

PON LUSS Port of Newcastle Operations Pty Limited 10-Oct-2017 Doc No. 60427457-RPT-003

# Port of Newcastle Land Use Safety Study

**Overview Report** 

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Client: Port of Newcastle Operations Pty Limited

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Prepared by

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# **Quality Information**

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## 1.0 Introduction

## 1.1 Background

Port of Newcastle Operations Pty Limited (trading as Port of Newcastle) manages the port under a 98 year lease from the New South Wales Government which commenced on 30 May 2014. PON's vision is to maintain and enhance trade through development of the Port as controlled by the State Environmental Planning Policy (Three Ports) 2013 (Ports SEPP).

The Land Use Safety Study (LUSS) will be a key tool to assist in and provide an efficient system for planning assessments and approval of development projects. Furthermore, the study will promote the orderly development of industrial/port land and also the protection of community safety through an understanding of the Study Area's current cumulative risk profile.

In NSW, such studies have previously been undertaken at Port Botany and Kurnell. A similar LUSS risk assessment was undertaken for Newcastle and Kooragang Island in 1993. The study for Newcastle and Kooragang Island is over 20 years old, and significant changes have occurred in respect to land use in and surrounding the Port area, as well as changes to statutory planning controls and planning policies relating to ports and hazardous industries. As a result, it is necessary to undertake a LUSS for the Port that reflects the existing context and also provides a platform for proposed development that could potentially occur in the future.

Land Use Safety Studies focus mainly on hazards that affect people and to some extent, property and the biophysical environment. It is important that the large inventories of hazardous chemicals, which have the potential to create a major hazard (i.e. fire, explosion or toxic hazards that are most likely to affect the public), are identified and the materials that do not pose a significant potential for a major hazard are screened out. The scope of the study is defined by the boundaries set in the Ports SEPP, and includes privately owned land as well as Port tenants and users. In order to provide more detail, the area defined by the study area has further been divided into four precincts namely Carrington, Mayfield, Kooragang and Walsh Point Precincts.

## 1.2 Study Area

The Study Area is defined as the special activity sites within the Port of Newcastle SEPP Boundary as shown in Figure 1. The previous LUSS for the area was completed in 1993 [1] but almost all the significant industrial sites assessed under this study, with the exception of ATOM, Orica and Incitec, have been decommissioned. Due to the improvements in safety management systems and facility upgrades over 20 years, the assumptions and conclusions within that report are no longer valid.

The LUSS defined a new base case covering current operations and approved projects to date (June 2015) and evaluated possible future developments as a second case. The study focused on risks associated with fixed industrial sites, berthing operations and associated pipelines. Future development and their associated risks were evaluated against the provisions of the Ports SEPP and key strategies such as PON's Port Development Plan, Newcastle Council and NSW Urban Growth planning strategies, National Ports Strategy, National Land Freight Strategy, and the NSW Ports and Freight Strategy.

Dangerous goods are transported by an extensive road and rail infrastructure to and from the Port. An evaluation of the risks associated with these routes was assessed and findings or recommendations included within the study.



## 1.3 Purpose

The purpose of the Land Use Safety Study is to:

- estimate the cumulative risks from facilities within the study area to the surrounding land uses for current and for future project expansion of the Study Area activities.
- identify significant risk contributors and their causes, and assess the magnitude of their impact in relation to the relevant NSW risk criteria.
- · identify options available to minimise risk and provide a regime for ongoing risk management.

# 2.0 Operations

## 2.1 Current (Base Case)

Key operational activities considered in the study are listed below. These activities at the currently operating facilities make up the scope of the base case assessment and are presented by precinct.

#### **Carrington Precinct**

- Combustible and flammable fuels: ATOM Terminal (storage, transfer and tanker loading), Dyke 1 Berth (ship unloading and pipeline).
- Natural Gas/Methane: Jemena (pipeline).

#### **Mayfield Precinct**

- Ammonium Nitrate: Mayfield 4 Berth (ship and transit storage).
- Explosives: Mayfield 4 Berth (ship and transit storage).
- Coal Tar Distillates: Koppers Manufacturing Plant (storage and processing), BHP 6 Berth (ship unloading/loading and pipeline), Booster station (storage and transfer).
- Combustible and flammable fuels: Stolthaven (storage, transfer and tanker loading), Mayfield 4 Berth (ship unloading and pipeline).
- Grade 1 Creosote: Koppers Manufacturing Plant (storage and processing), BHP 6 Berth (ship unloading/loading and pipeline), Booster station (storage and transfer).
- Naphthalene, Molten: Koppers Manufacturing Plant (storage and processing), BHP 6 Berth (ship unloading/loading and pipeline), Booster station (storage and transfer).
- Natural Gas/Methane: Jemena and Arrium (pipeline).

#### **Kooragang Precinct**

· Natural Gas/Methane: Jemena (pipeline).

#### Walsh Point Precinct

- Anhydrous Ammonia: Orica (storage and processing), Kooragang 2 Berth (K2) (ship and pipeline).
- Ammonium Nitrate: Orica and Kooragang 2 or 3 Berth (K2, K3) (ship and transit storage).
- Ammonium Nitrate Solution: Orica (storage, processing and tanker loading).

- Chlorine: Orica (storage).
- Combustible fuels: Park Fuels (storage, transfer and tanker loading), Kooragang 2 or 3 Berth (K2, K3) (ship unloading and pipeline).
- Hexane: Cargill Seed Crushing Site (storage and processing).
- · Inert and oxidising gases: BOC (storage).
- · LPG: Origin (storage, cylinder filling and tanker unloading/loading).
- · Natural Gas/Methane: Jemena (pipeline).
- Nitrogen Oxides: Orica (processing).

The dangerous goods rail and road routes within and bordering the study area were evaluated as part of the LUSS.

## 2.2 Proposed (Future Case)

The following future developments have been flagged as having the potential to change the cumulative risk of the study area beyond 2015 i.e. the "Future Case". These developments (in addition the base case activities) make up the scope of the future case and are listed below:

- Bulk Liquid Storage and Pipelines: Secondary Terminal Operator Development, Stolthaven Stage 3 Development, Adjacent Small Terminals and Mayfield 7 Berth.
- Ammonium Nitrate Production: Incitec Pivot.
- Methane: Jemena and Queensland Hunter Gas Pipeline.

The site locations identified as having potential significant offsite impacts ("LUSS activities"), potentially contributing to the overall risk profile of the Study Area, were quantitatively risk assessed as part of this study. This was largely due to the nature of the hazardous chemicals, their location and the quantity present on site.

# 3.0 Risk Assessment Methodology

The overall approach and methodology for the Newcastle Port LUSS can been divided into four (4) stages:

- Stage 1 Information gathering
- · Stage 2 Preliminary risk screening to confirm the focus of the study
- Stage 3 Site inspections and Quantitative Risk Assessment (QRA)
- Stage 4 Reporting of findings and recommendations

## 3.1 Stage 1 – Information gathering

A review of key background documentation took place to develop an understanding of the legislation, policies, guidelines, plans and studies associated with land use safety planning at the Port. A complete list was compiled of all the sites, existing and future, within the study area. Using site information, gathering questionnaires and various other sources of information (such as previous Preliminary Hazard Analyses (PHAs), Quantitative Risk Assessments (QRAs), Environmental Protection Plans etc.), a comprehensive list of all major inventories of hazardous materials was recorded. Each

hazardous material was assessed and the associated hazard identified for input into the multi-level assessment applied to the LUSS.

The information gathering also focused on the surrounding land use and identified sensitive receptors such as schools and hospitals within the areas that border the Port. The City of Newcastle has a documented urban development and renewal strategy that was used to highlight any changes in land use and sensitive receptors into the future.

## 3.2 Stage 2 – Preliminary risk screening

A total of seventy two (72) sites with a number of activities involving hazardous materials were investigated during the screening study. In order to facilitate the Preliminary Risk Screening, the NSW Planning and Infrastructure multi-level risk assessment approach [2] was followed. (Note: The LUSS made use of Steps 1 and 2 of the multi-level risk assessment as a screening tool to identify potentially significant hazardous activities to be carried into Stage 3). The multi-level risk assessment utilises relatively simple techniques (qualitative and semi-quantitative) to initially assess the hazards as part of a 'screening' process. Once this was done, the risks were classified and prioritised. The activities of highest risk or uncertainty were identified as the "LUSS activities" to be subjected to more detailed risk assessment and quantitative analysis in Stage 3 of the LUSS.

Activities included existing and approved development sites, pipelines, transport routes and proposed future developments.

## 3.3 Stage 3 – Site inspections and quantitative risk assessment

Each of the activities identified underwent a site inspection and questionnaire assessment to gather further information.

A Quantitative Risk Assessment (QRA) was completed by Core Engineering in the form of a technical report [3]. Core Engineering utilised the DAESIM Risk Assessor tool published by DAESIM Technologies Pty Ltd to conduct the QRA.

QRA, as a risk assessment technique, is a method of estimating risk associated with a system or process. As a quantitative methodology, QRA provides the ability to generate detailed assessments and incorporate the effects of multiple potential variables. However, given the complexity of real systems, the assessment necessarily involves some level of simplification. The assessment made use of assumptions to simplify complex parameters and provide conservative estimates of unknown data. While the assumptions and methodology employed for the QRA have been specified to provide a conservative assessment, it should be noted that the results of the QRA study represent an estimate of the risk associated with the Study Area, taking into consideration the assumptions and parameters used.

## 3.4 Stage 4 - Reporting

The process and findings of the risk assessment process were reported and a Summary Overview report was prepared.

# 4.0 Study findings

## 4.1 Discussion

The following criteria are suggested in Hazardous Industry Planning Advisory Paper (HIPAP) No.4, Risk Criteria for Land Use Safety Planning [4]:

- Hospitals, schools, child-care facilities and old age housing development should not be exposed to individual fatality risk levels in excess of half in one million per year (0.5 pmpa).
- Residential developments and places of continuous occupancy, such as hotels and tourist resorts, should not be exposed to individual fatality risk levels in excess of one in a million per year (1 pmpa). This study has also included the cruise terminal under this criterion for a factor of safety.
- Commercial developments, including offices, retail centres, warehouses with showrooms, restaurants and entertainment centres, should not be exposed to individual fatality risk levels in excess of five in a million per year (5 pmpa).
- Sporting complexes and active open space areas should not be exposed to individual fatality risk levels in excess of ten in a million per year (10 pmpa). This study has included the local cycling clubs under this criterion.
- Individual fatality risk levels for industrial sites at levels of 50 in a million per year (50 pmpa) should, as a target, be contained within the boundaries of the site where applicable.
- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the effects (consequences) of the more likely accidental emissions may threaten the longterm viability of the ecosystem or any species within it.
- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the likelihood (probability) of impacts that may threaten the long-term viability of the ecosystem or any species within it is not substantially lower than the background level of threat to the ecosystem.

These criteria are fundamental tenets of the land use assessment. The following Study outcomes have been achieved in the assessment:

- A list of hazardous materials and quantities stored, handled and/or used in the area and their type of containment.
- A list of the significant industrial sites and major pipelines in the study area.
- Summary of hazardous scenarios and consequences from the identified industrial sites and pipelines.
- Cumulative individual fatality and injury risk contours for facilities, pipelines and transport within the study area including an estimate of the current area societal risk and future estimated risk.
- Review of risks to the biophysical environment in the study area.
- Description of emergency response arrangements at the identified facilities and the overall area.
- Criteria and guidelines to meet the requirements of the NSW Department of Planning and Environment, for use in the assessment of Bulk Liquid Storage Facilities under Schedule 2 of the Ports SEPP.

- Recommendations to support compliance with the conditions and requirements of the Mayfield Concept Plan Approval regarding hazards, risk and emergency response and other risk reduction recommendations if applicable.
- · Constraints and opportunities for future developments.

### 4.2 Findings from the assessment:

The overall individual fatality risks for the base case operations in the study area are presented in Figure 2 for the base case (2015).

The overall individual fatality risks for the future case operations in the study area are presented in Figure 3 for the future case (10 to 15 years beyond 2015).





## 4.3 Key Conclusions

- Following criteria as defined in HIPAP 4, no industries are identified as inappropriately sited within the study area.
- None of the likely scenarios identified in the assessment threaten the long term viability of the ecosystem or any species within it.
- Individual fatality risks associated with the base case operations are at a level of less than 50 pmpa (pink criterion on Figure 2) and this criterion is contained within the boundaries of the Study Area.
- Individual fatality risks associated with the future case operations are at a level of less than 50 pmpa (pink criterion on Figure 3) and this criterion is contained within the boundaries of the Study Area.
- Evaluation of the risk criteria is that domino effects or neighbouring property damage is possible associated with explosive and ammonium nitrate activities at Mayfield 4 Berth.
- The cumulative societal risk for the current and future estimate of risk is considered tolerable hence, additional mitigation measures to reduce risk are deemed appropriate if reasonably practicable.

## 4.4 Key Recommendations

The study area has significant potential for future development.

 Due to the tolerable societal risks (associated with the Port of Newcastle Study Area, a specific criterion within the State Environmental Planning Policy (Three Ports) 2013 (Ports SEPP) is deemed appropriate for the Study Area. The following criterion is proposed with Schedule 2 Ports SEPP

"In the case of development in Port of Newcastle, demonstrates that proposed development will not cause any increase in the individual risk levels shown in the *future case* of the *Port of Newcastle Land Use Safety Study Overview Report* or will not increase the societal risk to exceed the *future* case ALARP band identified in the report".

- Planning development strategies should ensure that sensitive receptors, residential, recreational or commercial developments within the study area are located such that they would not impede expansion of the current facilities or be located such that they could restrict other developments in the future.
- Planning development strategies in the vicinity of the study area should consider the individual and societal risk implications of sensitive receptors and increased intensification of people in the vicinity of the dangerous goods transport routes.
- · Future development within the Carrington Precinct should consider the following;
  - The precinct is the least suited to development for hazardous industries that poses land use restrictions due to the close proximity of residential areas.
  - The risk associated with potential dust explosions from neighbouring facilities (NAT and GrainCorp) should be considered in proposed developments.
  - Dangerous Goods packaged containers should continue to be kept to negligible quantities within this Precinct. Facilities are not currently considered to be potentially hazardous as per SEPP 33 Guideline [8] in relation to movement of packaged containers. A significant increase in the movement dangerous goods packaging containers may result in a facility

- Hazardous industry development in proximity to residential and sensitive land users (including the Cruise Terminal) should be evaluated to consider the individual and societal risk implications.
- Future development within the Mayfield Precinct should consider the following;
  - The Intertrade Industrial Buffer Zone should be zoned to permit light to medium industry, so a buffer between heavy industry and residential areas is maintained.
  - The Intertrade site is an example of where intensification of land-use may occur within the Mayfield Precinct. Where development within the Mayfield Precinct will result in a population density of greater than 0.5 people/km<sup>2</sup>, then the risk associated with the intensification should be assessed. The development should account for risks also associated with hazardous industries and internal transport routes within the Mayfield Precinct.
  - Ensure hazardous industry development in the vicinity of the fuel terminals and Mayfield 7 Berth are not large congested facilities that may result in the creation confined spaces within 185 m of these locations. Allowance has been made for partially congested open plant and storage areas. An increase in the congestion (concentration of equipment and piping) e.g. through the development of a chemical processing plant would need to reassess the impact in relation to confined spaces.
  - Ensure hazardous industry development in the vicinity of the explosive and ammonium nitrate activities at Mayfield 4 Berth will not result in potential catastrophic accident propagation ('domino effect') from an explosion overpressure of 14 kPa at a frequency of more than 50 pmpa.
  - Risk reduction measures in relation to the use of Mayfield 4 Berth for explosive and ammonium nitrate activities should be a continued focus for the precinct.
- Future development within the Kooragang Precinct should consider the following;
  - Care should be taken not to develop land use that may have serious biophysical risks due to the proximity of the Precinct to the Hunter Wetlands National Park. Such hazardous industry development could involve an industry that handles or stores environmentally hazardous chemicals (e.g. Class 9 Dangerous Goods) that when released would result in an alternation or disturbance of a component of an ecosystem taking a number of years to recover.
- · Future development within the Walsh Point Precinct should consider the following;
  - There are a number of undeveloped lots especially on the eastern side of the precinct which could be developed. Major hazardous facility development of these lots should consider any cumulative increase to the overall risk profile of the precinct that may impact on established land use within and neighbouring the precinct.
  - Intensification of people through development such as major recreation facilities or increased duration and size of sporting events within this precinct should be carefully evaluated that it does not impede expansion of the current facilities or be located such that they could restrict other hazardous industry developments in the future.

# 5.0 References

- [1] Sydney Department of Planning, Newcastle and Kooragang Island Area Risk Assessment Study, 1993.
- [2] NSW Planning and Infrastructure, Assessment Guideline Multi-level Risk Assessment, 2011.
- [3] Core Engineering, Quantitative Risk Analysis, Land Use Safety Study Technical Note, Port of Newcastle, 2017.
- [4] NSW Government Planning, Hazardous Industrial Planning Advisory Paper No 4 Risk Criteria for Land Use Safety Planning, 2011.
- [5] NSW Government Planning, "Hazardous and Offensive Development Application Guidelines -Applying State Environmental Planning Policy No. 33 - (SEPP 33)," 2011.