Development Approval – Site Risk Assessment

Northshore Group – 66 Cullen Avenue W, Eagle Farm

Within
Brisbane City Council

For
Northshore Group

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

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STATEMENT OF LIMITATION

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1 Introduction

icubed consulting have been commissioned by Northshore Group Australia to prepare a Site Risk Assessment report for a proposed large equipment Auction Storage Yard, and Auction Facility including ancillary office, to be constructed at 66 Cullen Avenue West, Eagle Farm, QLD. The purpose of the report is to assess and demonstrate that the risk posed by existing neighbouring industries will not adversely affect the proposed development, and that any risk or operations from the proposed facility will not adversely impact on existing industrial operations in accordance with the general principles from the Queensland State Planning Policy—*State Interest Guideline - Emissions and Hazardous Activities 2016.*

Existing operations in the area that could potentially impact on the proposed development include asphalt and concrete batching plants as well as the Puma fuel storage and distribution site.

The approach taken by this report will be to identify the potential adverse impacts (hazards) from existing operations and to assess the likely frequency and consequences of these hazards to determine the overall level of risk. The hazards identified will be broadly classed into environmental, safety and operational/financial risks.

The risk assessment approach taken will be semi-quantitative in that where frequencies and consequences for hazards to be realised are available then quantitative estimates will be made. It is noted that obtaining estimates of risks that will externally impinge on a site can be difficult.

2 Site Description

The proposed development is at 66 Cullen Avenue (W) in Eagle Farm. The area is generally light industrial with some higher impact industries such as fuel storage and bitumen plants in the near vicinity.

Figure 1 (below) shows the general neighbourhood of the site and some of the industries identified as potentially impacting the proposed development site. The Puma fuels and distribution facility to the North of the site is the closest proximity hazardous industry to the site.

2.1 Proposed Development

The proposed development is shown in Figures 2 and 3 and consists of a large equipment storage yard, auction showroom and two small administration offices.

The level of permanent human occupation on the site is forecast to be low, with auction customers being present on the site only during specified auction periods. Experience with similar facilities suggests occupation levels of around 100 people who will be located inside the auction rooms for a period of two to three hours, one to two times per week.

Figure 1: Proposed Development Site (north to top of page)

Figure 2: Proposed Site Development Plan

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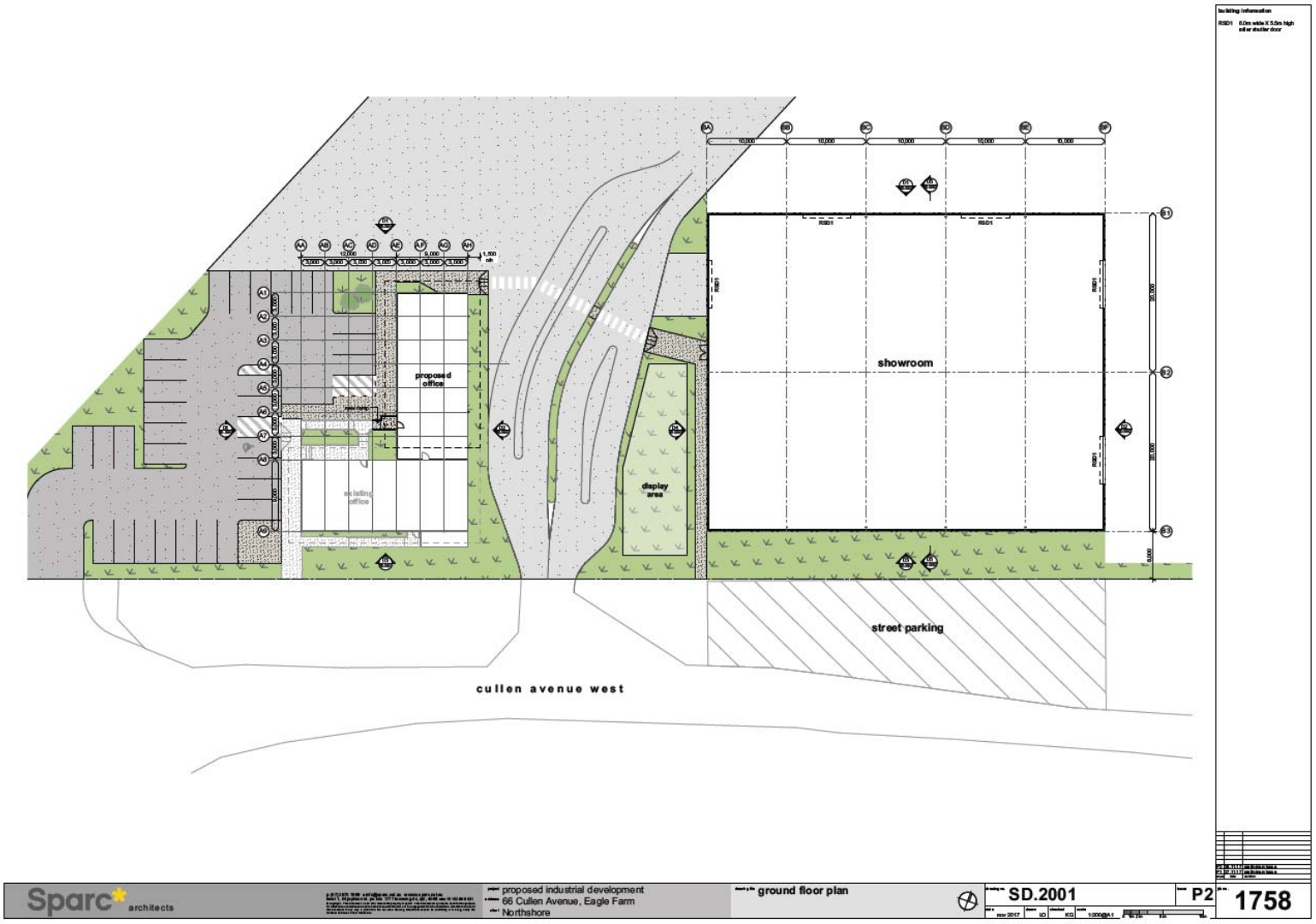

Figure 3: Showroom and Office Development

3 Risk Assessment Methodology and Assessment Criteria

The approach taken in this risk assessment has been to review the nature and type of the existing operations and conduct an historical review of the hazards and environmental impacts from the existing industries in the immediate vicinity of the site. From this review a series of credible incident scenarios that could potentially impact on the site was developed.

The consequences from these scenarios on the proposed development site have then been estimated. Depending on their nature,the credible scenarios are categorised as either environmental/miscellaneous/financial or health and safety related. The frequency of these events has been estimated and an overall assessment of risk has been made using one of the two risk assessment matrices below (Table 1 & Table 2) (depending on the type of consequences).

These risk assessment matrices are based on those used to evaluate risk at high risk facilities – such as a major hazard facility – and incorporate a greater range of high consequence, low frequency events than is typically found in risk assessment matrices. These additional spaces are included as the most likely impacts from an external source or property will or could occur from high consequence events.

Note that this assessment does not consider any hazards that may or could exist on the proposed development.

Table 1: Health & Safety Risk Assessment Matrix

Likelihood	Near Miss	Minor Injury	First Aid Injury	Medical Treatment Injury	Lost Time Injury	Serious/ Permanent Injury	Fatality/ Multiple Fatalities
Highly Improbable (once Every 100,000 years)	0.0000001	0.000001	0.00001	0.0001	0.001	0.01	0.1
Very Improbable (once every 10,000 years)	0.00001	0.0001	0.001	0.01	0.1	1	10
Very Rare (once every 1,000 years)	0.0001	0.001	0.01	0.1	1	10	100
Rare (once every 100 years	0.001	0.01	0.1	1	10	100	1000
Unlikely (every 10 years)	0.01	0.1	1	10	100	1000	10000
Likely (once a year)	0.1	1	10	100	1000	10000	100000
Frequent (every month)	1	10	100	1000	10000	100000	1000000
	Consequences						

Table 2: Environmental/Financial Risk Assessment Matrix

Likelihood	Internal Repair/ Management only	Minor Property Damage/$1	Property Damage $10	Significant Cost/Clean Up/Damage ~$100	Major Damage ~ $1,000	Business Critical ~$10,000	Major Community Damage $100,000+
Highly Improbable (once Every 100,000) years	0.000001	0.00001	0.0001	0.001	0.01	0.1	1
Very Improbable (once every 10,000 years)	0.00001	0.0001	0.001	0.01	0.1	1	10
Very Rare (once every 1,000 years)	0.0001	0.001	0.01	0.1	1	10	100
Rare (once every 100 years)	0.001	0.01	0.1	1	10	100	1000
Unlikely (every 10 years)	0.01	0.1	1	10	100	1000	10000
Likely (once a year)	0.1	1	10	100	1000	10000	100000
Frequent (every month)	1	10	100	1000	10000	100000	1000000

Consequences x $1,000

Risks are rated as acceptable in the green area, requiring attention or further action in the orange section and unacceptable in the red zone

3.1 Assessment Criteria

The Hazardous Industries and Chemical Branch cite the NSW Government HIPAP 4: Risk Criteria for Land Use Safety Planning (Consultation Draft) July 2008 as a reference source for determining acceptable levels of risk for facilities such as Large Dangerous Goods locations and Major Hazard Facilities (MHFs).

In this instance we are considering the impacts of neighbouring Large Dangerous Goods Locations (LDGLs) and possibly MHFs on the proposed site at 66 Cullen Ave.

The proposed site is in an industrial area; from HIPAP 4: Risk Criteria for Land Use Safety Planning (Consultation Draft) July 2008 acceptable risk levels from neighbouring facilities for proposed development are defined as:

Individual Fatality Risk Criteria from HIPAP 4 are detailed in Table 3 below;

Table 3: HIPAP 4 Individual Risk Criteria

Land Use	Suggested Criteria (risk in a million per year)
Commercial developments including retail centres, offices and entertainment centres	5
Sporting complexes and active open space	10
Industrial	50

Injury Risk Criteria for residential and sensitive use areas from HIPAP 4 are detailed in Table 4 below;

Table 4: Injury Risk Criteria for residential and sensitive areas

Land Use - Residential and sensitive uses	Suggested Criteria (risk in a million per year)
Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m	50
Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa	50
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
Toxic concentrations in residential and sensitive use 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

As the proposed use is primarily industrial in nature the injury risk criteria will only be used as a guide in this instance.

3.2 Review of Major Incidents

A review of major incidents reported in media and publicly available databases including fire and explosions from fuel storage facilities and asphalt was undertaken. From a dataset of primarily United States facilities, 132 significant incidents or events have been recorded over a 10 year period. A review of these events showed that there was mix of fires and explosions.

The majority of the data indicated that the consequences of these events were primarily localised and most likely contained to the site. No significant off-site impacts were reported.

A significant number of localised explosions were reported, meaning that offsite overpressures could be encountered. Heat flux radiation from a fire at the adjacent Boral Asphalt plant and exploding projectiles could also be encountered.

3.3 Credible Incident Scenarios

The following credible major incident scenarios were identified:

1. A pool fire from either a petrol or diesel spill at the adjacent Puma Site with potential for heat flux impacts on the development site.
2. A tank top fire from either a petrol or diesel spill at the adjacent Puma Site with potential for heat flux impacts on the development site.

3. A jet fire from a product transfer line within the Puma Site with potential for heat flux impacts on the development site.
4. Fires at the neighbouring Mobil Lube Site or the nearby Asphalt plant.
5. Impingement of toxic smoke plumes on the site.
6. Sundry fires or warehouse fires from nearby sites.

3.4 Likelihood & Frequency Data

Estimating the likelihood of events occurring at sites not controlled by the proponent is difficult; in this instance available data and accepted failure rates have been used to provide likelihood estimates. It is assumed that good management practises are observed at high hazard industries and that in general the likelihood of major incidents from these establishments is lower that less regulated industries.

3.4.1 Bulk Fuel Storage

In recent years there have been 2 notable large fires and explosions from fuel storage locations, the Buncefield explosion and fire in 2005, and the Coode Island Fire. The Buncefield fire and explosion was notable in that the overpressures from the explosive ignition of a fuel leak significantly exceeded those previously experienced from an unconfined vapour explosion. Both these events had off-site impacts. The Coode Island fire was responsible for a potentially toxic smoke plume. Of note, impacts from the smoke plume were not in the immediate vicinity of the fire but many kilometres away when the buoyant smoke plume began to fall.

In general, fuel storage facilities will need to be operating at or close to a level of risk that meets the regulatory requirements where off-site impacts meet the HIPAP 4 Criteria detailed in Tables 1 and 2. For the purposes of this report the off-site fatality consequence from the neighbouring fuel storages is estimated as 50 x 10^{-6}/yr and the offsite irritation/minor injury from heat flux or a toxic smoke plume frequency is estimated at 50 x 10^{-6}/yr.

3.4.2 Asphalt Plants

In order to assess the likelihood of a major incident at an asphalt plant the following assumptions have been made; there are approximately 5 asphalt plants per million people of population. On this basis there have been 132 reported major events over a ten year period in the US with a population of approximately 280 million people – this gives an approximate frequency of occurrence for a major incident of 1 x 10^{-2} /yr.

There are a range of consequences from these major incidents that range from localised fires that have resulted in injuries and fatalities. As the development site is more than 300m away from the asphalt plant no significant heat fluxes are expected. Potential impacts from toxic smoke plumes cannot be excluded.

3.4.3 Warehouse & Storage Fire

The United Kingdom Health and Safety Executive (UK HSE) stipulates that the average frequency for warehouse fires across all industries is 1 x10^{-2}/yr. Using the conservative estimate that 1 in 10 warehouses are used for chemical storage then the frequency estimate for a fire in a chemical warehouse is 1x10^{-3}/yr. It is noted that chemical storage warehouses are usually designed, constructed and operated to a higher standard also resulting in an overall lower frequency of fires. Chemical Warehouses on the adjacent Puma site are sufficiently separated from the proposed development. No other high hazard warehouses have been identified within the vicinity of the development that would impact on the risk posed either to or by the development.

3.5 Consequences

The Consequences of the incident scenarios are discussed below.

3.5.1 Bulk Fuel Storage

The range of consequences from fire or explosion from fuel storage depots are considered to be;

- a minor fire contained to site (no off-site impacts)

- a major tank fire or pool fire with possible resultant heat flux effects and potential toxic fume generation
- general vapour cloud explosion
- a jet fire from a product transfer line within the facility

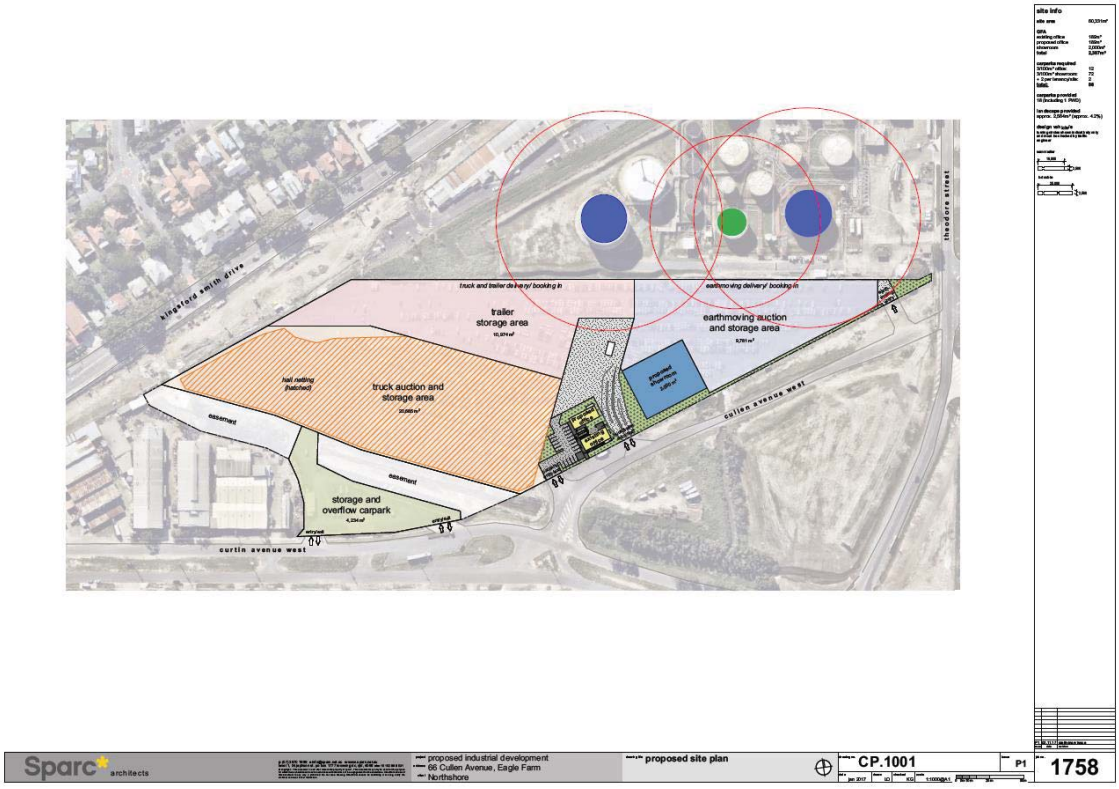

Figure 4: 4.7 kW/m^2 Heat Flux contours for Petrol and Diesel Fires.

Figure 3 shows estimated 4.7 kW/m^2 heat flux radiation contours for fires associated with the storage tanks closest to the proposed site and indicate the area where a person if exposed to the heat from a fire would be injured if they failed to immediately exit the area. These impacts are limited to regions of the site where there are no permanent office structures or permanent workforce or client/visitors. The likelihood of there being a fire and that simultaneously there were significant numbers of staff engaged in storing or inspecting is considered very low. Based on estimated time to store a piece of equipment (5 minutes) and exit (5 minutes) from the yard and the estimated equipment storage period (7 days) staff would only be in a hazard zone for approximately 0.1% of the time the site is operating. Equipment inspections maybe undertaken on a periodic basis and prior to auctions. An estimate is made that low levels (2-5 people) may be located in these areas for 2-3 hours per week (~2% of the time). Combined with the already low likelihood of a major fire event from the neighbouring site the risk is assessed as very low and tolerable. It should also be noted that any fire in a tank farm is unlikely to develop rapidly, providing sufficient time for persons in the storage yard area to be able to safely evacuate. No allowance has been made for shielding from bund walls or any equipment that would further reduce the impact radius of any event.

3.5.2 Asphalt Plants

The range of consequences from an asphalt plant major incident are considered to be;

- a minor fire contained to site with minimal off-site impacts
- a major tank fire or pool fire with possible resultant heat flux effects and toxic fume generation
- projectile drum/vessel

The asphalt plant is located approximately 300m from the development site and no credible scenarios, with the exception of a toxic smoke plume from a fire that could cause minor irritation, can be sensibly considered.

3.5.3 Warehouse & Storage Fire

The range of consequences from warehouse fire or explosion are considered to be;

- a minor fire contained to site with minimal off-site impacts
- a major fire or pool fire with possible resultant heat flux effects and toxic fume generation
- projectile drum/vessel from a warehouse fire.

A burning pool fire from a warehouse fire plant would be expected to have heat flux radii of approximately 40-60m at the 4.7 kW/m^2 level. This would not impact on the proposed development. The nearest storage identified is on the Puma site; this warehouse is more than 150m from the development and no significant threat is identified from this facility.

3.6 Environmental Impacts

A review of existing environmental hazards was undertaken with the results detailed in Table 5. Of note there were no significant hazards or risks identified.

It is recognised that the neighbouring asphalt plant will emit Volatile Organic Compounds, Sulfur Dioxide (SO_2), Nitrogen Oxides (NO_x) and poly aromatic hydrocarbons (PAH). The great majority of the SO_2 and PAH emissions are from a point source stack and should be emitted and dispersed without resulting in any significant ground level concentrations that would pose a threat to health.

3.7 Risk Assessment

The outcomes from the risk assessment including the hazards identified, likelihood and consequence estimates, and final risk ratings are presented in Table 3.

While there exists very low frequency events that could impact on the site in terms of heat fluxes from a fire or pressure impacts from vapour cloud explosions, the very sparse human occupation levels on the site reduces the risk of fatality or injury to levels that are acceptable. A comparable level of risk would exist walking along the footpath outside the Theodore St entrance to the Puma Site.

3.8 Existing Controls

3.8.1 Engineering & Design Controls

There are a number of features of the proposed design and site layout that will reduce the overall level of risk on the site. These are summarised below:

1. Separation Distances – The main office buildings are located as far as possible from the sources of off-site hazard. Heat Flux from fire on an adjacent site is unlikely to exceed 23 kW/m^2 at distances of 40m and 4.7 kW/m^2 at 60m. On this basis the office building area is sufficiently distant from neighbouring stores that heat flux from a fire will not pose a significant risk. The impacts of heat flux would be felt in the storage yard area. These areas are sparsely populated and staff and any visitors would be able to safely evacuate to the front of the site.

2. Location of staff and office. – The most densely occupied part of the site will be the office and showroom areas. The offices are facing south and are located as far as possible away from the bulk fuel stores.

3. Occupancy Levels
   The site is predominantly a storage yard that will have a very low density of human habitation, and will be predominantly vacant.

3.9 Proposed Mitigatory Controls

3.9.1 Emergency Plans and Procedures

It is recommended that Site Emergency Plans and Procedures be developed that include responses to the following scenarios:

1. Off Site fire that generates toxic smoke plume and requires an evacuation procedure where all staff and visitors to the site are relocated to safe area

2. Site evacuation procedure to the front of the site and then a secondary muster point to the east or west to avoid being downwind of any smoke plume.

Table 5: Off Site Impact Hazard Events for Proposed Development at 66 Cullen Ave W, Eagle Farm

Hazard/Event	Likelihood (per annum)	Consequences	Risk Rating[1]
Safety			
Minor Fire - neighbour site	0.01	No Impact/minor business interruption	0.001
Office/Admin Fire – neighbouring site	0.01	No Impact/minor business interruption	0.001
Warehouse Drum Store Fire	0.001	Potential for Projectiles with escalation potential - fire - Damage to equipment/office - Fire Brigades will be in attendance and should be able to control spot fires	1
Vehicle Rollover-Spill	0.01	No Impact/minor business interruption	0.001
Vehicle Rollover-Fire	0.001	No Impact/minor business interruption	0.001
Toxic Smoke from Major Fire (warehouse/asphalt)	0.01	Toxic Plume from incomplete combustion as a result of fire or combustion of toxic materials. - Business Interruption	1
Toxic Smoke from Major Fire (warehouse/asphalt)	0.01	Toxic Plume from incomplete combustion as a result of fire or combustion of toxic materials. - Minor Irritation - potential medical treatment	1
Toxic Smoke from Major Fire Puma/Whinstanes	0.00001	Toxic Plume from incomplete combustion as a result of fire or combustion of toxic materials. - Minor Irritation - potential medical treatment	0.1
Major Fire	0.01	Smoke Impacts from fire, area evacuated - Business Interruption - One week in duration	0.1
Major Fire	0.000005	Heat Flux From adjacent site fire-Whinstanes- will not cause property damage	0.00001
Major Fire	0.001	Heat Flux From adjacent site - Puma - property damage equipment in yard	0.1
Major Fire	0.000005	Heat Flux From adjacent site fire Mobil – property damage equipment in yard	0.01
Major Fire – Jet Fire	0.000005	Heat Flux From adjacent site - Puma - property damage equipment in yard	0.1
Environmental			
Dust	0.1	Nuisance/minor property damage	0.1
Filter Bag House Leak/Breakthrough	0.1	Nuisance/minor property damage & clean up	0.1
Petroleum/Fuel Odour	1	Nuisance	1
Toxic Gas Plume	0.001	Nuisance/illness possible irritation, medical assessment	0.1
Contaminated Overland Water Flow	0.001	Nuisance/minor property damage & clean up	0.001
Odour	0.1	Nuisance/minor property damage & clean up	0.1
Light	0.1	Nuisance/minor property damage & clean up	0.1
Noise	0.1	Nuisance/minor property damage & clean up	0.1
Groundwater Contamination	0.001	Nuisance/minor property damage & clean up	

[1] See Risk Matrices for Risk Acceptability – generally values less than 1 are considered tolerable.

4 Summary

This report has reviewed the overall risk posed on the proposed development. No significant risks were identified from existing neighbouring industries that would adversely impact on the operations of this site.

The design, location and orientation of the proposed development will assist in minimising any impacts if there was a major event such as a fire or explosion. The only areas of the development within a hazard range of a credible scenario will only have people present for a very small percentage of time thus significantly reducing any risk.

No credible hazard scenarios were identified that would adversely affect the proposed development and the development in itself will not impact on existing industries, and as such will comply with the general principles from the Queensland State Planning Policy—*State Interest Guideline - Emissions and Hazardous Activities.*