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).

Environmental Impact Statement prepared by:

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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.

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:  **Date:** May 2013

Name: WILLIAM MILES

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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	*The Australian Heritage Council Act 2003*
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information System
ANZECC	Australia and New Zealand Environment Conservation Council
ANZECC/ARMCANZ	*Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)*
AORA Act	*The Australian Oil Refining Agreements Act 1954*
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	*Birdlife Australia, the New Atlas of Australian Birds 1998-2012*
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	*Contaminated Land Management Act 1997*
CLOR	Caltex Lubricant Oil Refinery
CMA	Catchment Management Authority
CMZ	Contamination Management Zone
CO2	carbon dioxide
CO2-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	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000 (NSW)*
EPA	Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (C'th)
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ERA	Environmental Risk Analysis
ESA	Environmental Scoping Assessment
ESD	Emergency Shut Down
FM Act	*Fisheries Management Act 1994*
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
HAZID	Preliminary hazard identification
Heritage Act	*The Heritage Act 1977*
ha	Hectares
HHIMS	Historic Heritage Information Management System
HHRA	Human Health and Ecological Risk Assessment
HIA	heritage impact assessment
HIPAP No. 4	*Hazardous Industry Planning Advisory Paper No. 4*
HIPAP No. 6	*Hazardous Industry Planning Advisory Paper No. 6*
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	*National Parks and Wildlife Act 1974*
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	*Native Vegetation Act 2003*
NVIA	Noise and Vibration Impact Assessment
NW Act	*Noxious Weed Act 1993*
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	*The Protection of the Environment Legislation Amendment Act 2011* (NSW)
PHA	Preliminary Hazard Analysis
PIRMPs	Pollution Incident Response Management Plans
PoEO Act	*Protection of the Environment Operations Act 1997* (NSW)
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	*State Environmental Planning Policy No 14 – Coastal Wetlands*
SEPP 55	*State Environmental Planning Policy No. 55 - Remediation of Land*
SEPP 71	*State Environmental Planning Policy No. 71 - Coastal Protection*
SEPP S&RD	*State Environmental Planning Policy (State and Regional Development) 2011*
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	*Threatened Species Conservation Act 1995* (NSW)
ULP	Unleaded Petrol
VC	Vapour Cloud Explosion
VKT	Vehicle Kilometres Travelled
VOC	Volatile Organic Compound
VOL	Volatile Organic Liquid
WARR Act	*Waste Avoidance and Resource Recovery Act 2001* (NSW)
WH&S Act	*Work Health and Safety Act 2011* (NSW)
WH&S Regulation	*Work Health and Safety Regulation 2011* (NSW)
WM Act	*The Water Management Act 2000*
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. $L_{A90,15\ min}$.
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 *Threatened Species Conservation Act 1995*.
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 *Environment Protection and Biodiversity Conservation Act 1999*, it refers to a process that threatens the survival, abundancy 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:

- Slop[1]; 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 m^3 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 assess 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 $CO_{2\text{-}e}$ 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 wew 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 requiested 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.

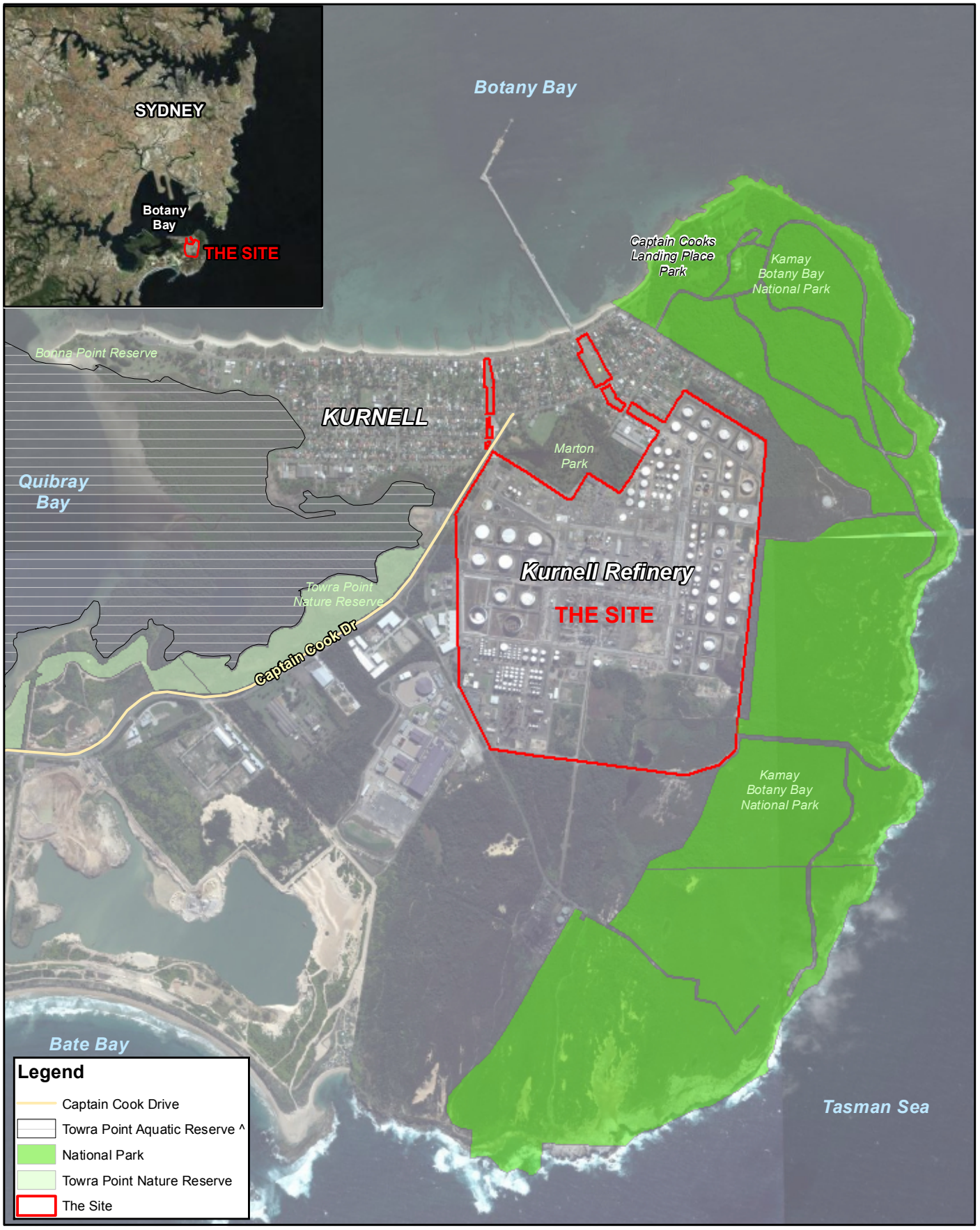
The Project would comprise:

- 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.



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Datum: GDA94
Grid: MGA Zone 56

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

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

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.

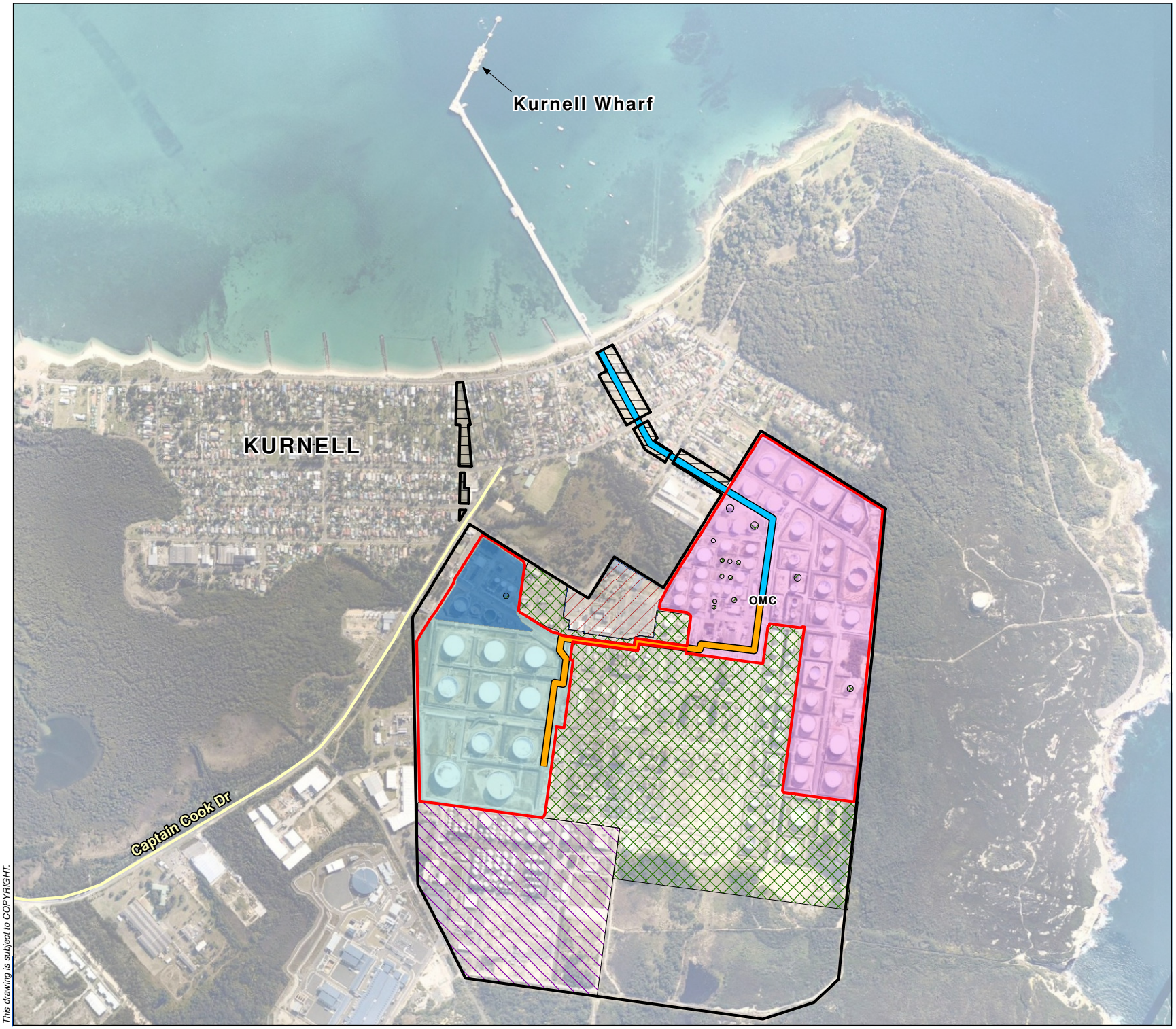
The ultimate aim of the proposed works is to allow the Site to be utilised as a terminal where finished products would be received by ship, stored in tanks before leaving the Site, predominantly by pipeline to the Caltex Banksmeadow Terminal, Silverwater Terminal, Joint User Facility at Sydney Airport, 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 *in situ* and largely does not form part of the Project. The infrastructure would be depressurised, cleaned in line with standard maintenance proceedures 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)

N W E S

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

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 Sighnificant 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	*Executive Summary*	This summarises the key issues and findings detailed in the other parts of the EIS.
	Introduction	**Chapter 1** provides an outline of the Project, briefly outlines the environmental impact assessment process and introduces the various terms used throughout the EIS.
	Project Need and Alternatives	**Chapter 2** details the Project need and Project alternatives.
	Project Location and Existing Environment	**Chapter 3** provides a description of the location of the Lot and the Site and describes the existing environment.
	Project Description	**Chapter 4** provides a detailed description of the Project.
	Legislation and Planning Policy	**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.
	Consultation	**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.
	Environmental Scoping Assessment	**Chapter 7** provides an assessment of the potential environmental impacts of the Project and identifies the key issues for further assessment.
	Environmental Assessment	**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.
	Management and Mitigation Measures	**Chapter 21** details proposed environmental management and mitigation measures to safeguard against or minimise potential impacts.
	Project Evaluation and Justification	**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

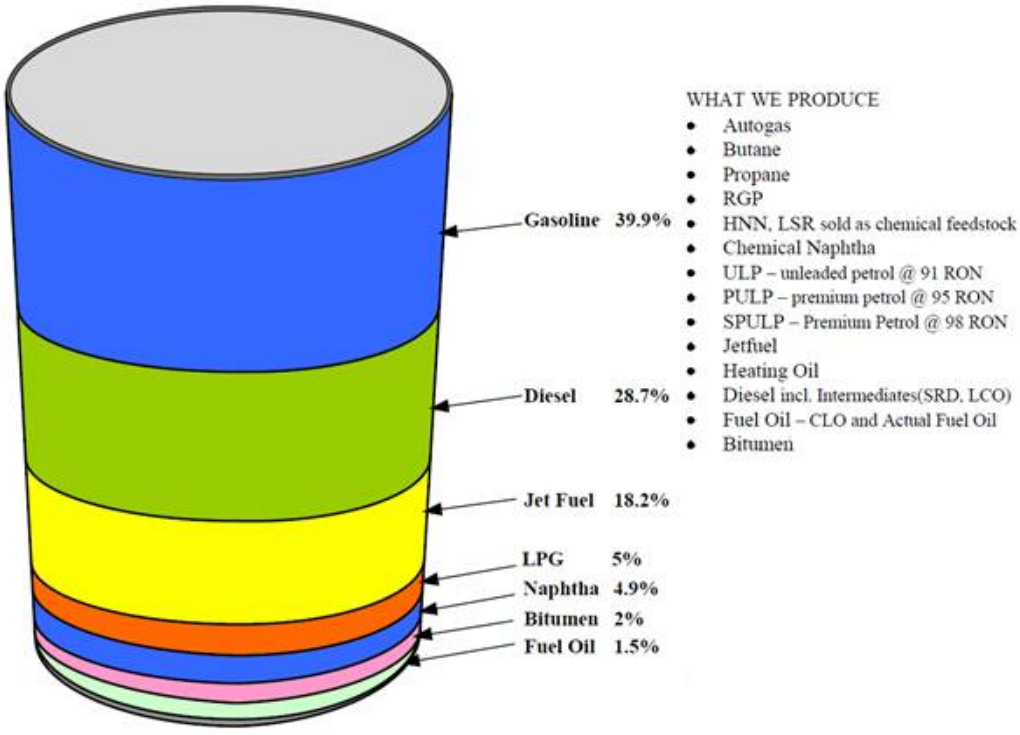
3.2.1 Site Context

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 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
- 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 Facilties (DA10/0690);
- Remedation of Limestone Pits (DA11/1090);
- SEPP 55 Caltegory 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 lan (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, the is the village of Kurnell;
- to the west of the Site is Quibray Bay; and
- land to the south west has the following landuse 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 2,213[1].

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:

- Slop[1]; 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 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

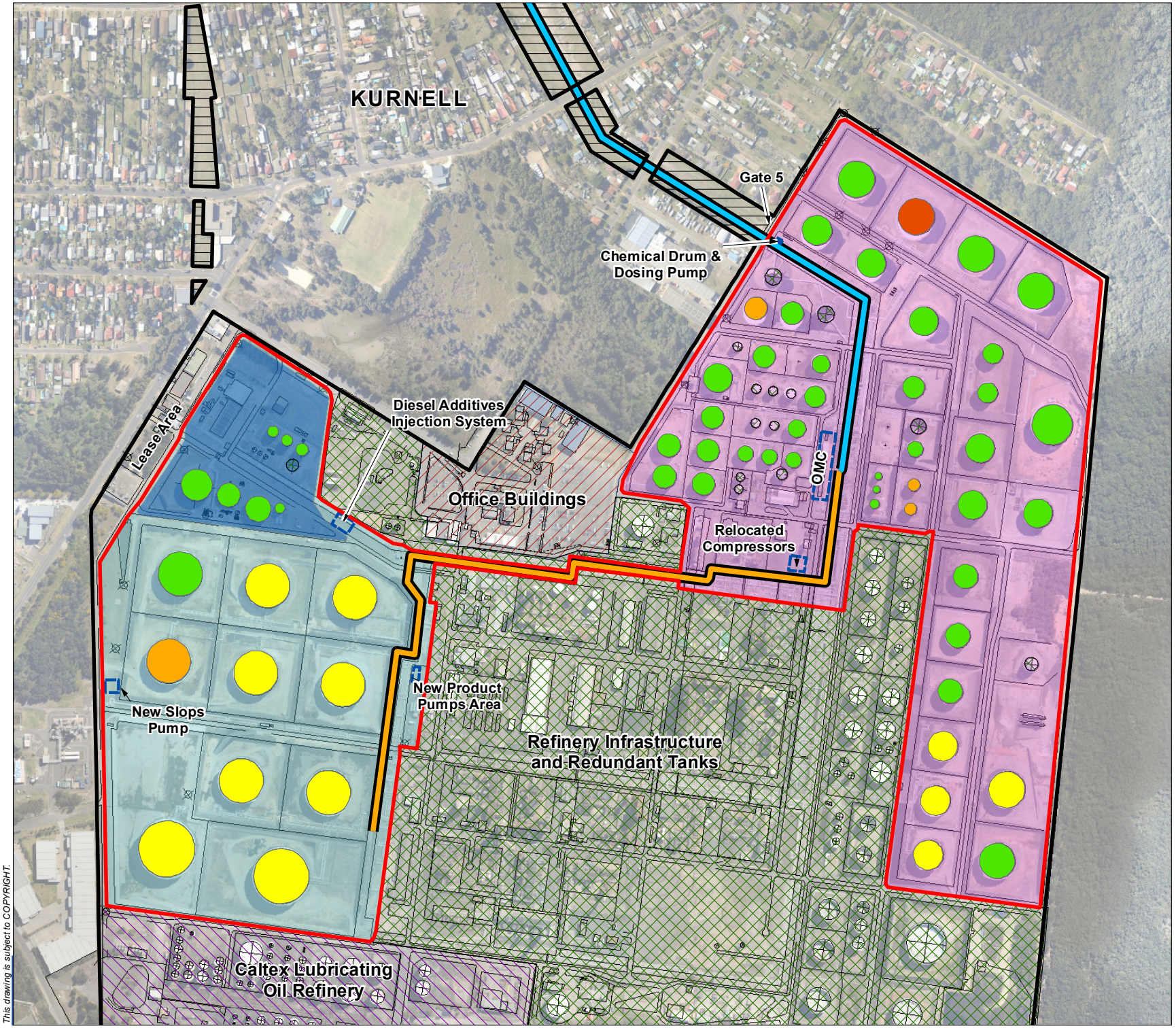
The existing Oily Water Management System (OWMS) at the Site collects process effluent and stormwater from areas of the Site where there is potential for interaction of water flows with petroleum products. Oily water from a range of sources is collected in the Site's oily water sewer system and is transferred 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)

N
W E
S

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

0 50 100 200
Meters

Source: Aerial Imagery - Nearmap Hypertiles 2012

PATH: T:\JOBS\43177836\Workspaces\

FILE NO: 43177836.024

DRAWN: STB APPROVED: RO DATE: 19/02/2013

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 strake[2] 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 system[3] 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 materials[4] 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[5]; 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-iventory 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 activites 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 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***
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 (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**	**180**[5]	**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 Assesment** 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 with 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 promtly.

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	
Consistancy Review Comments – 8.4.13, and meeting discussions – 12.4.13	
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	
Meeting Outcomes – 5.11.12	
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**
Consistancy Review Comments – 8.4.13, and meeting discussions - 12.4.13	
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; • Conformation 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	
Overview of Consultation – 17.7.12 – 29.1.13	
Initial meeting and Site vist with 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 correspdance 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
RMS	
Phone consultation regarding Transport and Access Chapter – 11.10.12 and 12.10.12	
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**
Sutherland Shire Council	
Phone consultation regarding Transport and Access Chapter – 9.10.12 and 10.10.12	
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**
Meeting Outcomes - 2.11.12	
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
Consistancy Review Comments – 8.4.13, and meeting discussions - 12.4.13	
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**
NSW DPI	
Phone consultation regarding DPI requirements – 12.12.12	
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**
NSW OEH	
Phone consultation regarding OEH requirements – 9.10.12	
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**
Heritage Council of NSW	
Response letter – 23.10.12	
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 incident[1] 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 províders, 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.

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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.

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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 (RiskMan2[3]). 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**).

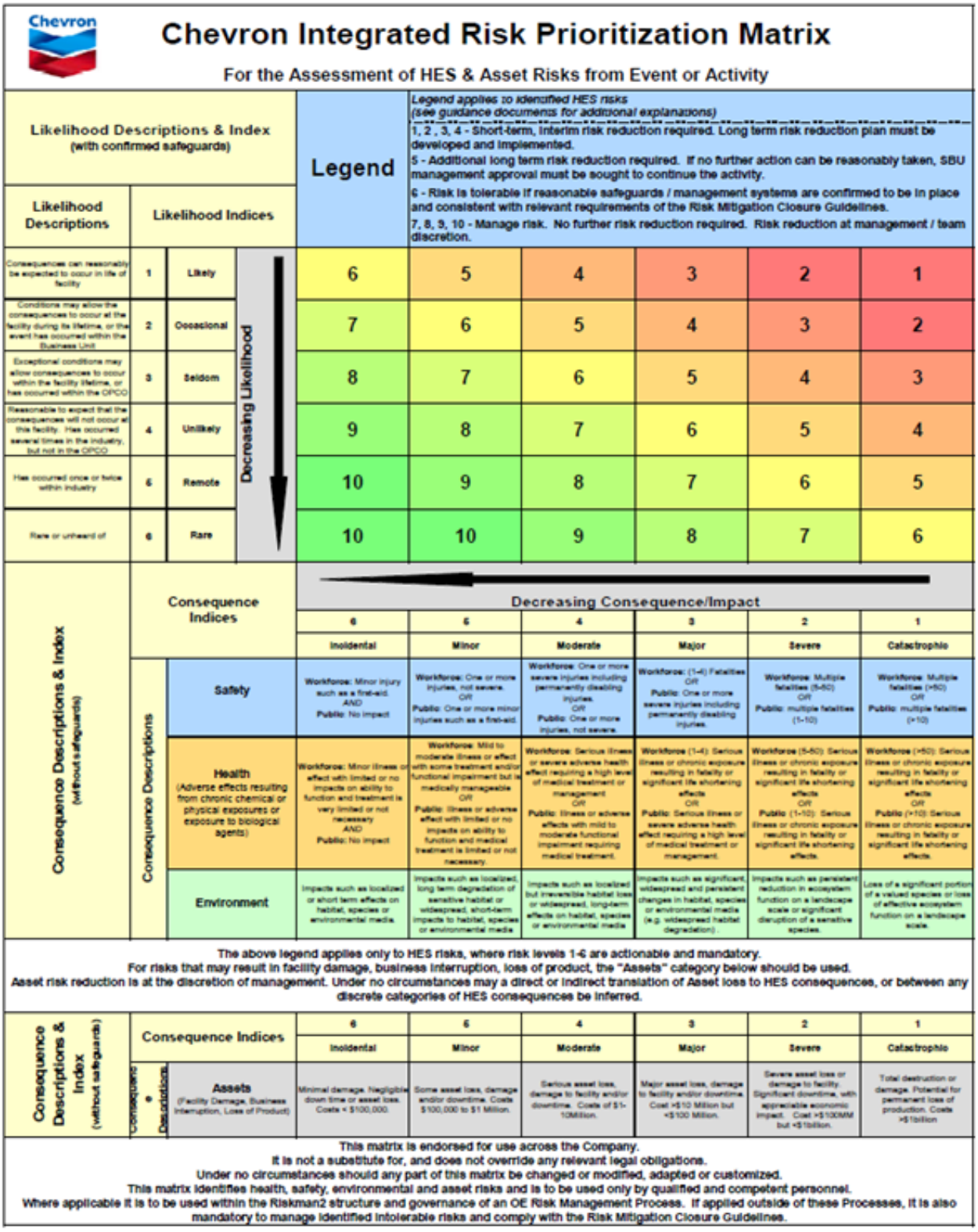
In addition to the QRA, Caltex has also undertaken a number of detailed Process Hazard Analysis studies in support of the proposed design. These studies are qualitative in nature and consider hazards to safety and health, the biophysical environment and to property. They have been a significant source 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 RiskMan2^3 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 RiskMan2^3 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)

Likelihood Descriptions	Likelihood Indices		Decreasing Likelihood
Consequences can reasonably be expected to occur in life of facility	1	Likely	
Conditions may allow the consequences to occur at the facility during its lifetime, or the event has occurred within the Business Unit	2	Occasional	
Exceptional conditions may allow consequences to occur within the facility lifetime, or has occurred within the OPCO	3	Seldom	
Reasonable to expect that the consequences will not occur at this facility. Has occurred several times in the industry, but not in the OPCO	4	Unlikely	
Has occurred once or twice within industry	5	Remote	
Rare or unheard of	6	Rare	

Legend

Legend applies to identified HES risks (see guidance documents for additional explanations)

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.

			6	5	4	3	2	1
			7	6	5	4	3	2
			8	7	6	5	4	3
			9	8	7	6	5	4
			10	9	8	7	6	5
			10	10	9	8	7	6

Consequence Descriptions & Index (without safeguards)

Decreasing Consequence/Impact

Consequence Indices			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) Fatalities OR Public: One or more severe injuries including permanently disabling injuries.	Workforce: Multiple fatalities (5-50) OR Public: multiple fatalities (1-10)	Workforce: Multiple fatalities (>50) 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 (5-50): 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 (>50): 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 Descriptions & Index (without safeguards)

Consequence Indices			6	5	4	3	2	1
			Incidental	Minor	Moderate	Major	Severe	Catastrophic
Consequence Descriptions	Assets (Facility Damage, Business Interruption, Loss of Product)		Minimal damage. Negligible down time 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 $1-10Million.	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 <$1billion.	Total destruction or damage. Potential for permanent loss of production. Costs >$1billion

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 criteria[2], 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.

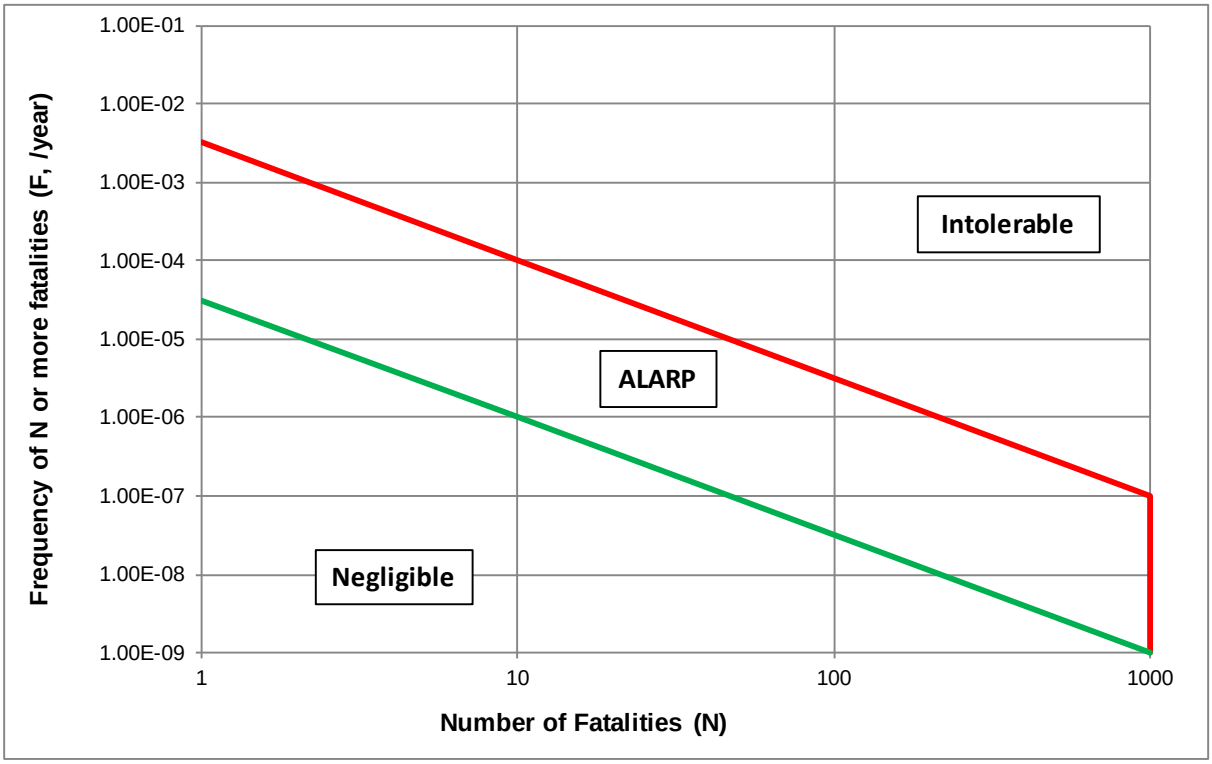
Table 8-2 HIPAP No. 4 Off-Site Risk of Fatality Criteria

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:

Risk = Consequence x 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^{o}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

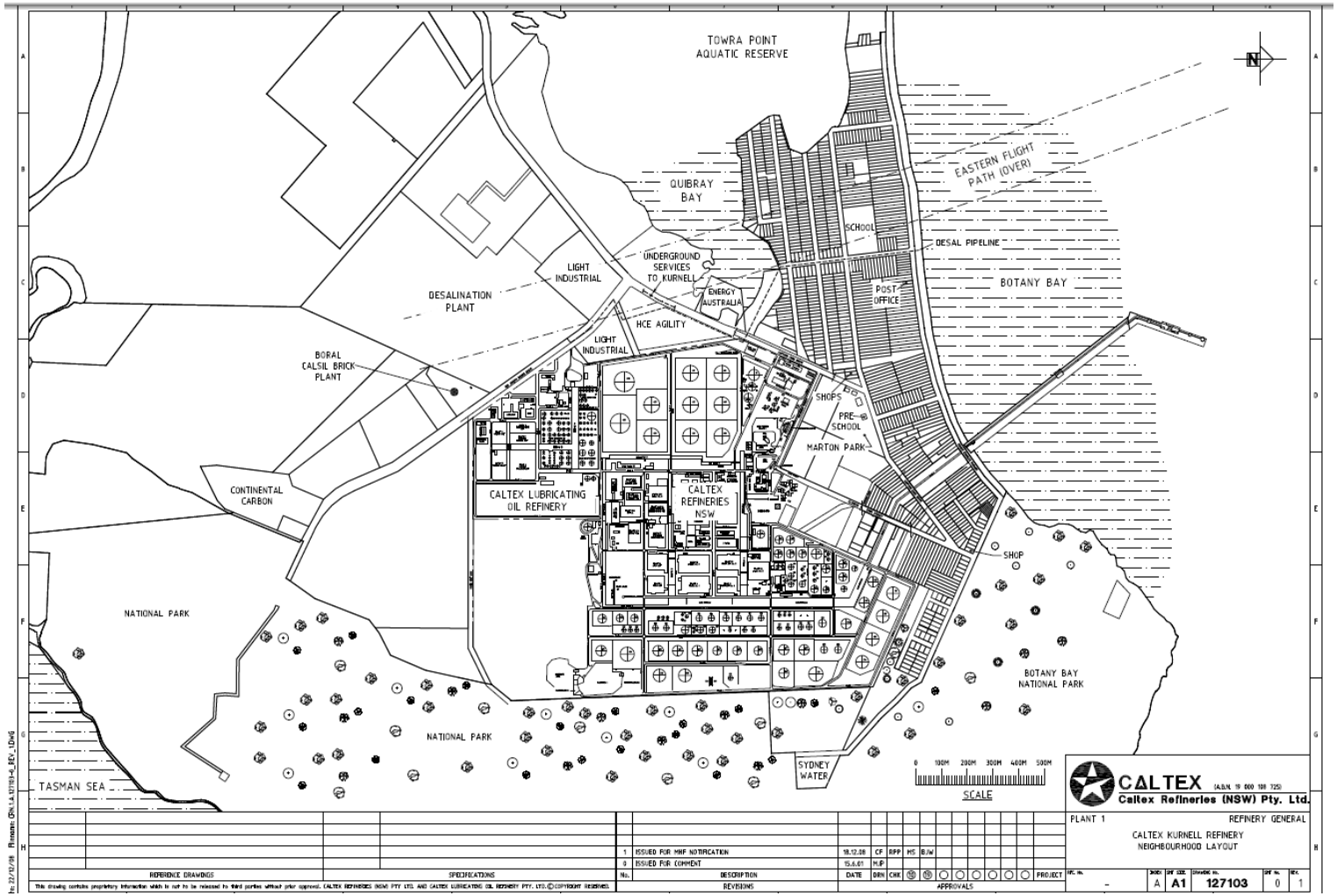
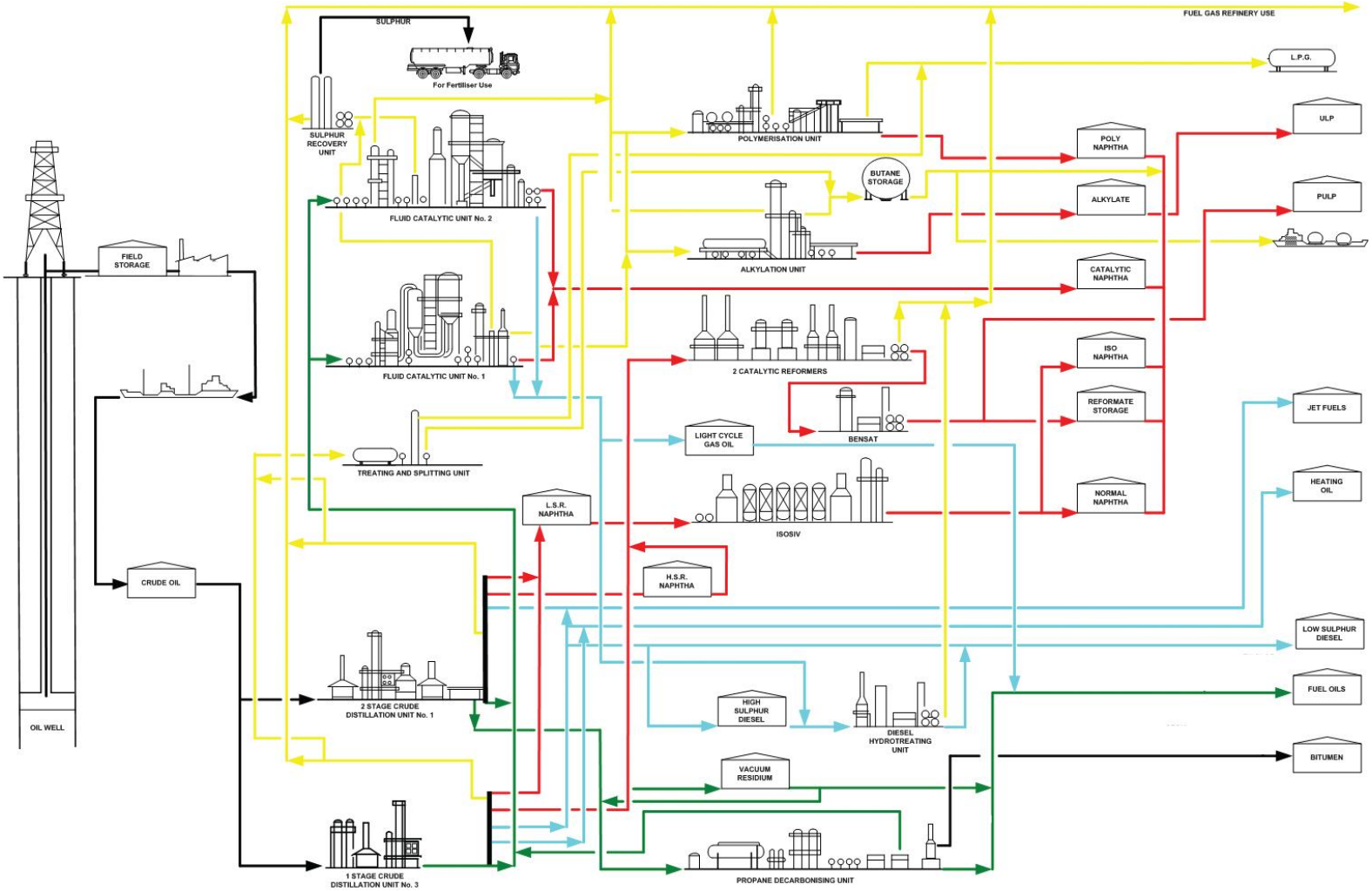


Figure 8-4 Existing Site Refining Process Overview



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 significant[4] 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 ***(planned).*** • 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 ***(planned).*** • Remote actuated tank inlet / outlet valves ***(planned).*** • 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 ***(existing but will be upgraded).*** • 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 ***(planned).*** • Closed circuit camera system for all low flash point tanks ***(planned).***	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 ***(existing but will be upgraded as required by design case).*** • 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 ***(planned)***. • Closed circuit camera system for tank top surveillance of all low flash point tanks ***(planned).*** **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 Svitzer 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 x 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 bulkibins 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 km^2. 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 works[1]) (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 exiting 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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COFFEY (2007) GROUNDWATER FLOW DIRECTION AND GROUNDWATER MONITORING WELLS

URS

Figure: 9-1

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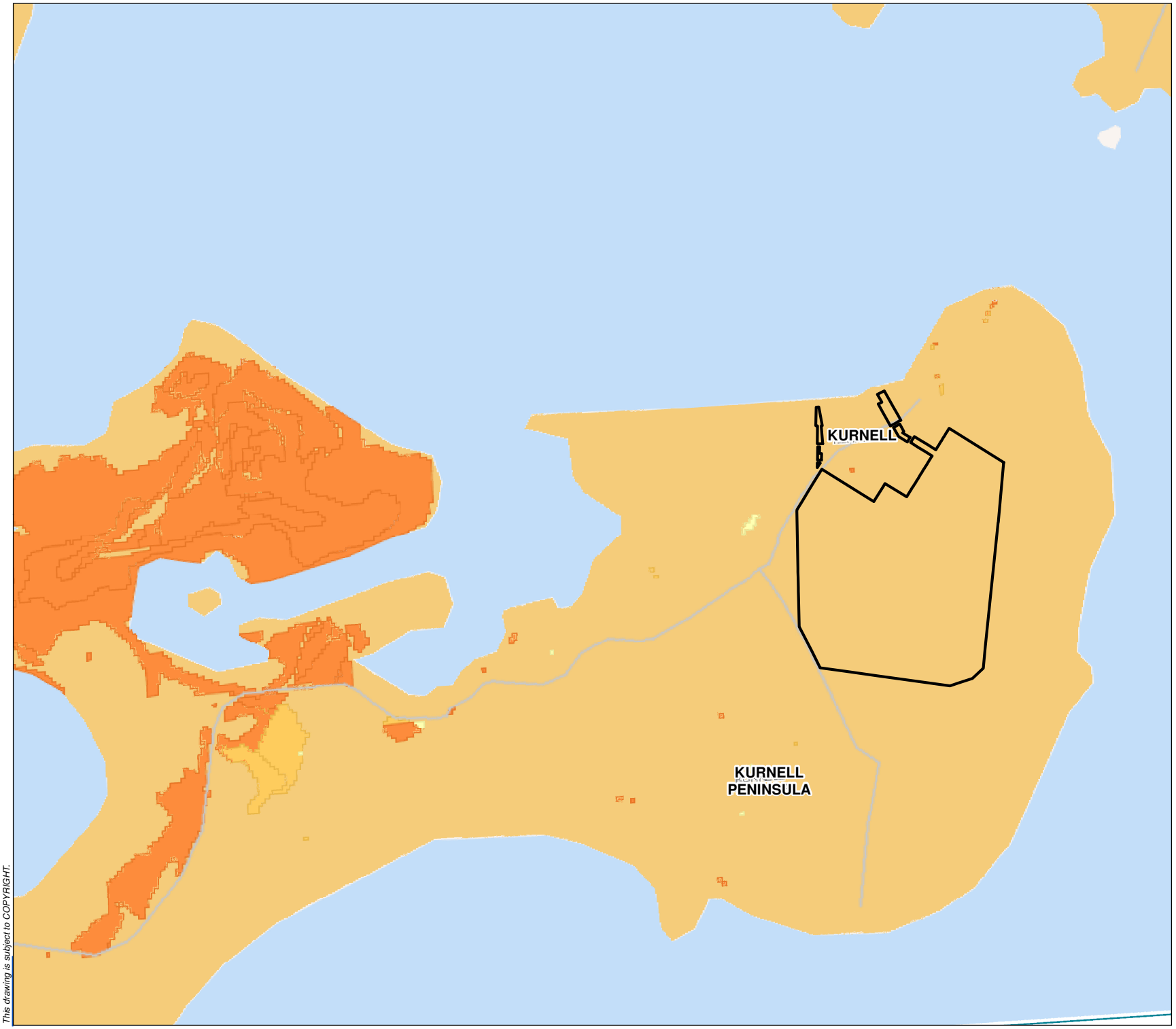

LEGEND

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

0 400 800 1,600

Meters

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

PATH: T:\JOBS\43177836\Workspaces\

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DRAWN: SB APPROVED: KT DATE: 16/01/2013

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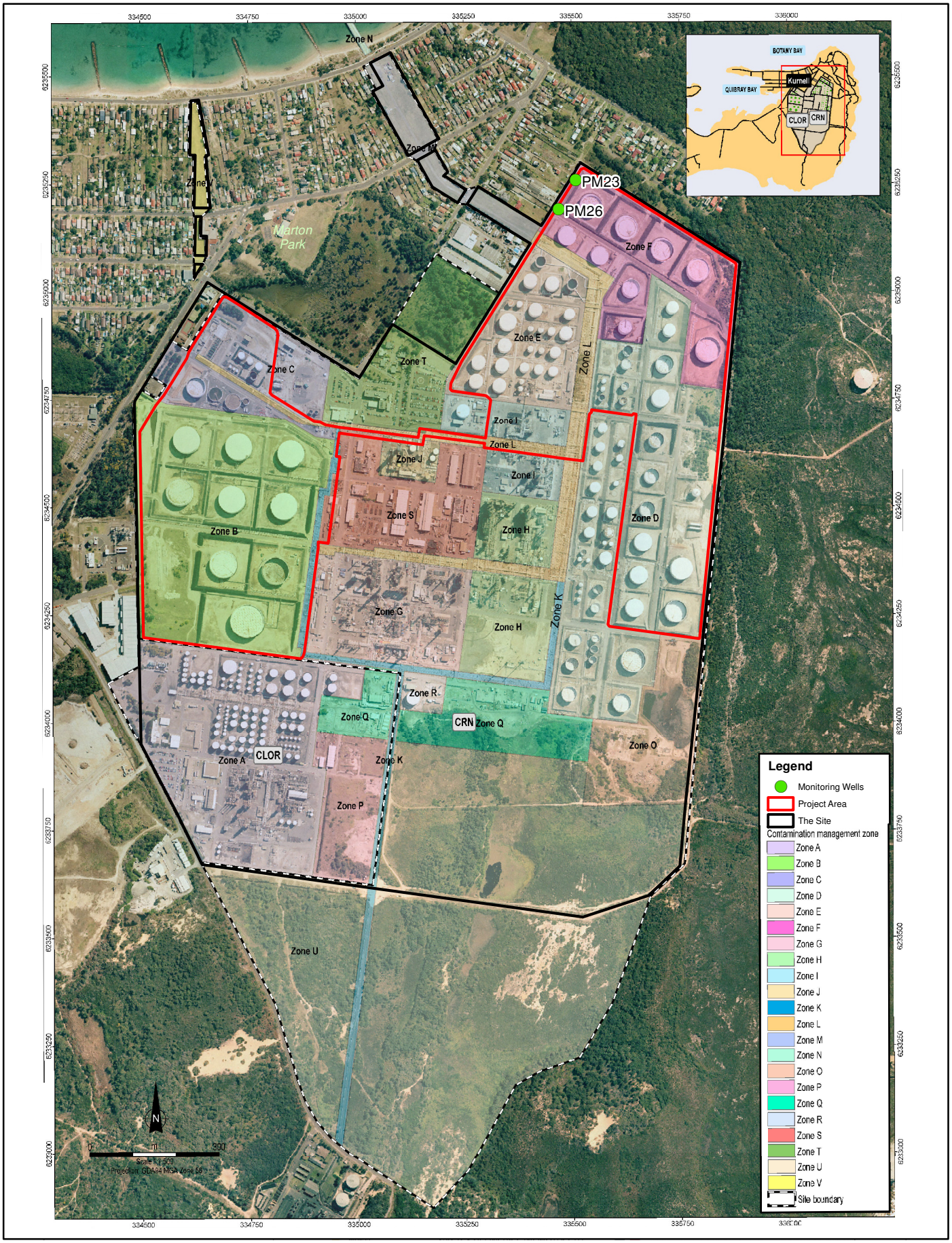
CONVERSION

GROUNDWATER DEPENDANT ECOSYSTEM MAP

URS

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

URS

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Figure: 9-3

Rev. A A4

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 m^3 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:

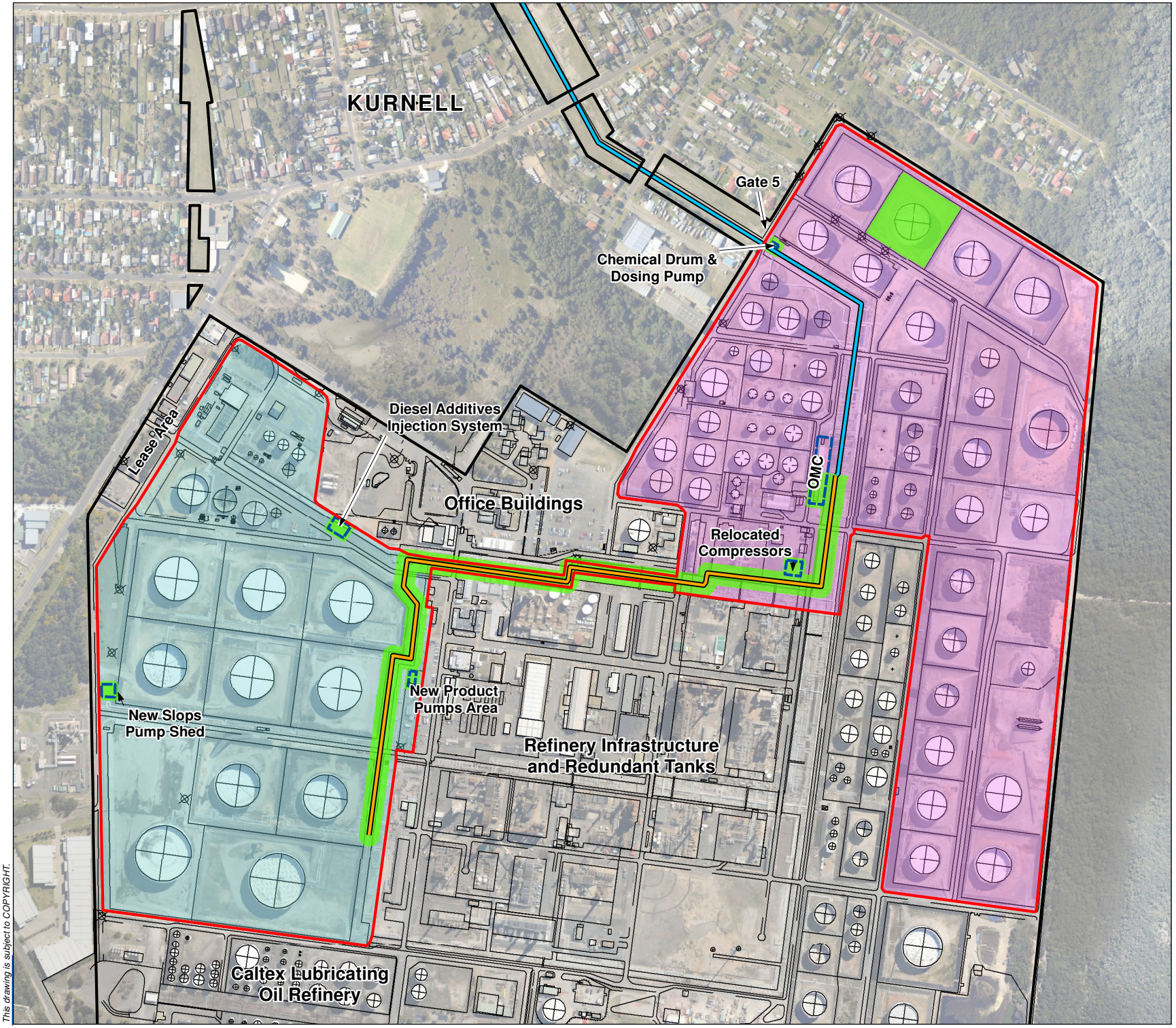
- disturbance of contaminated land or groundwater;
- contaminants leaking to the ground surface; and
- accidents or spills involving construction equipment.

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 m^3) 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.



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

N
W E
S

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

PATH: T:\JOBS\43177836\Workspaces\

FILE NO: 43177836.010

DRAWN: SB APPROVED: KT DATE: 11/01/2013

CALTEX (REFINERIES)
NSW PTY LTD

KURNELL REFINERY
CONVERSION

LOCATION OF GROUND DISTURBANCE ACTIVITIES

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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) *Waste Classification Guidelines: Part 1: Classifying Waste*, 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 *Waste Classification Guidelines* and the Contamination Management Plan (CMP) for the Project. Contaminated materials would be sent to appropriately licensed facilities in accordance with the *Contaminated Land Management Act 1997*.		✓	
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 *Protection of the Environment Operations Act 1997* 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**.

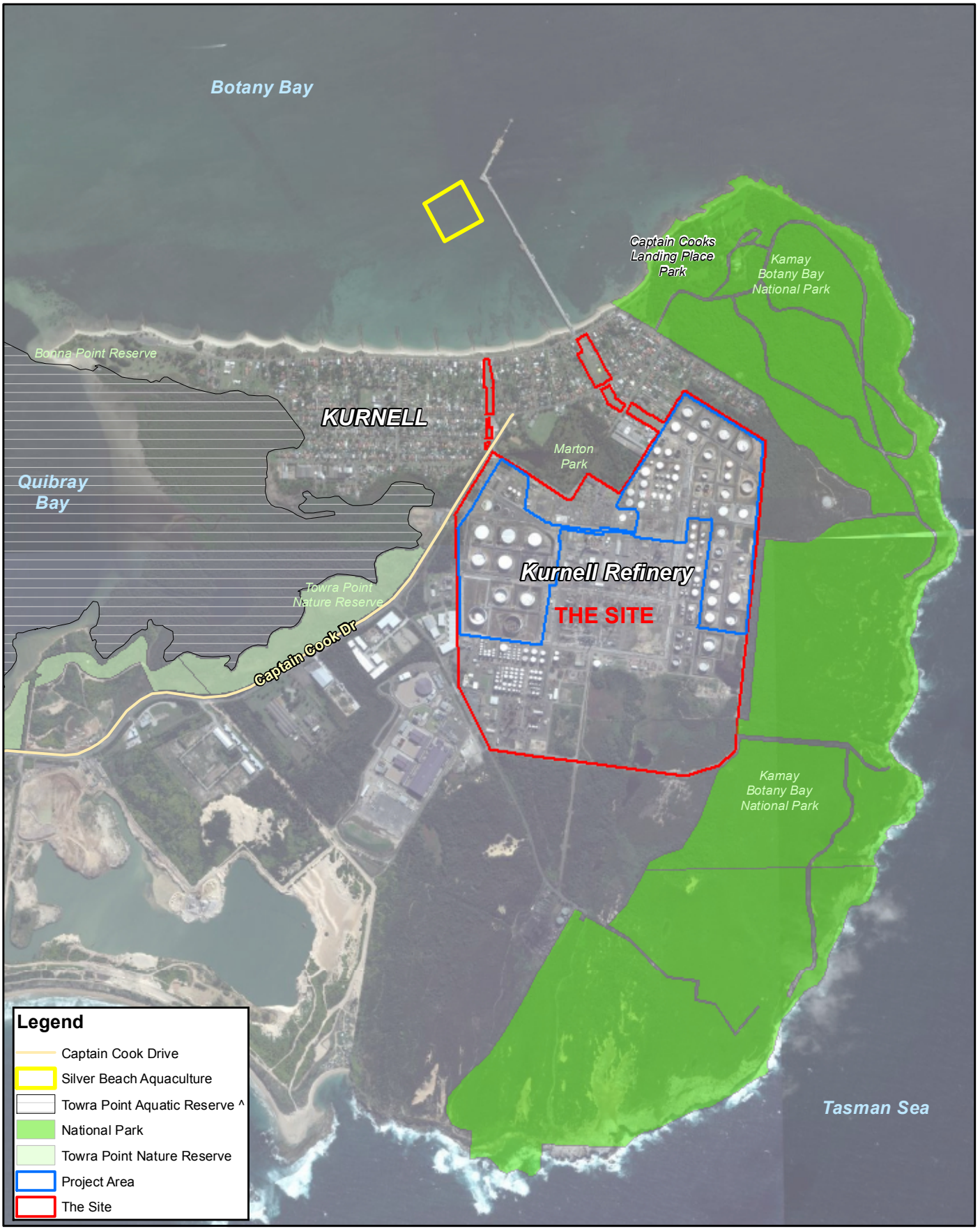
The key sensitive environmental aspects that may be affected by the Project are outlined below.

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 (REFINERIES) PTY LTD

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 addtional 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 (CMZ[1]) (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 *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.*
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 *Potentially metals and contaminants from off-site transported by the OWSS and stormwater network.*
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 *Potentially mercaptans and Pb (and possibly TEL) and contaminants from off-site transported by the OWSS and stormwater network.*
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, *Potentially metals, Lead (inorganic and TEL) and contaminants from off-site transported by the OWSS and stormwater network.*

[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 *Potentially metals and Asbestos from product storage and transfer and contaminants from off-site transported by the OWSS and stormwater network.*
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 *Potentially Phenols and Asbestos from product storage and transfer and contaminants from off-site transported by the OWSS and stormwater network.*
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 *Phenols; Metals; Asbestos and contaminants from off-site transported by the OWSS and stormwater network.*

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 m^3 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.		✓	✓