NSW GOVERNMENT
Department of Planning

MAJOR PROJECT ASSESSMENT:
Kurnell Refineries
Crude Oil Storage Tank (Tank 634)

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

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EXECUTIVE SUMMARY

Caltex Refineries (NSW) Pty Limited, a subsidiary of Caltex Australia Ltd proposes to construct and operate a new crude oil storage tank (Tank 634) to augment existing operations at its Kurnell refinery. Tank 634 is proposed to have a working capacity of 82 megalitres and would be located adjacent to Tank 633 in the existing crude oil tank area near the western boundary of the refinery.

The site is located within the Kurnell refinery which is on the Kurnell Peninsula approximately 30 kilometres from Sydney's central business district. The project would be undertaken wholly on land owned by Caltex Refineries (NSW) Pty Ltd within the Sutherland Shire Local Government Area. The proposed project is subject to Part 3A of the Environmental Planning and Assessment Act 1979 and requires the approval of the Minister for Planning.

The capital investment for the project would be approximately $28 million. Approximately 60 people would be employed during construction and the operation of the tank would require two new permanent positions. If approved, construction would take approximately 16 weeks.

The project would enable Caltex Refineries (NSW) Pty Ltd to maintain production of fuels and supplies to NSW and to better manage the fluctuations in the delivery of crude oil to the refinery as a result of shipping delays. The project would therefore enable Caltex Refineries (NSW) Pty Ltd to maintain the continuity of supply to its customers.

The Proponent has demonstrated that the project could be undertaken with minimal or no environmental impacts to surrounding land use. Nevertheless, due to the nature of the material present at the site, the Department has recommended that a number of hazard studies be undertaken as part of the recommended conditions of approval. These studies will ensure that the dominant risk contributors associated with the project are managed to comply with land use safety planning criteria.

Through the conditions of approval recommended by the Department, the impacts of the project can be mitigated, managed and monitored to ensure protection of the environment and human health. In doing so, the Department is satisfied that the construction and operation of Tank 634 can be achieved without detriment to the surrounding community or environment of the Kurnell Peninsula.

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1. BACKGROUND

1.1 Location

Caltex Refineries (NSW) Pty Limited (the Proponent), a subsidiary of Caltex Australia Ltd proposes to construct and operate a new crude oil storage tank (Tank 634) to augment existing operations at its Kurnell refinery. Tank 634 is proposed to be used for the storage of crude oil with a capacity of approximately 82 megalitres. The original project application made by the Proponent named the new tank as 'Tank 632', which was amended by the Proponent to 'Tank 634' during the assessment of the application.

The proposed location of the crude oil storage tank is within the existing Kurnell oil refinery located on the Kurnell Peninsula at 2 Solander Avenue (refer to Figure 1). The refinery is located within the Sutherland Shire local government area on land described as Lot 25 DP 776328. The site is generally bounded by Captain Cook Drive, Solander Street and Cook Street to the west and north-west, Sir Joseph Banks Drive to the south and Botany Bay National Park to the east.

The Kurnell Peninsula is bounded by Botany Bay to the north, the Tasman Sea to the east, the suburbs of Cronulla and Caringbah to the south-west and Bate Bay to the south. The refinery is approximately 30 kilometres from Sydney's CBD.

1.2 Existing Site

The Kurnell refinery was commissioned in 1956 and has a current crude oil processing capacity of 124,500 barrels per day (one barrel is equivalent to 159 litres of oil). The fuel refinery mainly produces petrol, diesel and jet fuel which amounts to 86% of its total production. Smaller quantities of other products are produced including fuel oils, liquid petroleum gas/ butane/ refinery grade propylene, bitumen and a mix of lubricating oil base stocks, waxes and process oils. The lube oil refinery comprises a significantly smaller operation than the fuel refinery.

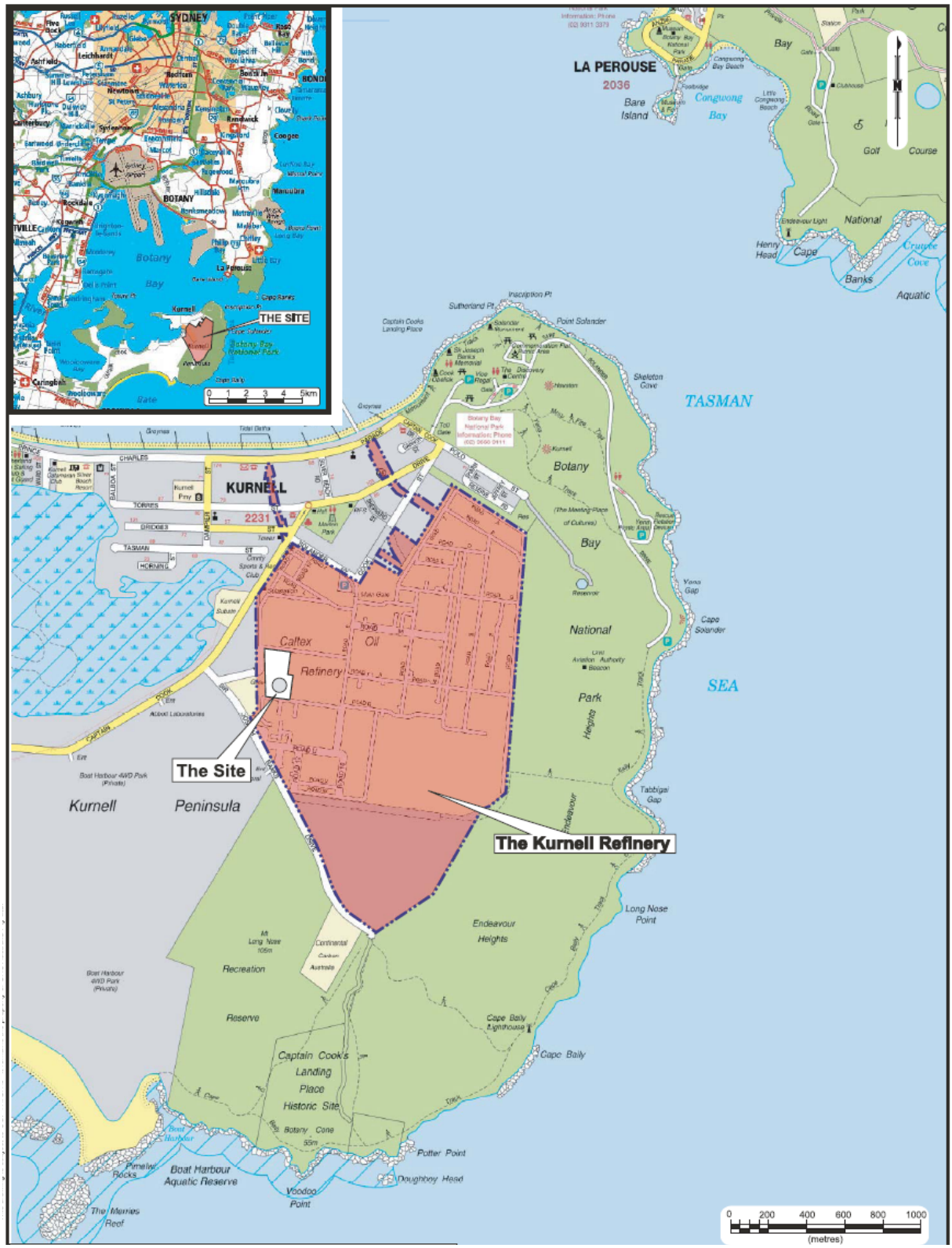
The proposed crude oil tank (referred to as Tank 634) would be located in the existing Crude Tank area, west of existing Tank 633 and south of existing Tank 611, near the western boundary of the refinery's site (refer to Figure 2). Tank 634 would be installed within a bunded area and connected to the existing crude oil pipelines.

1.3 Surrounding Land Use

Botany Bay National Park is located to the east of the site. The sand dunes of the Kurnell Peninsula are located to the south and Captain Cook Drive and other industrial development is located to the west. Kurnell Village and associated residential land is located immediately to the north.

In terms of the existing development surrounding the proposed tank within the site, Tank 634 is proposed to be located adjacent to an existing crude oil tank of similar height, structure and colour. Approximately 80 smaller tanks are located to the south of proposed Tank 634 and therefore within the context of the site. The position of Tank 634 among the other tanks is not expected to alter the physical appearance of the site to any great extent or to be particularly noticeable to surrounding land users.

Figure 1 – Site Location



Source – Figure 1.3.1 of *Kurnell Refineries Crude Oil Storage Tank (Tank 632) Environmental Assessment* (URS, 2006)

Figure 2 - Aerial View of Proposed Tank Location

Source: URS, 2006

2. PROPOSED DEVELOPMENT

2.1 Project Description

Crude oil is the raw material for all the products manufactured at the Kurnell refinery. Crude oil is delivered to the Kurnell wharf in Botany Bay by ship and is transferred to the storage tanks located in the western area of the refinery via pipelines. The crude oil is then piped from the storage tanks to the Crude Distillation Units for processing into fuels for supply to the New South Wales market.

The size of Tank 634 would be slightly larger than the adjacent crude oil tank on the site (Tank 633) and would have a working capacity of approximately 82 megalitres. The total volume of the tank would be 97 megalitres comprising the base of the tank, the working volume of 82 megalitres and a freeboard which comprises air space. Tank 634 would have a diameter of approximately 77.5 metres and a height of 20.5 metres above a concrete foundation. The tank would be constructed of carbon steel. The maximum depth of crude oil in the tank would be approximately 19.8 metres. The location of the tank in relation to the layout of the remainder of the refinery is shown on Figure 3.

The tank would include a mixing system which would manage the tank temperature to ensure that all crude oil stored in the tank would have a vapour pressure of less than 75 kPa (true vapour pressure). The mixing system would also ensure that the crude oil is consistent in composition throughout the tank. Water would be removed from the tank and would be directly connected to the refinery's oily water system for treatment.

Tank 634 would require heating to prevent the crude oil from cooling in the tank. Steam (at 140 kPa) would be used to heat the tank from heaters mounted on nozzles in the tank wall. The Proponent has indicated that the existing steam supply system on the tank farm is adequate to supply the additional tank. Earth bunds, lined with clay or similar material and sealed with concrete would be constructed around the tank. The floor inside the bund would also be sealed to prevent potential infiltration of liquids into the soil.

Construction of Tank 634 would generally involve the following:

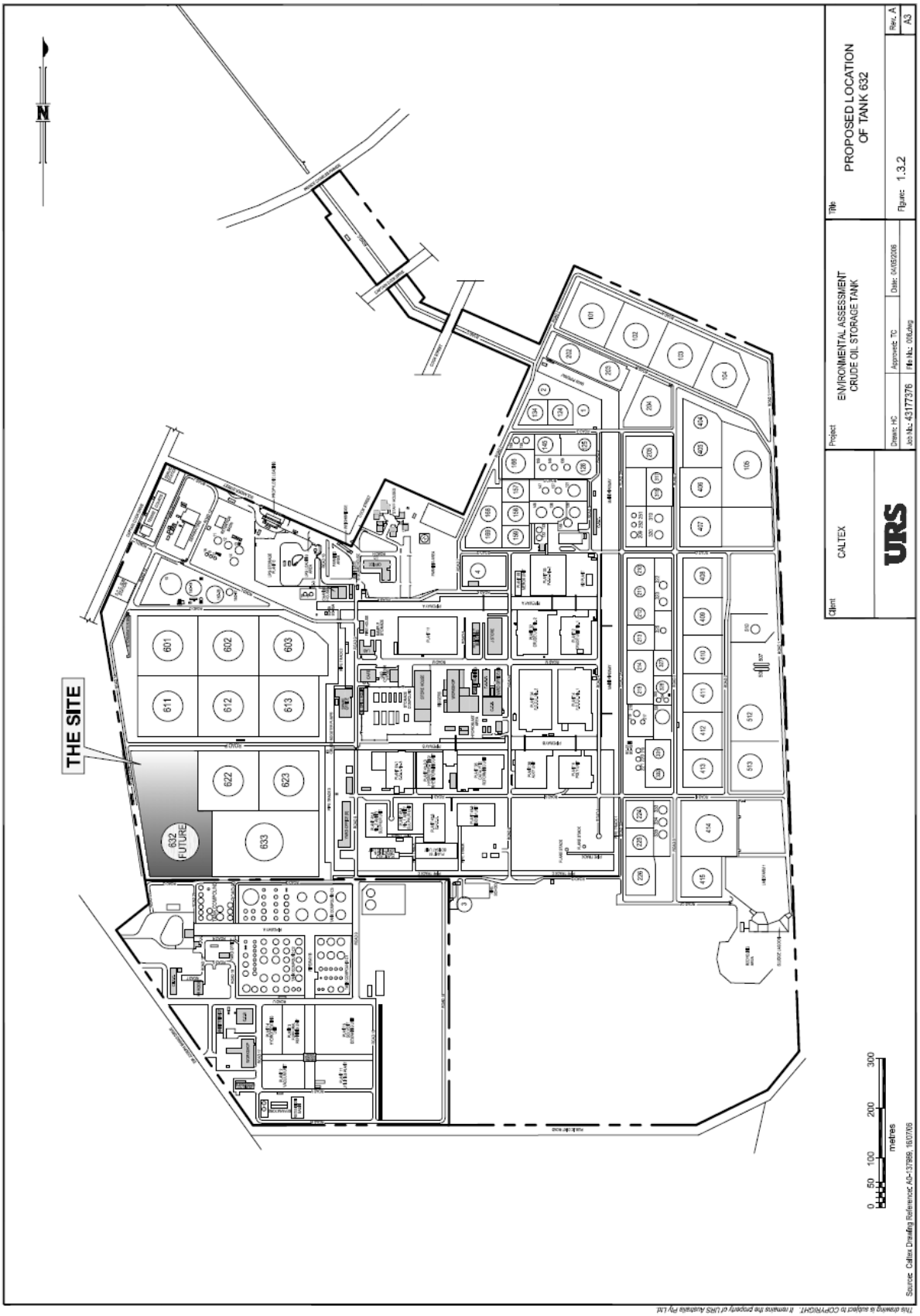
- clearing of vegetation;
- establishment of a base level for construction works and excavation of foundations, drainage system, bunds and access paths;
- installation of drainage system, impermeable liner and leak detection system;
- construction of tank floor, shell and roof;
- painting the tank;
- installation of mixers and heaters;
- construction of pedestrian access walkway and installation of stairs to the tank;
- connection of pipework and electrical equipment;
- construction of bund and water drainage system; and
- construction of access road, culverts and stormwater drainage system around the tank.

The construction works for the tank are expected to take approximately 16 months and involve approximately 60 construction workers.

2.2 Project Need

The current storage capacity of the existing storage tanks is equivalent to approximately ten-day's supply while each delivery ship contains approximately four to five days supply of crude oil. Therefore, before a ship can off-load its contents, there has to be less than five days of spare storage capacity which makes the timing of ship arrival critical to the supply of crude oil to the refinery. Shipping delays may be caused by disruptions in other ports or poor weather conditions and therefore can affect the supply of crude oil, which in turn reduces the production rate and may interrupt supply to customers. The construction and operation of Tank 634 would enable the refinery to better manage the fluctuations in the delivery of crude oil to the refinery as a result of shipping delays and would result in better management of variations in production rates. These factors would all aid in maintaining the continuity of supply to customers.

Figure 3 - Layout of Proposed Tank 634



Source: Figure 1.3.2 of *Kurnell Refineries Crude Oil Storage Tank (Tank 632) Environmental Assessment* (URS, 2006)

3. STATUTORY CONTEXT

3.1 Major Project

The project is declared to be a Major Project under *State Environmental Planning Policy (Major Projects) 2005* because it is development of a kind that is described in Schedule 1, clause 10(2), namely "development with a capital investment value of more than $20 million for the purpose of bulk liquid storage facilities". On 25 May 2006, the Director-General, under delegation from the Minister, formed the opinion that the project meets the requirements of the Major Projects SEPP and declared the project to be a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act). The project will therefore be assessed and determined by the Minister for Planning under Part 3A of the Act in accordance with section 75D(1).

3.2 Permissibility

The site for the proposed Tank 634 is zoned under *Sydney Regional Environmental Plan 17 – Kurnell Peninsula* as 4(c1) Special Industrial (Oil Refining). Oil refining activities are permissible within this zoning and therefore the construction and operation of proposed Tank 634 is not prohibited under the Plan.

3.3 Environmental Planning Instruments

The following environmental planning instruments are relevant to the assessment of the project:

- *State Environmental Planning Policy No. 33 –Hazardous and Offensive Development*; and
- *Sydney Regional Environmental Plan 17 – Kurnell Peninsula*.

State Environmental Planning Policy No 33

The proposed tank is characterised as "potentially hazardous" within the meaning of SEPP 33. The Proponent prepared a Preliminary Hazard Analysis (PHA) as part of the Environmental Assessment for the project. The PHA demonstrates that the land use safety criteria published by the Department would not be exceeded, and that the project would not constitute "hazardous development". The hazards and risk implications of the project are considered further in section 5.2 of this report.

Sydney Regional Environmental Plan 17 – Kurnell Peninsula

The SREP zones the site 4 (c1) Special Industrial (Oil Refining). The objectives of the zone are:

a) to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes.

b) to ensure that development has regard to environmental safety planning principles.

c) to mitigate land use conflicts within and adjacent to the zone and to ensure adequate provision is made for the supply of water and disposal in any environmentally sensitive manner all wastes and stormwater from the land.

The proposed new tank and associated infrastructure are consistent with these objectives.

3.4 Minister's Approval Power

The Major Project Application and Environmental Assessment were placed on public exhibition from Thursday 17 August .2006 to Monday 18 September 2006 and submissions invited in accordance with Section 75H of the Act. The Department has met all of its legal obligations so that the Minister can determine the application.

4. CONSULTATION AND ISSUES RAISED

The Environmental Assessment was publicly exhibited between Thursday 17 August 2006 and Monday 18 September 2006, during which a total of two submissions were received. One submission was received from Sutherland Shire Council and the other submission was received from the Department of Environment and Conservation (DEC). No public submissions were received.

Neither submission stated a position on whether the project is supported or opposed. However, both submissions received raised a number of issues to be considered as part of the assessment of the project. Sutherland Shire Council raised issues relating to air quality, wastewater management, management of potential acid sulphate soils and management of construction traffic. The Department has addressed these issues, where relevant, as part of its assessment of the project and considers that Council's residual concerns have now been resolved.

The DEC raised issues relating to air quality, specifically vapour pressure test methods. The DEC also recommended conditions of approval to address the issues raised in its submission, which have been incorporated into the recommended instrument of approval for the project.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Environmental Assessment, submissions, and the Proponent's response to submissions, the Department has identified the following key environmental issues associated with the proposal:

- air quality impacts;
- hazards and risk impacts;
- wastewater and stormwater management;
- acid sulfate soils management; and
- traffic and transport impacts.

All other issues are considered to be minor and have been adequately addressed as part of the Proponent's Statement of Commitments.

5.1 Air Quality Impacts

Issues

The principal air quality issue associated with the proposed new crude tank relates to vapour emissions. Volatile constituents of crude oil will naturally lie in vapour form above the stored crude oil, and be (fugitively) emitted from the tank.

Council suggested in its submission that there may be some confusion as to whether the tank requires a vapour recovery system under Part 5, clause 50 of the *Protection of the Environment Operations (Clean Air) Regulation 2002*. The Proponent indicated in the Environmental Assessment that the Reid vapour pressure will be maintained below the regulatory trigger value requiring the installation of a vapour recovery system. Nonetheless, Council raised concern that there is little information provided to indicate whether this is feasible in the daily operation of the tank given the variable composition of crude oil that will be stored in the tank and the minimum heating requirements of the oil.

Council also has some concerns over the secondary emissions impact of the increased efficiency of the operation facilitated by the addition of Tank 634 and Council has indicated that it is not confident that secondary air emissions will not be increased through the greater throughout made possible by the more efficient operation of the refinery infrastructure facilitated by the availability of the new storage infrastructure. It states that the Proponent has not provided sufficient information to determine if the individual, or cumulative efficiency gains in refinery operation provided by the proposed new Tank 634 as well as the new diesel storage tank (the subject of a separate Development Application to Council) will result in a significant increase in secondary emissions.

In its initial submission on the proposal, the DEC recommended that the vapour pressure of crude oil to be stored within the new tank be constrained to less than 75kPa and that vapour pressure be continuously monitored to ensure that this outcome was met. The DEC also noted that it was in the process of preparing a crude oil vapour pressure monitoring method for consultation.

Consideration

The Proponent submitted additional information in response to the issues raised in submissions made by Council and DEC with respect to vapour pressure and the emission of volatile crude components. In particular, the Proponent has demonstrated that all crude oils currently handled at the refinery are maintained below a true vapour pressure of 75kPa. The Proponent explains that this approach is already taken at the refinery for a number of reasons:

- storage of crude at a true vapour pressure in excess of 75kPa would require installation of a vapour recovery system, as required under *Protection of the Environment Operations (Clean Air) Regulation 2002*, at an additional capital cost. The Proponent prefers to avoid this additional cost by maintaining vapour pressures below 75kPa;
- elevated crude vapour pressures result in increased loss of product from storage tanks (volatilisation of components of the crude oils). It is in the Proponent's own commercial interests to minimise the loss of potential product by minimising vapour pressure above stored crude;

- operating below 75kPa also ensures the integrity of tank roof seals and prevents the floating roof from sinking.

The Proponent also highlighted that there is currently no means for "on-line" monitoring of crude oil vapour pressures. In fact, the Proponent currently calculates and manages vapour pressures from first principles and is in the process of computerising this system to contribute to optimisation of blending at the refinery.

In light of the additional information provided by the Proponent, the Department is satisfied that crude vapour pressures can and will be maintained below a true vapour pressure of 75kPa. It is recommended that this criterion be imposed as a condition of approval. With respect to monitoring vapour pressures, the Department is satisfied that the Proponent's current management system is appropriate for the purpose of ensuring compliance with the 75kPa vapour pressure requirement. There may be potential to update this system in future to reflect the outcomes of the DEC's draft methodology for monitoring crude oil vapour pressures, but a decision in this regard would need to be made if and when such a methodology is finalised.

In terms of secondary emissions as a result of the improved efficiency of the refinery from storage infrastructure improvements, the Department does not consider that the cumulative air emissions impact from the three current proposals being progressed by the Proponent will result in any significant secondary or cumulative impacts to air quality beyond the boundary of the site. The refinery operates under an existing Environment Protection Licence (EPL No. 837) which specifies load limits for air emissions for a number of assessable pollutants including benzene, benzo(a)pyrene (equivalent), fine particulates, hydrogen sulphide, nitrogen oxides, sulphur oxides and volatile organic compounds (VOC). These limits are not proposed to be altered, and provided that the limits specified in the EPL for VOC and benzene are not exceeded, the secondary impacts from the other proposals being progressed by the Proponent are not considered to be significant.

5.2 Hazards and Risks Impacts

Issues

While none of the submissions specifically raised hazards and risk from the construction or operation of Tank 634 as a concern, the Department considers it to be a key issue in the assessment of the proposal. A Preliminary Hazard Analysis (PHA) was undertaken as part of the Environmental Assessment. A number of issues were raised by the Department with respect to the scope and content of the PHA which required the Proponent to submit further information (specifically consequence modelling) regarding the potential hazards and risks associated with the proposal.

Consideration

The Department has reviewed the additional information provided by the Proponent in respect to potential contribution of facilities located near Tank 634 to the risk at the site boundary of the Kurnell refinery. The Proponent undertook further consequence modelling to determine the contribution of storage tanks 622, 623 and 633 to the individual risk of fatality at the Kurnell Refinery site and demonstrated that the contribution of the facilities, adjacent to Tank 634, will not contribute to significant off-site risk. The proposal satisfies the relevant risk criteria published by the Department in *Hazardous Industry Planning Advisory Paper No 4- Risk Criteria for Land Use Safety Planning*. The analysis undertaken by the Proponent is considered to have adequately addressed the hazards related issues associated with the proposed changes to the existing refinery operations. The Department has recommended a number of hazard specific conditions of approval to ensure that the hazard and risk associated with the proposal is managed appropriately. These conditions cover the usual suite of hazards management issues, including risk management during construction, consideration of risk minimisation during detailed design and on-going safety management and emergency preparedness during operation.

5.3 Wastewater and Stormwater Management

Issues

Council raised concern in its submission that although the stormwater drainage system for Tank 634 has been stated as being designed for rainfall events of up to 75 mm per hour, there appears to be no information provided on the potential failure of the stormwater storage system or the impact from rainfall events that exceed 75 mm per

hour. In addition, Council is concerned with the consequences from the possible failure of the floating roof drainage system that could include increased fire or explosion risk.

Consideration

The Department has reviewed the stormwater management assessment undertaken as part of the Environmental Assessment and understands that the roof drainage system of Tank 634 would be designed to accommodate runoff generated of up to 75 mm of rainfall per hour. Review of 75 years of climatic data for the locality indicates that the highest recorded daily rainfall has ranged between 112.3 mm and 216.2 mm over a 24 hour period and therefore the likelihood of more than 75 mm of rainfall being received for more than one hour is not a common occurrence. The mean rainfall ranges between 68.8 mm and 119.5 mm per 24 hour period with July being the driest month and March historically the wettest. Nevertheless, the Proponent has indicated that any excess flows could be stored in a retention tank at the wastewater treatment plant prior to being treated by the plant. The Department considers that the likely frequency of the site receiving rainfall events that exceed 75 mm per hour are extremely low and in the event that the site receives this rainfall it can appropriately store the additional flows.

With respect to safety issues associated with possible tank failure, the Department highlights that design requirements for crude tanks (and for that matter, other flammable liquids) are dictated by well established and commonly applied Australian Standards. As the proposed tank would be designed, constructed and operated in accordance with the design requirements of Australian Standards, the Department considers it neither necessary nor appropriate to impose additional design requirements on the proposed tank beyond those Standards.

5.4 Acid Sulfate Soils Management

Issues

The Environmental Assessment indicated that excavation for the proposed tank could be up to 1.5 metres below the current land surface. The submission from Council raises the concern that "according to the *Acid Sulfate Soil Manual (1998)* works undertaken in sites classified as Class 3 Acid Sulfate Soil require the undertaking of a Preliminary Assessment or the development of an Acid Sulfate Soil Management Plan for any works that take place one metre below the natural ground surface or works by which the watertable is likely to be lowered beyond 1 metre below the natural ground surface". Council considers that a Preliminary Assessment or the development of an Acid Sulfate Soil Management Plan is warranted for the proposal.

Consideration

The Department notes a difference of opinion between Council and the Proponent regarding the need for the preparation of an Acid Sulfate Soil Management Plan for the project. This is due to the different documents referenced with respect to the classification of the site and its potential to contain acid sulfate soils. The Department has considered the information provided in the Environmental Assessment and the concerns raised by Council and has recommended as a condition of approval that preliminary soil testing be undertaken prior to the commencement of construction activities to identify the presence or absence of acid sulfate soils. If acid sulfate soils are identified then the Department has recommended that the Proponent prepare an Acid Sulfate Soil Management Plan in accordance with the guidance provided in *Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998)*. The Department considers that this precautionary approach is appropriate to address Council's concerns, and only requiring further management measures to be developed in the event that acid sulfate soils actually exist on the site.

5.5 Traffic and Transport Impacts

Issues

Caltex has three concurrent proposals, being the construction of:

- the crude oil storage tank (the subject of this assessment);
- construction of a diesel storage tank (currently being assessed by Sutherland Shire Council), and
- construction of an odourant hut.

The submission made by Council raises the issue of construction traffic and the management of traffic during the construction of the abovementioned concurrent proposals at the refinery. Council recommends that Caltex

should be required to provide traffic impact studies to detail all refinery generated traffic anticipated for the construction period of Tank 634.

Consideration

The Department has considered the issues raised in the submissions and has reviewed the traffic impact assessment undertaken for both the proposed crude oil Tank 634 as well as the proposed construction of the diesel storage tank (currently being assessed by Sutherland Shire Council). The Department does not have any information on the potential traffic volumes associated with the construction of the odourant hut.

The Department considers that the potential traffic impacts from construction of both proposals occurring simultaneously can be managed with forethought and effective planning on the part of the Proponent.. While traffic generating activities will occur during construction of the project, these activities will not be constant during the entire construction period and therefore could be managed accordingly to reduce potential traffic conflicts. While the volumes of heavy vehicles may be high (dependent on the actual construction activity being undertaken such as earthworks and removal of excavated material) these volumes are relatively low when compared to the total traffic volumes on surrounding roads and therefore the Department concurs with the Proponent that any traffic impacts from construction would be negligible. Nevertheless, the Department has recommended that a Traffic Management Protocol be prepared as part of the Construction Management Plan for the proposal to outline the management measures to be applied to address potential traffic conflicts that may occur from the concurrent construction of a number of projects at the refinery. This Plan has been recommended to form a condition of approval for the proposal.

6. CONCLUSION

The Department has assessed the Environment Assessment and Statement of Commitments, and considered all issues raised in submissions on the proposal. Based on these considerations, the Department is satisfied that the impacts of the proposal can be mitigated and/or managed to ensure an acceptable level of environmental performance.

The construction and operation of Tank 634 would enable the Proponent to better manage the fluctuations in the delivery of crude oil to the refinery as a result of shipping delays and would result in better management of variations in production rates. These factors would all aid in maintaining the continuity of supply to customers.

APPENDIX A - CONDITIONS OF APPROVAL

APPENDIX B - STATEMENT OF COMMITMENTS

APPENDIX C - ENVIRONMENTAL ASSESSMENT