would continue to be considered during the further design stages of the Project, and if viable, would be implemented.

With the closure of the refining operation at the Site, the cooling water system used for the purpose of removing heat generated from the refinery process would cease operation. This includes the daily cooling water pumping and effluent discharge to Botany Bay. This would eliminate any negligible environmental impacts to water quality in Botany Bay and local ecology caused by this process.

The retirement of the cooling water system would mean seawater would no longer be available as back-up fire water supply. Maximum firewater demand and storage was determined by R4Risk (2012) as part of the Fire Safety Study (FSS) (refer to Section 9.3 of **Appendix E Water Management Report**). A maximum firewater demand case was identified and assessed assuming a full-surface tank fire, to allow estimation of the maximum fire water storage volume to be maintained. The assessment indicated the 16 ML firewater storage available on-site significantly exceeds the maximum firewater storage requirement. The performance of the current firewater system has been deemed adequate to satisfy demand under the proposed Project (R4Risk, 2012).

The fire water requirement for fire equipment testing, however, has not been estimated. Nonetheless, the requirement is expected to be less than is currently required (347 kL/d), as usage for refinery equipment would be no longer required.

11.6.5 Domestic Wastewater

The Project would utilise the existing wastewater infrastructure to service the continuing needs of Site amenities. The amount of sewage generated would be expected to decrease significantly following the shutdown of the refinery operations and proportional reduction in the workforce. Amenity water would continue to be pumped to the Sydney Water sewerage system for treatment at the Cronulla Treatment Plant. The overall load would reduce, approximately proportional to the reduction of the Site workforce.

11.6.6 Loss Control

The measures and processes currently in place at the Site to prevent any loss of contaminant would be maintained throughout the construction and operation phases of the Project. Caltex has committed that the bunding capacity for tanks retained in service would comply with the requirements of AS1940.

In addition, some improvements to monitoring would be initiated to ensure that if a loss of containment into a bund occurs it is detected early and contingency actions can be taken promptly.

The measures for tanks containing low flash materials¹ include:

- explosive vapour detectors within the bunds;
- triple infrared scanners on tank roofs; and
- CCTV in conjunction with infrared cameras as a confirmation for alarms.

All tanks on-site would be subject to:

- an automated high level shut off system²; and
- continuance of a comprehensive inspection/repair program.

Caltex's focus during the construction and operation of the Project would be on inspections, maintenance and spill prevention within the tank and tank bund areas. Extensive spill prevention measures would continue to be incorporated into the operation of the Project as outlined above.

Any tank floors that are rebuilt during the Project and during the ongoing operation of the terminal would incorporate a tank underfloor liner.

The primary loss control strategy to be continued by Caltex for the Project can be summarised as follows:

- primary focus on ensuring that a spill does not occur from the primary containment systems (i.e. tank and transfer systems);
- if a spill occurs it is detected quickly and responded to rapidly;
- it is contained in normally isolated adequately sized bunds; and
- supplementary capacity and tertiary containment systems are available outside of the bunds in the oily water sewer and stormwater management systems.

The stormwater systems within Catchments A and B (within which the Project Area is located) have the following important features:

- the pipeways are isolatable, allowing spill containment and providing additional storage capacity;
- they have manually operated skimmer pumps for product removal to the oily water system;
- each catchment has a syphon system and API oil/water separator to control discharge stormwater rate and quality; and
- Catchment B has the Quibray Bay Stormwater Retention Basin and overflow capacity, providing additional storage.

¹ The flash point of a chemical is the lowest temperature where it will evaporate enough fluid to form a combustible concentration of gas. The flash point is an indication of how easy a chemical may burn.

² This includes multiple high level detection instruments wired to an automatic valve which closes the tank inlet after a defined fill height has been reached.

11.7 Mitigation

11.7.1 Construction Phase

Appropriate construction phase procedures would be used to minimise soil erosion, sedimentation and contamination of nearby surface waters. A number of interrelated measures to help avoid or manage impacts on soils and groundwater have been detailed in **Chapter 9 Soils, Contamination and Groundwater**. These measures would also help manage potential impacts on surface water receptors. Key amongst these would be to complete all construction works in line with 'The Blue Book' *Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004).

Measures to manage potential impacts on surface water receptors would be detailed within the CEMP for the Project. These measures would be included in the Soil and Erosion Management Plan for the Project. These plans would include the following measures:

- All materials would be stockpiled in accordance with 'The Blue Book' *Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004). Principal controls would include the following:
 - silt fences would be installed around stockpiles to reduce erosion and the movement of suspended solids as necessary;
 - soil stockpiles and any polluted materials would be stored in designated areas which are not in close proximity to any stormwater drainage systems;
 - regular inspection of erosion control structures and bunded areas; and
 - regular inspection of containment areas, drainage lines and interception measures.
- Clean materials would be separated from contaminated materials.
- Suspected contaminated materials would then be classified in accordance with *NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste*, batched, further tested (where required) and either stored on the Site or disposed of in a timely manner.
- Soil erosion and sedimentation devices would remain in place until the disturbed ground surface is restored. These devices would also capture any gross pollutants.

11.7.2 Operational Phase

Stormwater

Kurnell Refinery is an operational industrial facility and as such operates under an Environment Protection Licence. In 2010 and 2011, heavy rainfall resulted in flooding at the WWTP which in turn resulted in oily water being discharged off-site. In response the EPA imposed a requirement for additional stormwater improvement investigations within *PRP U24.1: Stormwater Catchment and Management Plan*.

Caltex prepared a SMP in response to this PRP. This plan was prepared and submitted as required on 5 October 2012. The SMP committed Caltex to implementing a stormwater management strategy and completing a number of stormwater management measures in a staged manner. The measures within the SMP are outlined in greater detail in Section 11.5.6 and Section 3.2.6 of **Appendix E Water Management Report**.

Caltex is in the process of developing a stormwater management strategy for the Site to implement the requirements of the SMP.

Whilst no significant stormwater impacts are expected as a result of the Project, it has been recognised that the stormwater system at the Site requires improvement in order to ensure that contamination does not spread from the Site to the surrounding surface water receptors (in extreme weather conditions). Therefore the key measure to manage and mitigate future stormwater impacts on the Site would be the successful implementation of the SMP in consultation with EPA.

Flooding

The Project is not expected to change the flood risk profile in the Project Area nor would it change the ability to accommodate high rainfall events and/or broader flooding events from that which currently exists.

The implementation of the SMP and further changes to the stormwater system following completion of the Project and following any future demolition or remediation works would result in changes to flood risk on the Site. As such, Caltex will reassess the flood risk during the remediation works to ensure that any future flood risks to the Site are understood and appropriately managed.

Oily Water Management

Caltex are also in discussion with the EPA regarding the future of the OWMS at the Site. The reduction in process water from the refinery would mean that the existing WWTP would need to be reassessed to determine the potential for related changes in efficiency and performance. Caltex and the EPA have initiated discussions on this issue, and have an 'in principal' agreement in line with the approach outlined in **Section 11.6.2**.

At present treated effluent from the WWTP is discharged to the Tasman Sea via the Yena Gap outfall. The existing EPL for the Site requires this discharge is subject to quality monitoring to determine compliance with concentration limits. Whilst a permanent solution is found for the OWMS for the Site, Caltex have committed to managing the WWTP discharge within EPL limits. This commitment would ensure that the Project would not cause a greater impact on the quality of the receiving waters than the current operation.

11.8 Summary

In a number of areas, the potential impacts of the Project on water related issues would be positive when compared to the existing operations at the Site. The Project is likely to result in significantly less potable water use and would also result in a reduction in domestic waste. The retirement of the seawater cooling system would ensure that any negligible impacts associated with this process are also removed. Any potential impacts to stormwater quality during construction can be successfully managed and a number of additional loss control management systems would help ensure that the risk of contamination is reduced.

Stormwater captured on-site during operation would be managed through the existing systems and separated into clean or contaminated streams as required. The Site would still discharge stormwater into the same off-site areas and the quality of the stormwater would largely remain the same. Impacts related to flooding would remain the same as present, however the current measures on Site would be reviewed in line with the SMP, and flood risk would be reassessed in the future.

The management of stormwater and flooding at the Site would continue to be studied and improved as the measures within the SMP are completed and implemented. The key measure to manage and mitigate future stormwater impacts on the Site would be the successful implementation of the SMP in consultation with EPA. Equally, any wastewater discharges from the WWTP would remain within existing EPA limits to ensure no additional adverse impacts.

Table 11-2 presents the relevant management and mitigation measures for this chapter. The management and mitigation measures for construction provided under **Section 11.7.1** above have been summarised in **Chapter 9 Soils, Groundwater and Contamination** and **Chapter 17 Waste Management**. Therefore some of these management and mitigation measures are not reiterated in **Table 11-2**.

Table 11-2 Management and Mitigation Measures – Surface Water, Wastewater and Flooding

Management and Mitigation Measures	Implementation		
	Design	Construction	Operation
The Construction Environmental Management Plan (CEMP) for the Project would include a Soil and Erosion Management Plan. This plan would include the following measures: • All materials would be stockpiled in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004); • Silt fences would be installed around stockpiles to reduce erosion and the movement of suspended solids as necessary; • Soil stockpiles and any polluted materials would be stored in designated areas which are not in close proximity to any stormwater drainage systems; • Erosion control structures, bunded areas, containment areas, drainage lines and interception measures would be subject to regular inspection; • Clean materials would be separated from contaminated materials; and • Soil erosion and sedimentation devices would remain in place until the disturbed ground surface is restored. These devices would also capture any gross pollutants.		✓	
Caltex would continue to implement the measures within the Stormwater Management Plan for the Site. This plan has been produced in response to Environment Protection Licence No. 837, PRP U24.1: Stormwater Catchment and Management Plan. The SMP has committed Caltex to implementing a Stormwater Management Strategy and completing a number of stormwater management measures in a staged manner. Measures include: • Ongoing maintenance of the existing stormwater system; • Implementation of a number of projects to improve the infrastructure, reduce the potential for the refinery to flood, and prevent contaminated stormwater leaving the refinery premises; • Working with the NSW Office of Environment and Heritage (OEH), NSW EPA and Sutherland Shire Council to divert to flow of stormwater from the National Park away from the Site's stormwater system to the Sutherland Shire Council's stormwater infrastructure; • Carrying out stormwater flow monitoring; and • Updating the Site's stormwater system performance model to account for the changes to the stormwater system infrastructure that can then be used as a tool to assess future modifications, as necessary. This work would be completed in consultation with NSW EPA.	✓	✓	✓

Management and Mitigation Measures	Implementation		
	Design	Construction	Operation
Discharges from the Wastewater Treatment Plant would be within existing EPL limits during construction and operation. Any required change to this Oily Water Management System would be discussed and agreed with NSW EPA.	✓	✓	
The measures and processes currently in place at the Site to prevent any loss of contaminant would be maintained throughout the construction and operation phases of the Project. All bunds on tanks which are retained in service would meet the capacity requirements of Australian Standard AS1940 during the operation of the Project.		✓	✓
Improvements to monitoring would be initiated to ensure that if a loss of containment into a bund occurs it is detected early and contingency actions can be taken promptly. The measures for tanks containing low flash materials include: - explosive vapour detectors within the bunds; - triple infrared scanners on tank roofs; and - CCTV in conjunction with infrared cameras as a confirmation for alarms. All tanks on-site would be subject to: - an automated high level shut off system; and - continuance of a comprehensive inspection/repair program.		✓	
Caltex will reassess the Site's flood risk during the future remediation works that would be completed once the conversion works are complete to ensure that any future flood risks to the Site following conversion, demolition and remediation are understood and appropriately managed.			✓

12 Noise and Vibration

12.1 Introduction

The following chapter assesses the likely noise and vibration impacts resulting from the Project. A Noise and Vibration Impact Assessment (NVIA) was completed by acoustic consultants Wilkinson Murray. This report has been included as **Appendix F**. This chapter is based on the findings of the NVIA.

12.2 Scope of the Assessment

The DGRs for the Project (refer to **Appendix A**) require the EIS to include:

- *an assessment of all construction, operational and transportation noise impacts on surrounding residential receivers;*
- *any vibration impacts from construction and operation;*
- *cumulative impacts of other developments both on the site and in the vicinity of the site; and*
- *details of the proposed noise management and monitoring measures.*

Subsequent communications with the EPA noted that the assessment should include:

- *identification of all potential noise sources associated with the conversion works. This may include any demolition, construction and operational noises from the project and associated shipping movements;*
- *identify the location of all sensitive receptors;*
- *the proposed hours of construction and operation of the conversion works;*
- *an assessment of compliance with the project specific noise levels as determined using the above guidelines; and*
- *any proposed mitigation, monitoring and management measures which are necessary to achieve the above outcome.*

These requirements are addressed in **Appendix F Noise and Vibration Impact Assessment** and summarised in this chapter.

Due to the distances between the potential sensitive receptors and the proposed works the likelihood of a vibration impact associated with the Project is minimal and as such no further assessment has been conducted.

12.3 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. LA_{eq}).

- **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. $L_{A90,15 \text{ min}}$.
- **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. $L_{Aeq,15 \text{ min}}$.
- **Tonality:** Noise containing a prominent frequency and characterised by a definite pitch.
- **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. Some examples of SPL are provided in **Table 12-1**.

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	

12.4 Legislation and Planning Policy

NSW Protection of the Environment Operations Act 1997

The *NSW Protection of the Environment Operations Act 1997* (PoEO Act) includes a single licencing arrangement for a range of pollutants including noise. Under this Act certain scheduled activities are licenced, as is the case of the Kurnell Refinery operation. These activities require the operator to obtain an Environmental Protection Licence (EPL). The current operation is subject to approved noise limits as presented in the Site's Environment Protection Licence (no. 837). This licence defines operating noise limits that must be observed when working on the Site. This Act therefore serves to regulate noise pollution.

12.5 Method of Assessment

12.5.1 Overview

This assessment has been undertaken in accordance with the guidance noted below and has involved:

- review of the applicable noise criteria, legislation and Director General's Requirements;
- understanding the existing acoustic environment of the study area;
- identification of noise sensitive receptors;
- setting of Project specific noise criteria;
- prediction of operation and construction noise and comparison with the nominated noise criteria; and
- recommendation of necessary mitigation measures to achieve satisfactory noise criteria performance.

12.5.2 Guidance

Potential noise impacts associated with the proposed construction and operational activities have been assessed in accordance with the following guidelines:

- *NSW Industrial Noise Policy* (EPA, 2000) (INP) for the assessment of the operational noise;
- *Application Notes – NSW Industrial Noise Policy* (OEH, 2011);
- *NSW Road Traffic Noise Policy* (EPA, 2011) (RTNP) for the assessment of the off-site traffic noise on public roads;
- *Update of Noise Database for Prediction of Noise on Construction and Pen Sites* (DEFRA, 2005);
- *Construction Noise Handbook* (Federal Highway Administration, 2006);
- *NSW Interim Construction Noise Guidelines* (ICNG, DECC 2009) for the assessment of the noise from construction of the Project; and
- *Assessing Vibration: A Technical Guideline* (DEC, 2006) for the assessment of the vibration from construction of the Project.

12.5.3 Noise Assessment Criteria

Overview

The current operation at the Site is subject to approved noise limits as presented in the Environment Protection Licence (EPL) (No. 837) for the Site (refer to **Appendix B Environment Protection Licence**).

The Industrial Noise Policy (INP) is used to guide the assessment operational noise activities, while construction activities are assessed against the *Interim Construction Noise Guideline (ICNG)*. Both operational noise and construction noise activities are also assessed against the approved noise limits contained within the existing EPL.

Construction Noise

The criteria set out in the ICNG have been used as a basis for assessment of the potential construction noise impact of the Project. The ICNG was developed by the NSW EPA and took into consideration the fact that construction is temporary, noisy and difficult to ameliorate. Therefore, the ICNG was developed in order to identify and utilise the range of work practices most suited to minimising noise arising from construction, rather than focusing only on achieving a specific noise level.

The ICNG recommends that standard construction work hours should generally be as follows:

- Monday to Friday 7.00am to 6.00pm;
- Saturday 8.00am to 1.00pm; and
- No work on Sundays or public holiday.

Table 12-2 summarises the construction noise specified in the guideline.

Table 12-2 Construction Noise Criteria - Noise at Residences

Time of Day	Management Level L_{Aeq} (15 min)	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10dB (A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. 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 proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

Time of Day	Management Level L_{Aeq} (15 min)	How to Apply
Outside recommended standard hours	Noise affected RBL + 5dB (A)	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 specified noise affected level, the proponent should negotiate suitable work arrangements and mitigation measures with the community.

For commercial or industrial land the ICNG recommends the following noise management levels:

- industrial premises: external L_{Aeq} (15 min) 75 dB(A); and
- offices, retail outlets: external L_{Aeq} (15 min) 70 dB(A).

Traffic Noise Criteria

Criteria for assessment of road traffic noise impacts are specified in the *NSW Road Traffic Noise Policy* (RTNP). The relevant applicable criteria for assessment of the Project are summarised in **Table 12-3**.

Based on the RTNP, the goal noise levels at the residential receptors for this Project are:

- $L_{Aeq,15hr}$ day 60 dB(A); and
- $L_{Aeq,9hr}$ night 55 dB(A).

These limits only apply to off-site road traffic noise, and do not apply to vehicle movements within the Site. For the purpose of this assessment any noise generated by on-site vehicle movements while on the Site is considered as construction industrial noise and assessed in accordance with the Industrial Noise Policy (INP).

Table 12-3 RTNP Criteria for Road Traffic Noise

Type of Development	Assessment Criteria – dB(A)	
	Daytime (07:00-22:00)	Night (22:00-07:00)
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15\text{ hour}}$ 60 (external)	$L_{Aeq,9\text{ hour}}$ 55 (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1\text{ hour}}$ 55 (external)	$L_{Aeq,1\text{ hour}}$ 50 (external)

Where the criteria are already assessed as exceeding as a result of existing traffic, any increase in the total traffic noise level should be limited to 2 dB above the existing traffic noise levels. A 2 dB increase is not typically considered to be a noticeable change in noise levels.

Existing Operational Noise Limits

The existing EPL for the Kurnell Refinery provides the following operational noise limits for the Site:

L6.1 Noise from the premises must not exceed:

- a) an $L_{A10(15 \text{ minute})}$ noise emission criterion of 70 dB(A) (7:00 to 2200) seven days a week; and
- b) an $L_{A10(15 \text{ minute})}$ noise emission criterion of 65 dB(A) at all other times.

The EPL also provides number of other noise specific conditions for the measurement and assessment of noise generated by operations on the Site. These are provided in detail in **Section 6.1 of Appendix F Noise and Vibration Impact Assessment** and **Appendix B Environment Protection Licence**. The EPL uses the L_{A10} descriptor as this was used as standard when the EPL was issued prior to the introduction of the INP (EPA 2000). For the purpose of this assessment, it is conservatively assumed that the $L_{A10,15\text{min}}$ criteria (found within the EPL) is equivalent to the $L_{Aeq,15\text{min}}$ criteria. Typically a $L_{Aeq,15\text{min}}$ noise level from an industrial site is up to 3 dB lower than the $L_{A10,15\text{min}}$ noise level, therefore this assumption helps ensure a conservative assessment of noise.

Operational Noise

The Industrial Noise Policy (INP) provides the framework for deriving operational noise limits. The policy sets out two criteria to assess the potential operational noise impacts of industrial sources.

The first criterion “Intrusiveness” is used to assess short-term intrusive noise impacts at sensitive receptors (e.g. residents). The intrusiveness criterion is established by adding 5 dB(A) to the background noise levels (RBL). Where the RBL in the evening exceeds that in the daytime, the project-specific noise level was determined so that the intrusive noise level for evening was set at no greater than the intrusive noise level for daytime.

The second criterion “Amenity” is used to maintain noise level amenity for particular land uses for residences and other land uses. While the intrusiveness criterion is based on a typical worst case 15 minute period, the amenity criterion is expressed as an $L_{Aeq,period}$ noise level over the whole assessment period considered (day, evening or night).

The potentially affected residences near the Site are in areas that are classified as either “urban industrial interface” or urban. To be conservative the urban “acceptable” amenity criteria has been used in this assessment. The recommended acceptable “urban” noise levels are 60 dB(A), 50 dB(A) and 45 dB(A) $L_{Aeq,period}$ for daytime, evening and night time periods, respectively.

Where noise levels from existing industrial sources are close to or above the acceptable levels, the amenity criterion is adjusted on a sliding scale so that overall overall noise levels do not exceed the acceptable level with the addition of the new noise source.

12.5.4 Noise Modelling

The ‘Cadna A’ computer acoustics model program using ISO 9613 noise prediction algorithm was used to model the acoustic impacts of the Project. The Cadna A modelling software is accepted by the EPA for use in environmental noise assessments. For the purpose of this modelling assessment, predictions assumed 24 hour operation of the equipment.

INP default meteorological parameters have been used to predict noise levels at each receptor. It is a conservative approach, in that it is likely to predict the upper range of increases in noise levels due to meteorological conditions (refer to **Section 7 of Appendix F Noise and Vibration Impact Assessment**).

The Project has been modelled for the two following scenarios:

- initial construction phase involving the installation of new plant and refurbishment of tanks; and
- the typical worst-case scenario when new plant is operating concurrently.

12.6 Existing Environment

12.6.1 Noise monitoring data

The existing physical environment on the Site is outlined in **Chapter 3 Project Location and Existing Environment**. The acoustic environment on the Kurnell Peninsula is characterised mainly by industrial sources, however other activities also contribute to the existing noise environment. Marine activities in Botany Bay and aircraft noise from the Sydney (Kingsford Smith) Airport have potential to influence the acoustic baseline. Other noise sources include local traffic, ocean waves and local fauna.

In order to accurately assess the acoustic baseline it is necessary to establish a Rating Background Level (RBL). Due to the number of noise studies undertaken on the Kurnell Peninsula and Botany Bay in recent years, existing noise data was used in order to determine the RBL. The following documents have been referred to in this assessment:

- Environmental Assessment, Botany Bay Cable Project. (Wilkinson Murray, 2006);
- Caltex Jet Fuel Pipeline, Construction Noise and Vibration Assessment. (Renzo Tonin Associates, 2011);
- The Kurnell Port and Berthing Project Noise and Vibration Assessment (URS, 2012); and
- 2011 Computer Noise Update Project Caltex Refineries (NSW) Pty Ltd (HFP Acoustic Consultants Corp, 2011).

Table 12-4 summarises the relevant information from the above reports. The ambient noise levels are presented in the form of a Rating Background Level (RBL), which is defined in the INP. Monitoring locations are shown on **Figure 12-1**.

Table 12-4 Existing Noise Levels at Kurnell, L_{A90}

Monitoring Location	Reference	Monitoring Type	Location	Raing Background Noise Levels, L_{A90}			Ambient Noise Levels, L_{Aeq}		
				Day 0700-1800h (dB(A))	Evening 1800-2200h (dB(A))	Night 2200-0700h (dB(A))	Day 0700-1800h	Evening 1800-2200h	Night 2200-0700h
M1	Botany Bay Cable Project (Jul 2006)	Long-term noise logging	10 Prince Charles Parade	41	42	40	57*	54*	49*
M2	Noise update Project Caltex Refineries (2011)	Long-term noise logging	48 Prince Charles Parade	40	43	41	50	51	50
M3	Noise update Project Caltex Refineries (2011)	Long-term noise logging	39 Polo Street	40	40	41	54	52	51
M4	Jet Fuel Pipeline (April 2011)	Long-term noise logging	15 Cook Street	41	43	39	Not provided	Not provided	Not provided
M5	Noise update Project Caltex Refineries (2011)	Long-term noise logging	35 Cook Street	40	40	38	55	53	53
M6	Kurnell Port and Berthing (Dec 2012)	Long-term noise logging	Ranger's House	41	43	41	55*	57*	51*
M7	Noise update Project Caltex Refineries (2011)	Long-term noise logging	11 Tasman Street	40	39	36	53	52	51
M8	Noise update Project Caltex Refineries (2011)	Long-term noise logging	1 Silver Beach Road	44	40	40	52	50	50

Monitoring Location	Reference	Monitoring Type	Location	Raing Background Noise Levels, L_{A90}			Ambient Noise Levels, L_{Aeq}		
				Day 0700-1800h (dB(A))	Evening 1800-2200h (dB(A))	Night 2200-0700h (dB(A))	Day 0700-1800h	Evening 1800-2200h	Night 2200-0700h
M9	Noise update Project Caltex Refineries (2011)	Long-term noise logging	31 Silver Beach Road	47	49	38	55	54	51
M10	Noise update Project Caltex Refineries (2011)	Long-term noise logging	30D Cook Street	36	35	30	44	39	36

* Dominated by surf noise.



12.6.2 Sensitive receptors

Sensitive noise receptors were identified considering the location of the Project Area and available information. The following groups of receptors were identified and are shown on **Figure 12-1**:

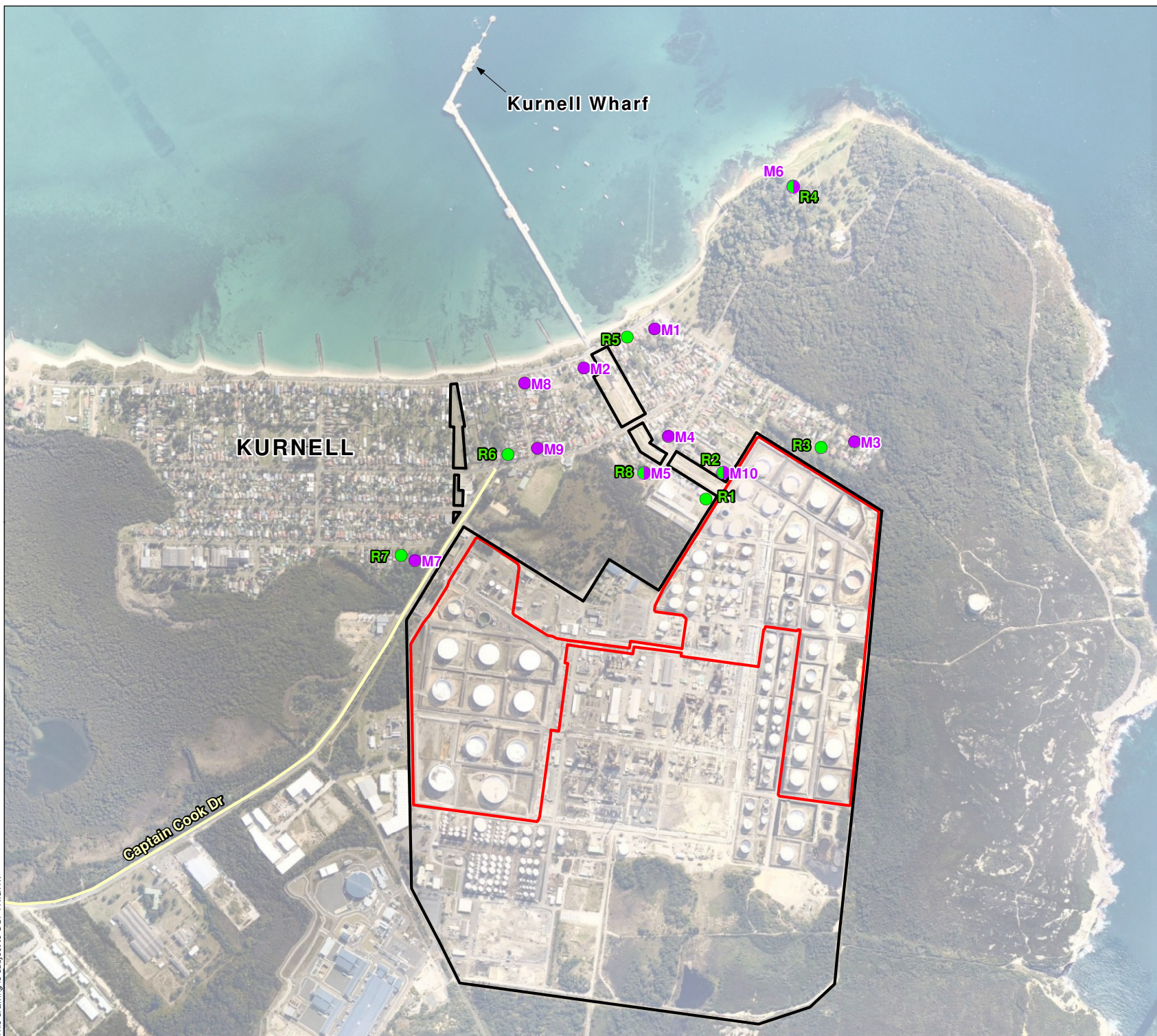
- Receptor 1 (R1): 44-64 Cook Street (Industrial Premises) Industrial premises adjacent to the Site to the west and sharing a common boundary;
- Receptor 2 (R2): 30D Cook Street (Residential) Residential property adjacent to the Site to the west and sharing a common boundary;
- Receptor 3 (R3): Reserve Road (Residential) Residential properties north of the Site;
- Receptor 4 (R4): Rangers' House (Residential) located towards the northern end of the National Park;
- Receptor 5 (R5): Prince Charles Parade (Residential) Residential properties south of the refinery wharf;
- Receptor 6 (R6): Corner of Captain Cook Drive and Silver Beach Rd (Residential) Residential properties north of the Site;
- Receptor 7 (R7): Tasman Street (Residential) Residential property west of the Site. and
- Receptor 8 (R8): 35 Cook Street (Residential) Residential property west of the Site.

In order to create an RBL for the Project, the ambient acoustic environment at each identified receptor location has been extrapolated from the existing monitoring data above. **Table 12-5** presents the RBL for each of the identified receptors and demonstrates how each of these RBL values was calculated.

Table 12-5 Rating Background Noise Levels, L_{A90}

Receptor Number	Sensitive Receptor	Rating Background Noise Levels, L_{A90}			Ambient Noise Levels, L_{Aeq}			Comments
		Day 0700 – 1800h	Evening 1800-2200h	Night 2200-0700h	Day 0700 – 1800h	Evening 1800-2200h	Night 2200-0700h	
R1 & R2	30D Cook Street	36	35	30	44	39	36	Based on M10
R3	Reserve Road	40	40	41	54	52	51	Based on M3.
R4	Ranger's House	41	43	41	55**	57**	51**	Based on M6.
R5	Prince Charles Parade*	40	40	40	50	51	50	Based on the lowest measured levels from M1, M2 and M8.
R6	Corner of Captain Cook Drive and Silver Beach Rd	47	49	38	52	50	50	Based on the lowest measured levels M9.
R7	Tasman Street	40	39	36	53	52	51	Based on M7.
R8	Cook St	40	40	38	55	53	53	Based on the lowest measured level from M4 and M5.

* For Prince Charles Parade the daytime RBLs are based on the attended measurements undertaken in 2012. **Dominated by Surf Noise



Legend

- Approximate Location of Noise Monitoring Locations
- Approximate Location of Noise Sensitive Receptors
- Captain Cook Drive
- The Site
- Project Area



Coordinate System: GDA 1994 MGA Zone 56
 Projection: Transverse Mercator
 Datum: GDA 1994
 Units: Meter

0 100 200 400
 Meters

Source: Aerial Imagery - Nearmap Hypertiles 2012

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CALTEX (REFINERIES)
 NSW PTY LTD

KURNELL REFINERY
 CONVERSION

**LOCATIONS OF SENSITIVE NOISE
 RECEPTORS AND PREVIOUS
 MONITORING LOCATIONS**

URS

Figure: **12-1**
 Rev. A A4



12.7 Impact Assessment

12.7.1 Construction Impacts

Construction Noise Criteria

The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environmental Protection Licence (No. 837) (EPL) for the Site. As discussed in **Chapter 4 Project Description**, in 2014 the refinery plant would be shut down, depressurised, de-inventoried and left *in situ* in a staged manner. The shut down and depressurisation of the refinery plant is a process that occurs as part of the T&I program on a rotating basis as part of the maintenance program for the Site. Caltex has extensive documented procedures which are used routinely during T&I activities. These procedures enable noise emissions of this process to be monitored and managed in compliance with the relevant EPL.

Based on the ICNG (refer to **Table 12-2**), **Table 12-6** presents the Project-specific construction noise criteria for the identified receptors associated with the Project.

Table 12-6 Project Specific Construction Noise Criteria

Receptor Number	Receptor Location	Day 0700-1800h L _{Aeq,15min} (dB(A))	Out of hours 18:00h 22:00h L _{Aeq,15min} (dB(A))	Out of hours 22:00h 7:00h L _{Aeq,15min} (dB(A))
R1	Cook Street (Industrial Premises)	75		
R2	30 D Cook Street (Residential Premises)	46	40	35
R3	Reserve Road (Residential Premises)	50	45	45
R4	Ranger's House (Residential Premises)	51	46	46
R5	Prince Charles Parade (Residential Premises)	50	45	45
R6	Corner of Torres Street and Silver Beach Rd (Residential Premises)	57	52	43
R7	Tasman Street (Residential Premises)	50	44	41
R8	Cook Street (Residential Premises)	50	45	43

Construction Noise Impacts

The likely acoustic impact of the construction phase of the Project has been calculated based on the type of plant that is anticipated to be used in the construction process, and the frequency with which the plant would be used during the construction. **Table 12-7** provides details of this plant and its anticipated usage factor (i.e. the small generator would be used 50% of the time). The assessment has assumed that all plant would be working concurrently during the construction period to provide a worst case scenario.

Table 12-7 Project Construction Plant

Item	Overall LA _{eq} (15 minutes) Sound Power Level (dB(A))	Usage Factor (%)
Miscellaneous hand tools x 3	100	40
Compressor for Pneumatic tools	93	40
Small Generator	93	50
Concrete Pump	106	20
Concrete Truck	105	40
Mobile Crane	104	16
Vacuum Truck	106	20
Excavator	108	20
Reversing Alarm for large trucks	106	5

Note: All plant and equipment acquired by Caltex would meet its purchasing policy of "85dBA at the source".

Based on **Table 12-7** and the description of construction activities in **Chapter 4 Project Description**, **Table 12-8** below presents the predicted level of acoustic impact of the Project at each identified receptor location during the construction phase.

The construction noise levels resulting from the Project are predicted to be below the daytime construction noise criteria at all receptors. For out of hours construction work noise levels as a result of the Project are predicted to be below evening and night construction noise criteria at all receivers except R2 and R3, for which where minor exceedances of up to 5 dB have been predicted.

However, as the construction activities are going to be taking place while the refinery is still in operation, the existing noise environment in addition to the construction noise levels is required to be considered.

The current noise levels for the Site with all plant operating are summarised and discussed in **Section 12.7.3**. The predicted construction noise levels presented in **Table 12-8** are at least 10 dB below the existing noise levels. Therefore, the noise contribution from the proposed construction activities have an acoustically insignificant contribution to the existing noise levels. Cumulatively, the additional construction noise levels and the current noise levels for the Site would also meet the Site's current EPL noise limits.

The predicted levels at the boundary of the Site are below the EPL daytime and night time noise limits and as such the limits would comply with EPL limits at all the closest residential receivers.

It should be noted that the majority of the conversion works would typically be completed between 7.00am to 10.00pm seven days a week, with some works consistent with Caltex's existing maintenance procedures occurring over a 24 hour period.

Table 12-8 Predicted L_{eq} Construction Noise Levels, dB(A)

Receptor	Description	Predicted L_{Aeq} Noise Level	Day 0700-1800h $L_{Aeq,15min}$ (dB(A))	Out of hours 18:00h-22:00h $L_{Aeq,15min}$ (dB(A))	Out of hours 22:00h-7:00h $L_{Aeq,15min}$ (dB(A))	Complies (Yes/No)
R1	Cook Street (Industrial Premises)	44	75			Yes
R2	Cook Street (Residential Premises)	40	46	40	35	Yes/Yes/No
R3	Reserve Road (Residential Premises)	49	50	45	45	Yes/No/No
R4	Rangers' House (Residential Premises)	28	51	46	46	Yes/Yes/Yes
R5	Prince Charles Parade (Residential Premises)	34	50	45	45	Yes/Yes/Yes
R6	Corner of Torres Street and Silver Beach Rd (Residential Premises)	36	57	52	43	Yes/Yes/Yes
R7	Tasman Street (Residential Premises)	38	50	44	41	Yes/Yes/Yes
R8	Cook Street (Residential Premises)	39	50	45	43	Yes/Yes/Yes

12.7.2 Construction Traffic Impacts

During construction, vehicles would access the Project Area from Captain Cook Drive, which is the major access road to the Kurnell Peninsula on the southern shore of Botany Bay and connects the Project Site to the wider Sydney road network. 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 to Kurnell.

Traffic generated by the Project would include the following vehicles:

- construction vehicles, 10 trucks (10 daily return trips) maximum would be required at the Site during the construction phase. These vehicles would typically include cranes and semi-trailers etc;
- equipment and material delivery vehicles, 10 trucks (10 daily return trips) maximum would be required to deliver the construction equipment and materials to the Site; and
- construction personnel, 140 additional personnel (140 daily return trips) on average would be required at the Site during the construction phase. This is in addition to approximately 40 existing employees that would assist with construction duties during the peak construction phase.

The existing traffic noise levels along the Captain Cook Drive already exceed the noise criteria of 60 and 55 dB(A) for the day and night, respectively. Captain Cook Drive east of Gannons Road had an average annual daily traffic flow of 38,810 (two-way) vehicles per day in 2012. Given these traffic volumes, the additional noise contribution from traffic generated by the Project construction would be negligible at residences on Captain Cook Drive (that is, less than a 2 dB increase).

12.7.3 Operational Impacts

Operation Project Specific Noise Levels (PSNL)

The *INP* states that the lowest of the two intrusive and amenity noise criteria be used as the Project Specific Noise Levels for the Project. The Project Specific Noise Levels are highlighted in “bold” in **Table 12-9**. Refer to **Section 12.5.3** for a description of how the Project Specific Noise Levels were determined.

Table 12-9 Project Specific Operational Noise Criteria

Receptor Number	Receptor Location	Time Period	Intrusiveness Criterion $L_{Aeq,15min}$ (dB(A))	Amenity Criterion $L_{Aeq,period}$ (dB(A))*
R1	Cook Street (Industrial Premises)	When in use	-	70
R2	30D Cook Street (Residential Premises)	Daytime (7.00 am–6.00 pm)	41	60
		Evening (6.00 pm–10.00 pm)	40	50
		Night Time (10.00 pm–7.00 am)	35	45
R3	Reserve Road (Residential Premises)	Daytime (7.00 am–6.00 pm)	45	59
		Evening (6.00 pm–10.00 pm)	45	42
		Night Time (10.00 pm–7.00 am)	45	41
R4	Ranger's House (Residential Premises)	Daytime (7.00 am–6.00 pm)	46	60
		Evening (6.00 pm–10.00 pm)	46	50
		Night Time (10.00 pm–7.00 am)	46	45
R5	Prince Charles Parade (Residential Premises)	Daytime (7.00 am–6.00 pm)	45	60
		Evening (6.00 pm–10.00 pm)	45	50
		Night Time (10.00 pm–7.00 am)	45	45
R6	Corner of Captain Cook Drive and Silver Beach Rd (Residential Premises)	Daytime (7.00 am–6.00 pm)	52	58
		Evening (6.00 pm–10.00 pm)	52	44
		Night Time (10.00 pm–7.00 am)	43	41
R7	Tasman Street (Residential Premises)	Daytime (7.00 am–6.00 pm)	45	60
		Evening (6.00 pm–10.00 pm)	44	42
		Night Time (10.00 pm–7.00 am)	41	41
R8	Cook Street (Residential Premises)	Daytime (7.00 am–6.00 pm)	45	59
		Evening (6.00 pm–10.00 pm)	45	43
		Night Time (10.00 pm–7.00 am)	43	43

Note: *As the operational noise levels are relatively constant from the facility it is conservatively assumed that the $L_{Aeq, period}$ and $L_{Aeq,15minute}$ noise levels are the same.

Operational Noise Impacts

Operational acoustic impacts were assessed against the INP Noise criteria. The likely acoustic impact of the operational phase of the Project has been calculated based on the new plant to be installed and the frequency that the plant would be employed. **Table 12-10** presents this plant and its anticipated usage factor. For the purposes of the assessment it was assumed that all plant would be operating concurrently following the shutdown of the refinery in the second half of 2014.

Table 12-10 Project Operation Plant

Item	Overall LA _{eq(15 minutes)} Sound Power Level (dB(A))	Usage Factor (%)
Ship	105	100
Product Pump	93	30
Slop Pump	81	30
Diesel additives injection system	90	5
Chemical drum and dosing pump	80	5
Compressors	90	40

Note: All plant and equipment acquired by Caltex would meet its purchasing policy of "85dB(A) at the source".

Noise levels experienced by a receptor at relatively large distances from a source can vary considerably under different meteorological conditions, particularly at night under temperature inversion conditions. Prevailing wind and air temperature gradients will change over the course of the day and night time periods; hence noise levels at receptors will change even when the source noise level is constant.

For projects in coastal areas, the INP recommends the following default meteorological conditions that enhance noise levels:

- Moderate (F-class stability category) inversions: 3°C/100 m inversion strength and source-to-receptor wind drainage of 2 m/s where applicable. As the area is relatively flat, drainage winds are not considered applicable for this area; and
- Gradient wind: Source-to-receptor gradient wind of 3 m/s.

Based on **Table 12-10** and the description of activities in **Chapter 4 Project Description**, **Table 12-11** presents the predicted level of acoustic impact of the Project at each identified receptor location during the operational phase. It should be noted that the cessation of refining operations at the Site would reduce noise levels substantially at the Site. Operational noise levels have been modelled assuming that all new plant is running concurrently following the shutdown of the refinery in the second half of 2014.

Table 12-11 Predicted L_{Aeq} Noise Levels – Operation – dB(A)

Receptor	Description	Predicted L_{Aeq} Noise Level			INP Noise Criteria (Day/Evening/ Night)	Complies (Yes/No)
		Calm	3 m/s down wind	3°C/100 m inversion strength		
R1	Cook Street (Industrial Premises)	29	31	31	70	Yes
R2	30 D Cook Street (Residential Premises)	31	33	33	41/40/35	Yes/Yes/Yes
R3	Reserve Road (Residential Premises)	25	29	29	45/45/45	Yes/Yes/Yes
R4	Ranger's House (Residential Premises)	33	38	38	46/46/45	Yes/Yes/Yes
R5	Prince Charles Parade (Residential Premises)	34	39	39	45/45/45	Yes/Yes/Yes
R6	Corner of Captain Cook Drive and Silver Beach Rd (Residential Premises)	31	36	36	52/44/41	Yes/Yes/Yes
R7	Tasman Street (Residential Premises)	34	39	39	45/42/41	Yes/Yes/Yes
R8	Cook Street (Residential Premises)	35	39	39	45/43/43	Yes/Yes/Yes

Note: If R1 was a residential receptor it would also comply with residential criteria.

The operational noise levels as a result of the Project are predicted to comply with the daytime, evening and night time operational noise criteria at all receptors. Therefore, no impacts are expected at any of the identified sensitive receptors as a result of operational noise resulting from the Project.

12.7.4 Operational Traffic Impacts

During the operational stage of the Project, Caltex would import finished products via the two fixed berths at the existing wharf and the sub berth located in Botany Bay. The major product distribution systems would continue as normal, with product being pumped under Botany Bay to the Banksmeadow Terminal, the Sydney/Newcastle pipeline or the Joint User Hydrant Installation (JUHI) at Sydney Airport for further distribution. Routine road transport of products from the Site would cease.

There would be a reduction in employees on site following the cessation of refining operation and the introduced high levels of automation of the terminal. It is anticipated approximately 100 employees would provide routine operational or supporting services to the terminal. These employees would operate in a shift arrangement 24 hours a day, 7 days a week. Up to an additional 90 people would be required at the Site during maintenance shutdown periods during the operation of the terminal, which are periodic and for short time frames (8-12 weeks).

Given the reduction in employees and cessation of road haulage at the Site, the number of vehicles generated by the operational phase of the Project would be significantly fewer than the existing number of vehicles generated by refining operations. This would result in a reduction in traffic volumes along Captain Cook Drive and subsequently lower levels of traffic noise. Therefore the operational phase of the Project would have a positive impact on sensitive noise receptors along Captain Cook Drive.

12.8 Mitigation

As the Project is not expected to adversely impact on the acoustic amenity of surrounding receptors, no specific mitigation measures are required. However, as a precautionary approach, a number of mitigation measures would be included to manage any potential construction noise risks moving forward. Measures would include:

- Provision of a Noise Management Plan as part of the CEMP for the Project. This plan would outline:
 - the locations of noise sensitive receptors;
 - construction noise monitoring procedures; and
 - construction equipment maintenance to ensure good working order.
- Activities that are undertaken that are in line with the existing maintenance procedures on the Site (such as the shut down, depressurisation and de-inventory of the refinery infrastructure) would be undertaken in line with existing Caltex procedures to ensure any noise emissions are monitored and managed in compliance with the relevant EPL.
- Awareness training for staff and contractors in environmental noise issues including:
 - minimising the use of horn signals and maintaining a low volume. Alternative methods of communication would be considered;
 - avoiding any unnecessary noise when carrying out manual operations and when operating plant; and
 - switching off any equipment not in use for extended periods during construction work.
- The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environmental Protection Licence (No. 837) (EPL) for the Site.
- Prior to operation of the new terminal, Caltex would agree appropriate noise limits (if required) for the Site with the EPA.
- Community consultation with local residents and building owners to assist in the alleviation of community concerns. Previous experience on similar projects has demonstrated that affected noise sensitive receptors may be willing to endure higher construction noise levels for a shorter duration if they have been provided with sufficient warning in the place of intermittent but extended periods of construction noise at lower levels. These existing 24 hour Community Concerns Hotline would continue to be operated for the Project; and
- Maintaining a suitable complaint register. Should noise complaints be received, noise monitoring would be undertaken at the locations concerned. Reasonable and feasible measures would be implemented to reduce noise impacts. All complaints would be managed through the existing feedback process at the Site.

Equally Caltex's current approach to managing complaints (from noise or otherwise) would continue. As discussed above, this approach includes a 24-hour hotline number for the local community. This number forms part of an established community complaints process where the community complaint or enquiry is emailed and texted to an Operations representative, the Shift Manager, the Environment Protection Superintendent, the Community Relations and Communication Advisor, amongst other refinery personnel. The complaint is responded to and investigated to determine the source of the noise and then, if required, operational adjustments are made to mitigate the noise. The resident is generally updated on the action(s) taken and asked about whether they consider that the operational adjustments have been effective.

12.9 Cumulative Impacts

12.9.1 Introduction

The noise assessment has also considered the cumulative impacts of the Project with other proposed works in proximity to the Site (refer to Section 10 of **Appendix F Noise and Vibration Impact Assessment**).

Caltex are proposing dredging work and upgrades to the Kurnell Port and Berthing Facility (SSD-5353). These upgrades have been described in the Caltex Kurnell Port and Berthing Facility Environmental Impact Statement (URS, 2013) (Kurnell Port and Berthing Project). There is potential for cumulative construction noise impacts between the Port and Berthing Facility Project and the Kurnell Refinery Conversion Project as both projects are likely to occur between the 3rd quarter of 2013 and the second half of 2014.

12.9.2 Construction Noise

The construction impacts from the Kurnell Port and Berthing Project have identified potential impacts at residences on Prince Charles Parade and the Rangers' House as these are the closest residential receivers. Maximum construction noise levels including piling and impulsive noise sources were predicted to be between 56 and 49 dB(A) for day time construction works (URS, 2013).

Construction noise levels for the proposed Project are identified in **Section 12.7.1** and show predicted construction noise levels of 34 dB(A) at Prince Charles Parade and 28 dB(A) at the Rangers' House. It can therefore be concluded that the predicted noise contribution from the proposed Project would have an acoustically insignificant contribution to the construction noise levels from the Kurnell Port and Berthing Project.

12.9.3 Construction Traffic Noise

The predicted construction vehicle generation relating to Kurnell Port and Berthing Project was also assessed cumulatively with the likely construction vehicles from this Project. Due to the anticipated small volume of vehicle movements from both the Kurnell Port and Berthing Project and the Project along Captain Cook Drive, cumulative road traffic noise impacts during construction would be less than 2 dB and as such considered negligible impact.

12.9.4 Operational Noise

The most accurate current noise levels for the Site with all plant operating including the refinery are presented in **Table 12-12** as summarised in a report by HFP Acoustic Consultants for the Site's pollution reduction program (HFP, 2011). From these predictions it can be concluded that the existing refining operation meets its EPL noise limits.

Table 12-12 Estimated Site Noise Levels with all Refinery Plant Operating, (HFP, 2011)

#	Receiver	Predicted L_{Aeq} Noise Level 3 m/s Southerly wind
R1	Cook Street (Industrial Premises)	57
R2	30D Cook Street (Residential Premises)	57
R3	Reserve Road (Residential Premises)	57-53
R4	Ranger's House (Residential Premises)	<45
R5	Prince Charles Parade (Residential Premises)	50
R6	Corner of Captain Cook Drive and Silver Beach Rd (Residential Premises)	55
R7	Tasman Street (Residential Premises)	55
R8	Cook Street (Residential Premises)	52

The predicted operational noise levels presented in **Section 12.7.3** are at least 10 dB below the existing noise levels. Therefore, the predicted noise contribution from the proposed Project would have an acoustically insignificant contribution to the existing noise levels. As such, in the short-term when the refinery is still operating, the cumulative noise levels from the Site including the Project would not change from those levels presented in **Table 12-12**.

Further, the additional Project noise levels and the current noise levels for the Site with all plant operating including the refinery would also meet the Site's current EPL noise limits.

Following cessation of refining at the Site, operational noise would reduce substantially and operational noise levels as a result of the Project would remain. These are predicted to be below the INP daytime, evening and night time noise criteria at the closest receivers.

It can therefore be concluded that no cumulative noise impact is predicted due to the construction or operation of the Project.

12.10 Summary

As the Project is not expected to adversely impact on the acoustic amenity of surrounding receptors, no specific mitigation measures are required. However, as a precautionary approach, a number of mitigation measures would be included to manage any potential impacts.

The proposed mitigation and management measures to be implemented during the construction and operation of the Project are summarised in **Table 12-13**.

Table 12-13 Management and Mitigation Measures - Noise

Management and Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
The CEMP for the Project would include a Noise Management Plan (NMP). The NMP would outline: - the locations of noise sensitive receptors; - construction noise monitoring procedures; and - construction equipment maintenance to ensure good working order.		✓	
Low-noise plant and equipment would be selected, where practicable, 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 are working correctly.		✓	
Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register is maintained and managed in line with the existing feedback process at the Site.		✓	✓
Any noise complaint(s) would be investigated immediately. Reasonable and feasible measures would be implemented to reduce noise impacts.		✓	✓
Construction equipment would be located to reduce noise emission to sensitive receptors, where practicable.		✓	
The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environmental Protection Licence (No. 837) (EPL) for the Site.		✓	
Construction staff and contractors would undergo training in environmental noise issues including: - minimising the use of horn signals and maintaining a low volume. Alternative methods of communication should be considered; - avoiding any unnecessary noise when carrying out manual operations and when operating plant; and - switching off any equipment not in use for extended periods during construction work.		✓	
Should any unexpected construction activities occur which could potentially generate significant noise not described in this report, monitoring would be undertaken to ensure construction noise emission levels do not exceed EPL limits.		✓	

13 Air Quality and Odour

13.1 Introduction

This chapter presents a summary of the air quality impact assessment (AQIA) undertaken to assess the potential air quality impacts associated with the Project. The AQIA is provided in full in **Appendix G Air Quality Impact Assessment**.

13.2 Scope of Assessment

The Director General's Requirements (DGRs) (refer to **Appendix A**) requested that consideration be given to the potential air quality impacts of the Project, and that the EIS include the following:

- *“a quantitative assessment of the air quality and odour impacts of the development on surrounding receivers, including impacts from construction, operation and road transportation; and*
- *details of the proposed management and monitoring measures.”*

The NSW Environment Protection Authority (EPA) also requested that impacts on air quality and odour associated with the Project be considered. The EPA require the EIS to undertake dispersion modelling where there is a risk of adverse impacts or where there is sufficient uncertainty to warrant a rigorous numerical impact assessment.

To meet these requirements, an assessment of the potential air quality impacts of the Project has been completed. The AQIA has incorporated the following elements:

- a review of activities proposed as part of conversion works and terminal operation;
- identification of key pollutants and emission sources associated with identified activities;
- a review of regulatory framework for air emissions including impact assessment criteria;
- preparation of an emissions inventory for the operational phase of the Project;
- atmospheric dispersion modelling of emissions from the operational phase of the Project;
- comparison of model predictions against impact assessment criteria; and
- proposed mitigation and monitoring measures relative to the Project.

13.3 Legislation and Planning Policy

Protection of the Environment Operations Act 1997

Part 5.4 of the *Protection of the Environment Operations Act 1997* (PoEO Act) defines air pollution.

The PoEO Act enables the NSW Government to:

- make protection of the environment policies to prevent or minimise air pollution;
- allocate responsibilities for environmental protection between the state Government and local councils;
- provide a range of tools to address air pollution including orders and directions concerning clean-up and prevention notices;

- enable a function for notices to be issued to maintain and operate equipment in a proper and efficient manner; and
- make it an offence to carry out various activities that cause the emission of air pollution and/or breach the conditions of an order, direction or notice.

Two principal regulations have been formed under the PoEO Act, one of which is relevant to this assessment and is discussed below.

Protection of the Environment Operations (Clean Air) Regulation 2010

The *Protection of the Environment Operations (Clean Air) Regulation 2010* sets the legislative context for air emissions associated with industrial and commercial developments. This Regulation is relevant to the proposed works as it sets out management responsibilities to minimise adverse air quality impacts.

13.4 Method of Assessment

13.4.1 Introduction

There are three types of criteria relevant to air emissions associated with the Project. These are:

- **Air Impact Assessment Criteria** – ambient criteria designed for use in air dispersion modelling and air quality impact assessments for new or modified emission sources;
- **Ambient Air Quality Standards** – regional standards against which ambient air quality monitoring results may be assessed; and
- **Emission Standards** – which specify maximum allowable in-stack pollutant concentrations as specified for particular industrial activities and plant types.

A combination of Emission Standards and Air Impact Assessment Criteria are typically used to evaluate the expected impact of air emissions on local air quality, and the effectiveness of plant design and associated emission controls. The wider objective of these criteria is to ensure that the resulting regional ambient air quality meets the relevant Ambient Air Quality Standards.

In addition, Ambient Air Quality Standards constitute an additional range of Criteria which can be used to provide additional context to modelling predictions.

13.4.2 Emissions and Odour

Key Pollutants

The products that are and would be stored on Site comprise a range of mixtures of organic compounds, including VOCs that have potentially adverse impacts on human health and amenity¹ and therefore the area of key relevance to this assessment. The compounds identified in *Toxicological Profile for Total*

¹ A consideration of Semi-Volatile Organic Compounds (SVOCs) as Polycyclic Aromatic Hydrocarbons (PAHs) was performed, however release modes from sources at the Site were found to be non-conducive to of PAH (B[a]P TEQ) emissions. Tank emission calculations were performed for SVOCs as PAHs (B[a]P TEQ) in accordance with the Potency Equivalency Factors [PEFs] provided in the *Approved Methods* in conjunction with product composition, and Total VOC emissions. Raoult's law was used to estimate B[a]P emissions as a fraction of total VOC emissions. As part of this calculation, all non-naphthalene PAHs were conservatively assumed to be present as 7,12 dimethylbenzanthracene (the PAH with the highest product of PEF and vapour pressure). These emissions were found to be in the order of ~1 g B[a]P/year which is considered negligible relative to levels associated with potentially adverse air quality impacts.

Petroleum Hydrocarbons (TPH) (ATSDR, 1999a) have been adopted as key pollutants for the assessment. These include:

- BTEX, consisting of:
 - Benzene;
 - Toluene;
 - Ethylbenzene;
 - Xylenes; and
- n-Hexane.

In addition, URS conducted a review of the Site's 2010-2011 tank emissions profile. This review confirmed that the compounds identified in ATSDR (1999a) were correct.

Petroleum hydrocarbons also possess a characteristic hydrocarbon odour typically associated with transport fuels. Sulphurous compounds such as mercaptans and hydrogen sulphide are also odorous gases present in petroleum hydrocarbons in small quantities.

Due to improvements in Australian fuel standards there has been a significant reduction in the amount of sulphur present in transport fuels and therefore it is expected that high levels of sulphur-based odorants would be only present in fuel oil.

Odour

In recent times, odour has been a key issue of community concern near to the Site. Odour complaints have typically numbered between 50 and 60 complaints per year. As a result of this, there is a large amount of existing baseline information about Site odour available therefore a quantitative assessment of odour has not been undertaken within this AQIA.

Caltex propose to manage odour from the Project through the odour reduction programs that are currently undertaken through the Environment Protection Licence (EPL) for the Site (EPL no. 837). A discussion of these programs is provided in **Section 7 of Appendix G Air Quality Impact Assessment** and summarised in **Section 13.7.2**.

13.4.3 Impact Assessment Criteria

Impact assessment criteria relevant to the Project have been taken from the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (the *Approved Methods*) (OEH, 2005). The pollutants relevant to this assessment are listed in **Table 13-1**.

Table 13-1 OEH Impact Assessment Criteria

Substance	Averaging Period	Impact Assessment Criteria		Criterion Type
		($\mu\text{g}/\text{m}^3$)	(ppb)	
Benzene	1 hour	29	9	Toxic
Toluene	1 hour	360	90	Odorous
Ethylbenzene	1 hour	8,000	1,800	Toxic
Xylenes	1 hour	190	40	Odorous
n-Hexane	1 hour	3,200	900	Toxic

Ambient Air Quality Standards

Ambient Air Quality Standards have been taken from the National Environment Protection (Air Toxics) Measure (NEPC, 2004). This document provides health investigation levels for a range of substances, some of which are relevant to the Project.

Whilst these standards are not intended directly for use in impact assessment, nor are they a specific regulatory requirement for the Project, the sources from which the criteria are developed are considered relevant and useful in the context of this assessment. Specifically, these criteria are available as long-term (annual) averages, therefore offering improved compatibility with the assessment of exposure to pollutants with chronic health effects (e.g. Benzene). **Table 13-2** provides a summary of the long-term National Environment Protection Measure (NEPM) monitoring investigation levels and assumed background levels for substances considered in this assessment.

Table 13-2 NEPM Monitoring Investigation Levels

Substance	Averaging Period	Monitoring Investigation Level	
		($\mu\text{g}/\text{m}^3$)*	(ppb)
Benzene	Annual	9.6	3
Toluene	Annual	377	100
Xylenes	Annual	870	200

Note: *Converted from volumetric units at a temperature of 25°C and pressure of 1 atmosphere.

Emissions Standards

NSW emission standards relevant to the Project are limited to those contained in Part 6, Clause 63, *Control of Volatile Organic Liquids (VOLs) – Control Equipment for Large Storage Tanks*. Clause 63 applies to large storage tanks (i.e. >150 kL capacity) used to store VOLs².

Of the liquids that would be handled on the Site, gasoline products would be classified as VOLs, whilst fuel oil, jet fuel and diesel would not meet this classification.

13.4.4 Quantitative Assessment

Construction Impacts

The Project, as described in **Chapter 4 Project Description**, was reviewed in the context of potential emissions to air.

As discussed in **Chapter 4 Project Description**, in 2014 the refinery plant would be shut down, depressurised, de-inventoried and left *in situ* in a staged manner. The shut down and depressurisation of the refinery plant is a process that occurs as part of the T&I program on a rotational basis as part of the maintenance program for the Site. Caltex has extensive documented procedures which are used routinely during T&I activities. These procedures enable air emissions from this process to be monitored and managed in compliance with the EPL. Therefore any air emissions from this process would be managed under the relevant EPL and do not require assessment as part of this Project.

² Those liquids with a vapour pressure greater than 25.8 mm Hg (~3.4 kPa) at storage conditions.

Given the minor scale and progressive nature of the construction activities, the potential for works to adversely impact air quality is considered small. Hence a quantitative assessment of these activities has not been undertaken. This is discussed further in **Section 13.6.1**.

Operational Impacts

Dispersion Modelling

Quantitative air quality assessments are undertaken using computer based dispersion models. These models rely on the input of accurate meteorological, baseline air quality and emission source data to calculate the worst-case dispersion of a particular emission across a study area. Three dispersion models are generally endorsed by OEH for use in AQIAs. These are AUSPLUME, TAPM and CALPUFF. The AUSPLUME model has been selected for the assessment and is considered to be appropriate for the operation of the Project for the following reasons:

- emission from the site occur at ground-level and are non-buoyant;
- receptors of key interest are located in the near-field range; and
- on-site meteorological monitoring data is available, and is sited in an area considered representative of key emission sources and receptors.

Receptor Locations

Modelling has been conducted for a receptor grid of 81 x 81 receptor points at 50 m resolution, which equates to a receptor grid of 4 x 4 km. The extent of this modelling domain encompasses the Site and surrounding areas of interest on the Kurnell peninsula as shown in **Figure 13-1**.

Figure 13-2 shows the location of eleven 'discrete receptors'. The selected discrete receptors are residential locations along the northern and north-eastern boundary of the Site that have been selected as a simple means of screening the modelling results at areas which are routinely occupied.

Meteorological Data

A site-specific meteorological dataset was prepared using meteorological data that has been collected at the Site and synoptic meteorological databases. This was done to calculate the meteorological parameters that are required for the dispersion model. Further detail and analysis of this process is provided in Appendix A of **Appendix G Air Quality Impact Assessment**.

Figure 13-1 Site and surrounding areas of interest

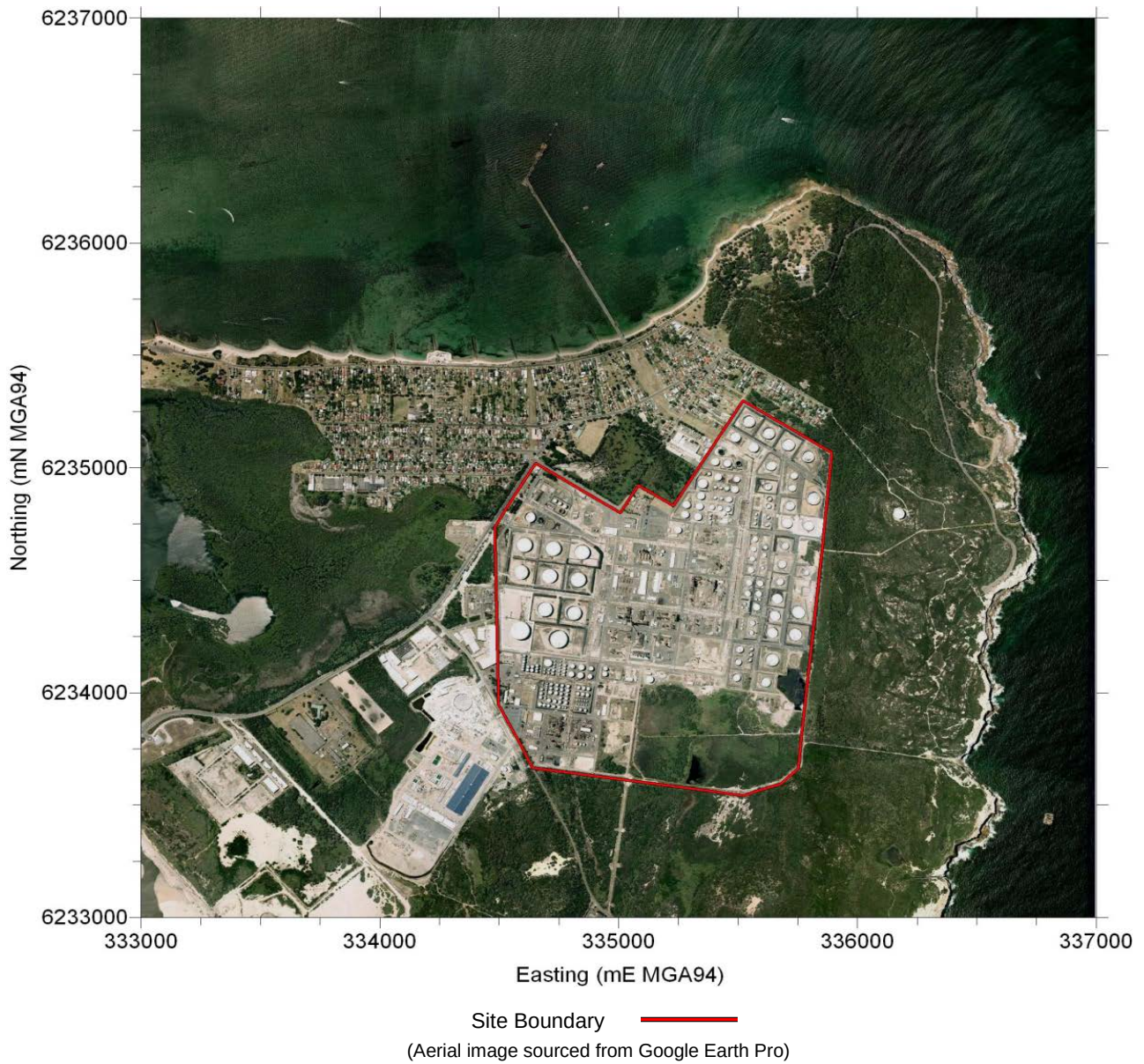


Figure 13-2 Discrete receptor locations



Site Boundary ———
 (Aerial image sourced from Google Earth Pro)

13.4.5 Other Assessment Parameters

Emission Sources

The products that are and would be stored on Site comprise a range of mixtures of organic compounds, including VOCs that have potentially adverse impacts on human health and amenity. During the operational phase of the Project, in the absence of combustion processes at the Site due to the cessation of refining, emission sources are primarily limited to those arising through fugitive volatilisation of hydrocarbon materials during importation, storage and exportation from the Site.

Based on the proposed works, the following potential emission sources were identified:

- **Storage tanks** - of the approximately 100 storage tanks existing on the Site, Caltex propose to retain approximately half of these in service for the storage of products and slop oil (excluding tanks associated with the Waste Water Treatment Plant (WWTP)).
- **Product transfer infrastructure** - fugitive emissions would occur from equipment that is used to move products around the Site including fugitive losses from plant items such as pump (seals), valve collars and pipe flanges.
- **Land farm** - is used to treat sludges that are generated from operational activities on the Site. Dozers are used to turn the material on a near daily basis, and material is turned and stored in stockpiles within the land farm. As part of this process, VOCs are released from the land farm material to the atmosphere.

- **Waste water treatment plant** - Caltex operate a WWTP which is capable of treating approximately 15 ML/day using physical, chemical and biological processes to treat wastewater prior to ocean outfall discharge. Emission estimates performed by Caltex indicate that VOC emissions from the WWTP are unlikely to be significant in the context of emissions from the Site³, and have therefore not been incorporated into the quantitative component of this assessment.
- **Shipping** - resulting from ship loading activities and emissions associated with the combustion of fuels whilst at berths.

Emissions have been represented in AUSPLUME as volume sources. Volume sources represent a generic method of representing fugitive emissions, such as those that are released into an aerodynamic wake (e.g. fugitive emissions from storage tanks). **Figure 13-2** shows the location of identified discrete receptors and emission sources.

13.5 Existing Environment

13.5.1 Climate and Meteorology

The dispersion of pollutants in the atmosphere is predominantly driven by local wind conditions. Meteorological data was collected on the Site and was used for the assessment in conjunction with synoptic meteorological databases. A review of meteorological monitoring on the Kurnell peninsula identified the following Automatic Weather Stations (AWS):

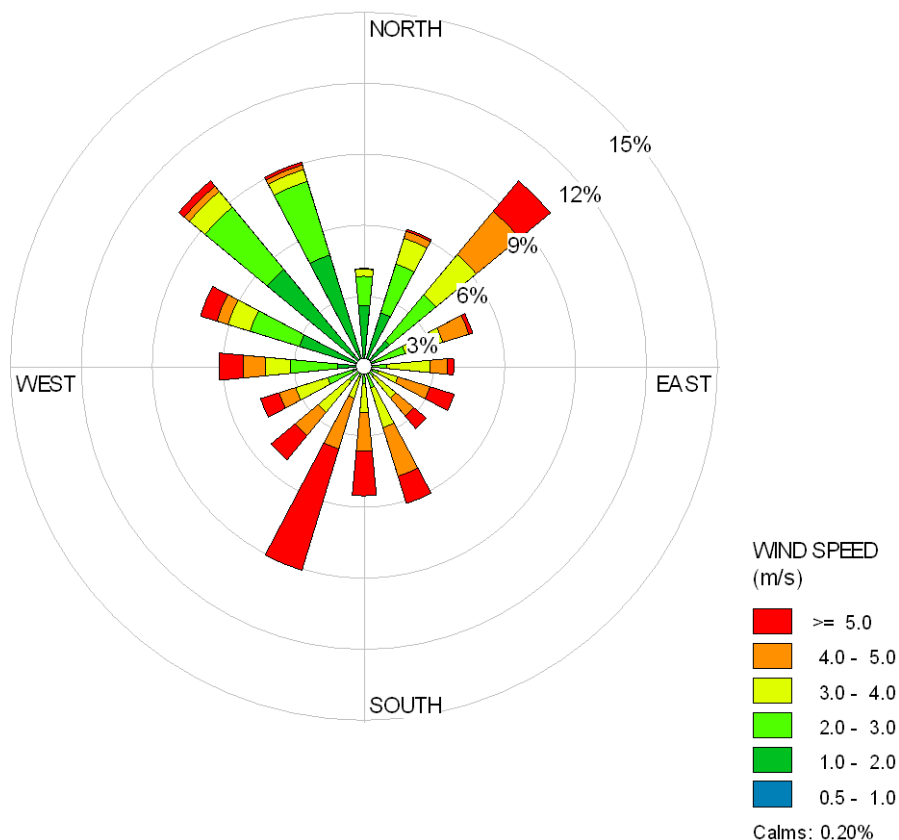
- Bureau of Meteorology (BoM) Kurnell;
- Caltex Kurnell Refining Performance Improvement Program (RPIP); and
- Caltex Lubricating Oil Refinery.

The BoM Sydney Airport AWS was also identified as a nearby source of long term meteorological records, relevant to the review of regional meteorological trends.

Terrain across the peninsula is generally low-lying with the exception of eastern-most portion of the headland where a ridge runs on a north/south alignment. The eastern boundary of the Site is bound by this ridge where elevations reach approximately 40 m above sea level. Winds at the Site are typical for coastal winds in the Sydney region, however higher than average wind speeds may be present due to the exposed nature of the peninsula. Some sheltering of easterly winds has potential to be present due to the ridge to the east of the Site. Five years of meteorological data (2007 to 2011 inclusive) were reviewed, and 2008 was selected as being representative of meteorological patterns across all years. **Figure 13-3** shows the wind rose for the Site from 2008. Winds are shown to be well distributed in all directions, with the slight accentuation of north easterly sea breezes, south-south westerly and north-westerly winds, as common to the coastal areas of Sydney.

³ Caltex routinely estimate Total VOC losses based on WWTP biological oxygen demand. Typically, these VOCs are estimated to constitute approximately 0.01% of Total VOCs from storage tanks under terminal operation.

Figure 13-3 Wind rose for 2008



13.5.2 Existing Air Quality

The existing air quality in the vicinity of the Site has been reviewed in order to establish general trends in pollutants and identify appropriate background values for use in this assessment. NEPC (2010) contains a summary of monitoring conducted as part of the NEPM Air Toxics program. The data from the Turrella monitoring station was selected as most representative of the current conditions as it is the closest to the Site. This area is densely-populated, and located on heavy arterial traffic routes including the M5 motorway. Whilst monitoring data from this location is unlikely to be directly reflective of background air quality in Kurnell, its use is considered appropriate as a representation of background air quality.

Table 13-3 provides a summary of the long-term NEPM monitoring investigation levels and assumed background levels for substances considered in this assessment.

Table 13-3 NEPM monitoring investigation levels and assumed background levels

Substance	Averaging Period	Monitoring Investigation Level		Assumed Background Level (Turrella Monitoring Station)	
		($\mu\text{g}/\text{m}^3$)*	(ppb)	($\mu\text{g}/\text{m}^3$)*	(ppb)
Benzene	Annual	9.6	3	1.2	0.38
Toluene	Annual	377	100	6.8	1.8
Xylenes	Annual	870	200	5.2	1.2

Note: *Converted from volumetric units at a temperature of 25°C and pressure of 1 atmosphere.

13.6 Impact Assessment

13.6.1 Construction Impacts

As discussed in **Section 13.4.4**, given the scale of the construction phase of the Project in relation to the existing operations on the Site, the potential for construction activities to adversely impact air quality is considered small. The following potentially emissive activities were identified:

- Volatile Organic Compound (VOC) emissions from the draining and cleaning of tanks;
- particulate emissions from metal fabrication: cutting, grinding and welding during tank and piping modifications;
- combustion emissions from portable plant items (e.g. generators and compressors);
- VOC emissions from painting of tanks and piping; and
- Particulate/VOC emissions from excavations, concrete cutting and concreting (as required for the installation of items such as pump foundations).

Potential air quality impacts would be managed through the implementation of an Air Quality Management Plan (AQMP) which would be incorporated into the Construction Environmental Management Plan (CEMP) for the Project. Mitigation measures suitable for incorporation into the CEMP have been provided in **Section 13.7**.

13.6.2 Operational Impacts

Change in Emissions Profile

The closure of refining operations would result a significant change in the emissions profile for the facility. Of key significance is the retirement of stationary combustion sources on the Site and associated classes of pollutant emissions, which include oxides of nitrogen (NO_x), carbon monoxide, sulphur dioxide, hydrogen sulphide and particulate matter.

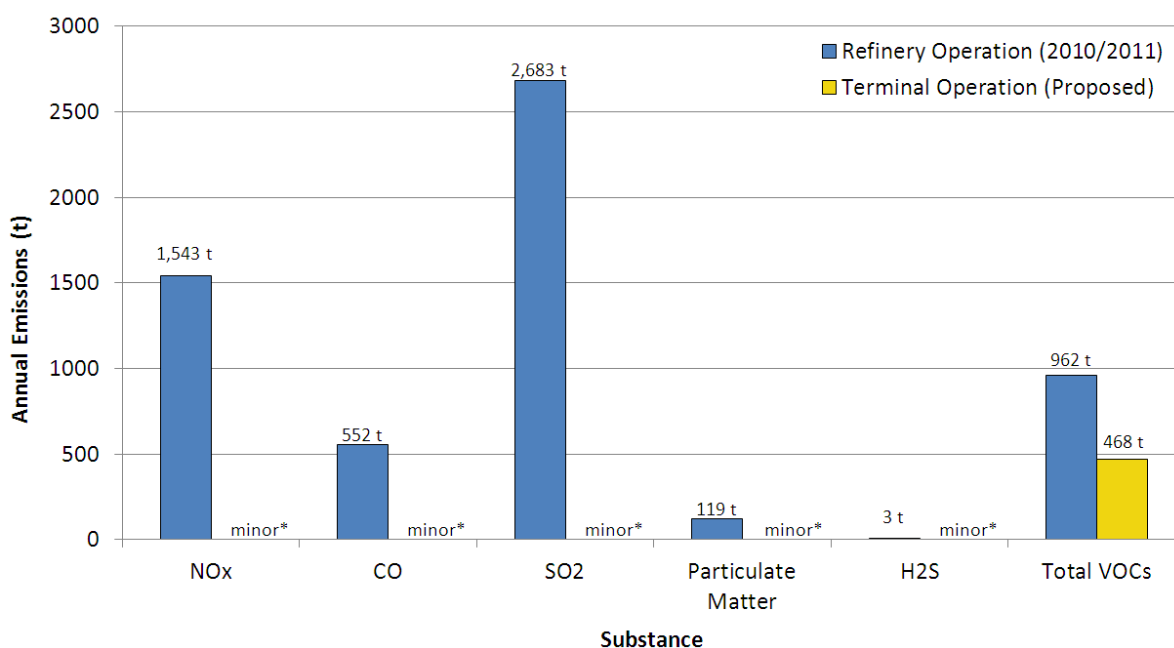
Table 13-4 and **Figure 13-4** show the change in emission profile relative to the 2010/2011 NPI reporting year (the base year). This reporting year is considered to be the most recent year in which the refinery (including CLOR) was operating at near to full capacity.

Table 13-4 Change in Emissions Profile Associated with Conversion of the Site

Pollutant	Site Emissions (t/annum)	
	Refinery Operation (Base Year)	Terminal Operation
Oxides of Nitrogen (NO _x)	1,543	Minor*
Carbon Monoxide	552	
Sulphur Dioxide	2,683	
Particulate Matter	119	
Hydrogen Sulphide	3	
Volatile Organic Compounds (VOCs)	962	468

Note: *Emissions have not been estimated, but would be primarily limited to those from vehicles and other mobile plant on the Site.

Relative to refinery operation, total VOC emissions are anticipated to halve in quantity under the proposed terminal operations. These reductions are due to a range of changes proposed as part of the Project. Total VOC emissions from storage tanks were estimated at 705 t for the current operation, as compared to 453 t under the proposed terminal operation. This is primarily associated with the removal of storage requirements for crude oil and intermediate products. In addition, the closure of the refinery process would result in a reduction of 142 t/year of VOCs when compared to the existing operation. These emissions were from both point sources (86 t) and fugitive sources (55 t) associated with the current refinery operations.

Figure 13-4 Change in Emissions Profile with Conversion of the Site

In addition, it is expected that with the retirement of refinery sources and associated plant, emissions of hydrogen sulphide (which possesses a potent rotten egg-like odour) would be significantly reduced. It is noted that these estimated reductions in emissions of VOCs and combustion pollutants would be a beneficial outcome of the Project.

Odour

As discussed in **Section 13.4.2**, odour has been a key issue of community concern near to the existing Site. It is expected that the closure of the refinery component of the Site would result in a significant reduction in the emission of odorous sulphur and VOC-based compounds. In addition, with the change in emissions profile, the sensitivity of nearby receptors to odour may also be modified. Whilst a significant reduction in odour emissions is expected, it is not anticipated that odour issues would be completely eliminated as part of the Project.

Given the established understanding of odour matters around the Site, a quantitative assessment of odour has not been undertaken within this AQIA. Noting this, Caltex propose to continue to manage odour through the odour reduction program that is currently implemented through the EPL for the Site (EPL no. 837). These measures are discussed in **Section 13.7.2**.

Emissions Estimation

This section provides an overview of the emission estimations from the operational phase of the Project. The emissions were estimated for each of the emission sources identified in **Section 13.4.3** and the operational emissions profile for the proposed operation of the Project.

Storage Tanks

Based on the estimated annual throughput of Products during the operational phase of the Project, Caltex is able to calculate predicted fugitive emissions from storage tanks at the Site on a tank by tank basis using a computer model called (TANKS). The predicted fugitive emissions of VOCs from the tanks is summarised in **Table 13-5**.

Table 13-5 Summary of Site Tank VOC Emission Estimates

Source	Emissions (kg/year)					
	Benzene	Toluene	Ethylbenzene	Xylenes	n-Hexane	Total VOCs
Tanks	2,968	6,426	603	2,928	6,450	452,608

Product Transfer Infrastructure

During operation of the Project, fugitive emissions have potential to occur from equipment that is used to move product around the Site. This includes fugitive losses from plant items such as pumps (seals), valves and pipes. The quantity of infrastructure on the Site means that the estimation of such losses is a complex exercise. In order to simplify this estimate, the “Yardlines” Total VOC emission estimate from the 2010/2011 NPI reporting year has been used. To provide a simple and conservative means of incorporating these emissions into the assessment, it has been assumed that they originate entirely from the OMC. This simplification is considered appropriate given that the OMC is the location of the piping manifolds and pumps, and is likely to constitute a significant proportion of the total Yardlines emissions.

Table 13-6 provides a summary of the Yardlines emissions estimates.

Table 13-6 Estimates of Yardlines Emission Estimates

Source	Emissions (kg/year)					
	Benzene	Toluene	Ethylbenzene	Xylenes	n-Hexane	Total VOCs
Yardlines	103	1,001	20	1,032	198	11,492

Land Farm

Land farm emissions have been estimated based on the source emission testing that was performed in 2005 using Isolation Flux Hoods (IFH's) by Coffey Geosciences P/L (Coffey, 2005). IFH sampling was conducted at three separate locations on the land farm. **Table 13-7** shows the estimates of land farm surface emissions.

Table 13-7 Summary of land farm surface emissions estimates

Source	Emissions (kg/year)					
	Benzene	Toluene	Ethylbenzene	Xylenes	n-Hexane	Total VOCs
Land Farm	3.5	1.6	5.3	41	113	4,369

Summary of Emissions

Table 13-8 presents a summary of emission estimates from the operation of the Project. Storage tanks were estimated to be the primary emission source, constituting approximately 97% of annual Total VOC emissions from the Site.

Table 13-8 Summary of emission estimates from terminal operations

Source	Emissions (kg/year)					
	Benzene	Toluene	Ethylbenzene	Xylenes	n-Hexane	Total VOCs
Tanks	2,968	6,426	603	2,928	6,450	452,608
Yardlines	103	1,001	20	1,032	198	11,492
Land Farm	3.5	1.6	5.3	41	113	4,369
Total	3,074	7,429	628	4,002*	6,760*	468,469

** It is noted that these totals are slightly different to actual totals from the numbers above. This slight discrepancy is due to rounding up or down when these figures were summarised.*

Dispersion Modelling Results

The results of the dispersion modelling were compared against OEH impact assessment criteria and the NEPM criteria identified in **Section 13.4.2**.

Short Term Model Predictions

Table 13-9 shows a summary of short-term model predictions as the 99.9th percentile 1 hour averages. These criteria are incremental, meaning that they apply to the incremental impact from emissions from the pollutant source alone. All concentrations at receptors R1 to R11 and at the Site boundary are compliant with the OEH impact assessment criteria. Concentrations for all substances other than benzene were less than 10% of OEH impact assessment criteria. Benzene was less than half of the OEH criterion at the Site boundary, with an estimated incremental impact of 13.5 µg/m³ on the eastern boundary of the Site. As Benzene is predicted to present the largest potential impact, the predicted 99.9th percentile 1 hour average benzene concentration during the operational phase of the Project is shown in **Figure 13-5**.

Table 13-9 Predicted 99.9th percentile 1 hour average concentrations

Receptor	Model Prediction ($\mu\text{g}/\text{m}^3$)				
	Benzene	Toluene	Ethylbenzene	Xylenes	n-Hexane
R1	2.2	6.2	0.6	4.1	4.5
R2	2.5	5.9	0.7	4.0	4.2
R3	2.6	6.7	0.7	4.0	4.6
R4	3.0	7.5	0.8	4.2	5.7
R5	4.9	12.5	1.6	8.3	8.2
R6	8.5	20.1	3.9	14.7	12.8
R7	9.6	20.6	4.9	12.0	13.0
R8	9.2	20.5	3.7	10.2	18.0
R9	7.7	18.5	2.1	8.3	15.2
R10	8.5	21.6	2.4	9.3	17.9
R11	8.8	23.3	2.2	11.6	20.2
Maximum (R1-R11)	9.6	23.3	4.9	14.7	20.2
Maximum (off-Site)*	13.5	35	5	19	37
Impact Assessment Criterion	29	360	8,000	190	3,200

Note:*Off-site concentrations estimated using kriging interpolation method.

Long Term Model Predictions

Table 13-10 presents a summary of long term model predictions as annual averages. These criteria have been applied to the cumulative impact from emissions from the pollutant and background levels.

From **Table 13-10**, it can be concluded that concentrations at receptors R1 to R11 and at the Site boundary are below the NEPM (Air Toxics) criteria. Emissions from the Site make a minor contribution to predicted cumulative (i.e. the Site and wider background) concentrations. A contour plot for an annual average prediction of benzene concentration is presented in **Figure 13-6**.

Table 13-10 Predicted annual average concentrations

Receptor	Model Prediction ($\mu\text{g}/\text{m}^3$)		
	Benzene	Toluene	Xylenes
R1	0.1	0.2	0.1
R2	0.1	0.2	0.1
R3	0.1	0.2	0.1
R4	0.1	0.2	0.1
R5	0.2	0.4	0.2
R6	0.5	1.0	0.6
R7	0.5	0.9	0.5
R8	0.4	0.8	0.4
R9	0.3	0.7	0.3
R10	0.4	1.0	0.4
R11	0.5	1.2	0.5
Maximum R1-R11	0.5	1.2	0.6
Background Concentration	1.2	6.8	5.2
Maximum R1-R11 (Including Background)	1.7	8.0	5.8
NEPM (Air Toxics) Criterion	9.6	377	870

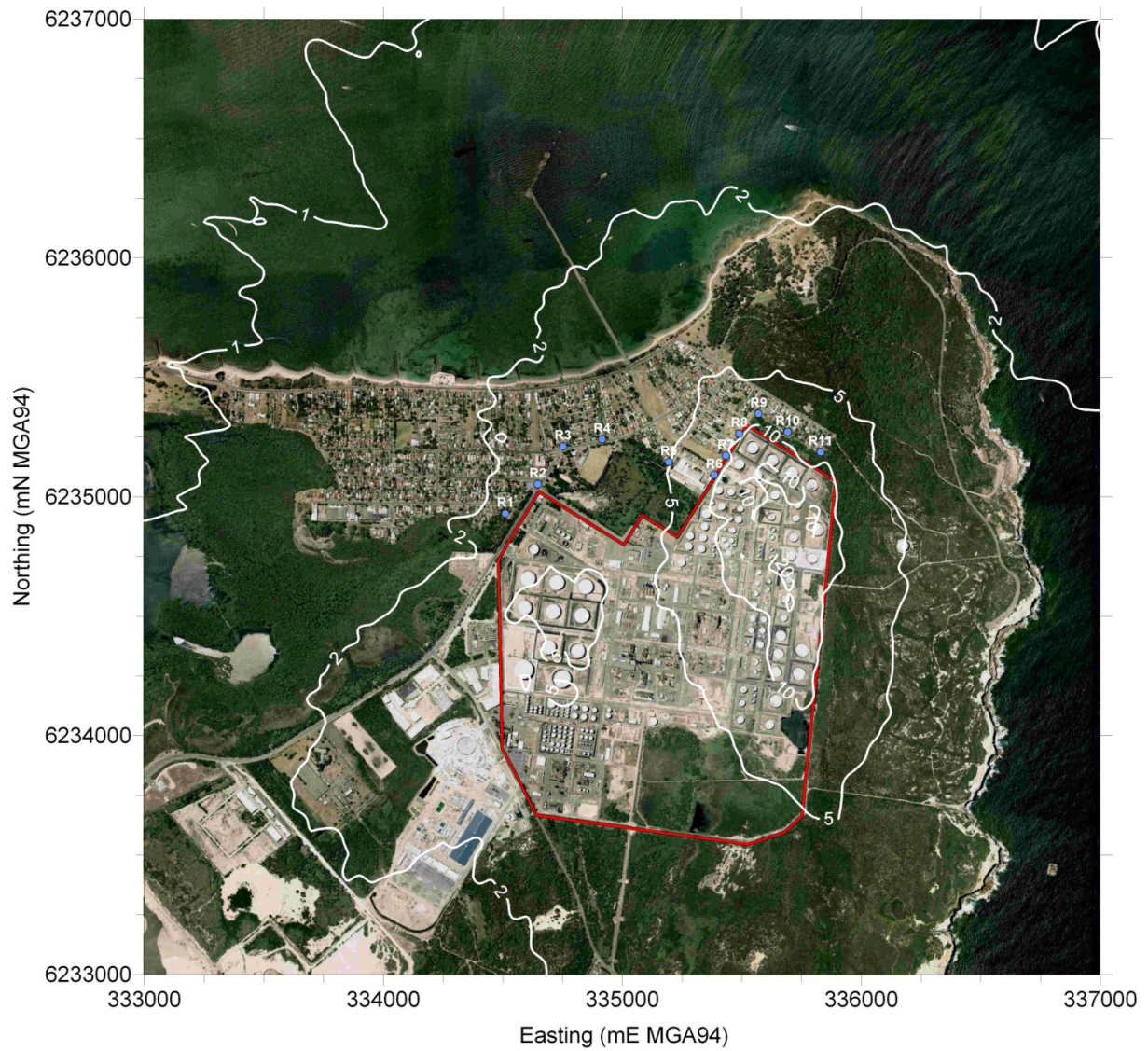
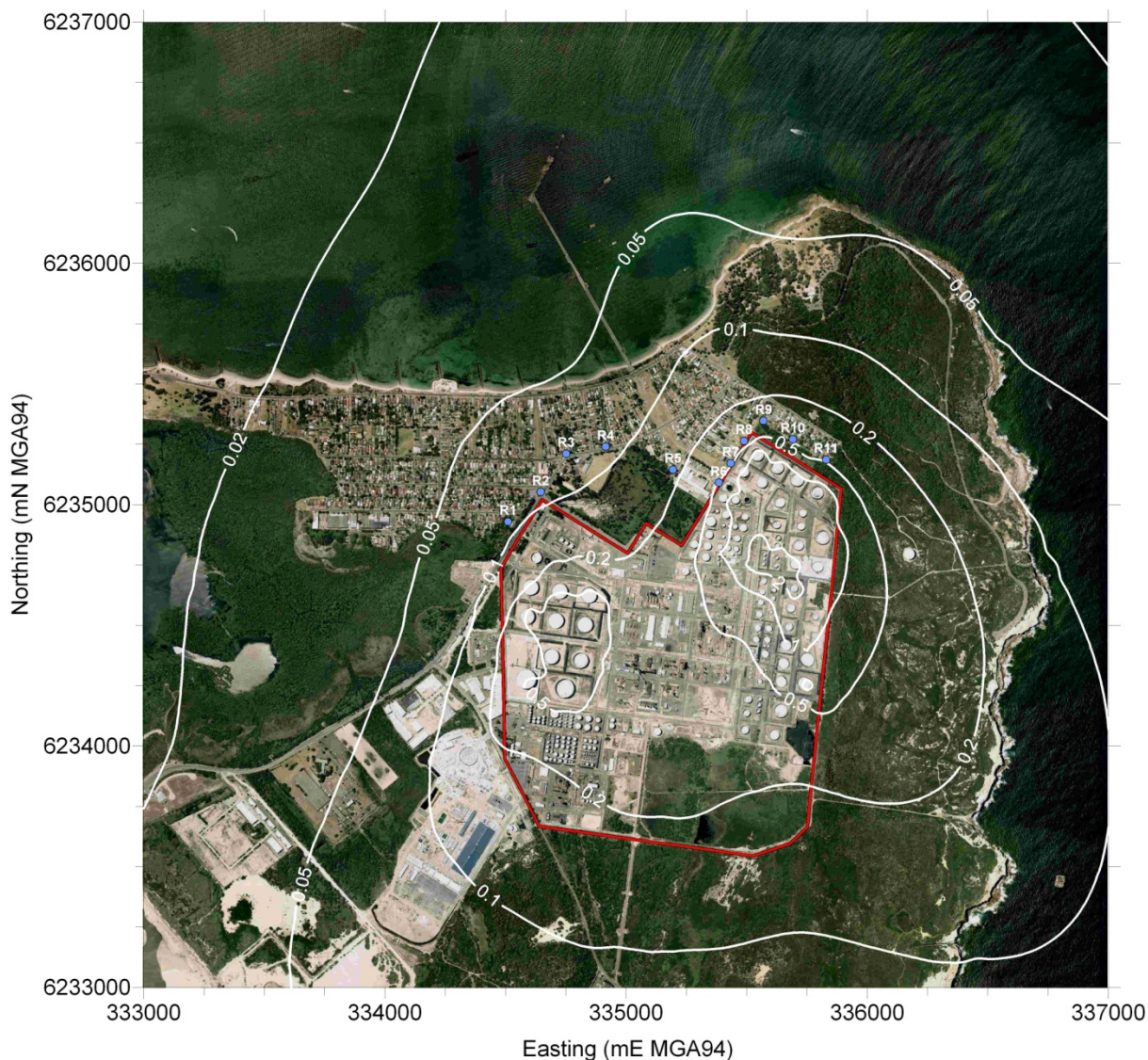
Figure 13-5 Predicted 99.9th percentile 1 hour average benzene concentration

Figure 13-6 Predicted annual average benzene concentration

Concentration contours shown in $\mu\text{g}/\text{m}^3$

(Aerial image sourced from Google Earth Pro)

Impact Assessment Conclusion

The results of the dispersion modelling show that the key pollution sources for the Project do not exceed OEH and NEPM criteria. Based on the information reviewed and the assessment performed, the potential for the Project to result in adverse air quality impacts during operation is considered to be low.

Additionally, relative to existing operations, total VOC emissions are anticipated to halve in quantity during the operational phase of the Project. These reductions are due to a range of changes proposed as part of the Project. Total VOC emissions storage tanks were estimated at 705 t/year for the current operations (base year), as compared to 453 t/year under the Project Operation. This is primarily associated with the removal of storage requirements for crude oil and intermediate products. In addition, the closure of the refining operations would result in a reduction of 142 t/year of VOCs against the base year.

Equally emissions of NO_x, carbon monoxide, sulphur dioxide, particulate matter and hydrogen sulphide would all significantly reduce following the cessation of refining at the Site, resulting in a beneficial outcome to local air quality.

13.7 Mitigation

13.7.1 Construction Mitigation

As discussed previously, given the minor scale and progressive nature of the conversion activities, the potential for these operations to adversely impact air quality is considered small, and most appropriately managed through the implementation of an Air Quality Management Plan (AQMP) to be included under the CEMP. The AQMP will include the following:

- Daily activities would be reviewed in the context of potential air emissions and mitigation measures;
- Activities undertaken in line with the existing maintenance procedures on the Site (e.g. the shut down, depressurisation and de-inventory of the refinery infrastructure) would be managed and monitored to be compliant with the relevant EPL in order to ensure no adverse air emissions.
- Workers would maintain a visual awareness of dust emissions, and a general awareness of potential odour emissions. During activities with the potential to create dust emissions, a designated worker would continuously monitor downwind emissions and call a halt to activities if the wind direction is towards the community or other sensitive on-site receiver locations (e.g. offices, car parks);
- Vehicle movements on unsealed areas would be minimised, and vehicles would travel on designated roadways where feasible;
- Where there is the potential for dust or odour generation, trucks carrying spoil loads would be covered. Tailgates on all trucks would be securely fixed prior to loading and immediately after unloading of materials. Loads would be less than the height of the side and tailboards of the trucks;
- Soil adhering to the undercarriage and wheels of trucks would be removed prior to departure from the works area where there is the potential for sediment to enter drains or for dust generation;
- Vehicles traveling at speed would avoid generating excessive amounts of dust. The maximum speed of vehicles in construction areas would be 10km/hr, and 25 km/hr elsewhere in the refinery;
- Construction activities would be minimised or ceased during undesirable weather conditions or forecasts (e.g. periods of high winds) near sensitive receptors or when offensive odours are noticed by receptors;
- Plant, equipment and vehicles shall be maintained and operated in accordance with the manufacturers specifications to minimise the emission of air pollutants and offensive odours and minimise the generation of dust;
- Plant or equipment would not to be left/parked with the motors running when not in use;
- Excavated soils would be assessed for odour as/if they are stockpiled, and would be controlled in order to manage potential odour or dust emissions;
- The effectiveness of any dust controls implemented would be visibly assessed and adjustments made accordingly;
- All concrete cutting and coring would to be undertaken using "wet tools"; and

- If excess dust is observed, due to extreme weather conditions or construction activities (e.g. high winds, surface dirt accumulation, etc.), work would cease or be phased down while the cause is being actively investigated and suppression measures are implemented.

13.7.2 Operational Mitigation

Caltex currently implements a range of management programs in order to address emissions from the Site under refinery operation. These programs would continue into the operational phase of the Project albeit in a modified form. Details of the programs proposed by Caltex are provided in the sections below.

Odour Reduction Program

An odour reduction program (ORP) is in the process of being introduced as part of the current EPL for the Site. The ORP involves a two stage process wherein stage one assesses odours associated with the operation, while stage two implements measures that would reduce odour from the Site. It is proposed that the ORP assessment program will be carried out as designed but that the implementation of any required mitigation measures would be adapted in order to target odour emission sources that are of potential significance for the Project.

Land Farm

As part of the Environment Protection Licence's Pollution Reduction Program (PRP), Caltex is committed to evaluate alternative options for the sustainable management of oily wastes/sludges that will facilitate Caltex to cease land farming at the premises.

Caltex is in the process of developing a management plan for the landfarm; incorporating options for the long term remediation, in line with, and as part of the Site's remediation plan. The land farm management plan will also include a review of terminal related oily wastes/sludges and their management in a sustainable manner.

Land farm management and waste management during the Project would be included in the CEMP for this project.

Tank Sleeve System

Caltex is in the process of implementing a trial program investigating the use of sleeves on the guidepoles on EFRTs. In view of the Project, Caltex has proposed not to carry out a trial program but to start the implementation of tank sleeves on all EFRTs that would be in gasoline service. These works would start during Project construction and would continue during the operational phase.

The guidepoles on EFRTs have been identified as one of the highest sources of VOC emissions from tanks. To reduce these emissions, a sleeve consisting of a transition box and a flexible enclosure that encapsulates the whole guidepole is attached to the floating roof. Preliminary assessments of the effectiveness of these sleeves have indicated that VOC emissions from EFRTs can be reduced by 50%. It is also noted that in order to maintain a conservative assessment of the impacts of the Project on air quality, modelling within this AQIA has assumed that the tank sleeves would be absent.

Leak Detection and Repair

Caltex have a well-established Leak Detection and Repair (LDAR) Program at the Site, a requirement of the current Site EPL. The LDAR Program is a monitoring program that involves technicians monitoring components such as valves and pumps in order to detect hydrocarbon leaks, which are a known source of odour. Caltex propose to continue the LDAR Program for the Project whilst the refinery is in operation.

Following the shutdown of refinery operations the LDAR program would be modified to a tanks and lines monitoring program due to the reduction in potentially emissive infrastructure at the Site.

13.8 Summary

A number of mitigation measures have been suggested to ensure that impacts during construction and operation of the Project are minimised as far as is practically possible. These are summarised in **Table 13-11**.

Table 13-11 Management and Mitigation measures - Air Quality and Odour

Management and Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
Dust emissions from the construction phase of the Project would be monitored by construction staff. A designated worker would continuously monitor downwind emissions to the community or local residents and call a halt to activities if sensitive receptors are likely to be affected by airborne particulate matter. Should significant impacts be likely, appropriate measures would be taken to mitigate any adverse air quality effects.		✓	
Within the refinery, construction vehicles would only travel on designated roads and would be limited to a maximum speed of 10 km/hr in construction areas, and 25 km/hr elsewhere.		✓	
Where there is the potential for dust or odour generation, trucks carrying spoil loads would be covered and all tailgates would be securely fastened. Vehicles would not be loaded higher than the sides and tailboard.		✓	
Construction activities would be limited during high wind events if sensitive receptors are likely to be significantly impacted.		✓	
Construction plant would be maintained and operated in line with the manufacturer's specifications in order to minimise the emission of air pollutants and offensive odours. Plant and construction vehicles would be turned off when not in use.		✓	
Stockpiled material would be assessed for the potential for causing odorous or particulate emissions. If air pollutants and offensive odours are likely, controls would be put into place to manage any adverse affects.		✓	
All concrete cutting and coring would to be undertaken using "wet tools".		✓	
An odour reduction program would be implemented in accordance with the existing EPL.			✓
The guidepoles on the EFRTs in gasolise service would be fitted with sleeves.		✓	✓
Caltex's Leak Detection and Repair (LDAR) Program would continue during Project construction and operation.		✓	✓

14 Greenhouse Gas

14.1 Introduction

This chapter assesses the potential impact of greenhouse gas (GHG) emissions associated with the Project.

14.2 Scope of Assessment

The Director General's Requirements (DGRs) have requested that GHG be assessed, including:

- *a quantitative analysis of the Scope 1, 2 and 3 greenhouse gas emissions of the development;*
- *a qualitative analysis of the impacts of these emissions; and*
- *details of the measures that would be employed to improve energy efficiency.*

Given the DGRs, the scope of the GHG assessment includes the following:

- a quantitative estimate of GHG emissions associated with the Site's operation as a finished product terminal;
- a comparison of these emissions with the current operation of the Site as a refinery, to outline potential changes in the GHG emissions profile for the Site; and
- a list of mitigation measures that would be implemented during the construction and operation of the Site to reduce GHG and their effects.

14.3 Legislation and Planning Policy

14.3.1 International Policy

Policy relating to the assessment of greenhouse gases (GHGs) within Australia is based on international approaches and guidance as described in the Kyoto Protocol, and international agreement created under the United Nations Framework Convention on Climate Change (UNFCCC), that sets binding obligations on industrialised countries to reduce emissions of greenhouse gases. The Kyoto Protocol was ratified by Australia in December 2007.

14.3.2 Commonwealth Legislation and Policy

The Project would need to operate in accordance with the following Commonwealth policies and legislation:

- *Clean Energy Legislation Amendment Act (CELA) 2012; and*
- *National Greenhouse and Energy Reporting (NGER) Act 2007.*

The NGER Act establishes a national framework for Australian corporations to report Scope 1 and Scope 2 GHG emissions, reductions, removals and offset, and energy consumption and production from 1 July 2008. With more than 50 sites around Australia, Caltex's operations have been reporting under the NGER Act. As of the 5 March 2012, Caltex Australia Limited reported 1,869,326 t CO_{2-e} total Scope 1 GHG

emissions, and 315,115 t CO_{2-e} total Scope 2 GHG emissions.¹ The CELA Act was passed in June 2012. The CELA Act makes amendments to the *Clean Energy Act 2011* and related legislation establishing the Government's carbon pricing mechanism. Companies operating large emitting facilities will be subject to the carbon pricing mechanisms operating in Australia (i.e. those companies whose facilities emit over 25,000 tonnes of CO_{2-e} emissions each year).

In addition to this legislation additional Commonwealth initiatives are in place to support reductions in carbon emissions and encourage market development of cleaner and more efficient energy production. The Clean Energy Future (CEF) initiative, promotes the adoption of policies and measures that will work towards a clean energy future for Australia, while Energy Efficiency Opportunities (EEO) initiative promotes opportunities to improve energy efficiency. Caltex Australia Limited has been an active member in the EEO Program, reporting GHG emissions from 2006 to 2011 from the Lytton and Kurnell Refineries. As a result of this program a number of measures to improve energy efficiency have been identified. This is discussed in **Section 14.5.2**.

14.3.3 NSW State Policy

NSW Greenhouse and Climate Change Action Plan

This Action Plan was released in November 2005 and provides a strategic approach to addressing climate change issues in NSW between 2005 and 2008, and beyond. The plan sets out actions to reduce GHG emission by the NSW Government. It also sets out measures through which the NSW Government would work with stakeholders in order to reduce GHG emissions from their activities.

Recently the NSW 2021 plan (discussed below) was released. It describes the NSW Government's agenda for addressing climate change issues in NSW.

NSW Greenhouse Gas Reduction Scheme (GGAS)

The NSW Greenhouse Gas Reduction Scheme (GGAS) is a mandatory greenhouse gas emissions trading scheme that aims to reduce GHG emissions associated with the production and use of electricity. It was put in place in 2002 through amendments to the *Electricity Supply Act 1995* and the *Electricity Supply Regulation 2001*, and commenced operation on 1 January 2003.

On 5 April 2012, the Minister for Resources and Energy announced the closure of GGAS, effective 1 July 2012, due to the commencement of the Commonwealth carbon pricing mechanism.

NSW 2021 – A Plan to Make NSW Number One

The NSW 2021 plan includes the NSW Government's key targets in relation to addressing GHGs and climate change issues. These include:

- completion of fine-scale climate change projections for NSW, making them available to local councils and the public by 2014; and
- work with government agencies and universities to deliver improved climate projections for NSW and the ACT.

¹ Information reported to the Greenhouse and Energy Data Officer, publically available at <http://www.climatechange.gov.au/en/government/initiatives/national-greenhouse-energy-reporting/publication-of-data/nger-greenhouse-energy-information-2010-11.aspx>

NSW 2021 also identifies goals and targets that support practical action to tackle climate change issues in NSW including:

- introducing a target for 20% renewable energy by 2020; and
- assistance for businesses and households to realise annual energy savings of 16,000 gigawatt-hours by 2020 compared with 'business as usual' trends.

14.4 Method of Assessment

14.4.1 Greenhouse Gases

GHGs in the earth's atmosphere absorb and radiate infrared radiation (heat) reflected from the earth's surface. The most abundant of these gases are carbon dioxide (CO₂) and water (H₂O). Other naturally occurring greenhouse gases such as methane (CH₄) and nitrous oxide (N₂O) are present in the atmosphere in much smaller quantities.

The less abundant GHGs (e.g. CH₄ and N₂O) are much more efficient in trapping infrared radiation than CO₂. 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-CO₂ greenhouse gas compared to one kilogram of CO₂, over a defined time frame. For example, over a 100 year time-frame, methane traps approximately 21 times as much infrared radiation as CO₂, and nitrous oxide traps approximately 310 times as much infrared radiation as CO₂. When compiling greenhouse gas inventories, this difference in greenhouse potential is accounted for by converting the mass of each non-CO₂ greenhouse gas emitted into a CO₂ equivalent (CO_{2-e}) amount, using the GWP for each particular non-CO₂ gas.

14.4.2 Estimating GHG Contributions

Greenhouse gas emission estimates for the Project have been based on:

- The Australian National Greenhouse Accounts Factors (DCCEE,2012a); and
- Project specific activity data (e.g. electricity consumption, and liquid fuel combustion).

Quantitative GHG emission estimations have focused on Scope 1 and Scope 2 emissions (as outlined in **Section 14.2**). Emissions have been defined as Scope 1, Scope 2 or Scope 3 in accordance with the detail provided 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 (in this case Caltex). 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 Site. Scope 2 emissions physically occur at the facility where the energy product 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 are:

- extraction, processing and transport of materials or fuels; or
- use of sold products and services.

Scope 3 emissions associated with the use of sold products such as fuels are reportable as Scope 1 emissions from the facilities that consume the fuels.

14.4.3 GHG Assessment

The assessment of GHG emissions has been completed by quantitatively estimating emissions associated with the current use of the Site with the proposed operation of the facility as a finished product terminal. These two scenarios are as follows:

- **Existing Operation.** Incorporating activity data for the 2010-2011 reporting year. This includes electricity consumption data from the now decommissioned Caltex Lubricating Oil Refinery (CLOR); and
- **Proposed Operation.** Incorporating estimates of activity data for the future operations of the Site as a finished product terminal. and as well as following the decommissioning of the CLOR.

GHG emissions associated with these two scenarios are likely to occur from the combustion of fuels (Scope 1) and consumption of purchased electricity from the grid (Scope 2). Predictions of GHG emissions from these sources in the existing scenario have been estimated from emission factors and Caltex provided records of fuel and electricity consumption for the 2010 – 2011 financial year. Predictions of GHG emissions for the proposed scenario have been estimated based on emission factors and assumptions of anticipated fuel and electricity consumption.

Given that the facility would continue to provide approximately the same liquid fuel products to the NSW and ACT markets, the downstream (Scope 3) emissions associated with the combustion of these produces are expected to remain at similar levels between the two scenarios. Therefore these Scope 3 emissions have not been quantified.

14.5 Existing Environment

14.5.1 Australia and NSW

Existing accounts of greenhouse gases provided by the Department of Climate Change and Energy Efficiency (DCCEE 2012b) estimate that approximately 559.7 Mega tonnes (Mt) of CO_{2-e} was emitted in Australia during the 2009-2010 financial year. A breakdown of the individual state and territory contributions is shown in **Table 14-1** below.

Table 14-1 Australian State and Territory GHG Emissions 2009-10 (DCCEE 2012b)

State or Territory	Total Emissions (Mt CO _{2-e})	% of Total
NSW	157.4	28.1 %
Queensland	157.3	28.1 %
Victoria	117.9	21.1 %
Western Australia	74.3	13.3 %
South Australia	29.3	5.2 %
Northern Territory	14.7	2.6 %
Tasmania	7.6	1.4 %
Australian Capital Territory	1.2	0.2 %
External Territories	< 0.1	< 0.1 %
Total	559.7	100 %

In New South Wales, the energy sector reported the highest contribution to the 2009-2010 inventory with 119.4 Mt CO_{2-e} emitted compared to the state total of 157.4 MT CO_{2-e}.

14.5.2 Kurnell Refinery

GHG emissions associated with the existing refining operations have been estimated to be 965,180 t CO_{2-e} (refer to **Section 14.6.2**), which represents approximately 0.6 % of the NSW inventory.

Ongoing commitments to energy reductions by Caltex through the EEO program have identified a number of opportunities at the Site for energy savings (refer to **Section 14.3.2**). Savings have been estimated as potentially being up to 1,120,845 GJ (7 % of the energy consumed as a Scope 1 source) per annum.

14.6 Impact Assessment

14.6.1 Construction Phase

The additional direct GHG emissions (Scope 1) generated 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 delivery trucks and cranes. Emissions from electricity use (Scope 2) are expected to be negligible as construction equipment is predominately fuel based. Indirect emissions (Scope 3) would be present in the form of embedded emissions associated with the construction material, e.g. steel and concrete.

Given the proposed retention of infrastructure at the Site, GHG emissions during the construction phase are considered immaterial when compared to the GHG emissions associated with the current refining operations (a known energy intensive operation). Hence GHG emissions during construction have not been quantified.

14.6.2 Operational Phase

Table 14-2 provides a summary comparison of the estimation of GHG emissions for the two scenarios considered; refer to **Section 14.4.3** for a description of these scenarios. The table includes the activity data and emission factors utilised in the estimation of these emissions.

There would be a significant decrease in emissions from the existing operation scenario to the proposed operation scenario, from 965.2 kilo tonnes to 23.6 kilo tonnes of CO_{2-e} respectively. This is mainly attributable to the cessation of refining activities on the Site, however a portion is attributable to the now decommissioned CLOR. This represents a positive impact from the Project.

The estimated GHG emissions associated with the proposed operation scenario represents approximately 0.02 % of the NSW inventory, and as a consequence has a minor impact on the overall GHG inventory of the State.

Table 14-2 GHG Emission Estimates for the Scenarios Considered

Source	Emission Factor ¹		Activity Data ²			GHG Emissions (t CO _{2-e})	
	Value	Units	Existing Operation (2010 – 2011)	Proposed Operation (2016 +)	Units	Existing Operation (2010 – 2011)	Proposed Operation (2016 +)
Scope 1 – Direct Emissions							
Diesel	69.5	kg CO _{2-e} / GJ	18,828	2,285	GJ	1,309	159
Fuel Oil	73.13	kg CO _{2-e} / GJ	216,153	0	GJ	15,807	0
Natural Gas	51.33	kg CO _{2-e} / GJ	214,454	0	GJ	11,008	0
Fuel Gas & Flare Gas	51.33	kg CO _{2-e} / GJ	15,524,758	0	GJ	796,886	0
Scope 2 – Indirect Emissions							
Purchased Electricity	0.88	kg CO _{2-e} / kWh	159,285,026	26,692,735	kWh	140,171	23,490
Total Scope 1 and 2 Emissions						965,180	23,649

Notes:

¹ Emission factors adopted from DCCEE (2012a)

² 2010-2011 and 2011-2012 activity data supplied by Caltex. Fuel quantities were converted from tonnes to GJ based on the following energy contents:

- Diesel: 45.7 GJ/tonne
- Fuel Oil: 43.8 GJ/tonne
- Natural Gas: 53.6 GJ/tonne

No fuel oil, natural gas or flare gas would be combusted during operation of the Project. Caltex estimate that approximately 50 tonnes/yr of diesel would be consumed by on-site vehicles during the operation of the Project.

Electrical tracing would be used to keep fuel oil at a constant temperature, i.e. no natural gas fired boilers are required.

Electricity use for the future scenario assumed to be 20 % of current usage (i.e. 2011- 2012 data), as per Rowe (2012).



14.7 Mitigation

Mitigation measures for potential GHG saving opportunities would be included within the Construction Environmental Management Plan (CEMP) for the construction phase. These would include procedures for the maintenance and inspection of all construction equipment to ensure equipment is of an appropriate size for the nature of the works, and is working in an efficient manner, so as to minimise GHG production from their use. In addition local supplier and/or facilities would be utilised where reasonable and feasible to minimise vehicle kilometres travelled, so as to minimise GHG from material transport.

GHG emissions during operation of the Project have been estimated to be approximately 2.5 % of emissions from the existing operation scenario. This is a significant reduction in GHG production and is considered minor (i.e. less than 0.05%) within the context of total NSW GHG emissions reported in 2009 – 2010 (refer to **Table 14-1**).

Identification of energy efficiency saving opportunities associated with the operation of the Project would be conducted during the detailed design phase.

14.8 Summary

The GHG assessment has concluded that GHG emissions would significantly reduce from the operation of the Site as a finished product terminal compared to the existing operating scenario. A large portion of the GHG reductions would be expected to be a direct result of the cessation of refining operations; however a portion of the GHG savings would be attributable to the now decommissioned CLOR.

Table 14-3 outlines the mitigation measures to be implemented throughout the Project.

Table 14-3 Management and Mitigation Measures– Greenhouse Gas

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

15 Socio-Economic

15.1 Introduction

This chapter provides the socio-economic assessment that has been undertaken for the Project to address the requirements of the Director General's Requirements (DGRs).

15.2 Scope of the Assessment

The DGRs state that the assessment should follow appropriate methodologies as indicated by the *"Draft Economic Evaluation in Environmental Impact Assessment"* (PlanningNSW, 2003).

A desktop assessment has been undertaken of local and state level impacts of the Project, and actions to mitigate any negative impacts have been outlined.

15.3 Method of Assessment

15.3.1 Overview

The following tasks have been undertaken in order to understand the socio economic impacts related to the Project:

- baseline description – the study area is defined, with a profile of demographic characteristics of the local area and region, along with a description of the current economic activities with the existing refinery operation.
- project description – a summary of the Project's potential impact on the local/state economy are presented. Construction and operational phases of the Project are described in terms of capital investment and employment. A breakdown of the source of inputs is provided.
- impact assessment - using the information gathered on aggregate expenditures, and associated breakdowns between capital and labour and local expenditure, a regional impact assessment has been undertaken of the consequential changes. These changes are indicated in terms of aggregate investments and employment changes.
- impact mitigation description - measures to minimise potential adverse impacts of the Project are described including opportunities to maximise the beneficial impacts including retraining and redeployment opportunities that might be available during transition phases of the Project.

15.3.2 Study Area

The Site is located on the Kurnell Peninsula within the Sutherland Shire Local Government Area (SSLGA), approximately 15 km south of Sydney's CBD. Data held by Caltex indicates that approximately 70 per cent (%) of refinery staff reside in the SSLGA. Therefore to provide a benchmark and comparison of the primary impact area against other local areas, data has been presented for the Local Government Area of Sutherland Shire (LGA 17150) (referred to as the 'study area'), Greater Sydney, and for NSW as a whole.

15.3.3 Demographic Analysis

The statistical demographic analysis is largely based on results of the most recent census data from the Australian Bureau of Statistics (ABS, 2011).

15.3.4 Economic Evaluation

The “*Draft Economic Evaluation in Environmental Impact Assessment*” EIA guidelines, published by PlanningNSW in 2003 (referred to as ‘the guidelines’ for this chapter), were recommended by the NSW Department of Planning and Infrastructure (DP&I) as the basis for defining a methodology to undertake this socio-economic impact assessment. This assessment follows those guidelines by including the economic assessment as a distinct component of the EIS.

The guidelines suggest that the main aims of an economic analysis should be to:

- assess whether specific development proposals are desirable on economic efficiency grounds;
- provide a framework for the evaluation of feasible alternatives (options); and
- assist in the design of economically efficient environmental mitigation and protection measures.

Additional information that may be a necessary includes:

- regional or state-wide economic impacts; and
- financial aspects of the proposal including the pricing of outputs or services supplied by the development.

Table 15-1 outlines the assessment requirements and methods suggested by the guidelines for the associated analyses.

Table 15-1 Assessment Requirements for Consideration

	When undertaken	Reasons for undertaking	Possible methods
Economic Efficiency Analysis	Always	Economic efficiency	Benefit-Cost Analysis, Cost Effectiveness Analysis
Economic Impact Analysis	Sometimes	Economic and distributional impacts	Input-Output Analysis, Computable General Equilibrium Analysis
Financial Analysis	Sometimes	Financial viability	Discounted cash-flow or other
Fiscal Analysis	Sometimes	Fiscal impacts	Fiscal assessment, pricing and funding costs

Source: PlanningNSW, (2003)

As outlined in **Chapter 2 Project Need and Alternatives**, this Project is being undertaken following Caltex’s review of their refining operations in May 2011.

This Project is being proposed on the basis of economic efficiency and continuing to supply a reliable source of finished product to NSW. This has been based on Caltex’s internal assessment of economic efficiency. This is not provided within this EIS as the information is commercial-in-confidence.

This EIS assesses the economic impacts of the Project using Input-Output Analysis, as recommended under the draft guidelines published by PlanningNSW (2003). This has been supplemented with some socio-demographic profiling of the workforce and the area in which most of the workers reside.

Financial analysis has also been undertaken but this has not been provided as the information is commercial-in-confidence.

Fiscal analysis is not warranted for this assessment as Caltex is not seeking public funding to facilitate the Project.

15.3.5 Input-Output Analysis

The Input-Output tables for the Australian economy produced by the ABS (ABS, undated) provide the means to estimate the impact of the Project on the local economy. 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. Multipliers are summary measures used for predicting the total impact on all industries in an economy, and of changes in the demand for the output of any one industry, such as the changes in demand that would result from investment into the Project 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.

15.4 Existing Environment

15.4.1 The Site

History and Recent Viability

The Site was commissioned in 1956 and is currently used for the receipt of crude oil and some refined products as well as the refining of crude oil delivered to the refinery via ships from Botany Bay.

Caltex initiated a review of their refining operations in May 2011, as refineries throughout Australia were competitively disadvantaged and were consequently losing money.

The Kurnell and Lytton refineries in their current configuration are relatively small and are disadvantaged compared to the modern, larger scale and more efficient refineries in the Asian region. This disadvantage has been exacerbated by the on-going strength of the Australian dollar, lower Caltex refining margins and increasing costs on the 'as is' refining business. *"The two refineries lost more than A\$200 million (\$208 million) in 2011, most of which was attributable to Kurnell. In the first half of 2012, refining recorded an operating loss of A\$53 million, with Kurnell's poor result offset by a small profit at Lytton, Caltex said in late August"* (Platts.com, 2012).

As a result of the refining review, Caltex is proposing to close the Kurnell Refinery and convert the Site to a finished product terminal (the 'Project'). The Project is required to support the safe, reliable supply of fuel to Caltex's marketing operations, and more broadly to ensure supply reliability of petroleum fuels to the NSW and ACT economy.

¹ ABS (undated), Catalogue No 5246.0, Information Paper; Australian National Accounts; Introduction to Input-Output Multipliers.

In arriving at this proposal, several alternatives were considered, including the performance of the Kurnell and Lytton refineries and various levels of investment in refining plant. The decision to close the refinery and convert the Site to a terminal was made following consideration of a wide range of criteria, including financial metrics, the level of risks involved in the alternatives, the impact on the marketing operations, the company's competitive position, Caltex's funding capacity and the feasibility to execute (including Caltex's internal capabilities and resourcing constraints). The Project was considered to be the only viable alternative.

National context of production volumes from Kurnell Refinery

The Kurnell Refinery has a production capacity of 135,000 barrels per day (b/d). Caltex (Kurnell) supplies around 40% of all transport fuels in NSW and posted sales of 15.7 billion litres in 2011. The company currently sources around 55% of its sales volume from its own refineries, but that would fall to 25% once (if approved) the refinery shuts down in 2014. Caltex estimated recently that imports would grow from 23% of the market in 2010 to 54% in 2015 and 60% in 2020 (Platts.com, 2012).

The closure of the refinery leaves Australia with five operating oil refineries, each with capacity of around 100,000 b/d. In addition to Lytton (Qld), the remaining refineries are owned by BP (Kwinana and Bulwer Island), ExxonMobil (Altona) and Shell (Geelong). The Australian petroleum products market totalled 53 billion litres in 2011, according to figures from the Bureau of Resources and Energy Economics. The (Australian) market is around 1 million b/d, making it small in comparison to Asia Pacific's total demand of 28 million b/d (Platts.com, 2012).

Residence location of Kurnell Refinery workers

The majority of staff live near the Site (with about 70% living within the study area (Sutherland Shire) and are employed on a full time basis.

Current Operational Workforce

As of October 2012 there were approximately 410 Caltex employees working at the Kurnell Refinery. There were also approximately 475 contractors employed by over 30 different contract companies (Caltex does not hold demographic or salary information for contractors). Maintenance shutdowns occur two to three times each year for up to 8 - 12 weeks at a time. During these periods there may be up to an additional 500 contractors working at the refinery – which equates to about 205 Full Time Equivalents (FTE).

15.4.2 Socio-Demographic Analysis

Selected demographic and income data

Table 15-2 shows that the median age of people in the study area is some three years older than for Greater Sydney, and one year older than for NSW as a whole. **Table 15-2** also shows that personal income and family income in study area is higher than for Greater Sydney and NSW. However, median mortgages and rents within the Sutherland Shire are also higher.

Table 15-2 Selected Demographics for the Study Area, Greater Sydney and NSW

Selected Medians and Averages	Sutherland Shire (study area)	Greater Sydney	NSW
Median age of persons	39	36	38
Median total personal income (\$/weekly)	718	619	561
Median total family income (\$/weekly)	2,014	1,683	1,477
Median total household income (\$/weekly)	1,674	1,447	1,237
Median mortgage repayment (\$/monthly)	2,400	2,167	1,993
Median rent (\$/weekly)	370	351	300
Average number of persons per bedroom	1.1	1.2	1.1
Average household size	2.7	2.7	2.6

Source: ABS 2011 Census of Population and Housing

Household weekly income for family households

Table 15-3 shows the weekly income for family households across a number of income categories. The proportion of families in the higher income brackets is higher in the study area than for Greater Sydney or for NSW.

Table 15-3 Household Weekly Income for Family Households

Total Household Weekly Income for Family Households	Sutherland Shire (study area)	Greater Sydney	NSW
\$1-\$199	0.8%	1.2%	1.3%
\$200-\$299	0.4%	0.8%	0.8%
\$300-\$399	0.8%	1.4%	1.6%
\$400-\$599	5.3%	7.3%	9.3%
\$600-\$799	5.9%	7.4%	8.9%
\$800-\$999	6.8%	7.4%	8.6%
\$1,000-\$1,249	6.5%	8.0%	8.7%
\$1,250-\$1,499	7.0%	7.9%	8.4%
\$1,500-\$1,999	13.8%	13.9%	14.0%
\$2,000-\$2,499	14.0%	12.4%	11.7%
\$2,500-\$2,999	13.6%	11.4%	9.8%
\$3,000-\$3,499	11.1%	8.5%	7.2%
\$3,500-\$3,999	5.3%	4.4%	3.5%
\$4,000 or more	8.8%	8.2%	6.1%

Source: ABS 2011 Census of Population and Housing

Education and training profile

Table 15-4 and **Table 15-5** provide a summary of education and training qualifications in the study area. **Table 15-4** presents the highest year of school completed and **Table 15-5** presents the levels of non-school qualification achieved. The proportion of people in the study area who have completed year 12 is lower than the mean for Greater Sydney but higher than for NSW. The proportion with year 10 as the highest level achieved is higher in the study area than Greater Sydney and NSW as a whole. People with postgraduate degree qualifications are proportionally less in the study area than either Greater Sydney or NSW, as are those with bachelor degrees. However, the proportion with advanced diplomas, diplomas, or certificate qualifications is higher than in those other areas.

Table 15-4 Highest Year of School Completed

Highest year of school completed	Sutherland Shire (study area)	Greater Sydney	NSW
Year 12 or equivalent	56.7%	60.1%	52.0%
Year 11 or equivalent	5.1%	5.7%	6.5%
Year 10 or equivalent	28.8%	21.5%	26.4%
Year 9 or equivalent	5.8%	6.0%	7.9%
Year 8 or below	3.2%	5.2%	6.1%
Did not go to school	0.4%	1.4%	1.1%

Source: ABS 2011 Census of Population and Housing

Table 15-5 Non-School Qualification

Non School Qualification	Sutherland Shire (study area)	Greater Sydney	NSW
Postgraduate Degree Level	6.7%	11.7%	9.5%
Graduate Diploma and Graduate Certificate	3.2%	3.3%	3.2%
Bachelor Degree Level:	27.4%	34.1%	30.2%
Advanced Diploma and Diploma Level:	19.4%	16.6%	16.1%
Certificate Level:	36.9%	27.7%	34.1%

Source: ABS 2011 Census of Population and Housing

Labour force and employment indicators

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.

The number of people employed in the study area was approximately 104,000 in 2011 (refer to **Table 15-6**). The mix of employment undertaken/available by people living in the study area compared against those living in the Greater Sydney area and across NSW and provided in **Table 15-7**. The proportional mix of occupations for people living in the study area is shown to differ from the Greater Sydney area and NSW means. There are less managers, professionals, and clerical and administrative workers, but more technicians and trade workers, and sales workers.

Table 15-6 Employment Numbers

Employed	Sutherland Shire (study area)	Greater Sydney	NSW
Full-time	70,369	1,358,191	2,007,925
Part-time	33,836	584,777	939,464
Total employed	104,205	1,942,968	2,947,389

Table 15-7 Occupation

Occupation	Sutherland Shire (study area)	Greater Sydney	NSW
Managers	11.7%	14.0%	13.5%
Professionals	20.7%	27.0%	23.0%
Technicians and trades workers	14.1%	10.9%	13.2%
Community and personal service workers	11.6%	8.8%	9.6%
Clerical and administrative workers	15.7%	17.1%	15.2%
Sales workers	13.6%	9.2%	9.4%
Machinery operators and drivers	4.1%	5.4%	6.3%
Labourers	7.7%	6.4%	8.6%

Source: ABS 2011 Census of Population and Housing

Table 15-8 shows the age of the labour force on the Site, in the study area, in Greater Sydney and in NSW. The Site has a proportionally older workforce than the study area and employs proportionally less people in the younger age groups from 15 – 29 years.

Table 15-8 Age of Labour Force

Age of Labour Force	Site (number of employees)	Sutherland Shire (study area)	Greater Sydney	NSW
15-19 years	0.2% (1)	8.6%	4.2%	5.1%
20-24 years	2.5% (11)	10.4%	9.2%	9.3%
25-29 years	5.3% (23)	8.9%	12.0%	10.9%
30-34 years	10.4% (45)	8.7%	12.2%	11.0%
35-39 years	10.8% (47)	10.3%	12.2%	11.6%
40-44 years	13.1% (57)	10.7%	11.7%	11.6%
45-49 years	12.9% (56)	11.1%	11.4%	11.7%
50-54 years	16.4% (74)	11.5%	10.4%	11.0%
55-59 years	15.2% (66)	9.2%	8.1%	8.7%
60-64 years	11.3% (49)	6.4%	5.4%	5.8%
65-69 years	1.8% (8)	2.8%	2.1%	2.2%
70-74 years	0% (0)	0.9%	0.7%	0.7%
75 years and over	0% (0)	0.5%	0.3%	0.4%

Source: ABS 2011 Census of Population and Housing

Table 15-9 presents labour force data from the 2011 Census. As at the time of the Census, the unemployment rate in the study area (3.5%) was lower than for Greater Sydney (5.7%) and NSW as a whole (5.9%). The work force participation rate in the study area was also higher with 29% not in the labour force (as a per cent of people 15 years and over), whereas the rate was 32.4% for Greater Sydney and 34.6% for NSW.

Table 15-9 Labour Force Status

Labour force status	Sutherland Shire (study area)	Greater Sydney	NSW
Employed, working:			
Full-time	61.4%	62.1%	60.2%
Part-time	29.5%	26.7%	28.2%
Employed, away from work	3.7%	3.4%	3.6%
Hours worked not stated	1.7%	2.1%	2.1%
Total	96.5%	94.3%	94.1%
Unemployed, looking for:			
Full-time work	2.0%	3.3%	3.5%
Part-time work	1.6%	2.4%	2.4%
Total	3.5%	5.7%	5.9%
Total labour force	100.0%	100.0%	100.0%
Not in the labour force (% of people 15 yrs and over)	29.0%	32.4%	34.6%

Source: ABS 2011 Census of Population and Housing

Table 15-10 presents the proportion of unemployed looking for full or part-time work. The figures were lower in the study area across all age groups when compared to Greater Sydney and NSW totals. The highest rate for the study area was in the 15-19 years age group.

Table 15-10 Unemployed Looking for Full or Part-Time Work by Age Group

Unemployed looking for full or part-time work by age group	Sutherland Shire (study area)	Greater Sydney	NSW
15-19	0.7%	0.9%	1.0%
20-24	0.6%	1.0%	1.0%
25-34	0.5%	1.2%	1.2%
35-44	0.6%	1.0%	1.1%
45-54	0.6%	0.9%	0.9%
55-64	0.4%	0.6%	0.6%
65-74	0.1%	0.1%	0.1%
75-84	0.0%	0.0%	0.0%
85 years plus	0.0%	0.0%	0.0%
Total	3.5%	5.7%	5.9%

Source: ABS 2011 Census of Population and Housing

15.5 Impact Assessment

15.5.1 Introduction

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

The multipliers used for the impact assessment were Type 1a multipliers for the Manufacturing and Construction sectors - a Manufacturing Sector multiplier of 1.55, and a Construction Sector multiplier of 1.65.

Workforce

The construction phase of the Project would involve expenditure over five to seven years and would generate associated employment. It is expected that the proposed works would be carried out over a 54 month period. The number of staff employed on Site would fluctuate during the construction phase. A timeline of workforce numbers for the existing Site, and those projected during the construction and operation of the Project are presented in **Table 15-11**, along with estimates of the annual value of salaries paid to workers (Caltex employees, contractors, and construction workers).

Table 15-11 Kurnell Employees (Historical and Projected Numbers)

	2012 ²	2013	2014 ³	2015	2016	2017
Caltex Employees	410	400	450 ⁴	40	45	45
Contractors	475	475	475	40	55	55
Project Construction	-	140	140	100	90	-
Total	885	1,015	1,065	180⁵	190	100
Maintenance Shutdown Periods ¹	500 (200 FTE)	0	0	0	90 (36 FTE)	90 (36 FTE)
Total FTE (inc. Maintenance Activities)	1,085	1,015	1,065	180	226	136
Indicative value of salaries (\$m)	125	129	138	18	23	14

¹ Maintenance shutdown periods are periodic and for short time frames (8-12 weeks) two or three times a year. A FTE is assumed to be 40% of the number employed part time over shut down periods.

² Current employee numbers at the Site.

³ 2014 would be the peak construction period. Additional personnel brought to the Site for the Project construction would be a maximum of 140 personnel.

⁴ Additional Caltex Employees in 2014 would be staff hired for terminal operations.

⁵ The large reduction in numbers between 2014 and 2015 follows the cessation of refining at the Site. The increase in workforce numbers between 2015 and 2016 represents a gradual stabilisation of the terminal operational workforce.

The Project would employ approximately 140 construction staff during the first peak construction phase, in the first 24 months. This number would decrease to approximately 90 construction staff during the final twelve months of the construction phase of the Project. During approximately the first 24 months of construction, the Site would still be operating in its current mode as both a refinery and a terminal. Cessation of refinery operations would occur in the second half of 2014 and this would be followed by the further conversion of some tanks within the Project Area to hold finished products. Additional conversion

works would continue until December 2016 when the proposed conversion activities would be completed. Eventually the Site would operate wholly as a terminal (URS, 2012a). At present there are no plans to cease terminal operations at the Site (refer to **Chapter 4 Project Description**).

Capital expenditure

Caltex expects to incur costs of about \$430 million associated with the cessation of refining operations at the Site. This total includes land based and port and berthing works, as well as redundancies, retraining and supporting works. Of this amount, Caltex plans to invest \$350 million in the conversion and expansion of current import facilities at Kurnell (of which \$230 million is land based works, and \$120 million is for port and berthing works), with the remaining \$80 million dollars being spent on redundancies, retraining and supporting works.

The estimated capital investment in the Project (land based works) is approximately \$230 million broken down between local, Australian and overseas markets as follows:

- Local (NSW) - \$166 million;
- Australian (non NSW) - \$2 million; and
- Overseas - \$62 million.

It is assumed that this expenditure would occur between 2013 and 2016.

The Project would generate a positive economic impact within the local community through the creation of local employment opportunities during the construction phase. Given the characteristics of the labour force in the study area, it is anticipated that the workforce required could be primarily sourced from the study area and Greater Sydney. The direct spending within the local economy would have a positive impact on local services and businesses during construction.

Impact of Construction Expenditure on the NSW 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 local regional economy can be calculated. Given the employment of some 140 construction staff at an annual cost of \$100,000, the estimated expenditure of \$14.0 million on labour sourced from NSW would result in a total value to the NSW economy of \$23.1 million in 2013 (using the Construction Sector multiplier of 1.65). The aggregate direct value of construction wages over the project is \$47.0 million which would have a multiplied total value of \$77.6 million over the four years of construction.

With respect to the proposed capital expenditure of \$230 million, it is necessary to make adjustments for the share of materials/capital that would be sourced from outside the state. Supplied data suggests some \$166 million would be spent in NSW. Using the multiplier for the Construction Sector of 1.65, the total impact of this expenditure is calculated at \$273.9 million. When combined with the total impact of labour expenditure of \$77.55 million over the four year construction period, the total impact of the Project on NSW during the construction phase is calculated at \$351.5 million.

15.5.2 Operational

Workforce

With the removal of the refining operation at the Site, the number of employees would decrease. The final operational workforce is currently being determined. However, it is anticipated approximately 100 employees, would provide routine operational or supporting services to the terminal. These employees would operate in a shift arrangement 24 hours a day, 7 days a week. Up to an additional 90 people would be required at the Site during maintenance shutdown periods during the operation of the terminal, which are periodic and for short time frames (8-12 weeks). These 90 part time employment phases are assumed to equate to 36 FTE positions. The total FTE for the new operation is estimated at 136 with an annual salary of \$13.6 million.

Existing employment at the Site is currently concentrated mostly around activities associated with the refining and processing units. These activities would be discontinued following cessation of refining operations. There would also be a reduction in contract labour as most of this effort is expended in the processing areas.

Impact of Operation change on the NSW Economy

The current value of salaries for Caltex employees, and contractors, at the Site is approximately \$125 million (see **Table 15-11**). By 2017, it is expected that the terminal at Kurnell would require staffing of approximately 136 FTE employees at a cost of \$14 million. These numbers indicate a reduction of more than 949 full time equivalent (FTE) salaries valued at near to \$111 million annually. Using the Manufacturing Sector multiplier of 1.55, the economic impact of this reduction is estimated to be approximately \$172.0 million annually on the NSW economy. The ongoing value of operational employment expenditure of the proposed terminal to the NSW economy is estimated to be approximately \$21.7 million per annum.

Impact of Operation change on the Study Area

Impacts of the Project would be most significant in the study area where some 70% of employees reside. Following the shutdown of the refinery it is estimated that there would be a reduction of 949 FTE positions with a direct salary loss of some \$111 million annually. This reduction suggests a loss of some 664 positions and direct loss of \$77.7 million in wages annually from the workforce in the study area. Out of the total number employed in the area of 104,000 this is a decline of 0.6% in an area with lower than state average unemployment and a higher participation rate. The multiplied impact (using the Manufacturing Sector multiplier of 1.55) on the study area economy is an annual loss of \$120.4 million.

Non-salary operational costs

It is expected there would be a 96% reduction in variable costs (utilities and consumables) related to the conversion to terminal operation. The value of this expenditure is commercially sensitive.

15.5.3 Heritage and social values

Potential impacts on heritage values are addressed in **Chapter 18 Heritage** and **Appendix H Heritage Impact Assessment**.

Given the above assessments the Project is not expected to cause notable impacts on heritage or social amenity values.

15.5.4 Other Social values

It is expected that there would be an improvement in local amenity values with the cessation of refining operations as there would be a reduction in noise from the Site, a reduction in surface water impacts, improved air emissions and reduced traffic impacts (refer to **Chapter 11 Surface Water, Wastewater and Flooding**, **Chapters 12 Noise and Vibration**, **Chapter 13 Air Quality and Odour** and **Chapter 16 Traffic and Transport** and **Chapter**.

Caltex also consults regularly with the community, updating them on the refinery and responding to any concerns they may have. Caltex would continue this during the construction and operation of the Project (refer to **Chapter 6 Consultation**).

15.6 Mitigation

Caltex would expend approximately \$430 million to cover the cost of the Project. This cost would include employee programs (Platts.com, 2012). Caltex has indicated that \$80 million dollars is budgeted to be spent on redundancies, retraining and supporting works.

For the period leading up to the shutdown of refining operations, Caltex has developed an employee program named "Stay, Focus & Develop". The intent of the program is to enable the achievement of safe and reliable operations at the Site, while demonstrating a high level of care for employees as they prepare for the next phase of their lives and careers following the shutdown on the refinery. This program incorporates transitional support through generous redundancy benefits, outplacement support services, careers fairs featuring prospective employers, vocational training allowances, health and wellbeing programs and services, and industry retraining.

15.7 Summary

This Project is being proposed on the basis of economic efficiency and continuing to supply a reliable source of finished product to NSW. This has been based on Caltex's internal assessment of economic efficiency. This is not provided within this EIS as the information is commercial-in-confidence.

The current value of salaries for Caltex employees, and contractors, at the Site is approximately \$125 million. By 2017, it is expected that the terminal at Kurnell would require staffing of approximately 136 FTE employees at a cost of \$14 million. These numbers indicate a reduction of more than 949 full time equivalent (FTE) salaries valued at near to \$111 million annually. The economic impact of this reduction is estimated to be approximately \$172 million annually on the NSW economy.

The ongoing value of operational employment expenditure of the proposed terminal to the NSW economy is estimated to be approximately \$21.7 million per annum.

Impacts of the Project would be most significant in the study area where some 70% of employees reside. Following the shutdown of the refinery it is indicated that there would be a reduction of 949 FTE positions with a direct salary loss of some \$111 million annually. This suggests a loss of some 664 positions and direct loss of \$77.7 million in wages annually from the workforce in study area. Out of the total number employed in the study area of 104,000, this is a decline of 0.6% in an area with lower than state average unemployment and a higher participation rate. The multiplied impact on the study area economy is an annual loss of \$120.4 million.

The impact of capital expenditure during the construction phase is \$273.9 million. When combined with the impact of labour expenditure during construction of \$77.55 million, the total impact of the Project on NSW during the construction phase is calculated at \$351.5 million.

No assessment has been undertaken as to how the benefits of economic efficiency improvement to Caltex may flow to the local, NSW and Australian economies.

To help the staff that would no longer be required at the Site move on in their lives and careers, Caltex has implemented an employee program named “Stay, Focus & Develop”. This program would provide transitional support for any affected staff. Caltex has indicated that \$80 million dollars is budgeted to be spent on redundancies, retraining and supporting works.

16 Transport and Access

16.1 Introduction

This chapter provides an assessment of the potential traffic and access impacts of the Project during construction and operation.

16.2 Scope of the Assessment

With regards to traffic and access, the DGRs require that the EIS include:

- *accurate predictions of the traffic generated by the development;*
- *a detailed assessment of the potential impacts of the development on the capacity, efficiency and safety of the road network including the cumulative traffic generated by all existing and the proposed development;*
- *details of any upgrades to road infrastructure that would be required due to the development; and*
- *site accesses, internal roads and vehicular parking required as a result of the development.*

In order to understand the effect the Project could have on the road network around the Site (i.e. the 'study area'), the existing transport environment was investigated and analysed. Following this, a transport impact assessment was completed to assess the likely impacts associated with the construction and operation of the Project.

16.3 Method of Assessment

This transport and access assessment involved a detailed desktop analysis using aerial photography. Traffic count data for relevant road locations was obtained from the New South Wales Roads and Maritime Services (RMS) and Sutherland Shire Council databases. This information was used to determine background traffic volumes for the study area. ABS Census Data was used to determine projected population increases, and the Guide to Traffic Engineering Practice – Roadway Capacity (AustRoads, 1988), to determine existing and proposed Level of Service (LOS) and to assess the traffic impact of the Project.

LOS is a performance measure used to describe the performance of an intersection or midblock location. LOS ranges are defined as falling between A, which indicates good intersection performance, to F, which indicates saturated conditions with long queues and delays.

Traffic generation during the construction and operational phases of the Project was estimated from construction vehicle volumes and operational activities provided by Caltex. These traffic volumes were applied to forecasts of the background traffic volumes to determine the proportional increase arising as a result of the Project.

As required by RMS the assessment has been completed in line with the guidance *Guide to Traffic Generating Developments* (RTA, 2002).

The following steps were undertaken as part of the transport and access assessment:

1. Data collection and collation to facilitate reporting of existing conditions. This included a desktop review of information obtained from RMS and Sutherland Shire Council, as well as the use of online resources. The information reviewed included traffic volumes, crash data, school bus routes, stock routes, rail crossings, and road construction standards.
2. The road network environmental values were identified and their sensitivity to changed traffic conditions were analysed.
3. The peak traffic generating years for the construction and operational phases were identified.
4. The background traffic for the peak construction year and operating years were forecast based upon growth rates calculated from the most recent census (2011).
5. The number and type of vehicles likely to be generated during the various phases of the Project were identified based on information provided by Caltex.
6. The magnitude of the Project's potential impacts on the various environmental values was identified.
7. The significance of the Project's impact on the road network environmental values was determined.
8. Mitigation and management measures were identified. These would be incorporated into any future Transport Management Plan (TMP) developed by Caltex as the Project progresses.

16.4 Existing Environment

16.4.1 Existing Highway Network

The Project is located on the southern shore of Botany Bay and is accessed by a main arterial road and local streets. The main arterial road that is located adjacent to the Project is Captain Cook Drive. A location plan showing the surrounding road network can be found in **Figure 16-1**.

Captain Cook Drive is the major access road to 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 Woollooware Road. It further decreases to an undivided carriageway with one lane in each direction east of Woollooware Road to Kurnell.

Therefore the main highways, arterial and sub-arterial roads providing access from the Kurnell Peninsula to the wider region consist of the following:

Freeway/Highway:

- Princes Highway - A major north/south road link.

Arterial:

- Taren Point Road - Running parallel to Princes Highway and crossing the Georges River, connecting the Rockdale and Sutherland local government areas.;
- Kingsway - Connects the Princes Highway to Cronulla.
- Captain Cook Drive. Connects Kurnell to the rest of the Sutherland Shire. The section of Captain Cook Drive between Woollooware Road and Elouera Road is currently being upgraded from two lanes to four lanes of traffic and is scheduled for completion in 2015.¹

Sub-Arterial:

- Gannons Road. A major road providing access to Woollooware.

The main entrance to the Site is via Solander Street, which is a two lane undivided road exiting from Captain Cook Drive. Vehicle access to the Site is also available from Sir Josephs Banks Drive.

16.4.2 Existing Traffic Generation and Car Parking

Traffic from the Site is generated by employee movements to and from the Site, and movement of approximately 70-90 trucks per week of finished product via road haulage. The official number of employees at the Site at the end of April 2012 was 410 employees and 475 contractors giving a total of 885 workers at the Site during normal working periods. Up to an additional 500 contractors come to Site during maintenance shutdown periods. These periods range from 8-12 weeks in duration.

Information provided by Caltex has confirmed that there exists sufficient employee and visitor car parking for existing operations at the Site.

16.4.3 Existing Traffic Volumes

Table 16-1 provides an outline of the 2005 Annual Average Daily Traffic (AADT) volumes for the traffic count stations relevant to this transport and access assessment, as well as an estimate for 2012 (the existing 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 Greater Sydney (Statistical Region) between the 2006 and 2011 Census results.

Table 16-1 Most Recent Available AADT Data and 2012 AADT Estimate for Existing Road Network

Traffic Count Station	Road	Location	Base Year	AADT (two-way)	2012 Estimated AADT (two-way) (1.3% pa growth)
RMS 36.206	Captain Cook Drive	East of Gannons Road	2005	35,455	38,810

¹ http://www.sutherlandshire.nsw.gov.au/Building_Development/Council_Works_Projects/Current_Works_Projects/Captain_Cook_Drive_Upgrade



Legend

- Roads
- The Site



0 0.5 1 2 Kilometers

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

Source: Aerial Imagery from Bing Maps © 2010 Microsoft Corporation and its data suppliers and Neamap Hypertiles. Map compiled using MapInfo StreetPro data. © 2011 MapInfo Australia Pty Ltd and PSMA Australia Ltd. URS Australia, MapInfo Australia or PSMA Australia do not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that these companies shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Whilst every care is taken by URS to ensure the accuracy of the digital data, URS makes no representation or warranties about its accuracy, reliability, completeness, suitability for any particular purpose and disclaims all responsibility and liability (including without limitation, liability in negligence) for any expenses, losses, damages (including indirect or consequential damage) and costs which may be incurred as a result of data being inaccurate in any way for any reason. Electronic files are provided for information only. The data in these files is not controlled or subject to automatic updates for users outside of URS.

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NSW PTY LTD

KURNELL REFINERY
CONVERSION

ROAD NETWORK

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Figure: **16-1**
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16.4.4 Existing Level of Service

As outlined in **Section 16.3**, LOS 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 (i.e. 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 LOS thresholds for each road segment have been determined, in accordance with the methodology presented in the Guide to Traffic Engineering Practice – Roadway Capacity (AustRoads, 1988). The existing LOS provided in **Table 16-2** has been identified for the midblock AADT volumes outlined in **Table 16-1**.

Table 16-2 Existing LOS

Road	LOS Range (veh / hr, two-way)						2012 Estimated Volume		2012 LOS ³
	A	B	C	D	E	F	AADT (two-way)	Peak Hour (two-way) ¹	
Captain Cook Drive, east of Gannons Road ²	-	<2,760	2,760 – 3,679	3,680 – 4,659	4,660 – 6,139	6,140+	38,810	3,881	D

Assumptions:

- 1) 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.
- 2) 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.
- 3) LOS has been calculated based on AustRoads 'Guide to Traffic Engineering Practice – Roadway Capacity'.

16.4.5 Accident analysis

Raw crash data was sourced from RMS for the most recent complete available five year period (2007 - 2011). In addition, crash rates per 100 million vehicle kilometres travelled (VKT) for various sections along Captain Cook Drive have also been included. The supplied crash data is summarised in **Table 16-3** and graphically represented on **Figure 16-2**.

Table 16-3 Accident Data for Captain Cook Drive

Road	From	To	Road Type	Crashes (2007 – 2011)	Crashes/ 100 million VKT
Captain Cook Drive	Taren Point Road	Endeavour Road	Urban divided	67	61.2
	Endeavour Road	Elouera Road	Urban divided	47	23.8
	Elouera Road	Lindum Road	Urban undivided	12	16.9
	Lindum Road	Prince Charles Parade	Urban undivided	30	54.8

Figure 16-2 Road Crash Frequency Map

Table 16-3 indicates that crash rates for the assessed road sections vary from 16.9 crashes per 100 million VKT to 61.2 crashes per 100 million VKT, with a weighted average of 36.1 crashes per 100 million VKT for Captain Cook Drive from Taren Point Road to Prince Charles Parade.

By comparison, *Road Safety Engineering Risk Assessment Part 7: Crash Rates Database* (AustRoads, 2010) indicates that a crash rate of 61.86 crashes per 100 million VKT is typical for urban roads with divided sealed carriageways in New South Wales and a crash rate of 82.49 crashes per 100 million VKT is typical for urban roads with undivided sealed carriageways. Each of the four road sections assessed in **Table 16-3** are below the typical crash rates, with only the crash rates reported on the Taren Point Road to Endeavour Road section of Captain Cook Drive being close to that typically observed in New South Wales. The supplied crash rate data therefore indicates that all assessed roads generally performed well over the most recent five year reporting period for which data was available.

16.5 Impact Assessment

16.5.1 Vehicle Routes

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 Site is via Captain Cook Drive and Solander Street as indicated in **Figure 16-1**. This is the proposed route for all vehicle movements generated by the Project.

16.5.2 Construction Traffic Generation

The traffic generated by the Project would incorporate a mix of construction plant vehicles, delivery vehicles and construction personnel movements. A summary of the construction vehicle mix includes:

- construction vehicles - 10 trucks (10 daily return trips) maximum would be required at the Site during the construction phase. These vehicles would typically include cranes and semi-trailers etc.;
- equipment and material delivery vehicles - 10 trucks (10 daily return trips) maximum would be required to deliver the construction equipment and materials to the Site; and
- construction personnel - 140 additional personnel (140 daily return trips) on average would be required at the Site during the construction phase.

For the purposes of this assessment, the largest construction vehicle and plant delivery vehicle would be a semi-trailer of which its dimension and mass would not exceed the maximum unrestricted permissible size on New South Wales (NSW) public roads (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 Project during the construction phase is provided in **Table 16-4**.

Table 16-4 Staff and Plant Requirements for Construction

Description		Daily Movements (return trips)	Peak Hour Trips ¹
Heavy Vehicles	Construction Vehicles (Cranes/semi-trailers etc.)	10	2
	Equipment/Material Delivery Vehicles	10	2
Private Vehicles	Construction Personnel*	140	140
TOTAL		160	144
Heavy Vehicle Proportion		13%	3%

1. Assumptions

- all personnel would arrive to Site during the AM Peak Hour and depart during the PM Peak Hour;
- personnel would utilise their own private vehicle with no use of car-pooling or public transport;
- heavy vehicle movements would 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.

*Max number of construction staff in the peak construction year (2014).



There is sufficient car parking capacity within the Site to accommodate all construction workers during the construction phase.

16.5.3 Construction Phase Traffic Impact

The impact of the Project on the traffic in the area is determined by adding the expected level of traffic generated by the Project (presented in **Table 16-4**) to the background traffic level prediction for the peak construction year of 2014. This assessment will determine whether the Project would have a significant impact on the local road network. **Table 16-5** provides a summary of the impact assessment during the construction phase of the Project.

Table 16-5 Impact Assessment Summary

Road	Pre-Construction		During Construction Phase		
	<i>2014 Background Peak Hour Volume (two-way)</i>	<i>LOS</i>	<i>Peak Hour Trips Generated by Construction Activities</i>	<i>Total 2014 Peak Hour Volume</i>	<i>LOS</i>
Captain Cook Drive	3,983	D	44	4,127	D

As indicated in **Table 16-5**, the number of trips generated by construction activities is very minor (approximately 1%) when compared to the background volumes on Captain Cook Drive. As such, the midblock LOS remains unchanged during the construction phase. Therefore it can be concluded that the traffic impact of the Project would be negligible on the road network surrounding the Site.

It should be noted, however, that the road network around the Site already experiences congestion issues during peak periods without inclusion of the vehicles generated by the Project. This is illustrated, in particular, by the fact that the LOS for Captain Cook Drive is currently in the D range. Consequently, construction vehicles utilising these roads during the AM or PM Peak Hour would experience traffic congestion and potential delays.

16.5.4 Operational Phase Traffic Impact

Once the conversion of the Kurnell Refinery is complete, Caltex would import finished products (gasoline, jet fuel, diesel and fuel oil) through the two fixed berths at the Kurnell Wharf and the sub berth located in Botany Bay. This product would be stored in existing and converted tanks.

The major product distribution systems would continue to operate in line with current practice, i.e. product would be pumped under Botany Bay to the Banksmeadow Terminal, the Sydney/Newcastle pipeline or the Joint User Hydrant Installation (JUHI) at Sydney Airport for further distribution. Under typical operation, road transport of products from the Site would cease. However, in exceptional circumstances some road transport of product may be required.

With the cessation of the refining operation at the Site and the high levels of automation of the terminal, the number of employees on Site would reduce. The final operational workforce is currently being determined. However, it is anticipated approximately 100 employees would provide routine operational or supporting services to the terminal. These employees would operate in a shift arrangement 24 hours a day, 7 days a week. Up to an additional 90 people would be required at the Site during maintenance shutdown periods during the operation of the terminal, which are periodic and for short time frames (8-12 weeks).

With the reduction in employees from approximately 900 to approximately 100 and cessation of routine road haulage at the Site, the number of vehicles generated by the Project during its operational phase would be significantly fewer than the number of vehicles generated by the existing refinery operations. This would result in a net reduction in traffic volumes along Captain Cook Drive. Therefore it can be concluded that during operation the Project would result in an improvement to the local traffic environment and a beneficial transport impact.

16.6 Mitigation

The impact assessment has illustrated that there would be a negligible impact on the capacity and operation of the existing road network during the construction phase of the Project, whilst during the operational phase of the Project the Site would result in less traffic on the local road network.

However, in order to manage vehicle activities during both phases of the Project, it is recommended that a Traffic Management Plan be developed to include the following:

- hours of permitted vehicle activity;
- designated routes for construction traffic and defined access points to the Site;
- a community consultation plan to ensure residents in close proximity to the Site are informed of upcoming construction activities and have a point of contact during construction activities;
- designated areas within the Site for truck turning movements, parking, loading and unloading to allow heavy vehicles to enter and leave the Site in a forward direction;
- sequence for implementing traffic management measures should these be required; and
- procedures and/or principles for construction vehicle speed limits and the safe operation of construction vehicles.

Development and implementation of the Traffic Management Plan would be undertaken in consultation with RMS and Sutherland Shire Council. The Traffic Management Plan would be a working document with flexibility to address any traffic issues arising during the construction of the Project.

16.7 Cumulative Impact Assessment

This section considers relevant developments that have been placed on exhibition, but are not yet approved or approved but not yet commissioned, and which are located within a 1 km radius of the Site. Such projects, could give rise to cumulative impacts in combination with the Project-generated construction and operational traffic. **Table 16-6** provides the details of the development identified for consideration in the cumulative impact assessment.

Table 16-6 Relevant Cumulative Developments

Project Name	Location	Description	Expected Construction Dates
Kurnell Port and Berthing Facility Upgrade Works	Botany Bay / Kurnell	Upgrade to the Kurnell port and berthing facility	Q3 2013 – Q2 2015

Sutherland Shire Council and RMS were contacted requesting the details of any additional developments that should be considered as part of this assessment. Neither authority was aware of any additional relevant developments within the surrounding area.

The construction stage of the Kurnell Port and Berthing Facility Upgrade Works are expected to commence in Q3 2013 and continue to Q2 2015. The EIS produced for the Kurnell Port and Berthing Facility Upgrade Works (SSD-5353) noted one period of time when there would be a number of trucks accessing the Kurnell Wharf. There would be nine days between Q3 2014 and Q2 2015 when there would be 100 concrete pouring trucks accessing the Wharf. There could be up to 25 trucks on one day with the remaining days seeing up to nine trucks in one day (URS, 2012).

By the time there is a potential for a cumulative impact of construction traffic between the two projects, the refinery operations at the Site would have ceased (second half of 2014) and the number of workers accessing the Site would have begun to reduce. Therefore, traffic generation from the Project would be significantly lower than at present and the potential for a cumulative impact associated with the construction stage of the Kurnell Port and Berthing Facility Upgrade Works and the Project would be negligible.

16.8 Summary

The transport and access assessment has concluded that the impact that of Project construction traffic on LOS at the nominated road midblock is negligible and that the operational phase would result in a net reduction in traffic generated for the Site. Therefore during operation there is likely to be a positive impact upon the local road network along the Kurnell Peninsula.

The mitigation measures outlined above are summarised and outlined below in **Table 16-7**.

Table 16-7 Management and Mitigation Measures – Traffic and Transport

Mitigation Measure and Commitment	Implementation		
	Design	Construction	Operation
Local Authorities and Kurnell residents would be informed of any Project related work which would affect the road network.		✓	
A Traffic Management Plan would be developed for the construction phase. The Traffic Management Plan would comply with all relevant Regulations and By-Laws and in particular address safe access and egress to the public road network. The Transport Management Plan would include: • hours of permitted vehicle activity; • designated routes for construction traffic and defined access points to the Site; • designated areas within the Site for truck turning movements, parking, loading and unloading to allow heavy vehicles to enter and leave the Site in a forward direction; • sequence for implementing traffic management measures should these be required; and • procedures and/or principles for construction vehicle speed limits and the safe operation of construction vehicles.		✓	

17 Waste Management

17.1 Introduction

The following chapter assesses waste management issues relating to the construction and operational phases of the Project.

17.2 Scope of the Assessment

The DGRs for the Project (refer to **Appendix A**) requested that consideration be given in the EIS to waste including:

- *“Accurate estimates of the quantity and classification of the potential liquid and non-liquid waste streams of the development;*
- *identification of beneficial reuse opportunities for all waste generated by the development; and*
- *a description of the measures that would be implemented to ensure that any waste produced is appropriately handled, processed and disposed of.”*

This chapter will identify, quantify and classify potential sources of liquid and non-liquid waste streams generated from the construction and operation of the Project and recommend preferred management strategies for effective storage, reuse/recovery, treatment and/or disposal in-line with applicable standards and regulatory requirements.

17.3 Legislation and Planning Policy

17.3.1 Commonwealth Requirements

National Waste Policy: Less Waste, More Resources (EPHC 2009)

The *National Waste Policy: Less Waste, More Resources* (EPHC, 2009) builds on the 1992 *National Strategy for Ecologically Sustainable Development* (ESD) (COAG, 1992) commitments to improve the range, variety and quality of environmental resources and reduce the environmental impacts of waste disposal. This Policy drives streamlined and accurate business reporting to the National Pollutant Inventory (and under a national product stewardship framework in the future).

National Environment Protection Measures (Implementation) Act 1998

Under the *National Environment Protection Measures (Implementation) Act 1998*, the National Environmental Protection Council (NEPC) was established to set national environmental goals and standards for Australia through the development of National Environment Protection Measures (NEPMs). The following NEPM is relevant to this Project:

The National Environment Protection (National Pollutant Inventory) Measure (NPI)

The *National Pollutant Inventory* (NPI) NEPM (NEPC, 2008) establishes goals to assist in reducing existing and potential impacts of certain substances being emitted to air, land and water. Where the use of an NPI substance triggers the established threshold for that substance, emissions of that substance must be reported to the NPI. Emissions of these substances from various industrial and diffuse sources are reported to the NPI, which is an internet database to provide publicly available information on the types and amounts of certain substances being emitted. In 2008, the NPI NEPM was varied to require mandatory reporting of NPI substances in waste transferred to a destination for containment or final disposal.

Emissions to land, air and water from the Project would be reported annually in accordance with the NPI Guide (DSEWPaC, 2011). The NPI Guide (DSEWPaC, 2011) provides direction and guidance on NPI substances, trigger thresholds and reporting of emissions and transfers of waste. Emission estimation will be carried out in accordance with the most current Emission Estimation Technique Manuals (published online). The Project's emissions would be reported to DSEWPaC and would be publicly accessible via the NPI database at www.npi.gov.au.

17.3.2 NSW State Requirements

Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) promotes waste avoidance and resource recovery by providing a framework for the development of strategies and programs such as the extended producer responsibility scheme for industry. It defines the waste hierarchy ensuring that resource management options are considered against the following priorities:

- avoidance including action to use resources efficiently and reduce the amount of waste generated;
- resource recovery including reuse, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources; and
- disposal including management of all disposal options in the most environmentally responsible manner.

Waste Avoidance and Resource Recovery Strategy 2003 and 2007

The previous NSW Waste Strategy was issued in 2003. It provided a framework for reducing the generation of waste and improving the efficient use of resources. Broad targets included in the strategy aimed at:

- preventing and avoiding waste;
- increasing the recovery and reuse of secondary resources;
- reducing toxic substances in products and materials; and
- reducing litter and dumping.

The 2003 Strategy was superseded in 2007. Whilst this saw the retention of the 2003 targets, it also saw the introduction of a number of key actions and programs that would be implemented by NSW EPA to support meeting these targets. The targets set by the above Strategy can be directly applied to the Project. They require that proposals:

- achieve 76% recovery (the target for the construction and demolition sector);
- avoid using any of the 'priority substances' that are considered toxic; and
- ensure appropriate waste management processes are in place to prevent littering/dumping.

The *Waste Avoidance and Resource Recovery Strategy 2007* recognises the importance of the waste hierarchy to guide effective resource management. It acknowledges, however, that different materials require different approaches. The choice of approach, including re-use, recycling and energy from waste, will depend on a balance of factors including economic and environmental considerations.

Protection of Environment Operations Act 1997

The *Protection of Environment Operations Act 1997* (PoEO Act) defines 'waste' for regulatory purposes and establishes management and licensing requirements along with offence provisions to deliver environmentally appropriate outcomes. The Act also establishes the ability to set various waste management requirements via the regulation.

The Regulation also sets out provisions covering the way waste is managed in terms of storage and transportation as well as reporting and record keeping requirements for waste facilities. It:

- provides for contributions to be paid by the occupiers of licensed waste facilities for each tonne of waste received at the facility or generated in a particular area;
- exempts certain occupiers or types of waste from these contributions; and
- allows deductions to be claimed in relation to certain types of waste.

The Regulation also makes special requirements relating to asbestos and clinical waste.

Protection of the Environment Operations (Waste) Regulation 2005

These regulations enable NSW to issue 'resource recovery exemptions' that allow for the beneficial 'reuse' of wastes via land application or for use as a fuel. These regulations support the principle of 'wastes to resources' where the wastes are fit for beneficial reuse.

Applicants must demonstrate that the waste reuse is genuine, beneficial, and will cause no harm to the environment or human health.

NSW can issue both general and specific resource recovery exemptions. *"A general exemption can be issued for commonly recovered, high-volume and well-characterised waste materials. These exemptions may be used by anyone, without seeking approval from OEH, provided the generators, processors and consumers fully comply with the conditions they impose."*

"... Where no general resource recovery exemption is available for the intended use, an application may be made to the Office of Environment and Heritage for a specific exemption, which would then be issued by the agency, if appropriate."

Waste Classification Guidelines

It is the responsibility of those who generate the waste to classify it. To assist waste generators classify the wastes they produce, OEH has developed the *"Waste Classification Guidelines"* (DECCW, 2009) which outline a clear and easy-to-follow, step-by-step process for classifying waste under the current classification system. All waste generated from the Project would be classified in accordance with these guidelines and managed accordingly.

17.3.3 Local Government Requirements

The Project is located within the Sutherland Shire Council Local Government Area (SSC LGA). The *Sutherland Shire Local Environment Plan* (SSLEP) (2006) and *Development Control Plan* (DCP) (2006) outline development requirements which need to be considered for projects within the SSCLGA.

The SSLEP aims to promote an appropriate balance of development and management of the environment that will be ecologically sustainable, socially equitable and economically viable.

Notwithstanding the above, the Site is zoned pursuant to SEPP (Kurnell Peninsula). Therefore, the local zoning provisions of the SSLEP are not applicable to the Project. Refer to **Chapter 5 Legislation and Planning Policy** for further details on the SEPP (Kurnell Peninsula) requirements in relation to the Project.

The DCP 2006 outlines key control measures designed to ensure sustainable development within the SSC LGA. However, this does not specifically outline waste management control measures that would need to be adopted for the Project.

17.4 Method of Assessment

The waste management assessment involved an analysis of the Project to identify potential or likely waste streams and volumes arising from the construction and operation. The assessment has been completed using information provided by Caltex and the requirements of legislation and policy outlined in **Section 17.3**.

17.5 Existing Environment

17.5.1 Existing Waste Management System

Waste generated from Caltex's existing operations at the Site is typically recycled or sent to landfill for appropriate treatment and disposal in accordance with Caltex's Waste Management System (WMS) 2012. The WMS outlines the existing waste management processes currently in place at the Site. Waste generated from the proposed Project would continue to be managed in accordance with the existing system and associated procedures, in particular:

- PROC 5.06.11.001 Kurnell Waste Management;
- PROC 5.06.11.002 Use of Sludge Lagoons;
- PROC 5.06.11.003 Management of Used and Empty Drums; and
- STD 5.06.11.001 Management of Waste Skip Bins in the Kurnell Refinery.

The Site also has conditions on its existing EPL (837) for the management of waste:

- *O5.1 The licensee must ensure that any liquid and/or non-liquid waste generated and/or stored at the premises is assessed and classified in accordance with the NSW (2009) Waste Classification Guidelines as in force from time to time.*
- *O5.2 The licensee must ensure that waste identified for recycling is stored separately from other waste.*

The key existing on-site waste management facilities utilised for management of waste generated from existing operations include:

- **Empty Drum Storage Area:** The Empty Drum Storage Area is used for the storage of empty drums prior to sending them for recycling.
- **Waste Water Treatment Plant (WWTP):** Water treatment involves three stages of treatment from physical to chemical and biological. The unit allows on-site treatment of all effluent, spent caustic waste, second and third flush water from the Polymerisation Plant reactors and a large range of aqueous liquid wastes. Refer to **Chapter 11 Surface Water, Wastewater and Flooding** for further details.

- *Landfarm*: This is used to degrade the hydrocarbon content of oily sludge's, tank bottoms or highly contaminated sand/soil used during a spill. Access to the Landfarm is controlled through the use of a Waste Disposal Permit. No material is to be placed on the Landfarm or hard stand adjacent to it without the authorisation of an approved Waste Disposal Permit.
- *Slop Troughs*: CRN operates a melting trough for the recovery of clean oils for reprocessing.
- *Metal Recycling Area*: This is used to store only uncontaminated metal pieces, which are suitable for on-site reuse, or off-site recycling.

17.6 Impact Assessment

17.6.1 Environmental Values

Waste has the potential to impact ecological function and services, biodiversity, water quality, social value and human health. However, if re-use options are available and utilised, waste can be considered a resource.

The environmental values that have the potential to be impacted by waste are:

- life, health and wellbeing of people;
- diversity of ecological processes and associated ecosystems;
- land use capability, having regard to economic considerations; and
- the management of finite natural resources.

The effective management of waste protects these values during development of the Project.

An Ecological and Human Health Risk Assessment has been undertaken for the Project. This is provided in **Appendix D Human Health and Ecological Risk Assessment** and summarised in **Chapter 10 Human Health and Ecological Risk**.

Management strategies developed for each waste stream have been designed to be consistent with the waste management hierarchy, meet relevant legislation and policy, and to achieve the environmental objectives of the Project.

17.6.2 Waste Streams

The waste impact assessment involved an analysis of the Project to identify potential or likely waste streams and volumes arising from construction and operation of the finished product terminal.

If not managed responsibly, waste generated by the Project has the potential to cause the following impacts:

- water pollution caused by the release or spills of liquid waste, either directly or indirectly via stormwater run-off, to receiving waters from waste contaminated areas/sites;
- land and water (surface and groundwater) contamination as a result of spills or inappropriate storage, handling, transportation and disposal of solid and liquid wastes;
- land and water (surface and groundwater) contamination as a result of spills/overflows from extreme rainfall events;

- increased population of vermin and spread of disease from inappropriate storage and handling of wastes;
- odours caused by improper storage and treatment of putrescible wastes;
- visual amenity impacts caused by poorly executed land clearing activities and inappropriate storage of waste;
- the loss of vegetation and increasing soil sodicity caused by release or spills of wastewater with high total dissolved solids (TDS) concentrations; and
- inefficient and careless use of resources.

Mitigation measures to manage these potential impacts are discussed in **Section 17.7**.

17.6.3 Construction Phase

The construction term for the facility is scheduled to occur over a 54 month period.

The construction workforce is expected to total 140 personnel in addition to the existing workforce on Site (in the peak construction year of 2014) . Conservative estimates for waste generation for the construction phase of the Project are presented in **Table 17-1**. The waste management strategies identified demonstrate the application of the preferred waste management hierarchy in promoting options for on-site reuse, recycling and treatment initiatives.

Table 17-1 Construction Phase Waste Generation and Management

Waste Type	Waste Classification ¹	Estimated Volume ²	Management Strategy	Final Disposal Arrangements
Excavated Soils (hydrocarbon contamination)	Hazardous waste or General solid waste (non-putrescible)	20 m ³	To be remediated on-site at the landfarm in accordance with the EPL and current operating procedure.	Retained on-site for reuse.
Excavated Soils (asbestos contamination)	Special Waste	20 m ³	- To be managed on-site. - Stockpiles to be covered and wetted down as required to minimise dust creation and propagation. - All testing and disposal is to be completed in accordance with an asbestos soil management plan. - Only clean fill is to be used for back filling excavations.	Disposal off-site required to appropriately licensed landfill facility once it has been classified in accordance with the DECCW, NSW (2009) <i>Waste Classification Guidelines</i> .
Excavated Soils (no contamination)	General solid waste (non-putrescible)	140 m ³	Soil would be stored on-site for back fill.	Retained on-site for reuse.
Metals (Surplus materials from installation and construction)	General solid waste (non-putrescible)	2 tonnes	- Ferrous bin required. - All metals would be free of hydrocarbons before disposal into the designated bin.	Transported by a licensed contractor (Sell and Parker) to a recycling facility.
Concrete (from construction)	General solid waste (non-putrescible)	2 tonnes	- Waste concrete is to be stockpiled. - Any concrete that is suspected to have been contaminated should be segregated. - Any contaminated waste concrete would be appropriately tested and classified prior to recycling or disposal.	Kurnell Landfill
Asbestos cement products	Special Waste	<1 tonne	- Any Asbestos cement products would be wrapped in plastic by a licenced contractor before disposal in a suitable waste bin. - All material is to be double bagged.	The bin would be picked up by waste contractor (Veolia) to a specialist off-site waste receiving facility for disposal.

Waste Type	Waste Classification ¹	Estimated Volume ²	Management Strategy	Final Disposal Arrangements
Wash water (as a result of washing concreting tools and equipment)	Liquid waste	500 litres	No washing of equipment or tools is allowed outside of the designated washing area. Hay bales would be placed in strategic locations to stop any solids from the wash water going into the stormwater system.	Wash water would be sent to the on-site Water Treatment Plant. Treated effluent is discharged to ocean in accordance with EPL conditions. All used hay bales and any solid materials are to be disposed of as general waste.
Excavated road base and asphalt (no contamination)	General solid waste (non-putrescible)	20 m ³	Materials would be stored on-site for a limited time only - some may be used for back fill.	Disposal off-site required to appropriately licensed landfill facility once it has been classified in accordance with the DECCW, NSW (2009) <i>Waste Classification Guidelines</i> .
Excavated road base and asphalt (hydrocarbon contamination)	Hazardous or General solid waste (non-putrescible)	20 m ³	Store at the back of CLOR in batches. Stockpiles to be covered and wetted down as required to minimise dust creation and propagation. All testing and disposal is to be completed within one month. Only clean fill is to be used for back filling excavations.	Disposal off-site required to appropriately licensed landfill facility once it has been classified in accordance with the DECCW, NSW (2009) <i>Waste Classification Guidelines</i> .
Dewatered groundwater (hydrocarbon contamination)	Liquid waste	2,000 litres	Contaminated groundwater is to be sucked out of excavations with minimal sediment and directed to the American Petroleum Institute (API) oil-water separator for removal of any HC contamination.	API oil-water separator.
Dewatered groundwater (no contamination)	Liquid waste	5,000 litres	Clean groundwater is to be American Petroleum Institute (API) oil-water separator.	API oil-water separator.
Domestic wastewater	Liquid waste	12 m ³ /day, based on 150L/person/day	Domestic wastewater sent to on-site sewage tank with sewage pump and standby pump. When the sewage level rises to a predetermined level the sewage is discharged into Sydney Water Vacuum Pit.	Refer to Chapter 11 Surface Water, Wastewater and Flooding for further details.
General Waste including putrescibles	General solid waste (putrescible)	50 m ³	- Stored in designed skip bins on-site. - No recyclable or contaminated materials are to be placed in this bin.	Waste contractor (i.e. TPI) would pick up the skip bin(s) and take it off-site as required.

Notes: (1) Waste classification would be confirmed prior to disposal in accordance with the DECCW, NSW (2009) *Waste Classification Guidelines*.

(2) Construction stage waste volume estimates provided by Caltex.

17.6.4 Operational Phase

Over the operational life of the Project, waste streams would be generated from industrial activities including maintenance of the Site (i.e. tank, pipeline and pump maintenance), administration activities, and associated services (e.g. water treatment, sewage treatment). Outlined in **Table 17-2** are the key operation waste generated and the proposed management measures.

It is important to note that the Project would result in a significant reduction in operational waste generation compared to the existing operations, due to reduced staffing and ceasing of refinery operations.

Table 17-2 Operational Waste Generation and Management

Waste Type	Waste Classification ¹	Estimated Annual Volumes ²	Primary Source of waste	Management Strategy
Wastewater	Liquid Waste	Refer to Chapter 11 Surface Water, Wastewater and Flooding for details on management of wastewater.		
Fuel oil and diesel slops	Liquid Waste	42 kilolitres	Tank Cleaning Water and Sludge	Oil slops would be sold and exported for reprocessing
Oily waters and sludge	Liquid Waste	55 kilolitres	Sourced from tank water bottoms	Oily waters would be sent to the WWTP, Sludge would be sent to the Landfarm.
Garnet Grit	Hazardous Waste or General solid waste (non-putrescible)	20 tonnes	Sourced from tank bottoms	Sent off-site once it has been classified in accordance with the DECCW, NSW (2009) <i>Waste Classification Guidelines</i> .
Used Absorbent	Hazardous Waste or General solid waste (non-putrescible)	<1 tonne	From maintenance activities	Sent off-site for disposal once it has been classified in accordance with the DECCW, NSW (2009) <i>Waste Classification Guidelines</i> .
Oily rags and gloves	General solid waste (non-putrescible)	<0.5 tonne	From maintenance activities	Sent off-site for disposal once it has been classified in accordance with the DECCW, NSW (2009) <i>Waste Classification Guidelines</i> .
General Waste including putrescibles	General solid waste (putrescible)	45 tonnes	From approx. 100 operation staff (1.25kg/person/day) 365 days per year	Sent off-site for disposal to licensed landfill.

Notes: (1) Waste classification would be confirmed prior to disposal in accordance with the DECCW, NSW (2009) *Waste Classification Guidelines*.

(2) Based on data from NPI transfer for Banksmeadow Terminal provided by Caltex.

17.7 Mitigation

17.7.1 Waste Management

To manage the potential waste impacts during the construction phase a Construction Waste and Resource Management Plan (WRMP) would be produced for the Project. This would be a sub-plan to the CEMP.

During operation the existing WRMP for the Site would be updated to apply to the new Kurnell Terminal operation.

Both the Construction and Operation WRMPs would be based on the following overarching objectives, principles and strategies to deliver effective waste management across the Site.

17.7.2 Waste Management Objectives

The environmental objectives for the management of waste generated from the construction and operation of the Project are to:

- minimise the waste generated throughout the Project life and maximise the reuse and recycling of waste materials produced; and
- store, handle, transport, and dispose of waste in an environmentally responsible manner that does not cause harm or contamination to soil, air or water.

17.7.3 Waste Management Strategy

The waste management hierarchy is a framework for prioritising waste management practices to achieve the best environmental outcome.

The preferred order of adoption is as follows:

- 1) **Avoid** by identifying appropriate materials and procuring.
- 2) **Reduce** waste by optimising construction, operation and decommissioning methods.
- 3) **Reuse** waste by identifying sources that can utilise the waste.
- 4) **Recycle** waste by identifying facilities that are able to recycle waste.
- 5) **Recovery** of waste materials, including energy from waste.
- 6) **Disposal** of waste at an appropriate facility.

The underlying objective of effective waste management is to minimise the impacts to the environmental and social values and to implement sustainability principles. To deliver effective waste management across the Project, a number of strategies would be adopted. These are discussed below.

17.7.4 Waste Minimisation

Waste prevention and minimisation would be addressed, where feasible, through the consideration of alternative materials and products, using efficient production and construction techniques, and the application of sustainable procurement practices including the provisions of contracts encouraging sustainable waste management practices and performance targets for contractors.

During the initial planning and conceptual design phases of the Project waste minimisation measures have been considered and would continue to be incorporated during the detailed design, construction and operations phases of the Project.

Where feasible the generation of waste would be identified and prevented or reduced through measures of substituting inputs for those that generate less waste, increasing the efficiency of raw materials, energy, and water by applying cleaner design practices. The use of pre-fabricated materials and structures where feasible, would play an important role in minimising the generation of waste. Using pre-fabricated components would reduce the volume of some waste streams being generated during the construction phase and facility maintenance.

Cleaner Production

Cleaner production principles are preventive continual environmental protection processes designed to maximise resource efficiency and minimise waste. Cleaner production techniques involve identifying and reducing environmental impacts along the entire life cycle of a project by conserving resources (raw materials, energy and water), eliminating toxic raw materials and reducing the quantity and toxicity of all emissions and wastes.

The following cleaner production techniques have been identified as being applicable to this Project:

- improved operation and maintenance practices to reduce the quantity of resources used and to minimise the amount of waste generated;
- selection and use of the most appropriate technology to reduce the quantity of resources used and to minimise the amount of waste generated;
- segregation of waste to facilitate re-use; and
- closed-loop recycling.

Cleaner production techniques and opportunities during the construction and operational phases of the Project include:

Construction

- adoption of sustainable procurement practices to ensure waste is eliminated before it is generated;
- the adoption of industry best practice construction techniques to ensure that minimum waste volumes are generated during construction works;
- provision of resource efficiency and waste minimisation procedures in contracts to encourage construction contractors consider environmental management objectives;
- procurement of pre-fabricated materials to eliminate off-cuts on-site, and the re-use of concrete formwork where feasible; and
- provision of separate waste containers/skips to ensure waste material segregation and maximise the opportunities for re-use and recycling.

Operational

- identification of appropriate practice and best available technology (BAT) for processing techniques to ensure most efficient use of energy and resources;
- application of most efficient production processes to ensure resourcefulness in the use of energy, water, and natural resources;
- identification and selection of energy efficient equipment at procurement;
- minimisation of waste generated in day-to-day operations and ensuring that process residues are re-used where possible or recycled;
- safe storage and disposal of residual waste and process residues ensuring least amount of harm to surrounding environment; and
- promotion of safe handling procedures of products in line with regulations and industry best practices.

Source Separation

The identification and separation of solid waste would be carried out at point of generation to aid the maximum re-use and recycling of materials. Appropriate containers and bins would be provided for the source separation of materials and to aid the separation of re-usable and recyclable materials.

Waste Re-use

The re-use of waste would be achieved through identifying re-use opportunities on-site and subsequently identifying market demands for waste items. To maximise the re-use opportunities wastes would be segregated. Where feasible, Caltex would work with suppliers and investigate the opportunities for the re-use of packaging materials and surplus materials, such as timber pallets and scrap metal. During the pre-works phase, vegetation and soils from the Site would be cleared, stockpiled, and if possible re-used for any on-site landscaping.

Throughout the Project, investigations would continue looking into re-use opportunities, both on-site and with local businesses/industries. Additionally, the marketability of wastes would be regularly reviewed to ensure potential new and emerging opportunities for waste re-use are identified and maximised.

Waste Recycling

Where practical and considering potential health and hygiene issues, wastes would be collected and segregated on-site and stored in suitable containers before the transport of wastes to approved licensed facilities prior to works being carried out.

The market demand for recyclables would be investigated as volumes of waste materials are generated and an assessment would be undertaken to assess the opportunities for these waste streams. This assessment would consider the availability and capacity of local recycling facilities.

Caltex would work with local industries to encourage them to take advantage of opportunities for re-use and recycling where feasible.

Waste Disposal

The disposal of waste materials would be considered as last resort and where all other avenues have been investigated. Where no other option is available, all waste would be handled and disposed of in a manner that causes the least environmental harm.

General waste would be transported to a local licensed landfill for disposal in line with regulatory requirements. Regulated wastes would be handled by a licensed waste contractor and transported to an appropriate regulated waste facility.

Caltex intends to utilise existing local waste management facilities and would employ licenced waste management companies to manage the identified waste streams arising from the Project.

17.7.5 Waste Monitoring and Auditing

On-site waste monitoring and auditing procedures would be developed for the Project for types of waste streams, volumes produced, and waste management practices during the construction and operational phases of the Project.

The objectives of these procedures would be to provide:

- an assessment of the actual wastes compared to predicted waste streams and volumes;
- monitor, and if required, initiate actions as to fulfil the Project's environmental objectives;
- monitor the potential environmental impacts;
- review the waste transportation records and disposal routes;
- enable positive actions to be taken in the event of incidents or accidents occurring on-site;
- recommend future actions to improve waste management practices; and
- monitor the implementation of the principles of waste management hierarchy.

Inspections of the waste management areas would be conducted on a weekly basis to ensure that correct waste management procedures are being followed, in that all waste materials are appropriately separated, stored and labelled.

New waste streams would be addressed as they arise and assessed to determine the most suitable management measures to use when handling, storing, transporting and disposing of the waste. Unidentifiable waste streams would be analysed and sent for testing in an accredited laboratory to assess the risks associated with handling and disposal of the waste.

17.7.6 Waste Reporting

A database inventory would be used to record and report all waste streams, volumes and management measures for all waste streams arising through the Project. This database would be used to inform internal and external stakeholders, and government agencies on the types and volumes of waste being generated, re-use and recycling rates, and the types and quality of substances emitted to land, water and air.

Caltex would report annually on the waste emissions for the Project in accordance with EPL and NPI reporting requirements.

17.8 Summary

Table 17-3 summarises the management and mitigation measures that would be described in the Construction and Operational WRMPs and implemented to minimise waste impacts and maximise resource efficiency.

Table 17-3 Management and Mitigation Measures

Mitigation Measure and Commitment	Implementation		
	Design	Construction	Operation
The Project would be integrated into existing resource efficiency, waste management and handling, emergency response and preparedness plans for the existing Kurnell Refinery.	✓	✓	✓
Construction and Operation <i>Waste and Resource Management Plans</i> (WRMP) would be compiled prior to the each phase commencing.	✓		
The WRMPs would: • identify requirements consistent with the waste and resource hierarchy; • ensure resourcing efficiency is delivered through the design and responsible construction and operational practices; • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures (consistent with current management practices relating to Caltex's Kurnell Waste Management System); • identify disposal and management routes consistent with current management practices as adapted for the Project; • set out clear requirements for meeting legislative and regulatory requirements; • define requirements to support Caltex's sustainable procurement objectives through effective, design, construction, operation and procurement; and • set out processes for disposal, including on-site transfer, management and the necessary associated approvals.	✓	✓	✓
The WRMPs would incorporate the requirements of the waste and resource hierarchy and cleaner production initiatives.	✓	✓	✓
The WRMPs would include a process for auditing, monitoring and reporting, which would include regular inspections off-site activities and the waste management area(s). The WRMPs would be subject to regular auditing and a system would be used to record and report the types, volumes and management measures for all waste and resource arising from/used for the works.	✓	✓	✓
Works-generated waste would be segregated at source and stored in accordance with current Site practices. Site management practices would potentially need adapting to consider additional storage requirements. Regardless, all waste would be stored in suitable containers and designated waste management areas.		✓	✓
Caltex's existing procedures for the disposal of sewage, greywater, hazardous materials, general waste and recyclable materials would be adopted for the Project (and modified if required). This would include using licensed contractors to remove and transport waste from the Site.		✓	✓

18 Heritage

18.1 Introduction

The following chapter considers the potential impacts of the Project on Indigenous (Aboriginal) and non-Indigenous (Historic) heritage values. It provides a summary of the Heritage Impact Assessment (HIA) which is provided in full in **Appendix H Heritage Impact Assessment**.

18.2 Scope of Assessment

The Director General's Requirements (DGRs) (refer to **Appendix A**) requested that consideration be given to heritage, and that the EIS include *"an Aboriginal cultural heritage assessment (including both cultural and archaeological significance), which must demonstrate effective consultation with relevant Aboriginal community groups, and a non-Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:*

- *Include a statement of heritage impact (including significance assessment) for the site and any National, State significant or locally significant historic heritage items in the area, including the Kurnell Peninsula Headland; and*
- *Outline any proposed management and mitigation measures."*

This chapter and **Appendix H Heritage Impact Assessment** meet these requirements.

18.3 Legislation and Planning Policy

18.3.1 Commonwealth Legislation

Australian Heritage and Commission Act 1975

The *Australian Heritage and Commission Act 1975* (AHC Act) established the Register of National Estate (RNE). The RNE now exists as a non-statutory archive of heritage items.

Items in the vicinity of the Project Area that are listed on the RNE are listed below in **Section 18.6**.

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework for the protection and management of places of national environmental significance. Two instruments exist under the EPBC act, these are:

- the Commonwealth Heritage List (CHL); and
- the National Heritage List (NHL).

The CHL protects heritage items, and places owned or managed by Commonwealth agencies. The NHL protects places that have outstanding value to the nation. Approval from the Federal government is required for actions that would have an impact on items listed on the NHL or the CHL.

Items in the vicinity of the Project Area that are listed on the NHL or the CHL are listed below in **Section 18.6**.

18.3.2 State Legislation and Policy

Heritage Act 1977 (NSW)

This Act ensures the protection of significant heritage places, buildings, works, relics, moveable objects and/or precincts. These include Aboriginal places or objects, items and places of historic heritage significance, and shipwrecks. Where these items have particular importance to the State they are listed on the State Heritage Register (SHR).

Items in the vicinity of the Project Area that are listed on the SHR are listed below in **Section 18.6**.

National Parks and Wildlife Act 1974 (NSW)

This Act provides for the care, control and management of historic sites within the Office and Environment and Heritage (NSW OEH) Estate. This Act also provides for the protection of all Aboriginal places and objects throughout NSW. Aboriginal objects reported to NSW OEH are registered on the Aboriginal Heritage Information Management System (AHIMS).

Items in the vicinity of the Project Area that are registered on the AHIMS are listed below in **Section 18.6**.

State Environmental Planning Policy: Kurnell Peninsula 1989

The State Environmental Planning Policy: Kurnell Peninsula 1989 (SEPP (Kurnell Peninsula)) provides for use of land on the Kurnell Peninsula, aims to conserve the natural environment and “ensure that development is managed having regard to the environmental, cultural and economic significance of the area”.

Sections 23A-23D of the SEPP (Kurnell Peninsula) include provisions for the protection of local heritage items, relics and archaeological sites. Archaeological sites and heritage items that are covered by this policy are listed in Schedules 2 and 3 of the SEPP.

Items in the vicinity of the Project Area that are included in the SEPP (Kurnell Peninsula) are listed below in **Section 18.6**.

18.4 Method of Assessment

18.4.1 Overview

The Aboriginal heritage assessment undertaken for this Project is consistent with the provisions of the following guidance and policy documents:

- The Burra Charter (The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance); and
- the *Draft Guidelines For Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005).

The historic heritage assessment undertaken for this Project is consistent with:

- the Burra Charter (*The Australia ICOMOS charter for the conservation of places of cultural significance*);
- the *NSW Heritage Manual (1996)* (NSW OEH) and associated supplementary publications; and
- the *Significant Impact Guidelines 1.1 Relating to Matters of National Environmental Significance* (Department of Environment, Water, Heritage and the Arts, 2009).

The assessment has involved a detailed desktop review of numerous historical texts, reports, maps and photographs, along with various heritage registers that exist at a Commonwealth, State, local and non-statutory level in order to understand the history of the Kurnell Peninsula. The following resources have been reviewed to compile a list of heritage values within the study area.

- National Heritage List (NHL);
- Commonwealth Heritage List (CHL);
- State Heritage Register (SHR);
- State Heritage Inventory (SHI);
- Aboriginal Heritage Information Management System (AHIMS), Office of Environment and Heritage (OEH);
- Historic Heritage Information Management System (HHIMS), OEH;
- SEPP (Kurnell Peninsula), Schedules 2 and 3;
- Sutherland Shire Heritage Inventory;
- National Trust of Australia (NSW) Register;
- National Trust of Australia (NSW) Industrial Archaeological Sites List (IAS); and
- Register of the National Estate (RNE).

This desktop review was followed by a site inspection of the Project Area, conducted by AMBS Heritage Consultants on 31 October 2012, accompanied by a La Perouse Local Aboriginal Land Council (LALC) representative and a Caltex representative. The inspection was conducted in order to confirm the location and condition of known and potential Aboriginal and historic heritage items, places and archaeological sites within the Project Area.

The findings of the desktop reviews and site inspection were used to build an understanding of the heritage baseline within the Project Area and study area. From this baseline it is possible to assess the potential impacts of the Project on identified cultural heritage values or items, places and archaeological sites.

18.4.2 Assessment of Significance

The assessment of whether an impact is likely to be significant is based on professional judgement and an understanding of how the Project would be likely to impact on the historic, aesthetic, scientific, social or spiritual significance of a heritage item, place, or archaeological site, having regard to the context or intensity of the impacts. Heritage significance or cultural heritage value is embodied in the place itself; its fabric, setting, use, associations, meanings, records, related places and related objects.

An impact is considered 'significant' where there is a real chance or possibility that the action would have a major impact on the heritage values of a National heritage place or, in the case of a local heritage item, results in a permanent loss of heritage value. Such impacts are subject to mitigation and consideration of their residual effects. Partial loss of heritage fabric can be considered as a 'significant' impact, where the fabric embodies particularly sensitive or important values. Where the potential impacts are serious or irreversible, the precautionary principle and the principle of inter-generational equity apply.

This principal was applied to the Project to determine the impact of the Project.

18.5 Consultation

18.5.1 Aboriginal Heritage

Consultation with the local aboriginal community has been undertaken to:

- provide La Perouse Local Aboriginal Land Council (LALC), as statutory representatives of the local Aboriginal community, with the opportunity to comment on the Aboriginal cultural heritage values of the study area and to be involved in the heritage assessment process;
- identify potential Aboriginal cultural heritage values of the study area;
- integrate potential Aboriginal heritage values and recommendations for management into the assessment report; and
- provide an opportunity for the local Aboriginal community to comment on the outcomes and recommendations of HIA reporting.

Initial consultation was undertaken with La Perouse LALC on 18 October 2012. The LALC was advised of the Project and invited to identify any spiritual, traditional, historical or contemporary associations and attachments that the study area has for the present-day Aboriginal community in accordance with Step 1 of the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005).

Due to the disturbed nature of the Project Area and its continued industrial use, full Aboriginal consultation in accordance with the *Interim Community Consultation Requirements for Applicants* (DEC 2004) has not been undertaken. As Aboriginal cultural heritage values are not likely to be affected by the Project (refer to **Section 18.7.1**) there is no further requirement for Aboriginal consultation or assessment.

18.5.2 Historic Heritage

A meeting was held with the Heritage Branch on 10 January 2013 to discuss the potential heritage impacts of the Project and discuss recommendations for the ongoing management of the Site. These recommendations were incorporated into **Section 18.9** and Section 10 of **Appendix H Heritage Impact Assessment**.

18.6 Existing Environment

18.6.1 Aboriginal Heritage

Aboriginal occupation of the Sydney region is likely to have spanned at least 20,000 years. The Kurnell Peninsula was inhabited by the Gweagal people at the time of European contact. Early European accounts of the area indicate that small groups of Aboriginal people camped near the water, sometimes in bark huts. There is extensive recorded evidence of fishing and shell fishing activity in the area. Radiocarbon dating has been obtained for a number of Aboriginal occupation sites on the Kurnell Peninsula, the majority of which date to within the last 3,000 to 5,000 years.

A search of the AHIMS database, undertaken on 28 August 2012, showed 75 registered Aboriginal sites identified within a 6 km x 7 km area centred on the Project Area. These items are listed in **Table 18-1** and are shown on **Figure 18-1**.

Table 18-1 Registered Aboriginal Heritage Items from within the Study Area

Site Type	Number Present
Artefact Scatter	14
Burial	1
Burial/s, Midden	2
Midden	36
Midden, Open Camp Site	3
Midden, PAD	1
PAD	3
Restricted	3
Rock Engraving	10
Shelter with Art	1
Shelter with Midden	1
Total	75

The majority of the identified sites are midden sites, artefact scatters and rock engravings. Subsurface midden material is unlikely to be present within the Project Area due to the high levels of historic ground disturbance involved in the construction and operation of the existing refinery.

18.6.2 Historic Heritage

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 1800s and for sand extraction in the early 1900s. Fishing was also an important source of income. Around these various industries a small community started to develop.

In the 1950s Caltex commenced building Kurnell Refinery. The work to build the refinery involved draining swamps, clearing scrub and installing roads, water supplies and sewerage facilities. This activity led to the further development of the peninsula and of the village of Kurnell.

Table 18-2 lists all the historic heritage items that are listed on the Kurnell Peninsula. Reference numbers for all the listed items are provided in **Appendix H Heritage Impact Assessment**.

Legend

— Captain Cook Drive

□ The Site

□ Project Area

■ Protected Areas

Heritage Site Types

▲ Artefact Scatter

▲ Burial

▲ Burial/s, Midden

▲ Midden

▲ Midden, Open Camp Site

▲ Midden, PAD

▲ Open Camp Site

▲ PAD

▲ Rock Engraving

▲ Shelter with Art

▲ Shelter with Midden

--- Four Wheel Drive Track

□ Kurnell Peninsula Headland
(National Heritage List)



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0 150 300 600 900 1,200
Metres
Datum: GDA94
Grid: MGA Zone 56

Source: Aerial Imagery from Bing Maps © 2010 Microsoft Corporation and its data suppliers.
Heritage Sites and Search Area provided by Australian Museum Business Services (AMBS), 15 January 2012.

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CALTEX
(REFINERIES)
PTY LTD

KURNELL REFINERY CONVERSION

RECORDED HERITAGE
ITEMS

URS

File No: 43177836.015.mxd

Drawn: SB/STB Approved: RO

Date: 23/04/2013

Figure: 18-1

Rev. A

A4



Table 18-2 Items of Historic Heritage Significance from within the Study Area

Item	Primary Address	CHL	NHL	RNE	SHR	SEPP
Kurnell Peninsula Headland	Kurnell Peninsula		✓			
Kamay Botany Bay*	Kurnell Peninsula		✓			
Cape Bailey Lighthouse	Sir Joseph Banks Dr, Kurnell	✓		✓		
Alpha Farm	Botany Bay National Park				✓	✓
Banks Monument	Botany Bay National Park				✓	✓
Captain Cook's Landing Place	Botany Bay National Park			✓	✓	✓
Commemorative Tree Plantings	Botany Bay National Park				✓	
Cook's Monument	Botany Bay National Park				✓	✓
Cook's Well	Botany Bay National Park				✓	✓
Discovery Centre	Botany Bay National Park				✓	
Forby Sutherland Movement	Botany Bay National Park				✓	✓
Foreshore Pines near Flagstaff	Botany Bay National Park				✓	
Foreshore Sea wall – coursed stones	Botany Bay National Park				✓	
Freshwater Steam Plaque	Botany Bay National Park				✓	
Inscription Point Plaque	Botany Bay National Park				✓	
Issac Smith Memorial	Botany Bay National Park				✓	
Kurnell meeting Point Precinct	Botany Bay National Park				✓	
Landing Place Memorial	Botany Bay National Park				✓	
Main Flagstaff	Botany Bay National Park				✓	
Prince's Tree memorial	Botany Bay National Park				✓	
Queen Elizabeth II Tree	Botany Bay National Park				✓	
Solander Memorial	Botany Bay National Park				✓	
Trust Wharf Abutment	Botany Bay National Park				✓	✓
Botany Bay National Park	Cape Solander Drive					✓
Kurnell Monuments	Cape Solander Drive					✓
Solander Monument	Cape Solander Drive					✓
Cook's Watering Hole	Cape Solander Drive					✓
Flagpole	Cape Solander Drive					✓
Yena Track	Cape Solander Drive					✓
Muru Track	Cape Solander Drive					✓
Tabbagai Gap cliff site	Tabbagai Gap					✓
Tabbagai Gap house site	Tabbagai Gap					✓
Four wheel drive track	Captain Cook Drive, Kurnell					✓
Australian Oil Refinery	Sir Joseph Banks Drive, Kurnell					✓

*A listing for the Kamay Botany Bay has been nominated for inclusion in the NHL, if included this listing would include all the values currently listed within the Kurnell Peninsula Headland listing within a broader boundary and would recognise additional associative heritage values, thereby superseding the former listing.

Figure 18-1 shows the location of the aboriginal and historic heritage items (excluding those in Kamay Botany Bay National Park) that have been recorded on the Kurnell Peninsular.

As shown on **Figure 18-1**, there are three identified historic heritage items or places in the immediate vicinity of the Site. The Project Area itself forms part of the locally significant 'Australian Oil Refinery' (as listed on Schedule 2 of the SEPP (Kurnell Peninsula)). The locally significant four wheel drive track (Captain Cook Drive) is closely associated with the north-west and south-west boundaries of the Site. However, there is no physical evidence of the track within the boundary of the Site today.

The nationally significant Kurnell Peninsula Headland adjoins the eastern boundary of the Site. Other heritage items on the Kurnell Peninsula are at a distance of at least 300 m or more from the Site and would not be affected by the Project.

18.7 Impact Assessment

18.7.1 Aboriginal Heritage

No Aboriginal archaeological sites, objects or places, or areas of archaeological potential or Aboriginal sensitivity, were identified within the Project Area (refer to **Figure 18-1**).

Due to the extensive disturbance on the Site from industrial development (confirmed following the site inspection conducted with a representative of La Perouse LALC), it is considered highly unlikely that any Aboriginal heritage items remain within the Site.

Therefore, the proposed works are expected to have no impact on any known Aboriginal heritage sites or values during the construction or operation of the Project. As such, the Project would be unlikely to affect the historic significance, aesthetic significance, scientific significance, and social/spiritual significance of any Aboriginal sites or places.

18.7.2 Historic Heritage

Overview

The Project has the potential to impact three historic heritage items. These are:

- Australian Oil Refinery;
- Four-wheel drive track (Captain Cook Drive); and
- Kurnell Peninsula Headland – incorporating a number of historic heritage items.

These are discussed below. The Project is not anticipated to have an impact on any other historic heritage item identified on the NHL, CHL, RNE or SHR in the vicinity of the Site. Caltex is therefore not required to submit a referral under the provisions of the EPBC Act with regards to heritage related MNES.

Kurnell Peninsula Headland

The Project would not impact on the heritage fabric of the NHL Kurnell Peninsula Headland, and there would be no change to the identified historic or social values of the place. The Project would not alter the existing landscape setting of the Kurnell Peninsula Headland or otherwise impact on the existing view corridors associated with the national heritage values of the place. Therefore no adverse impacts from the Project are expected on the NHL Kurnell Peninsula Headland.

Four Wheel Drive Track

There is no physical presence of the original four wheel drive track within the boundary of the Site today. The proposed works would not extend beyond the boundary of the Site. Therefore there is no anticipated impact on the historic significance of this item.

Australian Oil Refinery

The conversion of the refinery to a finished product terminal would have an adverse impact on the technical and scientific values of the Australian Oil Refinery site. Decommissioning the plant would diminish the ability of the Site to demonstrate its technological significance and its historical contribution to development of an oil refining industry in NSW in the mid-twentieth century.

The conversion of all crude oil tanks to finished products tanks and possible discontinuation of use of other speciality tanks would have a minor adverse impact on the technical significance and representative value of the Site, by reducing the functional range of tanks in use. However, the cleaning and/or modification of some of the existing tanks at the Refinery to store finished petroleum products would conserve an element of the historical value of the Site keeping the Site as part of the Australian petroleum industry.

Although the installation of new pipelines along the existing Pipeline Easement, and conversion of an existing pipeline within Pipeline Easement 1 to a new use may have minor impacts on the Australian Oil Refinery site, they are consistent with on-going use of the Site, and necessary to update infrastructure to current operational standards.

18.8 Mitigation

18.8.1 Aboriginal Heritage

Despite the disturbed nature of the Project Area if *in situ* Aboriginal heritage items are found during the construction of the Project, works would cease and notification made to the NSW Heritage Office.

18.8.2 Historic Heritage

Caltex is aware of the heritage significance of the Site and has undertaken a number of measures to document the history of the Site and to present the history to its employees and the local community. For example, in 2005, Caltex produced a DVD capturing 50 years of refining at the Kurnell Refinery.

In addition to this, Caltex also has plans to:

- form an in-house team to manage documentation and interpretation of the history of the refinery prior to its closure, including production of a colour illustrated book on the history of the refinery, targeted at Caltex's employees;
- liaise with the Mitchell Library (NSW State Library) to prepare a photographic record of the Site and people associated with the refinery for inclusion in the library's archives; and
- engage a professional photographer to prepare a photographic exhibition on the refinery.

Caltex maintains a collection of historical material from the Site including photos, hardware, clothing and tools. A site librarian manages the collection of refinery photos and memorabilia for Caltex. This collection is located in a secured area and includes:

- photos covering the history (both plant and people) of the refinery from construction to the present day (some originals, others scanned from originals provided by employees);
- photos from other parts of Caltex including marketing, distribution and the corporate office;
- photos depicting Caltex's and the refinery's involvement in the community;
- past issues of the company magazine, the "Caltex Star", back to the 1950s (issues have also been lodged with the Mitchell Library);
- past issues of refinery newsletters, including the "Look Box", and the "Good Oil", going back to the 1950s;
- film footage from the refinery;
- Caltex and Ampol advertisements (also held by the National Film and Sound Archive in Canberra);
- films about aspects of Australian life produced by Caltex and Ampol in the 1960s and 1970s (when the company was involved in film making);
- various company and Caltex memorabilia dating back to before the refinery's construction including signs, sporting trophies, employee booklets, plaques, old turnover books etc.; and
- original Max Dupain photos of the refinery including images of the Harry Seidler designed refinery houses featuring original furnishings.

Further, as part of the Heritage Impact Assessment and ongoing management of the Site, Caltex has committed to undertaking the following additional measures to manage and mitigate impacts arising from the Project:

- an archival photographic record of the existing fabric and operations of the Refinery would be prepared while the plant is still operational, and during the decommissioning process. The recording would be undertaken in accordance with the Heritage Council guidelines on *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006). The archival recording would be maintained for the appreciation of present and future generations. The recording would be lodged with Sutherland Shire Library and the NSW State Library.
- a Heritage Management Strategy would be prepared for the Australian Oil Refinery site prior to shut-down of the refinery plant, to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works on the Site. The Strategy would include a review of the heritage significance of the overall Site. The review would clarify the extent and relative heritage value of the place by identifying key elements of industrial and built heritage, as well as social values of the refinery, and the relative contribution of these elements to the overall significance of the Site. Recommendations would also address the future assessment and management of memorabilia and other significant items of moveable heritage maintained on-site.

18.9 Summary

Impacts of the Project on local heritage items would be limited to the impact to the Australian Oil Refinery through decommissioning and conversion of the existing refinery to a finished product terminal. Although decommissioning would have an impact on parts of the listed item, the action would conserve some historical value through the cleaning and/or modification of some of the existing tanks at the Refinery.

The potential discovery of unlisted Aboriginal and/or Historic heritage items would be managed in accordance with the mitigation and management measure listed below. Providing this measure is implemented there would be no further anticipated impact on Aboriginal heritage items from the Project.

Table 18-3 outlines the management and mitigation measures that would be put in place to minimise any adverse impacts on existing and potential heritage items affected by the Project.

Table 18-3 Management and Mitigation Measures - Heritage

Management and Mitigation Measures	Implementation		
	Design	Construction	Operation
An archival photographic record of the existing fabric and operations of the Kurnell refinery would be prepared while the plant is still operational, and during the decommissioning process. The recording would be undertaken in accordance with the Heritage Council guidelines on Photographic Recording of Heritage Items Using Film or Digital Capture (2006). The archival recording would be maintained for the appreciation of present and future generations. To this end, the recording would be lodged with Sutherland Shire Library and the NSW State Library.	✓		
A Heritage Management Strategy would be prepared for the Australian Oil Refinery prior to shut-down of the refinery plant, to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works. The Strategy would include a review of the heritage significance of the overall Site. The review would clarify the extent and relative heritage value of the place by identifying key elements of industrial and built heritage as well as social values of the refinery, and the relative contribution of these elements to the overall significance of the Site. Recommendations would also address the future assessment and management of memorabilia and other significant items of moveable heritage maintained on-site.	✓		
If any further heritage items were discovered throughout the Project, work would cease until an assessment is carried out by a qualified heritage professional.	✓	✓	

19 Ecology

19.1 Introduction

URS Australia Pty Ltd (URS) commissioned Biosis Pty Ltd (Biosis) to undertake a Flora and Fauna Assessment for the Project. This chapter provides a summary of the assessment which is provided in full in **Appendix I Ecology Impact Assessment**.

The Flora and Fauna Assessment describes the existing ecological environment relevant to the Project, and assesses the potential impacts of the proposed works on the ecological values of the local area (assessed as 5 km surrounding the Project Area). A particular emphasis is placed on threatened species, populations and ecological communities. The assessment has been based on a literature and database review and a site investigation.

19.2 Scope of the Assessment

The Flora and Fauna Assessment was undertaken to address the DGRs for the Project, which require the EIS to assess any potential impacts on flora and fauna with specific consideration of:

- *“terrestrial and aquatic ecology, including the surrounding Botany Bay National Park, Towra Point Nature Reserve and Towra Point Aquatic Reserve.”*

The objectives of this Flora and Fauna Assessment were to:

- determine ecological impacts that may result due to the Project;
- undertake background research to determine the likelihood for New South Wales (NSW) and/or Commonwealth threatened biota to be present within the Project Area and within a 5 km radius of the Project Area;
- describe the flora and fauna present within the Project Area and understand its general condition;
- map native vegetation and other habitat features (rocky outcrops, noxious weeds, water bodies, hollow-bearing trees, etc.);
- determine presence or absence of threatened NSW and Commonwealth listed threatened biota, listed under the TSC Act, FM Act or EPBC Act considered with the potential to occur. From prior site/area experience the target species will likely include threatened flora, frogs and birds; and
- identify potential implications of the Project and provide recommendations to assist with mitigating any potential impacts.

19.3 Method of Assessment

A literature and database review, field inspection and reporting was undertaken for the assessment. These tasks undertaken are outlined in **Section 19.3.1** to **Section 19.3.3** respectively.

19.3.1 Literature and Database Review

Database searches were undertaken for flora and fauna from within 5 km of the Project Area (the 'local area') from the following relevant public databases:

- Protected Matters Search Tool of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for matters protected by the EPBC Act;
- Department of Primary Industries (DPI) Threatened & Protected Species – Records Viewer for Sydney Metro CMA and Hawkesbury Nepean CMA;
- NSW Bionet Atlas of NSW Wildlife Office of Environment and Heritage (OEH);
- PlantNET for Rare or Threatened Australian Plant information (The Royal Botanic Gardens and Domain Trust, 2012); and
- BirdLife Australia, the New Atlas of Australian Birds 1998-2012 (BA).

Additional information was collected from previous reports and other published material relevant to the local area (refer to **Appendix I Ecology Impact Assessment**).

The results of the literature and database review were used to assess the likelihood of threatened biota occurring within the local area. Those species which were considered to have a medium or high likelihood of occurrence were given further consideration during the field inspection and, if necessary, the impact assessment.

19.3.2 Site Investigation

Flora and fauna surveys for the Project Area were completed on the 30 October 2012.

The flora survey traversed the Project Area using a combination of random meanders (Cropper, 1993) to identify vegetation associations (Specht, 1970), as well as transects to determine the vegetation assemblage and the relevant classification present within the Project Area. The general condition, structure and connectivity of native vegetation was recorded. Notes were made on specific issues such as noxious weeds, evidence of management works and general impacts. Habitat features were also searched for including hollow-bearing trees, coarse woody debris, natural waterbodies, etc.

Targeted surveys were undertaken for the threatened Coast Groundsel *Senecio spathulatus* (endangered, TSC Act) to determine whether it was present, or whether suitable habitat exists for the species within the Project Area. This was triggered by a previous OEH record of the species located within the Site.

The fauna survey aimed to determine if potential habitat for threatened fauna existed within the Project Area. All species of fauna observed during the survey were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks, woody debris and artificial debris, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. A detailed description of the survey methods used is provided in **Appendix I of Appendix I Ecology Impact Assessment**. Fauna species were recorded with a view to characterising the values of the Project Area and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the Project Area over time. The field inspection aimed to identify potential habitat for threatened fauna species. However, no targeted surveys were undertaken during the Site investigation.

Mapping was compiled using hand-held (uncorrected) Global Positioning System (GPS) units (WGS84) and aerial photo interpretation. Locations of pest species and/or areas of ecological sensitivity were recorded using hand-held (uncorrected) GPS units (generally ± 7 metres accuracy).

19.3.3 Reporting and Assessment

Habitat Suitability Assessment

Following the completion of the desktop review and Site investigation, an assessment of the potential habitats present within the Project Area was undertaken for those threatened species, populations and ecological communities predicted to occur in the local area. This assessment focused on TSC Act, FM Act and EPBC Act listed species, populations and ecological communities and is provided in **Appendix I Ecology Impact Assessment**. This technique aids in the determination of the potential for listed species, populations or communities to occur within the Project Area rather than relying solely on one-off surveys that are subject to seasonal and weather limitations and provide only a snapshot of ecological assemblages present. Threatened biota were ruled out from the assessment if suitable habitat did not exist within the Project Area.

Evaluation of Impact

Assessments of State and Commonwealth listed threatened biota that could be potentially impacted by this Project have been completed. Assessments of threatened biota listed under the NSW TSC Act and FM Act are addressed using the criteria provided in *Threatened Species Assessment Guidelines*, the *Assessment of Significance* (AOS) (DECC, 2008b). Assessments of threatened biota listed under the EPBC Act have been addressed using the criteria provided in DEWHA's (2009) '*Matters of National Environmental Significance, Significant Impact Criteria (SIC) assessment guidelines*'. These assessments are shown in full in **Appendix I Ecology Impact Assessment**.

Key Threatening Processes (KTPs) were also considered during the impact evaluation process. KTPs that are relevant to the Project are discussed in **Section 19.5.3**.

Mitigation measures have been proposed in **Section 19.6** to address any potential adverse impacts of the Project.

19.4 Existing Environment

19.4.1 Ecological Overview

Kurnell Refinery is located on the Kurnell Peninsula south of Botany Bay. The Site falls within the Hawkesbury Nepean Catchment Management Authority (CMA) following its merger with Sydney Metro CMA. The Site is located within the Sydney Basin bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway & Creswell 1995). The original vegetation has been extensively cleared on the Kurnell Peninsula. Only remnant patches of vegetation remain in some of the areas of more significant ecological value including:

- Botany Bay;
- Marton Park Woodland and Wetlands (a Groundwater Dependent Ecosystem which includes fringing Swamp Oak Floodplain Forest);

- Towra Point Nature Reserve (Ramsar wetland);
- Towra Point Aquatic Reserve; and
- Kamay Botany Bay National Park.

These areas are shown on **Figure 19-1**. The Towra Point Nature Reserve, a Ramsar wetland of international significance, is located within 5 km of the Site.

The vegetation and fauna habitat throughout the majority of the Project Area has been highly modified by past and current disturbance related to the Kurnell Refinery, since its development in 1953. The majority of the Project Area is devoid of vegetation and associated habitat due to the highly modified nature of the Site. The vegetation that remains is significantly degraded, providing limited value for native fauna.

19.4.2 Flora

A total of 76 flora species were recorded within the Project Area during the Site investigation, including 28 native species and 48 exotic species of which three were classed as noxious weeds (refer to Appendix A2.1 of **Appendix I Ecology Impact Assessment** for full species list). No threatened flora species, ecological communities or Rare or Threatened Australian Plants (ROTAP) were recorded.

The desktop review identified one threatened flora species as having been previously recorded within the Project Area: Coast Groundsel *Senecio spathulatus*. This species was not recorded with the Project Area during the Site investigation. While the record of this species is mapped within the Project Area, the accuracy associated with this mapping record is approximately 1 km, so it is considered likely that the previous record is actually located somewhere within the adjacent Kamay Botany Bay National Park.

19.4.3 Fauna

A total of 20 fauna species were recorded within the Project Area comprising 19 bird species and one reptile (refer to Appendix A3.1 of **Appendix I Ecology Impact Assessment** for full species list). Three of the birds recorded were introduced species.

The desktop review identified a number of threatened fauna species as having been previously recorded within close proximity to the Project Area. The high number of species is likely as a result of the proximity of the Site to the surrounding Ramsar Wetland, National Park and Nature Reserve, all of which provide substantial habitat for a range of threatened species. The Site itself provides limited habitat resources for threatened biota, given the overall lack of intact vegetation, lack of typical habitat resources, and ongoing disturbance and activities in the Site.



Legend

- Captain Cook Drive
- Silver Beach Aquaculture
- Towra Point Aquatic Reserve ^
- National Park
- Towra Point Nature Reserve
- Project Area
- The Site

Noxious Weeds

- *Chrysanthemoides monilifera* subsp. *rotunda*
- ▲ *Lantana camara*
- *Ricinus communis*

Vegetation

- Eastern boundary disturbed native vegetation
- North-east corner revegetation
- North-west corner planting

Coordinate System: GDA 1994 MGA Zone 56

Projection: Transverse Mercator

Datum: GDA 1994

Units: Meter

0 100 200 400 Meters

Source: Aerial Imagery - © NearMap '23 October 2013'
Streets and Protected Area - © Mapinfo Australia Pty Ltd and
PSMA Australia Ltd
Vegetation and Noxious Weeds - Biosis Pty Ltd, Figure 6
- 19 November 2012.

^ Office of Environment and Heritage (OEH)

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19.4.4 Vegetation Communities

The Project Area supports three small patches of vegetation:

1. *North West Corner Planting* - adjacent to the existing Waste Water Treatment Plant (WWTP). This patch of vegetation is approximately 0.17 hectares (ha) in size (refer to **Figure 19-1**), and comprises planted trees (including Radiata Pine *Pinus radiata*, Oleander *Nerium oleander* and Swamp Paperbark *Melaleuca ericifolia*) and over managed (mown) exotic grasses and weeds. This area of planting lacks ground and mid story vegetation supporting only highly mobile fauna species which move through the Project Area on occasion.
2. *Eastern Boundary Disturbed Native Vegetation* - this patch of vegetation exists mid-way along the eastern boundary of the Project Area and is approximately 0.55 ha in size (refer to **Figure 19-1**). This patch is bounded on all sides by roadways, tanks and hard stand areas and is disturbed by various site activities resulting in noticeable edge effects. The area was mapped as *Coastal Flats Swamp Mahogany Forest* by SMCMA in 2009 however the vegetation found in this location does not align with this community. The vegetation is likely to have once formed part of the closely adjoining Kamay Botany Bay National Park, and may have previously been considered *Coastal Sand Apple-Bloodwood Forest*, given the presence of diagnostic tree, shrub and ground cover species, as described by SMCMA (2009).

Vegetation within this patch included Sydney Red Gum *Angophora costata* and Coastal Banksia *Banksia integrifolia*, shrub species; Heath-leaved Banksia *Banksia ericifolia*, Coastal Wattle *Acacia longifolia* subsp. *longifolia*, Sweet Wattle *Acacia suaveolens*, Prickly Moses *Acacia ulicifolia* and Variable Bossiaea *Bossiaea heterophylla* as well as ground cover species; Blue Flax Lily *Dianella caerulea*, Bracken *Pteridium esculentum*, Matt rush *Lomandra longifolia*, Blady Grass *Imperata cylindrica* and Variable Sword-sedge *Lepidosperma laterale*.

Whilst this patch of vegetation contains the native species listed above, it was considered to be highly disturbed, given the presence of a number of weed species and the low diversity and overall lack of canopy and ground cover species. This patch does have a dense midstorey, which provides good cover for small woodland birds. Located on the eastern boundary of the Project Area, this vegetation is disconnected from the adjacent vegetation within Kamay Botany Bay National Park by a hard surfaced drainage channel approximately 10 m in width.

3. *North East Corner Revegetation* - located in the north eastern corner of the Project Area and approximately 0.60 ha in size (refer to **Figure 19-1**). This area appears to have been revegetated over the last one to two years and is showing good resilience. Within this vegetation, sporadic weeds were seen around the edges including NSW DPI and Sutherland Shire Council listed noxious weed, Bitou Bush *Chrysanthemoides monilifera* subsp. *rotunda*. This sandy exposed area of establishing regeneration provides ideal habitat for small reptiles to bask and shelter. Lying at the boundary of the Site, land this area is close to the adjacent Kamay Botany Bay National Park and may be utilised by mobile reptiles and potentially amphibians.

19.4.5 Habitat Resources

No hollow-bearing trees, coarse woody debris, rock outcrops or natural water bodies were found within the Project Area. The three vegetation patches outlined in **Section 19.4.4** form the primary fauna habitat within the Project Area. Other potential fauna habitat or foraging related assets include; perch structures (i.e. tank infrastructure) for birds of prey and debris, such as concrete blocks in areas around the edges of the Project Area providing sheltering sites for common reptiles and potentially amphibians.

No natural water bodies occur within the Project Area. As such aquatic habitat is limited to a single reservoir of water located at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive. This reservoir has sheer exposed sides, negligible aquatic habitat and does not provide culvert roosting opportunities for microbats. Other water bodies include concrete stormwater drainage channels and pipelines.

Connectivity across the Project Area is limited. However, given that Kamay Botany Bay National Park surrounds a large portion of Project Area, some dispersal is possible. Parts of the stormwater system, such as drainage channels and pipelines that capture and direct stormwater, may also provide dispersal passage for mobile fauna. The catchments within the Project Area which transfer contaminated water may not provide tolerable habitat for highly sensitive amphibian species. Piles of debris and rubble may provide temporary refuge for frogs if they are traversing through the Project Area. However, these areas are often localised and not well connected leaving large exposed areas to be crossed without refuge opportunities.

19.4.6 Threatened Biota

A number of threatened species, populations and/or ecological communities are predicted or known to occur within 5 km of the Project Area. Many of these species are considered unlikely to occur within the Project Area, due to a lack of suitable habitat. The threatened biota considered to have a medium to high likelihood of occurrence is presented in **Table 19-1**.

Table 19-1 Threatened Biota Considered to have the Potential to Occur within the Project Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Project Area Relationship
<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Vulnerable	This species has the potential to be found throughout the Project Area on occasion during dispersal, however it is more likely to be found within the eastern boundary vegetation patch and the north-east vegetation area based on their proximity to the adjacent Kamay Botany Bay National Park where historical records exist (refer to Figure 19-1).
<i>Crinia tinnula</i>	Wallum Froglet	Vulnerable	Not listed	This species has the potential to be found within the Project Area on occasion during dispersal, however is more likely to be found within the eastern boundary vegetation patch and the north-east vegetation area based on their proximity to the adjacent Kamay Botany Bay National Park where historical records exist (refer to Figure 19-1).
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not listed	The Powerful Owl may forage across the Project Area; however the primary areas which are likely to support prey species occur within the three vegetated patches shown on Figure 19-1 .

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Project Area Relationship
<i>Tyto longimembris</i>	Eastern Grass Owl	Vulnerable	Not listed	No breeding or preferred foraging resources occur within the Project Area. Given that this species was recorded approximately 1.5 km south of the Project Area within Kamay Botany Bay National Park as recently as 2010, it is possible that this species will move through the Project Area to forage, particularly the eastern and north-eastern vegetation patches shown on Figure 19-1 .
<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable	Not listed	No breeding or preferred foraging habitat occurs within the Project Area. The closest records are approximately 500m south within Kamay Botany Bay National Park, however the most recent of these records dates from 1988. More recent records occur within Towra Point Nature Reserve 5 km east of the Project Area. Although unlikely, if individuals from this population were to enter the Project Area, their presence would most likely be associated with the three vegetation patches within the Project Area.
<i>Calamanthus fuliginosus</i>	Striated Field Wren	Endangered	Not listed	No breeding or preferred foraging habitat occurs within the Project Area. The closest records are from approximately 5 km east dating from 2002 (Bird Life Australia data). Although unlikely, if individuals from this population were to enter the Project Area, their presence would most likely be associated with the three vegetation patches within the Project Area.
<i>Pandion cristatus</i>	Osprey	Vulnerable	Not listed	The Osprey was recorded in 2011, 5 km to the east of the Project Area. No foraging or breeding sites occur within the Project Area. However the Project Area contains tall infrastructure suitable as perching habitat for large birds such as the Osprey.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	Not listed	The Eastern Bentwing-bat was recorded in 2010, less than 1 km north of the Project Area. A reservoir of water occurs at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive. This reservoir had sheer exposed sides and does not provide roosting opportunities for microbats. Although the Project Area does not provide preferred foraging habitat, the Eastern Bentwing-bat may forage within the Project Area on occasion within the three vegetated areas.

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Project Area Relationship
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not listed	The Southern Myotis was recorded in 2009 less than 1 km south west of the Project Area. A reservoir of water occurs at Chisholm Drive at the western extent of the Project Area near Captain Cook Drive. This reservoir had sheer exposed sides and does not provide roosting opportunities. Although it is unlikely to support an abundance of prey, the Southern Myotis may forage over this water body on occasion.
<i>Senecio spathulatus</i>	Coast Groundsel	Endangered	Not listed	Although <i>S. spathulatus</i> has been recorded within the Project Area recently, the accuracy of the record is ~1km and given the lack of suitable habitat it is considered likely that the record was located in the adjacent Kamay Botany Bay National Park.
<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner (SSFCF)</i>	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner (SSFCF)	Endangered Ecological Community	Not listed	Although a threatened ecological community equating to the SSFCF has been previously mapped at three separate patches within the Project Area, ground truthing of these areas identified one as being un-vegetated and the remaining two not consistent with the final determination of the community. Outside of these areas, no potential habitat for SSFCF was identified within the Project Area.

The Project Area was considered unlikely to support any marine or freshwater threatened species given the lack of suitable habitat resources.

No NSW or Commonwealth listed Threatened Ecological Communities (TEC) were found within the Project Area. SMCMA (2009) mapping indicated that *Coastal Flats Swamp Mahogany Forest* occurs within the Project Area, in three separate patches along the eastern boundary. This SMCMA community, by definition aligns with TSC Act listed TEC, *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Swamp Sclerophyll Forest on Coastal Floodplains)*.

The SMCMA mapping notes that the vegetation in question has not been ground truthed or surveyed and has been interpreted to be present by aerial photograph imagery only. Based on this knowledge, the field survey specifically assessed the potential for the TEC to occur within the Site, in the locations shown on the SMCMA (2009) vegetation mapping of the region. It was determined that the vegetation present within the Site did not comprise the TEC, and instead aligned more closely with *Coastal Sand Apple-Bloodwood Forest*, which the SMCMA mapping shows within the adjoining Kamay Botany Bay National Park. The vegetation present within the Site was considered to align with *Coastal Sand Apple-Bloodwood Forest* given the presence of diagnostic tree, shrub and ground cover species, as described by the SMCMA (2009). *Coastal Sand Apple-Bloodwood Forest* does not align with any TEC under the TSC Act.

19.4.7 Critical Habitat

Habitat critical to the survival of an endangered or critically endangered species, population or ecological community can be identified under the TSC Act and listed on the Register of Critical Habitat kept by the OEH. The Project Area does not contain declared critical habitat as listed under the TSC Act or the OEH Register of Critical Habitat.

The identification of critical habitat for the Register of Critical Habitat, including location and extent information, is a matter of ecological judgement, and is based on the most up-to-date scientific information available to the Threatened Species Scientific Committee and the Minister for DSEWPac. There are no areas of critical habitat listed under the EPBC Act that are relevant to the Project Area or the surrounding area.

19.4.8 Noxious Weeds

Three noxious weeds, listed by NSW DPI for the Sutherland Shire Council listed under the *Noxious Weed Act 1993* (NW Act) were recorded in the Project Area, including:

- Bitou Bush *Chrysanthemoides monilifera* subsp. *rotunda*;
- Castor Oil Plant *Ricinus communis*; and
- Lantana *Lantana camara*.

These are all listed as Class 4 noxious weeds by NSW DPI. The requirements for the control of Class 4 noxious weeds, under the NW Act include:

- 'the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction'; and
- 'the plant must not be sold propagated or knowingly distributed'.

The latter requirement is not relevant to Caltex or this Project.

19.5 Impact Assessment

The Project would not result in the removal of any planted or native vegetation. Whilst there are patches of vegetation within the Project Area, these areas would not be cleared or impacted as a result of the proposed works. Given the lack of impacts to vegetation within the Site, the potential for impacts to native biota is considered to be negligible.

The Project is also unlikely to result in any impacts on surrounding water bodies (refer to **Chapter 11 Surface Water, Wastewater and Flooding**). As the Project is expected to have a negligible impact on stormwater flows, a beneficial impact on stormwater quality and a neutral impact on wastewater flows and quality, no adverse impacts on local aquatic biota are expected. Therefore marine and aquatic biota have not been considered further.

19.5.1 Threatened Biota

A number of species listed as migratory under the EPBC Act are predicted to occur within a 5 km buffer of the Project Area. While some of these species would be expected to pass over the Project Area on occasions, or may be resident in the adjacent Kamay Botany Bay National Park or Towra Point Nature Reserve, the Project Area does not provide important habitat for an ecologically significant proportion of any of these species, hence no Commonwealth significant impact criteria assessments were undertaken for listed migratory species.

The results of the habitat suitability assessments (refer to **Appendix I Ecology Impact Assessment**) indicate that two threatened fauna species, one threatened flora species, one threatened ecological community and one Ramsar wetland listed under the TSC and/or EPBC Act have been recorded or are considered as likely to occur within, or be relevant to the Project Area, and which have the potential to be impacted by the Project. Accordingly, assessments aligned with the criteria established in Appendix 3 of the *Guidelines for Threatened Species Assessment* (DEC & DPI 2005) (the NSW assessment of significance) and Commonwealth significant impact criteria assessments for the following threatened biota were undertaken:

1. Green and Golden Bell Frog *Litoria aurea*;
2. Wallum Froglet *Crinia tinnula*;
3. Coast Groundsel *Senecio spathulatus*;
4. Coastal Flats Swamp Mahogany Forest *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner*; and
5. Towra Point Nature Reserve Ramsar Site.

The results of the assessments indicate that no significant impact is considered likely to the Wallum Froglet *Crinia tinnula* or Coast Groundsel *Senecio spathulatus*, given the lack of suitable habitat within the Project Area.

The assessments conclude that it is unlikely that the Project has the potential to significantly impact the Green and Golden Bell Frog given that no potential breeding sites or foraging habitats would be negatively impacted as a result of the proposed works and connectivity around the Project Area would remain the same.

The significant impact criteria assessment concludes that it is unlikely that the proposal has the potential to significantly impact Towra Point Nature Reserve Ramsar Site.

19.5.2 Matters of National Environmental Significance

Three MNES were considered to be potentially relevant for the Flora and Fauna Assessment:

- listed threatened species and communities;
- listed migratory species; and
- Ramsar wetlands of international importance.

Based on the results of the Flora and Fauna Assessment, the Project is unlikely to significantly impact on any MNES, and therefore a Referral to the Minister under the EPBC Act is not required.

19.5.3 Key Threatening Processes

A Key Threatening Process (KTP) is defined under Schedule 3 of the TSC Act as 'a *threatening process*' where the process 'threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'.

The Project could potentially cause an increase in the following KTPs as listed under the EPBC Act:

- *Anthropogenic climate change* - Greenhouse gas emissions would result from increased traffic to, from and within the Site during construction, however there would be a net reduction in overall traffic movements for the finished product terminal. Also the proposed operation would require significantly less energy to operate than the existing refinery. Overall, the potential impact of this KTP should decrease.
- *Competition and grazing by the feral European rabbit (Oryctolagus cuniculus)* - rabbit scats were observed within the Project Area. However, the Project is unlikely to increase the prevalence of rabbits within the Project Area and should not contribute to the increase of this KTP.

The Project could potentially cause an increase in the following KTPs as listed under the TSC Act:

- *Anthropogenic climate change* - Greenhouse gas emissions would result from increased traffic to, from and within the Site during construction. However, there would be a net overall loss in overall traffic movements for the finished product terminal. Also the proposed operation would require significantly less energy to operate than the existing refinery. Overall, the potential impact of this KTP should decrease.
- *Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)* - Bitou Bush *Chrysanthemoides monilifera subsp. rotunda* was recorded within the Project Area. The Project has the potential to increase the presence of Bitou Bush during construction and operation, through the movement of vehicles and increased disturbance within the Project Area. The Project therefore has the potential to cause the spread of this species off-site, through wind and water seed dispersal.
- *Invasion and establishment of exotic vines and scramblers* - construction of the Project has the potential to increase the spread and establishment of exotic vines and scramblers through the disturbance of soils and the spread of seeds. Where exotic vines and scramblers are already present within the Project Area, there is potential for these species to be spread via construction vehicles and natural dispersal into cleared and disturbed areas.

19.5.4 Construction Impacts

A number of impacts have the potential to occur during the construction phase of the Project.

The Project is unlikely to cause direct ecological impacts given the works proposed and the limited vegetation within the Site. Nevertheless, the following direct impacts have the potential to occur as a result of the works:

- temporary and localised alterations to potential habitat for threatened species, including perch locations on tanks, and potential dispersal habitat for threatened amphibians during the construction of the Project;
- increased potential for a number of key threatening processes as listed under the TSC and EPBC Acts (**Section 19.5.3**); and

- potential impacts to the three patches of vegetation on Site. While there would be no clearing of vegetation from within the Project Area, mitigation measures must be implemented to control access to these vegetated areas to limit the potential for accidental impacts.

19.5.5 Operation Impacts

No on-going ecological impacts are expected during the operation of the Project. Once construction works are completed, activity levels on Site are expected to be less than those currently. Environmental management on Site will continue in line with Caltex's current operating procedures and the relevant Environment Protection Licence.

19.6 Mitigation

The following section identifies measures to avoid and mitigate the potential impacts on ecological values associated with the Project. No offset strategy is required for this Project, as the potential impacts are considered to be of low significance.

19.6.1 Impact Avoidance

Impacts on ecology have been avoided by locating the Project footprint in areas lacking ecological values. No vegetation clearing or loss of natural habitat features is envisaged. The three vegetation areas within the Site would not be impacted by the proposed works, nor would there be ongoing impacts to ecological values once construction is complete.

19.6.2 Impact Mitigation

An overview of the ecological mitigation and environmental management measures has been provided below.

Construction Environmental Management

A Construction Environmental Management Plan (CEMP) would be prepared for the construction phase of the Project and would include measures to minimise or avoid impacts on native biota. Management plans, mitigation measures and environmental management measures would be included in the CEMP through the establishment of a Biodiversity and Weed Management Plan (BWMP). The BWMP would be developed and included in the CEMP as a sub-plan to mitigate impacts on biodiversity, and to guide weed control activities throughout construction and operation of the Project. The following strategies and mitigation measures would be incorporated as part of the BWMP:

1. management of weeds;
2. restriction of access to existing vegetated areas;
3. management of sediment, erosion and pollutant run-off; and
4. fauna management.

Management of Weeds

Three noxious weeds were recorded within the Site. In addition, numerous other species of noxious weeds are known to occur within the Sutherland Shire LGA. The BWPM would aim to limit and control the spread of noxious weeds within the Site via the following methods:

- the provision of noxious weed information sheets to construction contractors to help identification of relevant noxious weeds during construction;
- strict stockpiling control and eradication of all noxious weeds as per the NW Act for each weed as per NSW DPI specifications for Sutherland Shire LGA;
- target and control noxious weeds as well as areas of potential new outbreaks including soil stockpiles and any other disturbed areas;
- use of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds. Frogs have been found to be very sensitive to some herbicide products and in particular to the surfactants, or wetting agents used to improve the effectiveness of the chemicals (Mann and Bidwell, 1998); and
- development of monitoring programs for noxious weeds on Site and in the surrounding area, during construction and operation of the Project.

Restriction of Access to Existing Vegetated Areas

While no vegetation clearing is required as part of the Project, existing vegetation on Site should be clearly marked on all Site plans and construction diagrams. It would be made clear that these areas are no-go zones for construction activities related to the Project. Existing vegetation should be clearly fenced off prior to the commencement of construction activities, and should remain fenced off until the completion of works.

Management of Sediment, Erosion and Stormwater Run-off

Sedimentation, erosion and stormwater run-off created from construction activities has the potential to influence water quality and vegetation condition for surrounding communities and catchment areas.

Standard industry measures for sediment runoff on urban developments should be implemented according to the *'The Blue Book Volumes 1 and 2'* (Landcom 2004), and *Managing Urban Stormwater: Soils and Construction Volume 1*, (DECC 2008). Specific sedimentation and stormwater runoff controls should be developed to protect sensitive ecological receptors adjacent to the Site, such as Kamay Botany Bay National Park. These measures have been included in **Chapter 9 Soils, Groundwater and Contamination**.

Fauna Management

While no natural fauna habitat features would be removed as a result of the proposed works, several man-made structures within the Site have the potential to provide habitat for native fauna species, such as perch points and the existing network of pipes and drains. To minimise the potential for impacts to native fauna species during construction works, the following measures are recommended for inclusion in the BWPM:

- if any common species of frogs are found within the Project Area, works should cease until frogs have been relocated to areas outside the area of impact;

- if any threatened frogs e.g. Green and Golden Bell Frog or Wallum Froglet are identified within the Site, works should cease and active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet;
- provide all construction workers on Site with identification sheets relating to the two threatened frog species predicted to occur within the Site (refer to **Appendix I Ecology Impact Assessment**);
- all trenches should be inspected prior to works each morning. Any frogs that become trapped within trenches should be assessed by a suitably qualified ecologist and then released into the nearest suitable habitat if uninjured;
- wash down protocols to prevent the spread of amphibian chytrid disease *chytridiomycosis* would be included within the BWPM. Protocols would be consistent with OEH guidelines (DECC, 2008b). Wash down would occur whenever vehicles enter or leave an excavation area;
- wash down protocols of construction vehicles, machinery, tools and footwear to prevent the spread of root-rot fungus (*Phytophthora cinnamomi*) would be included within the BWMP; and
- if fauna are found to be utilising the Site, or a nest, den or roost is found, work in the immediate area is to stop and the animals are to be allowed to move off freely, or relocated by an authorised person to an area outside the construction footprint.

19.7 Summary

Provided the measures outlined above, and summarised in **Table 19-2** below, are incorporated into the CEMP for the Project and implemented during construction, no adverse impacts are likely to occur on the ecological values identified within this assessment.

Table 19-2 Management and Mitigation Measures - Ecology

Management and Mitigation Measures	Implementation		
	Design	Construction	Operation
Management of Weeds			
A Biodiversity and Weed Management Plan (BWMP) would be prepared in order to limit and control the spread of noxious weeds within the Site. It would include the following: • wash down procedures to reduce the spread of weeds via vehicles and machinery; • measures to target potential new weed outbreaks including soil stockpiles and any other disturbed areas; • outline monitoring programs for noxious and problematic weeds on sites and in the surrounding areas; • measures for strict stockpiling control to help eradicate all noxious weeds as per NSW DPI specifications for Sutherland Shire LGA; • include a list of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds; and ensure that only amphibian friendly herbicides are used; • wash down protocols for construction vehicles and machinery to prevent the spread of root-rot fungus (<i>Phytophthora cinnamomi</i>); and • all personnel undertaking routine management activities of any noxious weeds should be appropriately trained and all contractors should hold the necessary permits and licenses.	✓	✓	✓

Management and Mitigation Measures	Implementation		
	Design	Construction	Operation
Restriction of Access to Existing Vegetated Areas			
A BWMP would be prepared in order to limit potential impacts to existing vegetation outside of the area of proposed works, but within the Site It would include the following: - existing vegetation on Site would be clearly marked on all Site plans and construction diagrams, with clear indications of no-go zones within all vegetated areas; - existing vegetation would be clearly signposted and fenced off prior to the commencement of construction activities, and should remain fenced off until the completion of works; and - absolutely all works would be limited to the defined construction footprint.	✓	✓	
Ecology- Fauna Management			
To minimise the potential for impacts to native fauna species, the BWMP would be developed and include following measures: - if any frogs are found within the Project Area, works would cease until frogs have been relocated to areas outside the area of impact; - if any threatened frogs e.g. Green and Golden Bell Frog or Wallum Froglet are identified within the Site, works would cease and active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet; - all trenches would be inspected prior to works each morning. Any frogs that become trapped within trenches would be assessed by a suitably qualified ecologist or veterinarian and then released into the nearest suitable habitat if uninjured; - identification sheets would be provided to all construction workers on Site for the two threatened frog species predicted to occur within the Site; - wash down protocols to prevent the spread of Amphibian Chytrid Disease (chytridiomycosis) would be implemented at relevant work areas. Protocols would be consistent with OEH guidelines (DECC, 2008b); 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO would be used for the control of noxious weeds; and - if fauna are found to be utilising the Site, or a nest, den or roost is found, work in the immediate area is to stop and the animals are to be allowed to move off freely, or relocated by an authorised person to an area outside the construction footprint.	✓	✓	✓

20 Cumulative Impact Assessment

20.1 Introduction

As requested by the DGRs, certain technical assessments have considered not only the impacts of the Project alone, but also the potential cumulative effects of the Project alongside other proposed developments. Where necessary a Cumulative Impact Assessment (CIA) was included in the technical chapters of this EIS. This chapter summarises the findings of those cumulative assessments.

20.2 Scope of Assessment

The Director General's Requirements (DGRs) (refer to **Appendix A DGRs**) requested '*an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes*'.

The DGRs also ask that the proponent '*Estimate the cumulative impacts for the overall site and the surrounding potentially hazardous developments in the area and demonstrate that the proposed development does not increase the cumulative risks of the area to unacceptable levels*'.

In addition, the Environmental Protection Authority (EPA) requested cumulative impacts be considered as part of the noise assessment, taking into account other projects in the area including '*the Maintenance Dredging around Caltex's wharf, the demolition of the Caltex Lube Oil Refinery and the possible future demolition of the Continental Carbon premises*' depending on the timeframe of these projects.

It should be noted that the demolition of the Caltex Lube Oil Refinery has already occurred and as such has not been considered as part of this EIS.

20.3 Legislation and Planning Policy

Environmental Planning and Assessment Act 1979

Under Part 5 of the EP&A Act there is a duty for a determining authority to consider the environmental impacts of proposed works. The supporting *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) states that '*for the purpose of the [EP&A] Act, the factors to be taken in to account when consideration is being given to the likely impact of an activity on the environment include...any cumulative environmental effect with other existing or likely future activities*'.

There is no provision in Part 4 of the EP&A Act explicitly requiring a consideration of the cumulative environmental effect in determining a development application. However, when determining a development application, the consent authority is required, under section 79C(1)(b) of the EP&A Act, to take into account the '*likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality*'.

There is also case law¹ where the consideration of cumulative impact assessment has been successfully contested under the EP&A Act.

¹ Environmental Law News, Spring 2009

20.4 Method of Assessment

20.4.1 Introduction

Cumulative Impact Assessment (CIA) is a receptor based assessment, whereby in order to have a cumulative effect two projects or impacts need to affect the same receptor. Therefore if the Project is not affecting a receptor or group of receptors 'alone' then it cannot have a cumulative effect with another project or action. The only exception to this rule is if one of the potential cumulative projects weakens a management or mitigation measure to the point where a Project residual impact becomes significant again. As such, CIA focusses on the residual impacts (i.e. those impacts that remain post mitigation) from a project.

Cumulative impacts can be formed antagonistically², synergistically³ or additively⁴. They are often caused by an action in combination with other past, present, and reasonably foreseeable future human actions⁵.

20.4.2 Approach

The first stage of CIA is to understand the adverse residual impacts of the Project. The second stage is to identify any other development nearby that may affect the same receptors as the Project and/or change the effectiveness of each other's mitigation and management measures. Other relevant projects that may generate a cumulative impact with the proposed works have been identified using the following assessment parameters.

- Spatial parameter - The spatial parameter will depend on the characteristics of the environmental impact and the likely area over which any residual impact would occur. For example, an air quality impact would potentially affect a wider area than a noise impact and would therefore affect different human or environmental receptors in different ways.
- Temporal parameter – The temporal parameter relates to how far into the future or the past the assessment considers cumulative proposals or activities. Projects that are operational have been considered as they form part of the existing environmental baseline for each environmental aspect assessed in this EIS (see **Chapters 8-19**). Projects that are not yet on exhibition have been discounted as their assessments do not contain enough detail on residual effects or final design to allow a robust cumulative impact assessment to take place.

Therefore this CIA has considered the following:

- development applications that are on exhibition;
- development applications that have completed exhibition but are not yet determined; and
- applications that have gained development approval but are not yet fully operational.

² Opposing each other potentially resulting in a lower overall environmental effect.

³ Where two or more impacts produce a total impact greater than the sum of the individual parts. For example oxides of nitrogen and volatile organic compounds each have impacts on human health, but when they combine they form ozone, their combined impact is potentially greater and of more concern to human health.

⁴ For example two sources of equally powerful noise can combine to create a greater overall impact.

⁵ Defined by the European Commission 1999.

In order to identify relevant development, two databases were reviewed in November 2012:

- Major Project Assessments register on the NSW Department of Planning and Infrastructure (DP&I) website; and
- public notices and the 'invitations to comment' register on the Commonwealth Department of Sustainability, Environment, Water, Population and Communities' (DSEWPaC) website.

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

20.4.3 Guidance and Standards

There is no guidance on undertaking interactive or cumulative impact/effect assessment in NSW or Australia. Therefore, this assessment has made reference to the European Commission (EC) *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions 1999* and the Canadian Environmental Assessment Agency *Cumulative Effects Assessment Practitioner's Guide 1999*.

20.4.4 Evaluation of Magnitude of Impact

The criteria adopted in each of the technical assessments (refer to **Chapters 8-19**) have been used to assess the significance of any cumulative impact.

20.5 Cumulative Impact Assessment

20.5.1 Cumulative Impact Scoping

Introduction

As discussed, for a cumulative effect to occur, two impacts need to affect the same receptor. The key receptors in the local area include the community of Kurnell and the environmental receptors of Botany Bay, Towra Point Nature Reserve, Towra Point Aquatic Reserve, Kamay Botany Bay National Park, Marton Park Wetlands and Oyster Farming in Quibray Bay and Botany Bay. Equally the heritage value of the refinery is also a consideration.

The Project has the potential to cause a number of environmental impacts. These have been grouped, assessed and discussed under twelve different environmental aspects (refer to **Chapters 8-19**). For the majority of these aspects, there are expected to be no significant residual impacts during construction or operation on any of the identified receptors. As such in many cases a CIA is not required. Provided the proposed management and mitigation measures (refer to **Chapter 21 Management and Mitigation Measures**) are implemented, and remain effective, there would be no likely residual adverse impact for the following aspects given the existing environment:

- Soils, Groundwater and Contamination (refer to Chapter 9);
- Human Health and Ecological Risk (refer to Chapter 10);
- Surface Water, Wastewater and Flooding (refer to Chapter 11);
- Air Quality and Odour (refer to Chapter 13);
- Greenhouse Gas (refer to Chapter 14);
- Waste Management (refer to Chapter 17); and
- Ecology (refer to Chapter 19).

For the remaining aspects, either the Project is likely to generate residual adverse impacts or consideration of cumulative impacts has been specifically requested. Therefore these aspects are discussed further below.

Hazards and Risk

Following the cessation of refining activities there would be a reduction the number of processes and the variety of petroleum products stored on the Site. Therefore the Project would effectively lower the risk profile of the Site.

As part of the Project, Caltex have, and would continue to, upgrade many of the safety mechanisms that currently operate on the Site. These upgrades would help to further reduce the risk profile for Site during and following the conversion works.

The Quantitative Risk Assessment that has been conducted for proposed terminal operation has demonstrated that the risk levels would be significantly reduced following conversion of the refinery to a terminal.

Appropriate risk levels for residential development in NSW have been established by NSW HIPAP No. 4 as one in a million. The one in a million cumulative risk level for operation of the Project would remain on Site with the small exception around one tank which extends a short distance into the adjacent Kamay Botany Bay National Park.

There would be no increase in cumulative risk associated with the Project.

Noise and Vibration

The acoustic environment surrounding the Project, including the nearest residential receptors at Kurnell, are already influenced by the noise from the existing operations. This noise environment is currently governed by noise limits laid out in EPL 837 (refer to **Appendix B EPL**).

During construction, there would be a number of construction plant (equipment) operating (refer to **Table 12-7 of Chapter 12 Noise and Vibration**). There would also be a small number of additional vehicles to the local road network during construction, prior to the shutdown of the refinery. The combination of these noise sources would have a negligible impact on the surrounding receptors and would be within both the Project Specific Noise Levels and the EPL. Despite this, the potential of an in-combination noise impact with surrounding projects has been considered in **Section 20.5.2**.

Following cessation of refining at the Site, operational noise would reduce substantially and operational noise levels as a result of the Project would remain. These are predicted to be below the INP daytime, evening and night time noise criteria at the closest receivers. It can therefore be concluded that no cumulative noise impact is predicted due to the operation of the Project.

Socio-Economic

This Project is being proposed on the basis of economic efficiency and continuing to supply a reliable source of finished product to NSW and ACT. This has been based on Caltex's internal assessment of economic efficiency (refer to **Chapter 2 Project Need and Alternatives**).

The socioeconomic impact of the Project would be most significant in the Sutherland Shire Local Government Area (SSLGA) where some 70% of employees reside. Direct salary loss from the refinery shut-down has been estimated to be approximately \$111 million annually.

To help the staff that would no longer be required at the Site move on in their lives and careers, Caltex has implemented an employee program named “Stay, Focus & Develop”. This program would provide transitional support for any affected staff. The intent of the program is to enable the achievement of safe and reliable operations at the Site, while demonstrating a high level of care for employees as they prepare for the next phase of their lives and careers following the shutdown on the refinery. This program incorporates transitional support through generous redundancy benefits, outplacement support services, careers fairs featuring prospective employers, vocational training allowances, health and wellbeing programs and services, and industry retraining.

Caltex has indicated that \$80 million dollars is budgeted to be spent on redundancies, retraining and supporting works.

Although the residual socio economic impact of the Project in the area would be significant, conversion to terminal operation would allow some of the existing staff to be retrained and redeployed once the Project is operational and the Site is once again economically viable.

Transport and Access

While not a significant impact, the Project (during construction) would add a small number of vehicles to the local road network. However, as described in **Chapter 16 Transport and Access**, the Level of Service for the peak construction year would remain unchanged.

It should be noted, however, that the road network around the Site already experiences congestion issues during peak periods without inclusion of the vehicles generated by the Project. This is illustrated, in particular, by the fact that the LOS for Captain Cook Drive is currently in the D range. Consequently, construction vehicles utilising these roads during the AM or PM Peak Hour would experience traffic congestion and potential delays.

It should also be noted that, following the shutdown of the refinery in the second half of 2014, road transportation of products from the Site would cease (except in exceptional circumstances) and worker numbers on Site would gradually decrease from approximately 885 to 100 full time employees, resulting in a significant improvement to the local traffic environment.

Heritage

The Site is listed as ‘Australian Oil Refinery’, an ‘archaeological heritage’ item on the SEPP (Kurnell Peninsula). The decommissioning and conversion of the existing refinery to a finished product terminal would result in a residual adverse impact. Although decommissioning would impact the heritage value of the refinery, the conversion works would conserve some historical value through continued use of the Site as a finished product terminal. A Heritage Management Strategy would be developed to mitigate the residual impacts from the Project as described in **Chapter 18 Heritage**.

Conclusion

The majority of the impacts related to the Project would be avoided or mitigated through the implementation of the measures outlined in **Chapter 21 Management and Mitigation Measures**. Residual impacts relating to Heritage would be managed through the production and implementation of a Heritage Management Strategy. Any impacts related to wastewater and noise would be managed by adhering to the wastewater and noise limits respectively within EPL 837.

During peak construction, traffic may increase from the Site. Whilst this increase would not change the LOS along Captain Cook Road, there would nonetheless be a small increase in traffic which could result in a cumulative impact with other projects.



Whilst no adverse noise impacts are expected, a consideration of cumulative noise impacts has been requested. Therefore the noise from the Project alongside other relevant developments has been assessed in more detail below.

In conclusion, noise and traffic impacts have been considered below.

20.5.2 Cumulative Impact Assessment

Approved and Committed Development

The following section considers approved and committed developments that are not yet fully operational, which could give rise to potential cumulative impacts in combination with the Project.

Table 20-1 identifies projects that meet the requirements of **Section 20.4.2**.

Table 20-1 Potential Cumulative Projects

Project Name	Reference No.	Location	Proposed Works	Approximate Commissioning Date	Status
Botany Bay Cable Crossing and modifications	MP 06_0284 Mod 3	Bunnerong Rd, Matraville to, Captain Cook Drive, Kurnell	Ausgrid propose to construct five rock mounds over a 50 metre section of the cable that cannot be buried to the required depth below the sea floor.	Modification 3: Committed Development (DGRs Issued) Cables have been laid. Remaining work at Kurnell substation to be completed in 2015.	Modification 3: 12/08/2011
*Concept Plan - Mixed Use Development, Cronulla Sharks	10_0229	461 Captain Cook Drive , Woollooware	Concept Plan application seeking approval for a mixed use development .	Approved Development.	27/08/2012
*Stage 1 - Retail Development, Cronulla Sharks	10_0230	461 Captain Cook Drive , Woollooware	Construction of a Neighbourhood Retail Centre and redevelopment of the existing Sharks Leagues Club facilities.	Committed Development (DGRs Issued).	25/03/2011
Caltex Kurnell Port and Berthing Project	SSD-5353	Botany Bay	Dredging of Botany Bay.	Q3 2013	On Exhibition
Continental Carbon Facility	DA 12/0760	145 Sir Joseph Banks Drive Kurnell	Demolition and remediation of the Continental Carbon Facility.	March 2013	Approved
Boral Kurnell	DA 12/0808	69-83 Sir Joseph Banks Drive Kurnell	Rehabilitation of the brick stockpile on site.	As soon as approved.	Not yet approved.

The Botany Bay Cable Crossing project is now largely complete with minor substation work required in 2015. These minor works are unlikely to result in cumulative impacts with the Project in terms of traffic and noise.

The Cronulla Sharks developments (10_0229 and 10_0230) do not share the same spatial or temporal parameters as the Project given the likely residual impacts of the Project.

The mixed use development next to the Cronulla Sharks ground is a development 6 km to the west of the Project. Consultation with RMS and SSC identified that it was not a development needing consideration in terms of potential cumulative impacts (refer to **Chapter 6 Consultation**) and does not share any of the same spatial parameters as the Project.

The Continental Carbon Facility demolition and remediation would be complete by the time construction of the Project commences. The Continental Carbon Facility is located approximately 1 km south of the Project Area. As per the Statement of Environmental Effects (SEE) undertaken for the development (GreenPlus, 2012), the majority of the demolition works would be completed prior to August 2013. There would be no significant overlap in construction works between the projects. The works at the Continental Carbon Facility in isolation do not have residual environmental impacts in terms of noise, traffic or any other environmental aspects. Therefore given the Continental Carbon Facility timescales and the conclusions of the assessments in the approved SEE, these works are unlikely to result in any significant cumulative impacts with the Project.

The Boral Kurnell project involves the rehabilitation of an existing brick stockpile at the former Boral brickworks site located along Sir Joseph Banks Drive immediately south west of the CLOR, and approximately 600 m south west of the Project Area. The works are minor in nature and the majority of any noise of traffic generating works would be completed in 2013. There would be no significant overlap in construction activities between these works and the Project. The works at the Boral Kurnell project are not expected to have residual environmental impacts. As such, these works are unlikely to result in any significant cumulative impacts with the Project.

Therefore, the Port and Berthing Project (SSD-5353) is the only proposed development that could affect the same noise and traffic sensitive receptors as the Project.

Cumulative noise and traffic assessments for the Project and the Port and Berthing Project are provided below.

Noise and Vibration

Current noise levels for the Site inclusive of all operating refinery plant are presented in **Table 12-12** of **Chapter 12 Noise and Vibration**. Current noise levels are shown to be within the limits of the Site EPL (**Appendix B EPL**).

The construction impacts from the Kurnell Port and Berthing Project have identified potential residual impacts at residences on Prince Charles Parade and the Rangers' House as these are the closest residential receivers. Maximum construction noise levels including piling and impulsive noise sources where predicted to be between 56 and 49 dBA for day time construction works (URS, 2013).

Construction noise levels for the proposed Project are identified in **Section 12.7.1** of **Chapter 12 Noise and Vibration** and show predicted construction noise levels of 34 dBA at Prince Charles Parade and 28 dBA at the Rangers' House. It can therefore be concluded that the predicted noise contribution from the Project would have an acoustically insignificant contribution to the construction noise levels from the Kurnell Port and Berthing Project.

Due to the anticipated small volume of vehicle movements from both the Kurnell Port and Berthing Project and the Project along Captain Cook Drive, cumulative road traffic noise impacts during construction will be less than 2 dB and as such considered negligible impact.

Transport and Access

The construction stage of the Kurnell Port and Berthing Facility Upgrade Works are expected to commence in Q3 2013 and continue to Q2 2015. The EIS produced for the Kurnell Port and Berthing Facility Upgrade Works (SSD-5353) noted one period of time when there would be a number of trucks accessing the Kurnell Wharf. There would be nine days between Q3 2014 and Q2 2015 when there would be 100 concrete pouring trucks accessing the wharf. There could be up to 25 trucks on one day with the remaining days seeing up to nine trucks in one day (URS, 2012).

By the time there is a potential for a cumulative impact of construction traffic between the two projects, the refinery operations at the Site would have ceased (second half 2014) and the number of workers accessing the Site would be gradually reducing from approximately 885 to 100. Therefore, traffic generation from the Project would be significantly lower than at present and the potential for a cumulative impact associated with the construction stage of the Kurnell Port and Berthing Facility Upgrade Works and the Project would be negligible.

Conclusions

A number of environmental aspects were required to be assessed in order to complete the cumulative assessments. These assessments have concluded that the Project is unlikely to result in a significant adverse cumulative impact on any of the surrounding community or environmental receptors.

21 Management and Mitigation Measures

The preceding chapters of this EIS describe the potential impacts of the Project and identify a range of measures to manage risk and avoid, mitigate or offset impacts. This chapter provides a summary of the proposed management and mitigation measures. These measures would provide a basis for the conditions of consent that would be issued to Caltex should the Project be approved.

This chapter details how mitigation and management measures would be implemented and monitored through a Construction Environmental Management Plan (CEMP) for the Project. Any operational measures presented below would be incorporated into existing management plans and operating procedures currently in place at the existing Site.

21.1 Draft Mitigation and Management Measures

The adoption of the mitigation and management measures discussed in **Chapters 8 - 19** is an important component of the Project and reinforces Caltex's commitment to controlling its impact on the environment. These measures would be complemented by an ongoing process of community and regulatory engagement, before and during the construction and operation of the Project. The details of the proposed engagement process are set out in **Chapter 6 Consultation**.

Table 21-1 presents the proposed management and mitigation measures, and confirms the proposed timeframe for their implementation. If required, these measures may be modified following review of any formal submissions received during the EIS exhibition, and as a result of subsequent discussions with NSW Department of Planning and Infrastructure (DP&I) and other stakeholders.

Table 21-1 Mitigation and Management Measures

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
General				
A1	Caltex would carry out the proposed works in accordance with the EIS and the approval conditions.	✓	✓	✓
A2	Caltex would implement reasonable and practicable measures to avoid, or minimise impacts to the environment that may arise as a result of the Project.	✓	✓	✓
A3	Caltex would ensure that the Project contractor prepares and implements a Construction Environmental Management Plan (CEMP) to manage any Project impacts. This would be reviewed and approved by a Caltex Environmental Management Representative (EMR).		✓	
A4	Caltex would appoint an EMR to monitor the implementation of all required environmental mitigation and management measures. The EMR would ensure that all measures were being effectively applied during the proposed works and that the work would be carried out in accordance with the CEMP and all environmental approvals and legislative conditions.		✓	
A5	Caltex and the various works' contractor personnel would undergo training in accordance with the CEMP and currently implemented environmental and safety measures agreed as part of the Project approval.		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
Hazard and Risk				
B1	A program of routine testing, inspection and maintenance would be developed for each new piece of equipment or function of instrumentation to be added to the preventative maintenance program already established for existing plant and equipment.		✓	✓
B2	The recommendations of the Fire Safety Study would be implemented for the design and operation of the terminal.	✓	✓	
B3	The Process Hazard Analysis Recommendations would be implemented for the design and operation of the terminal.	✓	✓	
B4	The spill response plan for the Site would be updated for the proposed terminal.		✓	
B5	Caltex would review hardware protection in place and proposed to ensure the risk of filling low flash point material into tanks designed for high flash point usage is minimised. Particular attention to human factors issues at manifolds.	✓	✓	
B6	Caltex would determine need for additional means of communication, e.g. for lone worker on the proposed terminal.		✓	
B7	Caltex would review the procedures used for potentially hazardous manual operation to ensure they are appropriate and sufficient for any increased frequency of use.		✓	
Soils Groundwater and Contamination				
C1	A Soils and Erosion Management Plan would be developed as part of the CEMP to manage the excavation, testing, stockpiling, reuse and rehabilitation of soils. This plan would outline: - the areas where soil disturbance is likely; - soil testing procedures; - soil handling procedures; - locations where soil would be stockpiled on-site for either removal, treatment or reuse; - procedures to reduce erosion and the spread of dust; - restricting traffic to defined roads or tracks where necessary; and - the rehabilitation of bare soil following completion of the construction works.		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
C2	All materials would be stockpiled in accordance with 'The Blue Book' Managing Urban Stormwater - Soils and Construction Volume 1 and 2 (Landcom, 2004). Principal controls would include the following: • silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary; • silt and sediment traps would be installed across stormwater drains in proximity to excavation areas; • stockpiles would be restricted to cleared areas and not impact any vegetation; • stockpiles would be placed on impermeable sheeting; • stockpiles would be covered and wetted down in order to reduce dust creation; and • stockpiles would not be located in close proximity to any stormwater drainage systems.		✓	
C3	The Soils and Erosion Management Plan would also outline the inspection program for any erosion control structures and bunded areas.		✓	
C4	Excavated soils would be tested for both contaminants and odour using standard practices (e.g. soil vapour and soil sampling etc.).		✓	
C5	Clean materials would be separated from contaminated materials for reuse as backfill where required.		✓	
C6	A Contamination Management Plan would form part of the CEMP for the Project. This plan would outline measures for testing, classifying, handling, storing and managing contaminated soils and contaminated groundwater that may be encountered.		✓	
C7	Suspected contaminated materials would be assessed and classified in accordance with EPL requirements and NSW (2009) <i>Waste Classification Guidelines: Part 1: Classifying Waste</i> , batched, further tested (where required) and disposed by a licenced contractor.		✓	
C8	Disposal of any contaminated soils or groundwater would be in accordance with EPL requirements and NSW DECCW's <i>Waste Classification Guidelines</i> and the Contamination Management Plan (CMP) for the Project. Contaminated materials would be sent to appropriately licensed facilities in accordance with the <i>Contaminated Land Management Act 1997</i> .		✓	
C9	If Acid Sulfate Soils (ASS) are encountered during construction, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
C10	A Groundwater Management Plan (GWMP) would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the testing, dewatering, storage, movement and treatment of any groundwater intercepted during the construction phase. Measures would include: - the use of appropriate drip trays and interception techniques for any construction specific liquids stored on the Site; - bunding of any fuel or chemical storage area at the construction Site; - regular inspection of construction equipment to ensure any leaks are minimised and rectified; - management of vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system; - appropriate and timely disposal of any contaminated soil, water or waste generated during construction; - regular inspection of erosion control structures and bunded areas; and - regular inspection and testing of containment areas, drainage lines and process pipe work.		✓	
C11	Any runoff that may accumulate in excavations would be periodically tested for elevated levels of contamination. Water that is found to have elevated levels of contaminants would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established refinery wastewater management procedures.		✓	
C12	Runoff entering any excavations would be limited by using bunds or similar structures as required.		✓	
C13	Construction workers would be instructed in appropriate health and safety and handling protocols for minimising human contact with contaminated soils and groundwater.		✓	
C14	During the cleaning of the crude and finished fuel tanks, measures would be implemented in line with Caltex's existing Turnaround and Inspection process to contain and collect any potentially contaminating material for appropriate disposal to the on-site wastewater treatment plant, landfarm or appropriate off-site disposal facilities. This process would be detailed within the CEMP.		✓	
C15	Permits would be required to work in the areas where potential soil and groundwater contamination exists. The work permit includes requirements such as monitoring and PPE. No unauthorised entry into these areas is permitted, without a permit.		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
C16	Appropriate inspection, assessment, maintenance and repair programmes that would be implemented as part of the operation of the Project. These safeguards would be incorporated into the updated management plans for the proposed terminal. The Project would be appropriately licenced under the <i>Protection of the Environment Operations Act 1997</i> and would be managed in accordance with EPL requirements.			✓
Human Health and Ecological Risk				
D1	Construction personnel would be made aware of the potential presence of Non Aqueous Phase Liquids (NAPL) and would be shown how to identify its presence. The CEMP would include management measures to appropriately deal with any NAPL found on Site.		✓	
D2	Construction staff would be inducted and provided with training prior to working with potentially contaminated soil as part of the Project, to prevent unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation).		✓	
D3	The location of potentially contaminated areas would be noted in the CEMP and provided to construction personnel involved in soil excavation and handling. The CEMP would also identify the type of contamination found in each area. Where necessary, safety training and appropriate PPE would be provided.		✓	✓
D4	Caltex would continue to monitor groundwater quality in areas that are known to contain impacts to ensure that significant mobilisation of COPC from groundwater to surface water is not occurring.		✓	✓
Surface Water, Wastewater and Flooding				
E1	The Construction Environmental Management Plan (CEMP) for the Project would include a Soil and Erosion Management Plan. This plan would include the following measures: • All materials would be stockpiled in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004); • Silt fences would be installed around stockpiles to reduce erosion and the movement of suspended solids as necessary; • Soil stockpiles and any polluted materials would be stored in designated areas which are not in close proximity to any stormwater drainage systems; • Erosion control structures, bunded areas, containment areas, drainage lines and interception measures would be subject to regular inspection; • Clean materials would be separated from contaminated materials; and Soil erosion and sedimentation devices would remain in place until the disturbed ground surface is restored. These devices would also capture any gross pollutants.		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
E2	Caltex would continue to implement the measures within the Stormwater Management Plan for the Site. This plan has been produced in response to Environment Protection Licence No. 837, PRP U24.1: Stormwater Catchment and Management Plan. The SMP has committed Caltex to implementing a Stormwater Management Strategy and completing a number of stormwater management measures in a staged manner. Measures include: - Ongoing maintenance of the existing stormwater system; - Implementation of a number of projects to improve the infrastructure, reduce the potential for the refinery to flood, and prevent contaminated stormwater leaving the refinery premises; - Working with the NSW Office of Environment and Heritage (OEH), NSW EPA and Sutherland Shire Council to divert to flow of stormwater from the National Park away from the Site's stormwater system to the Sutherland Shire Council's stormwater infrastructure; - Carrying out stormwater flow monitoring; and - Updating the Site's stormwater system performance model to account for the changes to the stormwater system infrastructure that can then be used as a tool to assess future modifications, as necessary. This work would be completed in consultation with NSW EPA.	✓	✓	✓
E3	Discharges from the Wastewater Treatment Plant would be within existing EPL limits during construction and operation. Any required change to this Oily Water Management System would be discussed and agreed with NSW EPA.	✓	✓	
E4	The measures and processes currently in place at the Site to prevent any loss of contaminant would be maintained throughout the construction and operation phases of the Project. All bunds on tanks which are retained in service would meet the capacity requirements of Australian Standard AS1940 during the operation of the Project.		✓	✓
E5	Improvements to monitoring would be initiated to ensure that if a loss of containment into a bund occurs it is detected early and contingency actions can be taken promptly. The measures for tanks containing low flash materials include: - explosive vapour detectors within the bunds; - triple infrared scanners on tank roofs; and - CCTV in conjunction with infrared cameras as a confirmation for alarms. All tanks on-site would be subject to: - an automated high level shut off system; and - continuance of a comprehensive inspection/repair program.		✓	
E6	Caltex will reassess the Site's flood risk during the future remediation works that would be completed once the conversion works are complete to ensure that any future flood risks to the Site following conversion, demolition and remediation are understood and appropriately managed.			✓

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
Noise and Vibration				
F1	The CEMP for the Project would include a Noise Management Plan (NMP). The NMP would outline: - the locations of noise sensitive receptors; - construction noise monitoring procedures; and - construction equipment maintenance to ensure good working order.		✓	
F2	Low-noise plant and equipment would be selected, where practicable, 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 are working correctly.		✓	
F3	Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register is maintained and managed in line with the existing feedback process at the Site.		✓	✓
F4	Any noise complaint(s) would be investigated immediately. Reasonable and feasible measures would to be implemented to reduce noise impacts.		✓	✓
F5	Construction equipment would be located to reduce noise emission to sensitive receptors, where practicable.		✓	
F6	The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environmental Protection Licence (No. 837) (EPL) for the Site.		✓	
F7	Construction staff and contractors would undergo training in environmental noise issues including: - minimising the use of horn signals and maintaining a low volume. Alternative methods of communication should be considered; - avoiding any unnecessary noise when carrying out manual operations and when operating plant; and - switching off any equipment not in use for extended periods during construction work.		✓	
F8	Should any unexpected construction activities occur which could potentially generate significant noise not described in this report, monitoring would be undertaken to ensure construction noise emission levels do not exceed EPL limits.		✓	
Air Quality and Odour				
G1	Dust emissions from the construction phase of the Project would be monitored by construction staff. A designated worker would continuously monitor downwind emissions to the community or local residents and call a halt to activities if sensitive receptors are likely to be affected by airborne particulate matter. Should significant impacts be likely, appropriate measures would be taken to mitigate any adverse air quality effects.		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
G2	Within the refinery, construction vehicles would only travel on designated roads and would be limited to a maximum speed of 10 km/hr in construction areas, and 25 km/hr elsewhere.		✓	
G3	Where there is the potential for dust or odour generation, trucks carrying spoil loads would be covered and all tailgates would be securely fastened. Vehicles would not be loaded higher than the sides and tailboard.		✓	
G4	Construction activities would be limited during high wind events if sensitive receptors are likely to be significantly impacted.		✓	
G5	Construction plant would be maintained and operated in line with the manufacturer's specifications in order to minimise the emission of air pollutants and offensive odours. Plant and construction vehicles would be turned off when not in use.		✓	
G6	Stockpiled material would be assessed for the potential for causing odorous or particulate emissions. If air pollutants and offensive odours are likely, controls would be put into place to manage any adverse affects.		✓	
G7	All concrete cutting and coring would be undertaken using "wet tools".		✓	
G8	An odour reduction program would be implemented in accordance with the existing EPL.			✓
G9	The guidepoles on the EFRTs in gasolise service would be fitted with sleeves.		✓	✓
G10	Caltex's Leak Detection and Repair (LDAR) Program would continue during Project construction and operation.		✓	✓
Greenhouse Gas				
H1	Equipment would be inspected and maintained to ensure efficient running, minimising Green House Gas (GHG) production, and so it is appropriately sized for the task in hand.	✓	✓	
H2	Local supplies and/or facilities would be utilised to minimise vehicle kilometres travelled (where reasonable and feasible).	✓	✓	
H3	Energy efficiency opportunities would be identified and implemented (where reasonable and feasible) during construction and operation of the Project.	✓	✓	✓
Traffic and Transport				
I1	Local Authorities and Kurnell residents would be informed of any Project related work which would affect the road network.		✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
I2	A Traffic Management Plan would be developed for the construction phase. The Traffic Management Plan would comply with all relevant Regulations and By-Laws and in particular address safe access and egress to the public road network. The Transport Management Plan would include: • hours of permitted vehicle activity; • designated routes for construction traffic and defined access points to the Site; • designated areas within the Site for truck turning movements, parking, loading and unloading to allow heavy vehicles to enter and leave the Site in a forward direction; • sequence for implementing traffic management measures should these be required; and • procedures and/or principles for construction vehicle speed limits and the safe operation of construction vehicles.		✓	
Waste Management				
J1	The Project would be integrated into existing resource efficiency, waste management and handling, emergency response and preparedness plans for the existing Kurnell Refinery.	✓	✓	✓
J2	Construction and Operation Waste and Resource Management Plans (WRMP) would be compiled prior to the each phase commencing.	✓		
J3	The WRMPs would: • identify requirements consistent with the waste and resource hierarchy; • ensure resourcing efficiency is delivered through the design and responsible construction and operational practices; • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures (consistent with current management practices relating to Caltex's Kurnell Waste Management System); • identify disposal and management routes consistent with current management practices as adapted for the Project; • set out clear requirements for meeting legislative and regulatory requirements; • define requirements to support Caltex's sustainable procurement objectives through effective, design, construction, operation and procurement; and • set out processes for disposal, including on-site transfer, management and the necessary associated approvals.	✓	✓	✓
J4	The WRMPs would incorporate the requirements of the waste and resource hierarchy and cleaner production initiatives.	✓	✓	✓

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
J5	The WRMPs would include a process for auditing, monitoring and reporting, which would include regular inspections off-site activities and the waste management area(s). The WRMPs would be subject to regular auditing and a system would be used to record and report the types, volumes and management measures for all waste and resource arising from/used for the works.	✓	✓	✓
J6	Works-generated waste would be segregated at source and stored in accordance with current Site practices. Site management practices would potentially need adapting to consider additional storage requirements. Regardless, all waste would be stored in suitable containers and designated waste management areas.		✓	✓
J7	Caltex's existing procedures for the disposal of sewage, grey water, hazardous materials, general waste and recyclable materials would be adopted for the Project (and modified if required). This would include using licensed contractors to remove and transport waste from the Site.		✓	✓
Heritage				
K1	An archival photographic record of the existing fabric and operations of the Kurnell Refinery would be prepared while the plant is still operational, and during the decommissioning process. The recording would be undertaken in accordance with the Heritage Council guidelines on <i>Photographic Recording of Heritage Items Using Film or Digital Capture</i> (2006). The archival recording would be maintained for the appreciation of present and future generations. To this end, the recording would be lodged with Sutherland Shire Library and the NSW State Library.	✓		
K2	A Heritage Management Strategy would be prepared for the Australian Oil Refinery prior to shut-down of the refinery plant, to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works. The Strategy would include a review of the heritage significance of the overall Site. The review would clarify the extent and relative heritage value of the place by identifying key elements of industrial and built heritage as well as social values of the refinery, and the relative contribution of these elements to the overall significance of the Site. Recommendations would also address the future assessment and management of memorabilia and other significant items of moveable heritage maintained on-site.	✓		
K3	If any further heritage items were discovered throughout the Project, work would cease until an assessment is carried out by a qualified heritage professional.	✓	✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
Ecology				
Management of Weeds				
L1	A Biodiversity and Weed Management Plan (BWMP) would be prepared in order to limit and control the spread of noxious weeds within the Site. It would include the following: - wash down procedures to reduce the spread of weeds via vehicles and machinery; - measures to target potential new weed outbreaks including soil stockpiles and any other disturbed areas; - outline monitoring programs for noxious and problematic weeds on sites and in the surrounding areas; - measures for strict stockpiling control to help eradicate all noxious weeds as per NSW DPI specifications for SSLGA; - include a list of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds; and ensure that only amphibian friendly herbicides are used; - wash down protocols for construction vehicles and machinery to prevent the spread of root-rot fungus (<i>Phytophthora cinnamomi</i>); and - all personnel undertaking routine management activities of any noxious weeds should be appropriately trained and all contractors should hold the necessary permits and licenses.	✓	✓	✓
Restriction of Access to Existing Vegetated Areas				
L2	A BWMP would be prepared in order to limit potential impacts to existing vegetation outside of the area of proposed works, but within the Site It would include the following: - existing vegetation on Site would be clearly marked on all Site plans and construction diagrams, with clear indications of no-go zones within all vegetated areas; - existing vegetation would be clearly signposted and fenced off prior to the commencement of construction activities, and should remain fenced off until the completion of works; and - absolutely all works would be limited to the defined construction footprint.	✓	✓	

Item	Mitigation and Management Measures	Implementation of Mitigation Measures		
		Design	Implementation	Operation
Ecology- Fauna Management				
L3	To minimise the potential for impacts to native fauna species, the BWMP would be developed and include following measures: • if any frogs are found within the Project Area, works would cease until frogs have been relocated to areas outside the area of impact; • if any threatened frogs e.g. Green and Golden Bell Frog or Wallum Froglet are identified within the Site, works would cease and active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet; • all trenches would be inspected prior to works each morning. Any frogs that become trapped within trenches would be assessed by a suitably qualified ecologist or veterinarian and then released into the nearest suitable habitat if uninjured; • identification sheets would be provided to all construction workers on Site for the two threatened frog species predicted to occur within the Site; • wash down protocols to prevent the spread of Amphibian Chytrid Disease (chytridiomycosis) would be implemented at relevant work areas. Protocols would be consistent with OEH guidelines (DECC, 2008b). • 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO would be used for the control of noxious weeds; and • if fauna are found to be utilising the Site, or a nest, den or roost is found, work in the immediate area is to stop and the animals are to be allowed to move off freely, or relocated by an authorised person to an area outside the construction footprint.	✓	✓	✓

21.2 Environmental Management

21.2.1 Overview

Current operations at the Site comply with EPL no. 837. In order to maintain compliance, Caltex implements an Environmental Management Plan (EMP). The EMP consists of a suite of internal policy documents and plans. The EMP is overseen by a dedicated member of the Caltex Environment Team.

The EIS has outlined a number of measures that would help to avoid, mitigate or manage the anticipated impacts associated with the construction and operation of the Project. These measures would be incorporated into the conditions of consent for the Project and during construction would be implemented through a Construction Environment Management Plan (CEMP).

The CEMP would cover all environmental aspects associated with the construction of the Project and would include the controls and mitigation measures identified within **Chapters 8 -19** of this EIS.

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.

Any operational measures included in the EIS and CEMP would be incorporated into existing management plans and operating procedures currently in place at the Site and in accordance with the EPL (refer to **Appendix B EPL**).

21.2.2 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 Caltex prior to commencement of 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 personnel to manage the environmental hazards and risks associated with the Project and to effectively minimise the potential for environmental harm. The CEMP would be subject to the regulator review prior to commencement of construction works and ongoing review 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 would be implemented to mitigate the potential impacts associated with the construction works and ensure that these works would 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 would be implemented to register, report and respond to any complaints during the construction work;
- a description of the procedures that would be implemented to manage any environmental incidents and associated reporting requirements;
- identification of key personnel who would 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:
 - Biodiversity and Weed Management Plan (BWMP);
 - Soils and Erosion Management Plan;
 - Contamination Management Plan;
 - Groundwater Management Plan;
 - Stormwater Management Plan (SMP);
 - Noise Management Plan (NMP);
 - Air Quality Management Plan;
 - Waste and Resource Management Plans (WRMP);
 - Traffic Management Plan;
 - Heritage Management Plan; and
 - Acid Sulfate Management Plan (if required).

These items are consistent with the management measures presented in **Table 21-1**.

21.2.3 Existing and Future EMS

The existing Environment Management System (EMS) for the Site, which is ISO 14001 accredited, consists of a suite of guidance documents, policies and procedures that cover every aspect of the existing operation. Relevant provisions from within **Table 21-1** would be incorporated into the existing EMS as it is updated to apply to the proposed terminal operation and any future changes to the Site EPL. The Caltex Kurnell EMS would continue to be implemented and monitored by a dedicated member of staff.

22 Project Evaluation and Justification

This chapter provides an evaluation of the Project and the outcomes of this Environmental Impact Statement, including a discussion of the justification for proceeding with the Project. The chapter also provides:

- an environmental 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.

22.1 Environmental Risk Assessment

The following Environmental Risk Assessment (ERA) provides an analysis of the environmental risks that have been identified and outlined as part of this EIS.

An initial qualitative environmental scoping exercise was completed in **Chapter 7 Environmental Scoping Assessment**. This exercise identified the key environmental issues for the Project, described them and categorised them according to their risk of impact.

The EIS process has confirmed the potential environmental impacts associated with the Project (construction and operation), proposed mitigation measures for those impacts and any potentially significant residual environmental impacts which still exist after the application of the proposed mitigation measures.

This 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 *HB 203:2006 Environmental Risk Management – Principles and Process*, Australian Standard *AS/NZ 4360:2004 Risk Management*, and *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines*.

The analysis categorised levels of risk for a given event based on the significance of effects (consequences) and the manageability of those effects (likelihood). The measures of likelihood categories and the measures of consequences categories as well as the risk ranking matrix are detailed in **Tables 22-1, 22-2 and 22-3** below.

Table 22-1 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 22-2 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.
1*	Extreme	Permanent and extremely beneficial impacts on the environment or population; large impact area.
2*	Major	Permanent and beneficial impacts on the environment or population; large impact area.
3*	Moderate	Substantial temporary or minor long term beneficial impacts on the environment or population; moderate impact area.
4*	Minor	Minor beneficial impacts on the environment or population; small impact area.
5*	Low	Nil or temporary beneficial impacts on the environment or population; small or isolated impact area.

* Indicates the ranking and criteria for positive consequences.

Table 22-3 Risk Matrix for ERA

		CONSEQUENCES				
		1 Extreme	2 Major	3 Moderate	4 Minor	5 Low
Likelihood	A (Almost Certain)	VH	VH	H	H	M
	B (Likely)	VH	H	H	M	M
	C (Possible)	H	H	M	M	L
	D (Unlikely)	H	M	M	L	L
	E (Rare)	H	M	L	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 8-19**, the Cumulative Impact Assessment in **Chapter 20** and the commitments provided in the **Chapter 21 Management and Mitigation Measures**, **Table 22-4** 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 22-4** based on the likelihood of occurrence and potential environmental consequence.

Note that where a positive impact has been identified, a shading of blue has been used in **Table 22-4**.

Table 22-4 Environmental Risk Analysis

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Hazard and Risk Chapter 8	Fires from large refined petroleum product storage tanks and associated transfer pipelines and pumps within the terminal.	D	1	H	Tank and infrastructure upgrades alongside modifications to existing Site hazard management measures and processes would ensure that any risks to on Site or off Site receptors would continue to be acceptable under HIPAP 4.	E	3	L
	Significant reduction in the variety of Dangerous Goods stored on Site and the cessation of refining process would remove some of the existing risks associated with the Site.	A	3*		As part of the Project Caltex would implement improvements and upgrades to the existing safety system to improve the safety of the facility.	A	3*	
	Significant reduction of loading and unloading activities associated dangerous goods. The majority of truck movements would cease. Most material would arrive on Site via ship or pipeline.	A	3*		None Proposed. The Project would result in a significant lowering of the risk associated with road transport in and out of the Site.	A	3*	
Soils, Groundwater and Contamination Chapter 9	Erosion of soils resulting in sedimentation of stormwater during construction.	C	5	L	A Soils and Erosion Management Plan would form part of the CEMP for the Project. This plan would outline management measures for any soils that are excavated or stored on-site during the construction works.	D	5	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Mobilisation of contamination from soils during excavation works.	C	3	M	A Contamination Management Plan would form part of the CEMP for the Project. This plan would outline measures for testing, handling, storing and managing contaminated soils and contaminated groundwater.	E	3	L
	Disruption of Acid Sulfate Soils during excavation works.	E	4	L	ASS Management Plan would be prepared in accordance with the ASS <i>Manual (ASS Management Advisory Committee 1998)</i> if ASSs were encountered during the construction phase of the Project.	E	4	L
	Contamination of runoff collected in excavations from soils or groundwater.	C	4	M	Runoff in excavations would be periodically tested for contamination. Water that is found to have elevated levels of contaminants would be collected and sent to the WWTP.	E	4	L
	Groundwater has the potential to be contaminated by spills, leaks or the mismanagement of certain substances e.g. contamination, cleaning product etc.	C	3	M	A Groundwater Management Plan would be included in the CEMP. This plan would recommend measures to prevent the infiltration of contaminated run off to groundwater due to construction activities. Other measures to manage related impacts would also be included in the CEMP (refer to Chapter 9 Soils, Groundwater and Contamination).	D	4	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Human Health and Ecological Risk Chapter 10	Asbestos in the form of small fragments and fibres has been recorded on-site in various places including in surface soil layers. This has the potential to cause a health risk to workers working with excavated soil.	C	2	H	Construction staff would be inducted and provided with training prior to working on the Site, to prevent unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation). These measures would be outlined in the CEMP. Chapter 10 Human Health and Ecological Risk provides further detail.	E	2	M
	Potential soil contamination may pose a vapour risk for workers spending extended time in enclosed or semi-enclosed areas above the source (e.g. in a building or a deep trench).	C	3	M	The location of potentially contaminated areas should be noted and provided to construction personnel (especially with regard to certain specific contaminants such as asbestos). Safety training should be provided, including assessment of PPE requirements. The depth of excavations mean impacts would be negligible.	D	4	L
	The completed Project would likely result in a reduction of risk of exposure of receptors to COPC.	B	3*		Risks to human health and the environment would be expected to be lower than or, in the worst case, equal to the risks currently posed by current operations on the Site.	C	3*	
Surface Water Wastewater and Flooding Chapter 11	Contamination of sensitive receptors especially during a high rainfall event.	C	3	M	Storm water captured on-site during operation would be managed through the existing systems and separated into clean or contaminated streams as required. A full list of management and mitigation measures is available in Chapter 11 Surface Water, Wastewater and Flooding .	E	3	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Spillages during terminal operation could have the potential to contaminate surface water.	C	4	M	Appropriate bunding would be maintained around storage tanks and in areas with potential for spillage to occur.	D	4	L
	Potential impacts on stormwater associated with construction include erosion, sedimentation impacts.	C	5	L	Spill detection measures would continue to be utilised in bunds as part of the Project. The Site would meet the capacity requirements of AS1940. Stormwater captured on-site during operation would be managed through the existing systems and separated into clean or contaminated streams as required. A full list of management and mitigation measures is available in Chapter 11 Surface Water, Wastewater and Flooding .	C	5	L
	Potential construction impacts include interaction of stormwater with hydrocarbon impacted soils.	C	3	M	Potentially contaminated soils would be stored in a manner that would discourage contamination of storm water. Contaminated storm water would be treated before disposal.	E	3	L
	Potential adverse impacts to stormwater flows and discharge.	C	3	M	Caltex has prepared a Stormwater Management Plan (EPA) for the Site with the EPA in response to EPL 837 Pollution	E	4	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Reduction in the overall contaminant load from Catchments A and B, which would reduce the cumulative impact, if any, of the discharges to the respective receiving environments.	B	3*		Reduction Plan U24.1: <i>Stormwater Catchment and Management Plan</i> . This plan involves implementing a stormwater management strategy at the Site and completing a number of stormwater management measures in a staged manner over the coming years. The SMP has committed Caltex to implementing a stormwater management strategy and completing a number of stormwater management measures in a staged manner. Implementation of the stormwater management strategy over the coming years would ensure any impacts are minimised.	B	3*	
	The overall volume and contaminant load to the oily water sewer would reduce substantially.	B	3*		Improvement - No Mitigation Measures Necessary.	B	3*	
Noise and Vibration Chapter 12	The construction phase of the Project could cause acoustic impacts at identified sensitive receptors. The construction noise levels from the Project would comply with the existing EPL for the Site.	D	4	L	Working hours and noise limits would be limited to within those specified within the EPL. A full list of Management and Mitigation Measures is available in Chapter 12 Noise and Vibration .	E	4	L
	Operational noise would be likely to be less than the current operations and within the acoustic limits of the EPL.	B	3*		Improvement - No Mitigation Measures Necessary.	B	3*	

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Given existing traffic volumes, the noise contribution from traffic generated by the Project construction would be negligible at residences on Captain Cook Drive (that is, less than a 2dB increase).	C	5*		No Mitigation Measures Necessary.	C	5*	
Air Quality and Odour Chapter 13	Construction activities have potential to cause odour and air quality impacts as existing infrastructure is decommissioned.	C	3	M	Excavated soils would be assessed for odour as/if they are stockpiled, and would be controlled in order to manage potential odour or dust emissions. Mitigation measures outlined within this EIS would be incorporated into the CEMP to reduce the impact during construction.	E	4	L
	Given the change in emissions profile, the odour sensitivity of nearby receptors may also be modified. Whilst a significant reduction in odour emissions is expected, odour would still need to be managed through the existing odour reduction programs present on the Site.	B	3*		An odour reduction program is in place for the Site and would continue to be implemented throughout the operation of the Project. A full list of Management and Mitigation Measures is available in Chapter 13 Air Quality and Odour .	B	3*	
	Relative to existing operations, total VOC emissions are anticipated to halve in quantity during the operational phase of the Project.	A	3*		Improvement - No Mitigation Measure Necessary.	A	3*	

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Greenhouse Gas Chapter 14	GHG emissions during the construction phase would add to local inventories.	B	5	M	Efficiency opportunities would be identified to allow construction phase GHG emissions to be reduced. A full list of Management and Mitigation Measures is available in Chapter 14 Greenhouse Gas .	B	5	M
	The Project would result in a significant reduction of GHG included as part of the NSW inventory of emissions.	A	3*		Improvement - No Mitigation Measure Necessary.	A	3*	
Socio-Economic Chapter 15	The Project would generate a positive economic impact within the local community through the creation of local employment opportunities during the construction phase.	A	4*		It is anticipated that the workforce could be sourced from the local area. The direct spending within the local economy would also have a positive impact on local services and businesses during construction.	A	4*	
	Cessation of refinery operations would occur in the second half of 2014 and would lead to a gradual loss of approximately 949 full time equivalent jobs.	A	2	VH	Caltex has developed an employee program incorporating transitional support through generous redundancy benefits, outplacement support services, careers fairs featuring prospective employers, vocational training allowances, health and wellbeing programs and services, and industry retraining. A full list of Management and Mitigation Measures is available in Chapter 15 Socio-Economic .	A	3	H

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Transport and Access Chapter 16	Construction traffic could impact the local road network.	B	5	M	A Traffic Management Plan would be incorporated into the CEMP to manage the traffic impacts during the construction phase of the Project. A full list of Management and Mitigation Measures is available in Chapter 16 Transport and Access .	E	5	L
	Routine distribution of petroleum products from the Site by road would typically cease once the Project is operational.	B	2*		Improvement - No Mitigation Measures necessary. During operation the Project would result in an improvement to the local traffic environment and a beneficial transport impact.	B	2*	
	A staffing reduction would result in a net reduction in traffic volumes along Captain Cook Drive gradually following cessation of refining at the Site.	B	2*			B	2*	
Waste Management Chapter 17	The Project could create additional waste streams from the Site.	B	5	M	A Waste and Resource Management Plan would be incorporated into the CEMP and into the Site EMPs to manage waste streams and ensure that the maximum resource efficiency is maintained. A full list of Management and Mitigation Measures is available in Chapter 17 Waste Management .	C	5	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Heritage Chapter 18	The Project would have an impact on the locally significant Oil Refinery Site.	A	3	H	A Heritage Management Strategy would be prepared for the Australian Oil Refinery site prior to shut-down of the refinery plant, to provide Caltex with a framework for the ongoing management of the Site's heritage during present and future works on Site. A full list of Management and Mitigation Measures is available in Chapter 18 Heritage .	A	4	H
Ecology Chapter 19	Potential impacts to significant ecological values in close proximity to the Site.	C	3	H	The management and mitigation measures for the Project would ensure that any off-site impacts to nearby ecological values would be negligible.	E	5	L
	Temporary and localised alterations to potential habitat on-site and to noxious weeds could occur as a result of the Project.	C	4	L	The following ecological aspects would be managed through measures within the CEMP: • spread of weeds; • impacts on existing vegetation; and • Fauna impacts. Implementation of these measures would ensure that any potential impacts would be avoided.	E	4	L

22.1.1 Summary of Risk Analysis

The Environmental Risk Assessment in **Table 22-4** illustrates how the assessments and mitigation measures contained within **Chapters 8 – 19** have helped understand the Project and reduce the potential environmental risks. Certain risks regarding the presence of contamination, the loss of jobs at the Site and impacts of the conversion works on the heritage value of the Site, remain. However, careful management would help avoid and mitigate these potential impacts as far as possible.

In addition to these risks the Project also creates a number of beneficial effects. The air quality around the Site is likely to improve as a result of the Project. Equally greenhouse gases generated from the Site, traffic movements and water usage on-site would also significantly reduce. Other environmental aspects, e.g. noise from the Site, would also experience improvements.

It can therefore be concluded that, provided the management and mitigation measures presented in **Chapter 21** are implemented, any remaining residual impacts would be negligible.

22.2 Ecologically Sustainable Development

22.2.1 The Principles

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."*

These principles are discussed below.

22.2.2 Precautionary Principle

The precautionary principle deals with certainty in environmental and technical 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 EIS is a public process which examines the potential effects of the Project. Therefore the EIS process is precautionary in nature. The requirement to assess the impacts of the Project is a form of regulation designed to identify and address uncertainty about the effects of the Project.

Caltex has commissioned specialists to conduct detailed assessments on a range of environmental aspects identified during the Environmental Risk Assessment process as outlined in **Chapter 7 Environmental Scoping Assessment**. These assessments provide sufficient scientific understanding of the Project and surrounding environment to enable a decision to be made that is consistent with this principle.

Project Objectives

The Project has been designed to include a number of design elements to reduce the severity of potential impacts and reduce the risk of potential impacts occurring. The Project has also been designed to ensure compliance with environmental criteria, community expectations, as well as all relevant statutory requirements. This is achieved through appropriate design, management and mitigation measures.

Design Safeguards

A number of design safeguards have been incorporated during the initial design stage in response to the Precautionary Principle. These design modifications include the following:

- The area affected by the Project would not extend beyond the boundary of the Site currently operated by Caltex.
- Improvements would be made to the existing infrastructure as part of the Project to increase the efficiency of the facility and reduce the likelihood of an environmental incident occurring.
- The finished product terminal would be designed to maintain integrity during all foreseeable operating conditions (e.g. start-up, shut down, and normal operation) to prevent an uncontrolled loss of containment. To minimise impacts associated with a loss of containment during an incident, the design would provide adequate sectioning and local containment as well as emergency response capability for mitigation.

Construction and Operational Principles

Should the Project be approved, a number of the safeguards and management and mitigation measures included in this EIS would form the basis of a Construction Environment Management Plan (CEMP). Operational safeguards nominated in this EIS would be integrated into existing management plans and operating procedures currently in place at the existing Site. Monitoring programs would be developed to address the specific content requirements within the Project Approval.

22.2.3 Inter-Generational Equity

Inter-generational equity requires that the present generation pass onto the next generation an environment that does not limit the ability of those 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 Project would ensure the continued use of the Site for distribution of petroleum products despite changes to the international petroleum market making the continued refining of crude within Australia less financially feasible. The cessation of refining at the Site would result in some beneficial environmental outcomes for future generations as outlined in **Table 22-4**.

Design Safeguards

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 no ecological features are impacted as a result the Project;
- reducing potential contamination by managing pollution risks during construction and managing any contamination that is found as part of the Project;
- maintaining agreed noise and air quality limits during construction and operation;
- the cessation of refining on the Site would reduce emissions of VOCs, combustion pollutants to air and would also result in a decrease in GHG emissions; and
- a 'whole of life' approach to the Project to benefit future generations (e.g. continuing use of the Site rather than the option of shutting down the refinery, allowing for some continuation of economic benefits in the area.

Construction and Operational Principles

Caltex would continue to maintain inter-generational equity through the safeguards identified in this EIS, 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.

The Project would result in a loss of jobs at the Site now and for the future. The loss of these jobs has been recognised by Caltex and they have implemented a program named "Stay, Focus & Develop". This program incorporates transitional support through generous redundancy benefits, outplacement support services, careers fairs featuring prospective employers, vocational training allowances, health and wellbeing programs and services, and industry retraining.

The loss of the heritage value of the Site would also affect inter-generational equity. Mitigation measures have however been identified to ensure that whilst the nature of the Site may change, a record of the Site's history would be retained for the appreciation of future generations.

22.2.4 Conservation of Biological Diversity and Ecological Integrity

This EIS includes an assessment of the ecological impacts of the Project against the requirements of NSW Legislation. The ecological impact assessment concluded that the Project is unlikely to cause any 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. The Site currently operates in line with existing legislation and guidance to ensure that the risk of any potential impact on the local environment is minimised.

22.2.5 Improved Valuation and Pricing of Environmental Resources

This ESD principle is premised on an assumption that all resources should be appropriately valued and that the value of environmental resources should be considered alongside any economic or cost benefit analysis for the life of the project.

Project Objectives

The Project would provide value to the local and State economy whilst 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. The cessation of refining at the Site would result in some beneficial environmental outcomes as outlined in **Table 22-4**.

22.2.6 Compatibility with the Principles of ESD

The approach taken in planning the Project has been multi-disciplinary, involving consultation with various stakeholders including government agencies and the community (refer to **Chapter 6 Consultation**). 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.

22.3 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 allowing the Site, which could otherwise become redundant, to continue to be operated by Caltex. By providing viable repurposing for the existing infrastructure, the Project provides for the continued use for an existing site and removes the need to develop a second location for the import and distribution of refined product to the NSW and ACT markets.

ii the promotion and co-ordination of the orderly and economic use and development of land.

The SEPP (Kurnell Peninsula) provides for the land use and zoning in the area. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone). The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. As the Project would continue the use of the land as a liquid fuel depot, the Project is deemed permissible under the land use zones in this SEPP and therefore is in line with orderly and economic use and development of land.

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

iii the protection, provision and co-ordination of communication and utility services.

The Project would not directly impact on the provision and co-ordination of communication and utility services.

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 co-ordination of community services and facilities.

The Project would not impact on the provision of existing or future 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 mitigation measures outlined within this EIS, 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 22.2** 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 as State Significant Development under Part 4 of the EP&A Act by the Department of Planning and Infrastructure (DP&I). In preparing to assess the Project, the DP&I request input from local councils to the Director General's Requirements. Sutherland Shire Council provided input into the DGRs for the Project and remains an important stakeholder during the ongoing consultation effort.

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. This consultation is summarised in **Chapter 6 Consultation**.

In addition, the EIS would be placed on public exhibition by the NSW DP&I 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.

22.4 Project Justification

Caltex initiated a review of their refining operations in May 2011, as refineries throughout Australia were competitively disadvantaged and were consequently losing money. The Kurnell and Lytton refineries in their current configuration are relatively small and are disadvantaged compared to the modern, larger scale and more efficient refineries in the Asian region. This disadvantage has been exacerbated by the impact of the on-going strength of the Australian dollar, lower Caltex refining margins, inability to meet market place fuel requirements, and increasing costs on the 'as is' refining business.

As a result of the refining review, Caltex is proposing to close the Kurnell Refinery and convert the Site to an finished product import terminal. Conversion to a terminal is required to support the safe, reliable supply of fuel to Caltex's marketing operations, and more broadly to ensure supply reliability of petroleum fuels to the NSW and ACT economies.

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

Potential impacts have been assessed and strategies to avoid, minimise and mitigate those impacts form a key part of the EIS. 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. Caltex has also considered impacts on the surrounding environment and community of Kurnell. Caltex firmly believes it can undertake the conversion and operate in a manner which would maintain and in certain areas improve the local environment and public amenity in the area.

This EIS has concluded that the Project should proceed because it would:

1. result in no long term adverse impacts to the environment or local community (and result in some beneficial outcomes as outlined in **Table 22-4**);
2. allow for the continued use of the Site following the closure of the refining facility;
3. facilitate the continued employment of local people (albeit at a reduced level); and
4. satisfy the principles of Ecologically Sustainable Development as described in the EP&A Regulation.

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

On the basis of the findings detailed within this Environmental Impact Statement, the Project is considered to be justified.

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