

30 June 2010

Rev 1

To	Bob Gregorovich	
From	Bronwyn Brookman Smith	Project No. P10016
Subject	Proposed Expansion of the Ammonium Nitrate Facility – CSBP Limited Kwinana	

1. Introduction

CSBP Limited (CSBP) proposes to expand the production capacity of its Ammonium Nitrate (AN) Production Facility at Kwinana from 520,000 tonnes per annum to approximately 936,000 tonnes per annum. This technical note discusses the offsite risk implications of this proposed expansion.

2. Objectives and Scope

The objective of this document is to discuss the offsite impacts of the proposed AN facility expansion. This review utilises the quantitative risk assessments completed by Qest Consulting (2005) [Ref 1], GHD (2007) [Ref 2], the Cumulative Risk Assessment for the Kwinana Industrial Area (GHD 2009) [Ref 3] and recent additional modelling conducted by GHD as an adjunct to the 2007 report¹.

Process Consult has based this review on the information contained in these documents and has not conducted any specific modelling or analysis to assess the assumptions or data utilised or the accuracy of the results developed in these report. But rather has interpreted the Land Use Safety Planning (LUSP) implications of these results in regard to the proposed AN facility expansion. Therefore no technical review has been undertaken of the modelling.

3. Background

The CSBP is a Major Hazard Facility under the *Dangerous Goods Storage (Major Hazard Facilities) Regulations 2007*. CSBP currently has a number of Safety Reports for the different operational areas at Kwinana. This includes the existing AN facilities. The AN Safety Report is currently being revised by CSBP for resubmission.

A number of risk assessments, including the recent Kwinana Cumulative Risk Assessment, have been completed for the CSBP complex. CSBP's Kwinana operations do not currently fully meet the EPA's risk criteria at the BP boundary fence [Ref 2]. The exceedance is historical and mainly driven by the close proximity of the existing ammonia storage tanks to the site boundary.

4. Individual Fatality Risk Criteria for Western Australia

In May, 1987 the Environmental Protection Authority (EPA) published Bulletin 278 "Risks and hazards of industrial developments on residential areas in Western Australia" [Ref 4] which details the requirements for the evaluation of risks and hazards from industrial developments. This was supplemented by Bulletin 611 (February 1992) [Ref 5] and Bulletin 627 (May 1992) [Ref 6] which set out the EPA's criteria for the assessment of the fatality risk acceptability of new industrial installations. These were more recently updated in the 2000 Guidance for Risk Assessment and Management: Offsite individual risk from Hazardous Industrial Plant [Ref 7].

¹ GHD have rerun the existing 2007 SAFETI model including the proposed expansion.

For the Kwinana Industrial Complex, where several hazardous industries or activities exist in a region, it was recognised that cumulative risk analysis for existing and proposed developments in the region should be undertaken. The contemporary cumulative risk results are contained in the Kwinana Cumulative Risk and Land Use Plan, completed by GHD in 2009. The cumulative individual fatality risk results are contained in Figure 1. The current risks from the Kwinana Industrial Area have some encroachment onto residential areas in the vicinity of pipelines and transportation routes, in Medina and along Thomas Road. Transportation risks are transient in nature. In the Kwinana Cumulative Risk Assessment these were calculated conservatively.

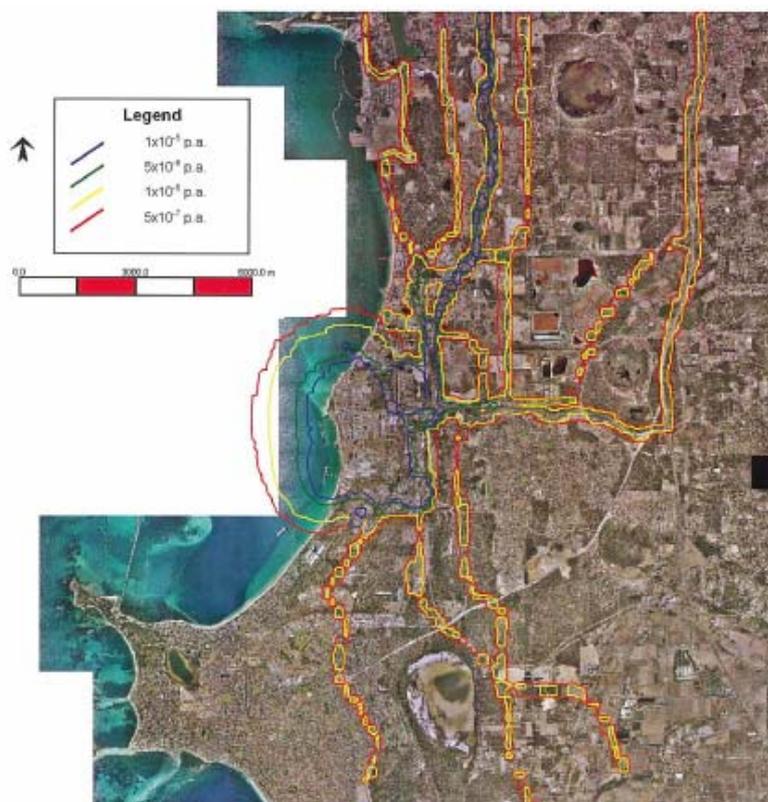


Figure 1: Kwinana Cumulative Risk Assessment (2009)

The activities from the CSBP facility do not encroach onto any surrounding residential or sensitive use areas.

For LUSP purposes individual risk results are compared against the criteria established in the EPA Guidance Note [Ref 7]. The following points describe the limitations of each criterion.

Land Use	Criteria
Plant Boundary & Maximum Risk	Risk levels from industrial facilities should not exceed a target of fifty-in-a-million per year (5×10^{-5}) at the site boundary for each individual industry, and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year (1×10^{-4}).
Active Space	Open A risk level for any non-industrial activity or active open spaces located in buffer areas between industrial facilities and residential areas of ten-in-a-million per year (1×10^{-5}) or less, is so small as to be acceptable to the EPA
Commercial	A risk level for commercial developments, including offices, retail centres, showrooms, restaurants and entertainment centres, located in buffer areas between industrial facilities and residential areas, of five-in-a-million per year (5×10^{-6}) or less, is so small as to be acceptable to the EPA

Land Use	Criteria
Residential	A risk level in residential areas of one-in-a-million per year (1×10^{-6}) or less, is so small as to be acceptable to the EPA
Sensitive	A risk level in "sensitive developments", such as hospitals, schools, child care facilities and aged care housing developments, of one-half-in-a-million per year (5×10^{-7}) or less is so small as to be acceptable to the EPA

5. Societal Risk criteria for Western Australia

There are two components to societal risk:

- The number of people exposed to levels of risk is important.
- Society is more averse to incidents which involve multiple fatalities or injuries than to the same number of deaths or injuries occurring through a large number of smaller incidents.

There are no government published societal risk criteria for Western Australia. Planning studies tend to rely on the Interim Societal Risk Criteria developed by DNV (then Technica) following the 1987 Kwinana Cumulative Risk Assessment [Ref 8]. This was revised and released in the AEA Cumulative Risk Assessment for Kwinana completed in 1995 [Ref 9]

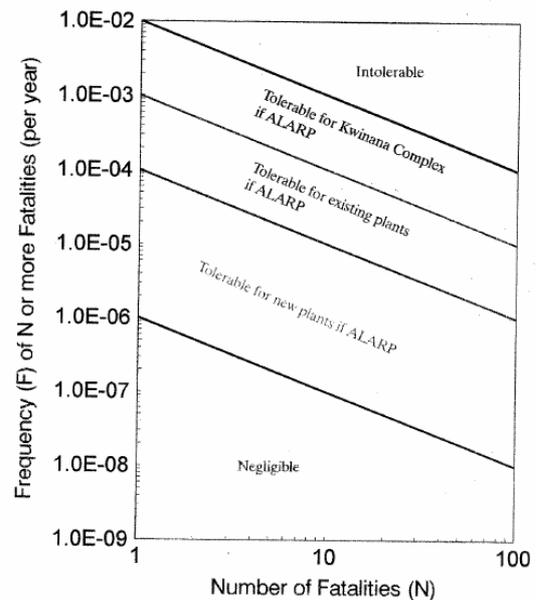


Figure 2: Societal Risk Criteria [Ref 8]

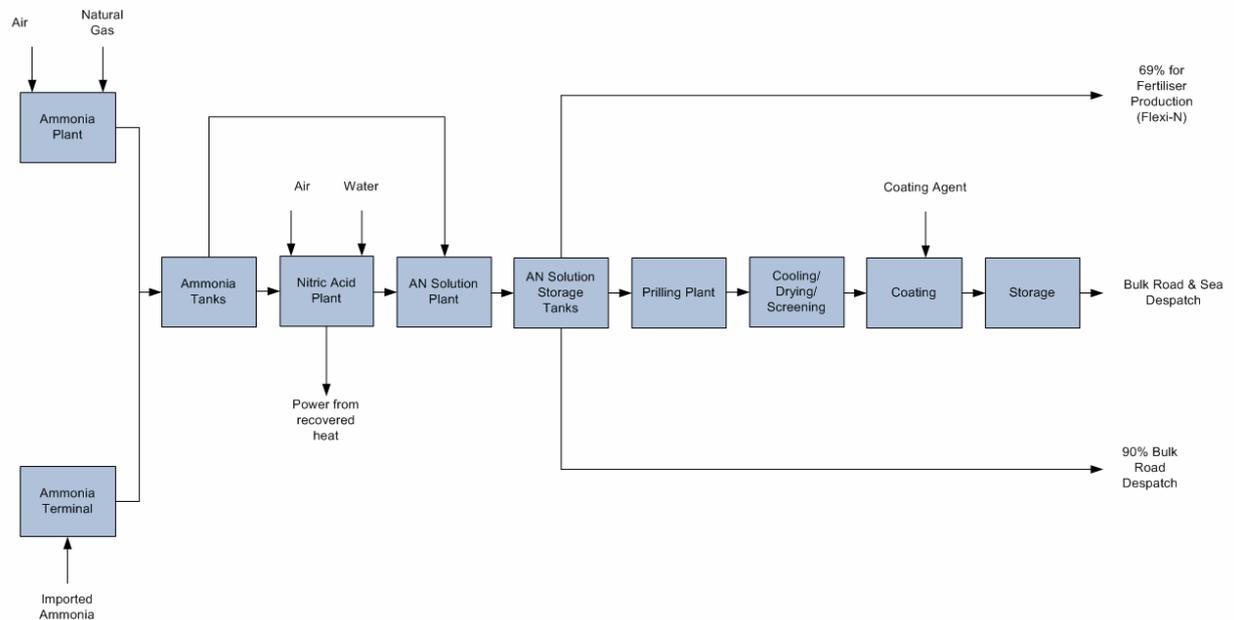
6. Ammonium Nitrate Production and Storage

An overview of the AN production process is set out in Figure 3. The ammonia plant was commissioned in early 2000 and is capable of producing 730 tonnes of ammonia per day. The principal raw materials for ammonia production are natural gas, steam and air. Ammonia can also be imported over the Kwinana Bulk Jetty.

The ammonia refrigerated storage tanks are located at the northwest end of the CSBP site, next to the shared boundary with BP. Currently there are two anhydrous ammonia storage tanks within CSBP, each with a maximum storage capacity of 10,000 tonnes (tank 1) and 30,000 tonnes (tank 2). Ammonia is stored as a liquid at -33°C , near its boiling point, at atmospheric pressure. The tanks are single walled within bunds. Each tank has a dedicated refrigeration system to maintain liquefied ammonia.

The original AN and Nitric Acid Plant (Plant #1) is located near the centre of the CSBP site, south west of the ammonia plant. The second Nitric Acid, AN and new prill plant (constructed in 2007) (Plant #2) are located next to the current ammonia plant.

Figure 3: Ammonium Nitrate Process



The Nitric Acid Plant uses ammonia and air as raw materials to produce nitric acid. The AN Plant uses nitric acid solution (62% w/w) and gaseous ammonia to produce AN solution. Molten AN is then cooled to form a solid pellet referred to as prill at the AN Prill Plant. CSBP developed a modern, world-class AN storage facility, at the Northeast corner of the CSBP Complex. The AN Storage building stores up to 15,000 tonnes of AN but has approval for up to 27,000 tonnes.

7. Proposed Expansion

CSBP propose to increase their AN production capacity by adding a third Nitric Acid/AN Plant (Plant #3), debottlenecking the existing Prill Plant and future debottlenecking activities for the 3 NA/AN plants, Figure 4. The proposed location is shown in Figure 5. The proposed expansion includes (Figure 5):

- Construction of an additional Nitric Acid/AN Plant. This will be a duplicate of 2008 AN plant design.
- Realignment and debottlenecking of the existing Prill Plant.
- Additional 305 m³ Ammonium Nitrate solution storage tank.
- Increased ammonia imports from the current 9 shipments per annum, up to 14 shipments per annum, with a possible further increase to 25 shipments per annum²

The proposed expansion requires no changes to the Department of Mines and Petroleum (DMP) approved utilisation of the 730m³ (equivalent to 900 tonnes) and 250m³ (equivalent to 310 tonnes) AN Solution Storage tanks. Nor is there any proposed increase of the approved 27,000 tonne AN storage facilities. Bagged prill will continue to be exported from the Kwinana Bulk Jetty North, 24 times a year in 4000 -7000 tonne shipments, in addition to the 12 shipments a year currently allocated to Dyno Nobel.

² The increase in ammonia imports to 25 per annum is to ensure continuation of ammonia supply during ammonia plant outages.

Figure 4: Proposed Expansion

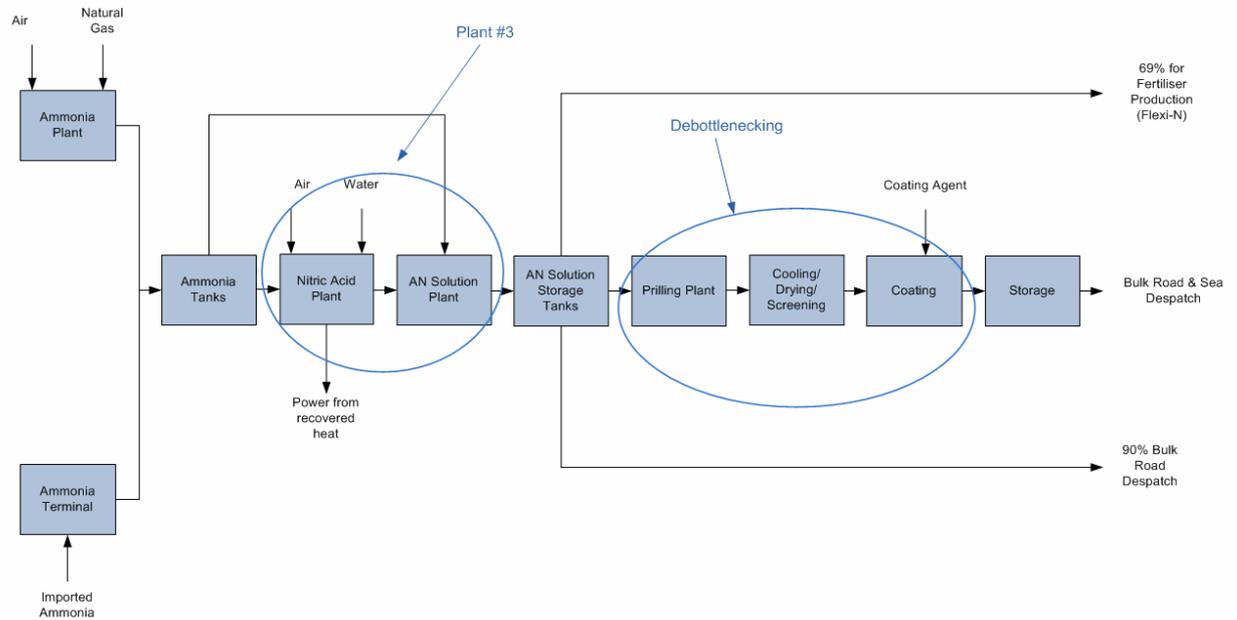


Figure 5: Proposed Location of AN facility



8. Risk Assessment

A number of Quantitative Risk Assessments (QRAs) have been completed for the CSBP facility, and the AN complex in particular. The existing base case of the CSBP facility, from the 2007 Total Site QRA [Ref 2], is provided in Figure 6. This is based on a maximum of 9 imports of ammonia per year.

This shows for the existing approved CSBP operations (including the existing AN facility) that the EPA criteria boundary risk criteria³ is exceeded in the north east corner of the CSBP site (adjacent to the AN facilities) on the boundary shared with BP. This is due to the location of the existing ammonia tanks and is a known historical exceedance.

Figure 6: Existing Base Case



Figure 7 provides the revised site individual fatality risk results (GHD) with the inclusion of the proposed AN #3 facilities, while increasing ammonia imports to 14 per annum.

Figure 8 provides the revised site individual fatality risk results (GHD) with the inclusion of the proposed #3 AN facility, while increasing ammonia imports to 25 shipments per annum. Note: the modelling of 25 ammonia imports per annum assumes that the ammonia plant is not operational, and therefore provides no contribution to the overall site risk.

³ – where risk levels from industrial facilities should not exceed a target of fifty-in-a-million per year (5×10^{-5}) at the site boundary for each individual industry

Figure 7: Existing Base Case including Plant #3 with 14 Ammonia Imports per annum

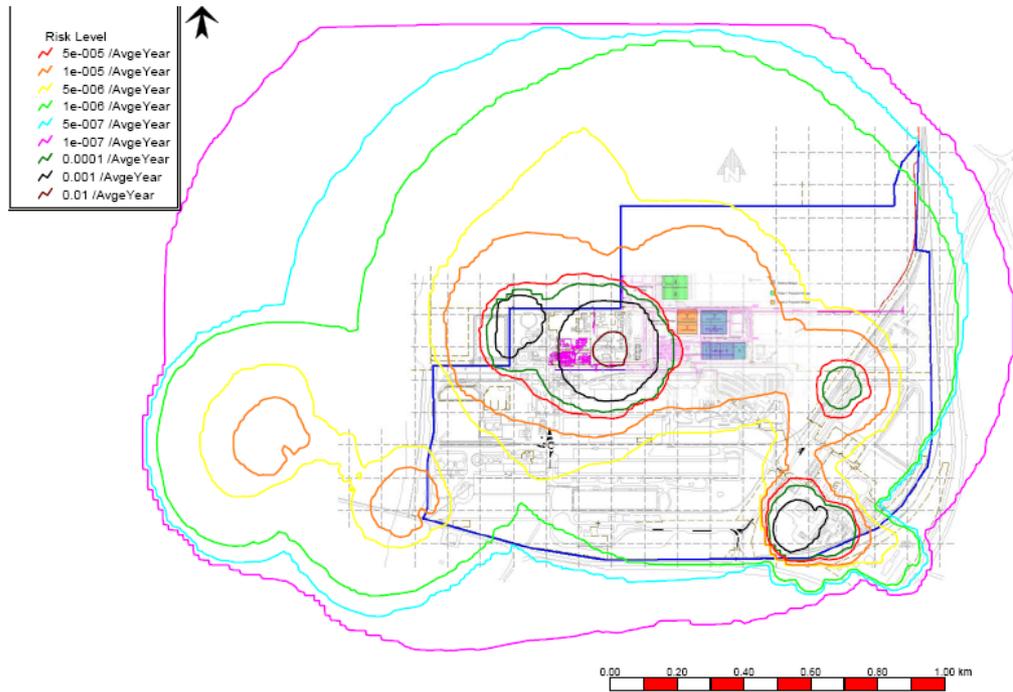
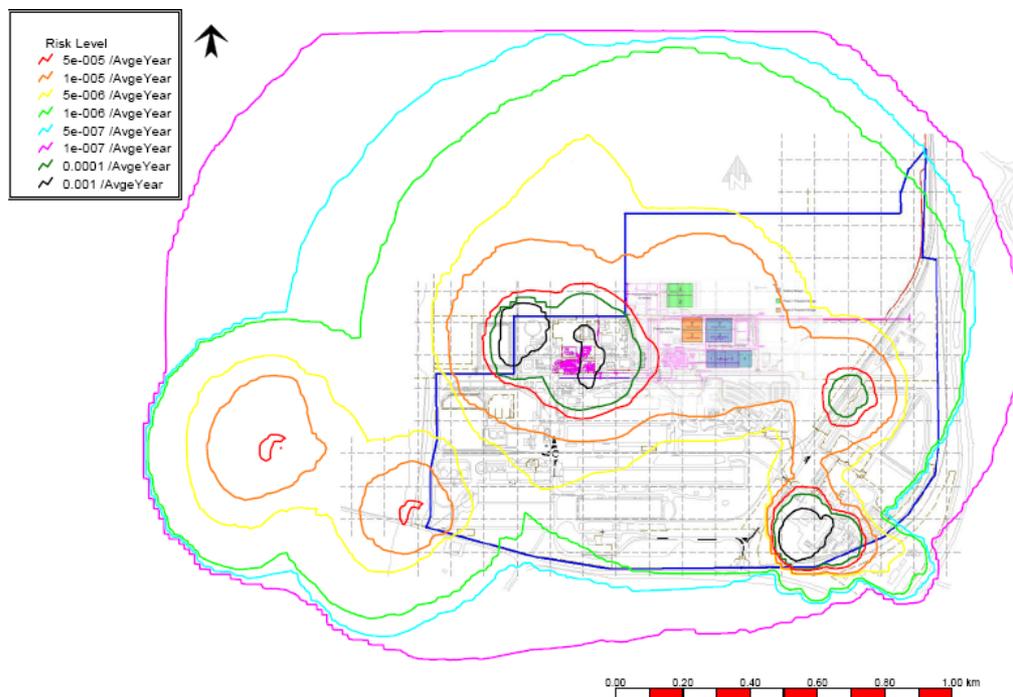


Figure 8: Existing Base Case including Plant #3 with 25 Ammonia Imports per annum



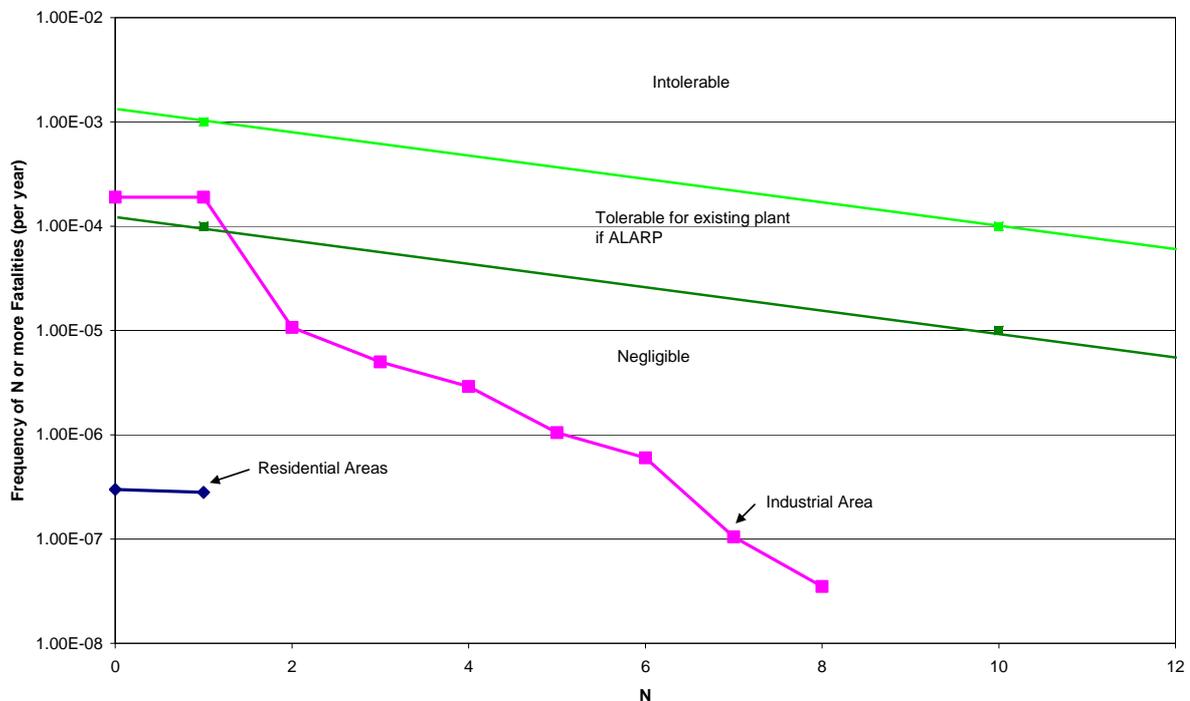
Based on the risk contours as shown in figures 6, 7 and 8, the proposed #3 AN facility will slightly increase the 5×10^{-5} pa contour onto BP land from approximately 75 metres to 85 metres. This area is utilised for soil remediation by BP and therefore is not normally populated. BP and CSBP currently

manage this encroachment between the sites, this action will continue with the proposed development of the #3 AN facilities.

No increase in risk onto public land has been measured as a result of the proposal. Wells Park is approximately 830 metres from KBJ Berth 3, with the 1×10^{-7} pa contour extending approximately 250 meters from KBJ, Berth 3.

Societal risk results are taken from the Kwinana Cumulative Risk and Land Use Plan [Ref 3]. These are shown in Figure 9. Two curves are shown, one for the potential impact on the surrounding residential population. This is placed well within the 'negligible' section of the societal risk curve. The second curve is for CSBP's potential impact on the populations of surrounding industrial developments. This includes BP and Coogee Chemicals. For less than 1 fatality the curve resides in the 'Tolerable for existing plant if ALARP' region.

Figure 9: Societal Risk Results for CSBP (from Kwinana Cumulative Risk Assessment)



9. Conclusion

The proposed development of a third Nitric Acid and AN plant, and subsequent debottlenecking activities together with increased ammonia imports have been assessed against the EPA individual fatality risk and proposed 1995 societal risk criteria. For the individual fatality risk criteria the whole site contours were produced. The following table provides an overview of the results.

Land Use	Criteria
Plant Boundary & Maximum Risk	Existing facility exceeds the plant boundary criteria in the vicinity of the BP facility. Proposed expansion does not result in a reduction of risk in this area.
Active Permanently Open Space	Modelling indicates the Proposed expansion does not exceed these criteria. Wells Park is located over 1km from the proposed development, and 850 metres from the KBJ Berth 3.
Commercial	Modelling indicates the Proposed expansion does not exceed these criteria. The nearest commercial operation would be the fast food convenience facility located on Rockingham Road (corner Beach Road) which is over 1km away from the proposed development. The commercial development contour extends some 50m outside the CSBP site boundary in the south easterly direction.
Residential	Modelling indicates the Proposed expansion does not exceed these criteria. There is no change in the 1×10^{-6} contour from the proposed development it continues to extend outside the site boundary by 50m on the western boundary. The nearest residential area is in Medina which is over 3km from the proposed development.
Sensitive	Modelling indicates the Proposed expansion does not exceed these criteria

Societal risk results indicate that the proposed development, when considered with the existing plants' societal risk results is negligible on the surrounding residential population and tolerable for the neighbouring industrial facilities if ALARP. The ALARP assessment is included in the CSBP AN plant Safety Report currently being revised for DMP.

Based on the above it would therefore appear that the development of the third Nitric Acid and AN plant, increased ammonia imports and associated debottlenecking activities should not significantly affect the LUSP aspects associated with the CSBP Kwinana operations and should therefore not be prevented on LUSP grounds.

10. References

- Ref 1 Qest Consulting, PRA of Proposed Ammonium Nitrate Production Expansion Project at CSBP Kwinana Industrial Complex, February 2005
- Ref 2 GHD Pty Ltd, Report for CSBP Kwinana Industrial Complex, Total Site Quantitative Risk Assessment, May 2007
- Ref 3 Kwinana Cumulative Risk Study (2008) – Non Technical Summary, Released on behalf of the Department of Industry and Resources, May 2008
- Ref 4 Environmental Protection Authority, Bulletin 278 Risks and hazards of industrial developments on residential areas in Western Australia, May 1987
- Ref 5 Environmental Protection Authority, Bulletin 611 Criteria for the Assessment of Risk from

Industry, February 1992

- Ref 6 Environmental Protection Authority, Bulletin 627 Criteria for the assessment of risk from industry — expanded discussion, May 1992
- Ref 7 Environmental Protection Authority Guidance Note No.2 Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant, July 2000
- Ref 8 Technica, Public Risk Criteria for the Kwinana Industrial Area, 1990
- Ref 9 AEA Technology, Kwinana Cumulative Risk Study, June 1995

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