PRELIMINARY HAZARD ANALYSIS FOR SPF DIANA AUSTRALIA PTY LTD 91 GARDINER STREET, RUTHERFORD NSW

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EXECUTIVE SUMMARY

Benbow Environmental has been commissioned by SPF Diana Australia Pty Ltd to prepare a Preliminary Hazard Analysis (PHA) for Lot 206, 91 Gardiner Street, Rutherford 2320.

The site will have the capacity to store over 135 tonnes of ADG class 8 corrosive substances. This quantity exceeds the *State Environment Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) screening thresholds and therefore, a preliminary hazard analysis is required.

The proposed storage includes 3x45 tonne vertical storage tanks containing phosphoric acid, lactic acid, and caustic soda. Minor quantities of cleaning chemicals will also be stored. The acids will be segregated from the bases in accordance *AS3780-2008 – The storage and handling of corrosive substance* requirements for incompatible substances.

This Preliminary Hazard Analysis (PHA) has been prepared in accordance with the Multi-Level Risk Assessment and Hazardous Industry Planning Advisory Papers (HIPAPs) guidelines stipulated by the Department of Planning. Industry and Environment (DPIE) NSW. The purpose of the PHA is to assess whether the proposed volume of dangerous goods stored and the operations that occur at the site are offensive or hazardous, thereby posing an unacceptable risk to the surrounding community.

This assessment found that:

- The chemicals stored do not present a credible fire risk;
- A spill of phosphoric acid, lactic acid or caustic soda would not generate a credible risk of vapour release;
- The reaction of phosphoric acid or lactic acid with caustic soda does not generate gaseous emissions;
- The liquid by-products of a reaction of phosphoric acid or lactic acid with caustic soda does not generate substances with credible risks;
- The heat generated from a worst case reaction of phosphoric acid and caustic soda as assessed and found that it would not generate offsite risks.

No credible events that would pose a risk to the surrounding community were found.

Safeguard measures have also been considered and included in the design and operation of the facility to ensure workplace safety.

Section 5 of the report has identified and examined a number of potential events/consequence scenarios that could occur on site. The prevention and protection measures designed into the operations of each of the activities associated with each event were listed and discussed in Hazard Identification Charts.

The Preliminary Hazard Analysis has found that the operation meets the criteria laid down in HIPAP No. 4 *Risk Criteria for Land Use Safety Planning* and would not cause any risk, significant or minor, to the community hence the proposed development would not be considered to be an offensive or hazardous development.

Approval of the development is requested.

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1. INTRODUCTION

Benbow Environmental has been commissioned by SPF Diana Australia Pty Ltd to prepare a Preliminary Hazard Analysis (PHA) for Lot 206, 91 Gardiner Street, Rutherford 2320.

The proposed storage includes 3 x 45 tonne vertical storage tanks containing phosphoric acid, lactic acid, and caustic soda. Minor quantities of cleaning chemicals will also be stored. The acids will be segregated from the bases in accordance with AS3780-2008 *The storage and handling of corrosive substances* requirements for incompatible substances.

The PHA has been prepared in accordance with the documents entitled "Multi-Level Risk Assessment", "Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning" (HIPAP No. 4)" and the "Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis" (HIPAP No. 6), all published by the Department of Planning, Industry and Infrastructure (DPIE).

The study includes the following key aspects of the assessment:

- Assessment of the proposed development with consideration to the provisions of SEPP 33.
- Evaluation of any potential hazards imposed by the proposed site operations on the surrounding environment and communities.
- Making recommendations on the relevant prevention/protection strategies necessary to minimise the impact and risk of human fatalities, property damage and environmental pollution.

2. SITE DETAILS

2.1 SITE LOCATION

The subject site is located 91 Gardiner Street, Rutherford 2320. Site identification and land use information are summarised in Table 2-1.

Table 2-1: Site Identification

Lot/Plan No.	Lot 2 DP1197299
Coordinates UTM	Easting: -32.72101, Northing: 151.49411
Local Government Area	Maitland City Council
Current Land Zoning	IN1 Industry (General Industry A)

Notes: Source: Brisbane City Council City Plan 2014

Figure 2-1: Site Location (Aerial View)

Source: SixMaps 2021

↑N Not to scale	LEGEND: Site location:	Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152

Figure 2-2: Aerial Photograph of the Site and Surrounds

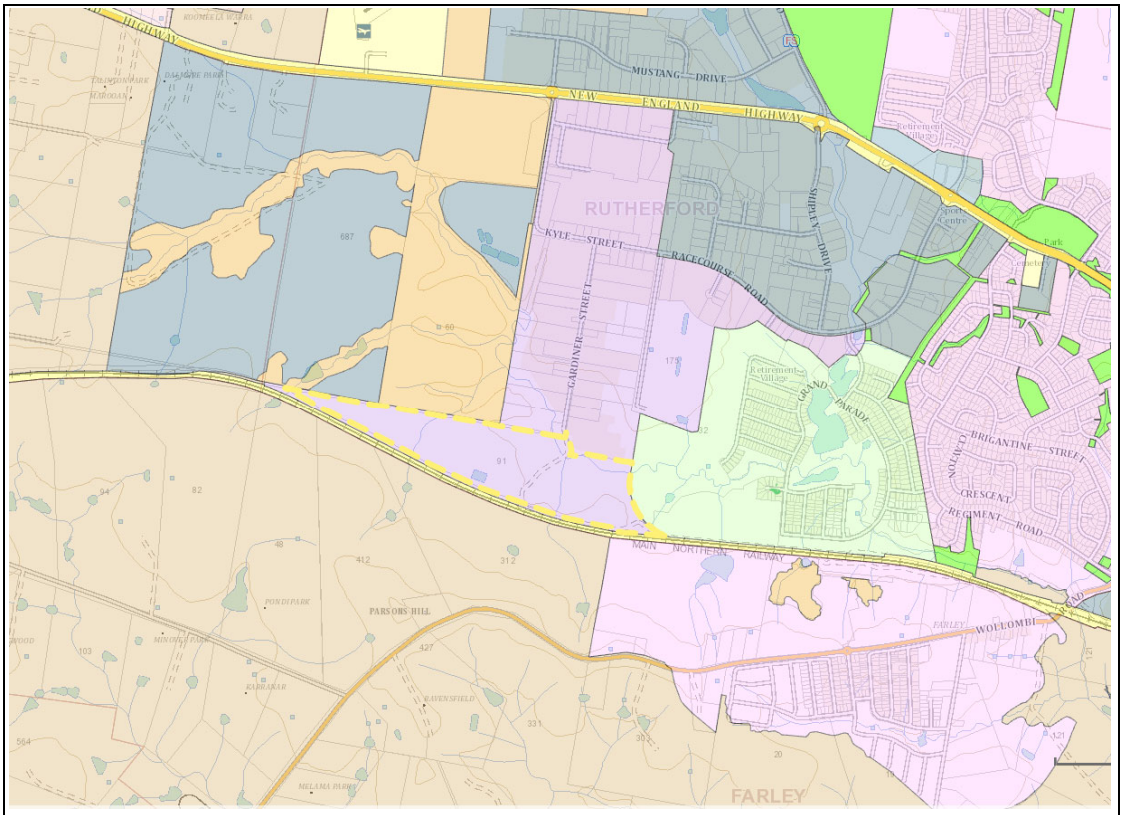
Source:

↑N Not to scale	LEGEND:	Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152

2.2 SITE DESCRIPTION AND ADJACENT LAND USE

The site is zoned as 'IN1 – General Industrial' under the Maitland Local Environmental Plan 2011. The site is currently surrounded by undeveloped land. However, the site is situated on parcel of land being subdivided (subject to a separate development application handled by the developer of the industrial park (not SPF Diana Aust. Pty Ltd)) and commercial/industrial sites will occupy this area in the future. The site is bordered to the south by a corridor of SP2 infrastructure zoning for the railway, beyond that the land south is zoned RU2 Rural Landscape. The lot immediately to the north of the site is zoned B5 business development, except for a tributary of stony creek and its banks. These areas are zoned E3 and covers a portion of the land to the north and north east of the site. This creek runs through the tip (western corner) of the subject site. The nearest residence are approximately 748m to the south.

Figure 2-3: Land Use Zoning Map



Source: NSW ePlanning Spatial Viewer 2021

N

Not to scale

LEGEND:

Site Boundaries

Zone

B1	Neighbourhood Centre	R1	General Residential
B2	Local Centre	R5	Large Lot Residential
B3	Commercial Core	RE1	Public Recreation
B4	Mixed Use	RE2	Private Recreation
B5	Business Development	RU1	Primary Production
B6	Enterprise Corridor	RU2	Rural Landscape
E2	Environmental Conservation	SP1	Special Activities
E3	Environmental Management	SP2	Infrastructure
E4	Environmental Living	SP3	Tourist
IN1	General Industrial		

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2.3 NEAREST SENSITIVE RECEPTORS

The subject site is surrounded by existing rural developments which are subject to development in future. Table 2-2 identifies the nearest sensitive receptors and future receptors that have the potential to be affected by the proposal. The aerial photographs of the sensitive receivers are shown in Figure 2-4. These receptors were selected based on their proximity and directional bearing from the subject site.

Table 2-2: Nearest Sensitive Receptors

Receptor ID	Address	Lot & Plan	Type	Approximate Distance from site
Existing				
R1	398 Wollombi Rd, Farley	4/DP234367	Residential	838 m
R2	412 Wollombi Rd, Farley	5/DP634525	Residential	748 m
R3	48 Old North Rd, Farley	4/DP634525	Residential	889 m
R4	94 Old North Rd, Farley	2/DP634522	Residential	1 km
R5	Cowhill Rd, Lochinvar	5/DP2397541	Residential	1 km
R6	669 New England Highway Lochinvar	5/DP846960	Residential	1.3 km
R7	641 New England Hwy, Lochinvar	2/DP749144	Residential	1.2 km
R8	60 Kyle St, Rutherford	4/DP790460	Commercial/ Industrial	482 m
R9	72 Gardiner St, Rutherford	191/DP809485	Industrial	548 m
Future				
R10	91 Gardiner St, Rutherford	2/DP1197299	Industrial	55 m
R11	687 New England Hwy, Lochinvar	1413/DP1141534	Commercial	251 m
R12	687 New England Hwy Lochinvar	6871/DP1121957	Commercial	40 m

Figure 2-4: Receptor Locations

↑N	Source: Google Maps 2021	Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152

3. PROPOSED SITE OPERATIONS

The proposed development manufactures a liquid palatability enhancer which is a liquid petfood ingredient supplied to petfood manufacturers.

3.1 PROCESS DESCRIPTION

The process consists of:

- Receiving
  Trucks arrive at the facility to drop off pallets of raw materials including:
  - Beef Livers
  - Chicken Livers
  - Chicken Guts
  - Chicken MDM (Mechanically deboned meat)
  - Salmon
  - Kangaroo

  The packaging of the incoming material is manually removed and the raw material is transferred into plastic lined crates.

- Unfreezing (if required)
- Most of the incoming material is delivered frozen. Frozen raw materials crates get moved into a tempering room (unfreezing room) which is heated with steam from the boiler.

- Grinding
  Other material and frozen material once thawed gets tipped into a grinder and the resultant slurry gets transferred into a mixing tank.

- Cooking and adding ingredients
  The mixing tank receives flavour additives before being transferred to the heated processing tank (reactor) where the pH and temperature is controlled (pH with dosing phosphoric acid and caustic soda) and temperature from the steam from the boiler. Strict control of these parameters are necessary for the efficacy of the enzymes which are added as a powder manually via a hatch at the top of the tank. The enzymes and temperature liquify the slurry. Typical temperature of the liquid is 100°C, and max is 130°C.

- Sifting
  This liquid is then sifted (screened using a vibrating screen) which removes solids such as bits of bone etc (material that the enzymes cannot break down) which is transferred directly into a bin as solid waste which is removed offsite by a licensed waste contractor.

- Transfer to storage tanks
- The product is cooled to 40°C transferred to bulk storage tanks where it is either decanted into IBCs BIBs Pallecons or Drums (mostly IBCs) or it is unloaded directly from the bulk storage via a tanker truck.

- Quarantine (if required)
  Some of the products are quarantined for a designated period within the facility.

3.2 WATER USE

The majority of water is used for cleaning purposes, some of the water is also added into the product. The cleaning water ends up as waste water to be processed in the site's waste water treatment plant before being discharged to trade waste.

Water is fed to a boiler which generates steam. This steam is used for cleaning, in the cooking process and for heating the tempering room (unfreezing room).

3.3 HOURS OF OPERATION

The proposed development will operate 24/7.

3.4 PROPOSED FIRE PROTECTION SYSTEMS

The site will have the following fire systems designed in accordance with the following standards:

- AS 2419.1 *Fire Hydrant Installations* Part 1: *System Design, installation*
- AS 1221 *Fire Hose Reels*
- AS 2118.1 *Automatic Fire Sprinkler systems* Part 1: *General systems*
- AS 2118.6 *Automatic Fire Sprinkler systems* Part 6: *Combined Sprinkler & Hydrant*

4. DANGEROUS GOODS STORAGE & HANDLING

4.1 QUANTITIES OF DANGEROUS GOODS

Dangerous goods are now classified as equivalent Global Harmonised System (GHS) classes and categories under the Work Health and Safety Regulations. However, as the many guidelines still refer to chemicals using the DG code, the original DG classes have been referred to in this assessment.

The following table presents the proposed dangerous goods storage.

Table 4-1: Proposed Dangerous Good/Chemical Storage

Location	Product Name	ADG Class	Packaging Group	GHS Category	UN Number	Max Storage Quantity	Storage Type	Storage Area
Location 1: CIP Area	Sodium hydroxide solution (NaOH (30%-60%)	8	II	Metal Corrosion Category 1 Skin Corrosion/Irritation Category 1A Serious Eye Damage Category 1	1824	3 tonnes	1000L IBC	Cleaning Chemical Storage
	Potassium Hydroxide Solution	8	II	Metal Corrosion Category 1 Skin Corrosion/Irritation Category 1A Serious Eye Damage Category 1	1814	250kg	25 Can	Cleaning Chemical Storage
	Nitric Acid 68%	8 (sub risk 5.1)	II	Oxidizing Liquid Category 2 Metal Corrosion Category 1 Acute Toxicity (Inhalation) Category 4 Skin Corrosion/Irritation Category 1A Serious Eye Damage Category 1	2031	2 tonnes	1000L IBC	Cleaning Chemical Storage
Location 2: Bulk storage area	Phosphoric acid, >=25%	8	III	Corrosive to Metals – Category 1 Acute Toxicity (Oral) – Category 4 Acute Toxicity (Dermal) – Category 5 Skin Corrosion/Irritation – Category 1B	1805	45 tonnes	45 tonne bulk storage tank	Bulk Chemical Storage Tank Area
	Caustic soda – liquid (NaOH 46%-50%)	8	II	Corrosive to Metals – Category 1 Skin Corrosion – Sub-category 1A Eye Damage – Category 1 Specific target organ toxicity (single exposure) – Category 3	1824	45 tonnes	45 tonne bulk storage tank	Bulk Chemical Storage Tank Area
	Lactic Acid	8	III	Skin Corrosion/Irritation Category 1C Serious Eye Damage Category 1	3265	45 tonnes	45 tonne bulk storage tank	Bulk Chemical Storage Tank Area
Location 3: Waste Water Treatment Plant	Acid for WWTP Dosing	8	IIII	Corrosive to Metals – Category 1 Acute Toxicity (Oral) – Category 4 Acute Toxicity (Dermal) – Category 5 Skin Corrosion/Irritation – Category 1B	TBA	<1 tonne	1000L IBC or Drums	Waste Water Treatment Plant
	Base for WWTP dosing	8	III	Corrosive to Metals – Category 1 Skin Corrosion – Sub-category 1A Eye Damage – Category 1	TBA	<1 tonne	1000L IBC or Drums	Waste Water Treatment Plant

Table 4-1: Proposed Dangerous Good/Chemical Storage

Location	Product Name	ADG Class	Packaging Group	GHS Category	UN Number	Max Storage Quantity	Storage Type	Storage Area
Location 4: Fire rated cabinet in warehouse	Isopropanol Alcohol 70%	3	II	Flammable Liquid Category 2 Eye Irritation Category 2A Specific target organ toxicity – single exposure Category 3 (narcotic effects)	1219	10L	10L Can	Cleaning Chemical Storage

4.2 PRELIMINARY RISK SCREENING – SEPP33

4.2.1 Onsite Storage

A preliminary risk screening of the proposed development in accordance with *State Environment Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) and the NSW Planning's *Applying SEPP 33* has been undertaken, with results provided below.

A preliminary risk screening of the proposed development in accordance with State Environment Planning Policy No. 33 – Hazardous and Offensive Development has been undertaken with results provided below.

Table 4-2: Comparison of Screening Threshold Quantities by SEPP 33

Class	Screening Threshold	Description	Site Specific Description	Quantity to be stored based on separation distances	Triggers SEPP33
Class 1.2	5 tonne	Explosives	None on site	None	No
Class 1.3	10 tonne	Explosives	None on site	None	No
Class 2.1	10 tonne or 16 m^3 if stored above ground 40 tonnes or 64 m^3 if stored underground or mounded	Flammable Gases	None on site	None	No
Class 2.2	Not Relevant	Non-flammable, non-toxic gases	None on site	None	No
Combustible Liquid C1	Not relevant	Combustible liquid with flashpoint of 150°C or less	None on site	None	No
Combustible Liquid C2	Not relevant	Combustible liquid with flashpoint exceeding 150°C	None on site	None	No
Class 2.3	5 tonne	Anhydrous ammonia, kept in the same manner as for liquefied flammable gases and not kept for sale	None on site	None	No
	1 tonne	Chlorine and sulphur dioxide stored as liquefied gas in contains <100 kg	None on site	None	No

Table 4-2: Comparison of Screening Threshold Quantities by SEPP 33

Class	Screening Threshold	Description	Site Specific Description	Quantity to be stored based on separation distances	Triggers SEPP33
	2.5 tonne	Chlorine and sulphur dioxide stored as liquefied gas in containers >100 kg	None on site	None	No
	100 kg	Liquefied gas kept in or on premises	None on site	None	No
	100 kg	Other poisonous gases	None on site	None	No
Class 3	**Assessed by reference to figures 8 & 9 of applying Sepp 33**	**Flammable liquids PG I, II and III**	**Small container isopropanol**	**10L**	**No**
Class 4.1	5 tonne	Flammable Solids	None on site	None	No
Class 4.2	1 tonne	Reactive in the air	None on site	None	No
Class 4.3	1 tonne	Spontaneous combustion in contact with water	None on site	None	No
Class 5.1	25 tonne	Ammonium nitrate – high density fertiliser grade, kept on land zoned rural where rural industry is carried out, if the depot is at least 50 metres from the site boundary.	None on site	None	No
Class 5.1	5 tonne	Oxidising substances	None on site	None	No
Class 5.1	2.5 tonne	Dry pool chlorine – if at a dedicated pool supply shop, in containers <30 kg	None on site	None	No
Class 5.1	1 tonne	Dry pool chlorine – if at a dedicated pool supply shop, in containers >30 kg	None on site	None	No
Class 5.1	**5 tonne**	**Any other Class 5.1**	**2 tonne nitric acid with sub risk 5.1**	**2 tonnes**	**No**
Class 5.2	10 tonne	Organic peroxide	None on site	None	No
Class 6.1 PG1	0.5 tonne	Toxic substances	None on site	None	No

Table 4-2: Comparison of Screening Threshold Quantities by SEPP 33

Class	Screening Threshold	Description	Site Specific Description	Quantity to be stored based on separation distances	Triggers SEPP33
Class 6.1 PGII & III	2.5 tonne	Toxic substances	None on site	None	No
Class 6.2	0.5 tonne	Includes clinical waste	None on site	None	No
Class 7	All	Should demonstrate compliance with Australian codes	None on site	None	No
Class 8 PGI	5 tonne	Corrosive substance	None on site	None	No
Class 8 PGII	**25 tonne**	**Corrosive substance**	**Caustic soda – liquid Cleaning Chemicals Various**	**52 tonnes**	**Yes**
Class 8 PGIII	**50 tonne**	**Corrosive substance**	**Phosphoric acid, >=25% Lactic Acid**	**90 tonnes**	**Yes**

As shown in the table, dangerous goods quantities exceed the SEPP 33 screening thresholds and therefore, a preliminary hazard analysis is required.

4.3 Transport Quantities

"Transportation Screening Thresholds" from *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33, NSW Government Department of Planning (2011)* are shown below.

Table 4-3: Transportation Screening Thresholds

	Vehicle Movements		Minimum quantity*	
	Cumulative	Peak	per load (tonne)	
Class	Annual *or*	Weekly	Bulk	Packages
1	see note	see note	see note	
2.1	>500	>30	2	5
2.3	>100	>6	1	2
3PGI	>500	>30	1	1
3PGII	>750	>45	3	10
3PGIII	>1000	>60	10	no limit
4.1	>200	>12	1	2
4.2	>100	>3	2	5
4.3	>200	>12	5	10
5	>500	>30	2	5
6.1	all	all	1	3

Table 4-3: Transportation Screening Thresholds

	Vehicle Movements		Minimum quantity*	
	Cumulative	Peak	per load (tonne)	
Class	Annual *or*	Weekly	Bulk	Packages
6.2	see note	see note	see note	
7	see note	see note	see note	
8	>500	>30	2	5
9	>1000	>60	no limit	

Note: Where proposals include materials of class 1, 6.2 or 7, the Department of Planning should be contacted for advice. Classes used are those referred to in the Dangerous Goods Code and are explained in Appendix 7.

* If quantities are below this level, the potential risk is unlikely to be significant unless the number of traffic movements is high.

The number of Class 8 dangerous goods deliveries per week is typically 4-5. Therefore, the vehicle movements are well below that which triggers SEPP33.

4.4 DANGEROUS GOODS STORAGE REQUIREMENTS

The site would be designed to conform to the *Work Health and Safety Regulation 2017,* and relevant Australian Standards.

All dangerous good storage and handling practices would comply with:

- *Work Health and Safety Act 2011*;
- *Work Health and Safety Regulation 2017*;
- *Dangerous Goods (Road and Rail Transport) Act 2008 No 95*;
- *Dangerous Goods (Road and Rail Transport) Regulation 2014;*
- How to Manage Work Health and Safety Risks Code of Practice 2018;
- AS/NZS 4804:2001 – *Occupational Health and Safety Management Systems – General Guidelines on Principles, Systems and Supporting Techniques*;
- AS3780-2008 – *The storage and handling of corrosive substance*
- AS/NZS 3833:2007 – *The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers*
- SafeWork Australia – National Standard for the Storage and Handling of Dangerous Goods [NOHSC:1015 (2001)];
- SafeWork Australia – National Code of Practice for the Storage and Handling of Dangerous Goods [NOHSC:2017 (2001)];
- Code of Practice: Managing risks of hazardous chemicals in the workplace (N.S.W. Code of Practice 2019);
- Globally Harmonised System of Classification and Labelling of Chemicals 8th Revised Edition (2017); and
- Australian Dangerous Goods (ADG) Code 7th Edition.

4.4.1 Notification to SafeWork

The proposed storage of class 8 PG II and III dangerous goods exceeds SafeWork's manifest quantities and therefore notification to Safework is required.

4.4.2 Emergency Plan

The site will have and implement an Emergency Plan which will include (but not be limited to):

- Fire Emergency Information Package (undertaken in accordance with the NSW Fire and Rescue Fire safety guideline – Emergency services information package and tactical fire plan).
  - Site plan showing fire services
  - Site plan showing location of the dangerous goods on site
  - Dangerous Goods Register
  - Evacuation overview
  - Tactical check list and fire plans
- Emergency and evacuation procedures
- Emergency contact details of key personnel
- Contact details of local emergency services
- Description of emergency or possible emergency alert mechanism

5. HAZARD ANALYSIS

5.1 LEVEL OF ASSESSMENT

There are three levels of assessment specified in the Multi-Level Risk Assessment (DPIE 2011) document and they are listed below.

Level 1 – Qualitative Analysis: primarily based on the hazard identification techniques. A level 1 assessment can be justified if the analysis of the facility demonstrates Societal Risk in the *negligible zone* and there are no potential accidents with significant off-site consequences.

Level 2 – Partially Quantitative Analysis: using hazard identification and the focused quantification of key potential off-site risk contributors. A level 2 assessment can be justified when the Societal Risk estimates fall within the middle *ALARP zone* or if one or more significant risk contributors had been identified but the frequency of risk contributors having off-site consequences is relatively low.

Level 3 – Fully Quantitative Risk Analysis: based on the full and detailed quantification of risks, consistent with HIPAP No. 6. A level 3 assessment is required where the Societal Risk from the facility estimates fall within the *intolerable zone* or where there are significant off-site risk contributors, and a level 2 assessment is unable to demonstrate that the risk criteria would be met.

The level of assessment required is dependent on a risk-based method which relies on broad estimations of consequences and likelihood of accidents. A risk classification and prioritisation technique is often used to determine the level of assessment. This technique provides the estimation of individual and societal fatality risk which can be compared against the given criteria. This has been examined in Section 5.2 below.

5.2 RISK CLASSIFICATION AND PRIORITISATION METHOD

The consequences of an accident involving a particular hazardous substance depends on the type and quantity of hazardous substance, the type of activity using the substance as well as the exposed population.

The Department of Planning, Industry and Environment document *"Multi-Level Risk Assessment"* (DPIE 2011) outlines a method of risk classification and prioritisation to assist in assessment of risks. The technique is based on the Manual for Classification of Risks Due To Major Accidents in Processes and Other Related Industries (IAEA, 1996).

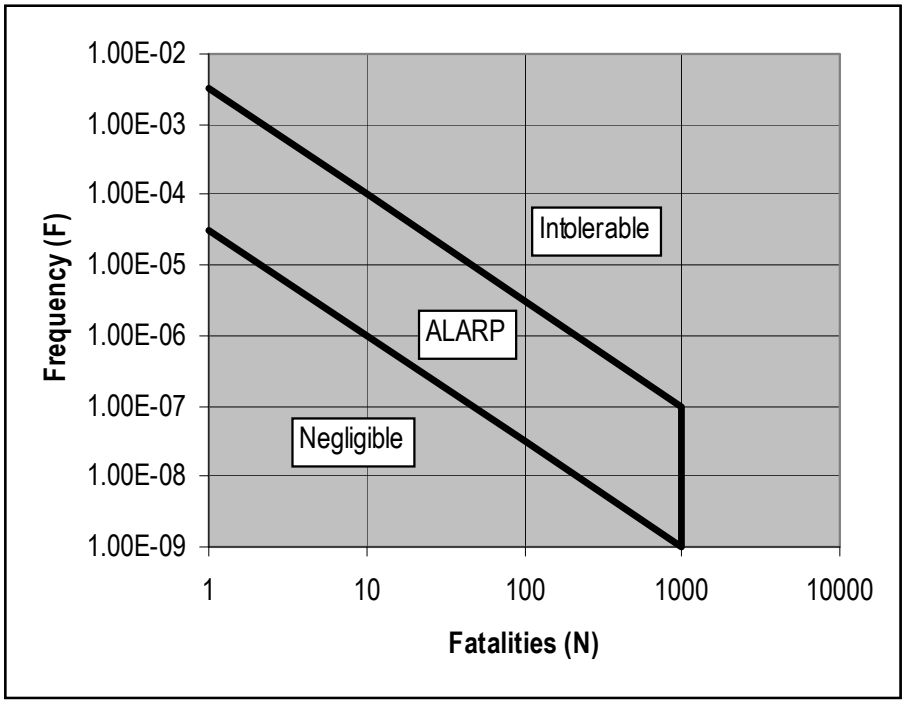
The IAEA method was developed to produce a broad estimate of the risks due to major accidents from the production, storage, handling and transport of hazardous materials. This method relies on broad estimations of consequences and likelihood of accidents, where outputs can be used to determine the appropriate level of further assessment.

The technique involves three stages:

- Estimation of the consequences;
- Estimation of the probability of a major accident happening; and
- Estimation of societal risk.

Upon estimation of these parameters, these figures are plotted on to the IAEA curve to determine the risk associated with each class of dangerous goods. This curve has been provided in the figure below.

Figure 5-1: IAEA F-N Curve – Indicative Societal Risk Criteria



The risk classification and prioritisation method covers only off-site risks arising from explosion, fire or release of toxic substances. The only acids specifically mentioned in the IAEA manual are Acroleine acids, Sulfuric Acid, Hydrofluoric acid, Nitric Acid due to the risk of toxic emissions. Furthermore, if the storage of corrosive substances were to be considered in table IV(a). under reference 16 toxic liquids – low toxicity – storage with tank, as the quantity proposed is less than 200t a risk category is not assigned, as only quantities above 200t are assigned risk categories for further assessment.

5.3 METHODOLOGY

The procedures adopted by this study for assessing hazardous impacts involve the following steps:

Step 1: Hazard identification;
Step 2: Risk analysis (consequence and probability estimations); and
Step 3: Risk evaluation and assessment against specific criteria.

The following sections of the report discuss the hazard identification and analysis process as prescribed by the Department of Planning, Industry and Environment in the document *Hazardous Industry Planning Advisory Paper No* 4 (*HIPAP No. 6) – Guidelines for Hazard Analysis* and *HIPAP No. 8 – HAZOP Studies* (DPIE 2011).

5.3.1 Hazard Identification

This is the first step in risk assessment. It involves the identification of all theoretically possible hazardous events as the basis for further quantification and analysis. This does not in any way imply that the hazard identified or its theoretically possible impact would occur in practice. Essentially, it identifies the particular characteristics and nature of hazards to be further evaluated in order to quantify potential risks.

To identify hazards, a survey of the proposed operations was carried out to isolate the events which are outside normal operating conditions and which have the potential to cause offsite impacts. In accordance with HIPAP No. 6, these events do not include occurrences that are a normal part of the operational cycles of the site but rather the atypical and abnormal, such as the occurrence of a significant liquid spill during product transfer operations.

5.3.2 Risk Analysis

After a review of the events identified in the hazard identification stage and the identification of prevention/protection measures incorporated into the design of the site, any events which are considered to have the potential to result in impacts offsite or which have the potential to escalate to larger incidents are carried over to the next stage of analysis.

5.3.2.1 Consequence Estimation

This aspect involves the analysis and modelling of the credible events carried forward from the hazard identification process in order to quantify their impacts outside the boundaries of the site. In this case, these events typically include fire and the potential effects on people and/or damage to property.

5.3.2.2 Probability Likelihood Estimation

If necessary, the likelihood of incidents are quantified by adopting probability and likelihood factors derived from published data.

5.3.3 Risk Evaluation and Assessment against Specific Criteria

The risk analysis includes the assessment of consequences for each hazardous event and the frequencies of each initiating failure. The results of these consequence calculations together with the probabilities and likelihood figures estimated were then compared against the accepted criteria, as specified by Department of Planning, Industry and Environment. Whether it is considered necessary to conduct the predictions would depend on the probability figures, likelihood estimations, and if the risk criteria are exceeded.

5.4 ASSESSMENT CRITERIA

The risk criteria applied by Department of Planning, Industry and Environment are published in the code and *Hazardous Industry Planning Advisory Paper No 4* (HIPAP No. 4) - *Risk Criteria for Land Use Safety Planning* (DPIE 2011). The following is a general discussion of the criteria that is used to assess the risk of a development on the surrounding community and environment.

5.4.1 Individual Fatality Risk Levels

The following paragraphs have been reproduced from HIPAP No. 4 to describe individual fatality risk levels:

> *"People in hospitals, children at school or old-aged people are more vulnerable to hazards and less able to take evasive action, if need be, relative to the average residential population. A lower risk than the one in a million criteria (applicable for residential areas) may be more appropriate for such cases. On the other hand, land uses such as commercial and open space do not involve continuous occupancy by the same people.*
>
> *The individual's occupancy of these areas is on an intermittent basis and the people present are generally mobile. As such, a higher level of risk (relative to the permanent housing occupancy exposure) may be tolerated. A higher level of risk still is generally considered acceptable in industrial areas"* (DPIE 2011).

The risk assessment criteria for individual fatality risk are presented below.

Table 5-1: Individual Fatality Risk Criteria (HIPAP No. 4)

Land Use	Risk Criteria x 10^{-6} (per year)
Hospitals, schools, childcare 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

Figures in the table above have been utilised in the assessment.

5.4.2 Injury Risk Levels

The code and HIPAP No. 4 provides guideline criteria for heat of radiation, explosion overpressure and toxic exposure. The quoted requirements from the referenced document have been summarised as follows:

- Guideline criteria for heat of radiation:

  "Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m^2, at frequencies of more than 50 chances in a million per year."

- Guideline criteria for 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."

- Guideline criteria for toxic exposure:

  "Toxic concentrations in residential areas should not exceed a level that would be seriously injurious to sensitive members of the community following a relatively short period of exposure at maximum frequency of 10 in a million per year."

  and

  "Toxic concentrations in residential areas should not cause irritation to the 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."

Please note that a risk hazard assessment only examines events that are considered to have the potential for significant off-site consequences and may not entirely reflect all variations in people's vulnerability to risk.

5.4.3 Risk of Property Damage and Accident Propagation

The code and HIPAP No. 4 indicates that siting of a hazardous installation must account for the potential for propagation of an accident, causing a "domino" effect on adjoining premises. This risk would be expected within an industrial estate where siting of hazardous materials on one site may potentially cause hazardous materials on an adjoining premises to further develop the size of the accident.

The criteria for risk of damage to property and of accident propagation are stated as follows:

"Incident heat flux at neighbouring potentially hazardous installations or at land zones to accommodate such installations should not exceed a risk of 50 in a million per year for the 23 kW/m^2 heat flux level."

and

"Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings should not exceed a risk of 50 in a million per year for the 14 kPa explosion overpressure level."

5.4.4 Criteria for Risk Assessment to the Biophysical Environment

The assessment of the ultimate effects from toxic releases into the natural ecosystem is difficult, particularly in the case of atypical accidental releases. Consequence data is limited and factors influencing the outcome variable and complex. In many cases, it may not be possible or practical to establish the final impact of any particular release. Because of such complexity, it is inappropriate to provide generalised criteria to cover any scenario. The acceptability of the risk would depend upon the value of the potentially affected zone or ecosystem to the local community and wider society.

The suggested criteria for sensitive environmental areas relate to the potential effects of an accidental release or an emission on the long-term viability of the ecosystem or any species within it and are expressed as follows:

"Industrial developments should not be sited in proximity to sensitive natural environmental areas where the effects or consequences of the more likely accidental emissions may threaten the long-term viability of the ecosystem or any species within it."

and

"Industrial developments should not be sited in proximity to sensitive natural environmental areas where the likelihood or probability of impacts that may threaten the long-term viability of the ecosystem or any species within it is not substantially lower than the existing background level threat to the ecosystem."

5.5 Assessment Criteria Applicable to the Proposed Development Application

In accordance with the code and *HIPAP No 4 Risk Criteria for Land Use Safety Planning*, the following discussion of the risk assessment criteria considered applicable to the proposed development has been provided.

5.5.1 Toxic Criteria

The code and HIPAP No. 4 indicates that citing of potentially hazardous developments also needs to consider the risk from accidental releases into the biophysical environment.

The National Institute for Occupational Safety and Health (NIOSH) and the American Industrial Hygiene Association (AIHA) provides the following 4 categories of health impact criteria which are of relevance during an emergency event:

- Immediately Dangerous to Life or Health (IDLH).
- Emergency Response Planning Guideline 1 (ERPG1).
- Emergency Response Planning Guideline 2 (ERPG2).
- Emergency Response Planning Guideline 3 (ERPG3).

The purpose of the values given for each of these limits for a particular chemical is to assess the capabilities of mitigation safeguards and emergency or accident response plans for the workplace.

The IDLH limit is defined by the Occupational Safety and Health Administration (OSHA) as:

> *"An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere."*

The following are definitions for each ERPG level as defined by American Industrial Hygiene Association, 2008 Emergency Response Planning Guidelines (ERPG) and Workplace Environmental Exposure Levels (WEEL) Handbook:

> *"The ERPG-1 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odour.*
>
> *The ERPG-2 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action.*
>
> *The ERPG-3 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects."*

The ERPG-2 level can be considered synonymous to the IDLH limit, although it has been observed that both slightly vary from each when comparing values for each contaminant. For this reason, both IDLH and ERPG limits were required to be considered in this assessment.

The above needs to comply with the following risk criteria:

- 10 in a million per year for seriously injurious toxic concentrations to sensitive members of the community following a relatively short period of exposure; and
- 50 in a million per year for toxic concentrations causing irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community

The toxic exposure criteria adopted in this assessment for the toxic chemicals potentially emitted from the site are defined in Table 5-2.

Table 5-2: Adopted Health Criteria Based of Potential Pollutants

Limit	Concentration (mg/m^3)		
	Phosphoric Acid	Lactic Acid	Sodium Hydroxide
IDLH	1,000	N/A	10
ERPG1	3	N/A	0.5
ERPG2	30	N/A	5
ERPG3	150	N/A	50

5.5.2 Biophysical Environment Risk Criteria

The proposed development will be located in a future industrial area. The proposed area of the development would be fully sealed.

Best practice in housekeeping and operational procedures would be implemented on site. Given this consideration, the proposed development would not introduce any additional risk that may threaten the long-term viability of the development and its effect to the local environment. Consequently, the DPIE-based criteria have been determined to be readily satisfied and no further analyses or discussions were considered necessary.

5.6 HAZARD IDENTIFICATION

The Hazard Identification approach has been developed in accordance with the code. It relies on a systematic and analytical approach to the identification and analysis of hazards, and the quantification of offsite risks, to assess any risk tolerability and land use safety implications based on HIPAP 6 (the code, section 4.5.6 – Quantitative risk assessment (QRA)). The NSW Department of Planning, Industry and Environment has advocated a merit-based approach, wherein the level and extent of analysis must be appropriate to the hazards present and therefore, need only progress to the extent necessary for the particular case.

5.6.1 Hazardous Materials

The main risks from hazardous materials on site is the storage of corrosive substances and hazards associated with incompatible materials.

Phosphoric acid and lactic acid are incompatible with caustic soda which must be kept in separate compounds and segregated by 5 m. These segregation distances may be measured laterally around an intervening screen wall. The screen wall shall extend a distance at least equal to the height of the higher store and have a FRL of at least 120/120/120.

In accordance with the SDSs these acids may react violently with bases. However, the bioproducts of this reaction is not considered a significant risk:

- Caustic soda (NaOH) and phosphoric acid react to make sodium phosphate and water. Sodium phosphate is a substance ingested to empty the colon prior to a colonoscopy (FDA approved and low risk).
- Caustic soda (NaOH) and lactic acid react to make sodium lactate and water. Sodium lactate is non-toxic and biodegradable and is used for electrolyte replenishment and as a systemic alkaliser.

These reactions do not generate toxic substances or release gaseous emissions.

5.6.2 Hazardous Events

The identification of possible hazardous events for this facility has been prepared and a comprehensive list of credible and significant incidents is provided in the form of a Hazard Identification Chart given below.

5.6.2.1 Hazard Identification Chart

A Hazard Identification Chart has been prepared for the proposed site based on operating scenarios that are relevant to the proposed development. This chart outlines the outcomes from the hazard identification phase of the assessment.

The chart consists of four columns:

Column 1
Heading: Functional/Operation Area
The area of the site involved with the potential event is listed.

Column 2
Heading: Possible Initiating Event
The individual events that are considered to be likely or realistic are then listed. Where the possible consequences are similar the events are listed together, each one individually numbered.

Column 3
Heading: Possible Consequences
The outcomes of an event if it occurred are listed.

Column 4
Heading: Prevention/Protection Measures
The measures designed into the functional/operation area and the site are listed. These measures may include for example safeguards, design features, management methods and/or operator training.

The hazard identification chart is presented in Table 5-3.

Table 5-3: Event/Consequence Analysis Table

Functional/Operational Area	Possible Initiating Event	Possible Consequences	Prevention/Protection Measures
Delivery of hazardous chemicals	Tanker truck collision with another vehicle	Large spill outside bunded area entering stormwater system and receiving waterways. Injury or harm to personnel due to contact or exposure to chemical.	Spill control kits available Stormwater isolation Emergency response team in place Trained drivers Preventive maintenance programme in place
	Tanker truck connects and delivers hose to incompatible substance tank	Chemical reaction, heat/pressure causing tank failure: Injury or harm to personnel due to contact or exposure to chemical.	Clear signage at fill point Bunded/graded filling area Emergency response team in place Spill control kits available Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good Access control in chemical tanker unloading area. Dual locks for compatible/incompatible coupling adaptors for acid and bases (one at the connection point and one at the adapter storage location).
	Pallet of hazardous chemicals is dropped	Injury or harm to personnel due to contact or exposure to chemical. Spill outside bunded area entering stormwater system.	Bunding Stormwater isolation Emergency response team in place Spill control kits available Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good Trained forklift drivers

Table 5-3: Event/Consequence Analysis Table

Functional/Operational Area	Possible Initiating Event	Possible Consequences	Prevention/Protection Measures
Storage and use of bulk hazardous chemicals	Tank failure, spill	Injury or harm to personnel due to contact or exposure to chemical. Spill escapes stormwater.	Bunding Stormwater isolation Emergency response team in place Spill control kits available Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good
	Pipe failure, leak	Injury or harm to personnel due to contact or exposure to chemical. Spill escapes stormwater.	
Cleaners store	Spill of chemicals	Injury or harm to personnel due to contact or exposure to chemical. Spill escapes stormwater.	Chemicals stored in bunded rooms/cabinets/on bunded pallets. Stormwater isolation Emergency response team in place Spill control kits available Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good
	Mixing of incompatible substances	Incompatible reactions occurring that may cause injury or harm to personnel.	Chemicals kept apart or segregated in accordance with AS3833:2007 and AS3780-2008 Emergency response team in place Spill control kits available Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good
Mixing and processing tanks	Tank failure, spill	Very hot liquid escaping causing severe injury or harm to personnel. Spill escapes stormwater.	Emergency response team in place Spill control kits available Preventive maintenance programme in place including routine safety/integrity checking of tanks.

Table 5-3: Event/Consequence Analysis Table

Functional/Operational Area	Possible Initiating Event	Possible Consequences	Prevention/Protection Measures
Packaging storage	Packaging (cardboard/plastic) coming in contact with ignition source	Minor fire Major fire spreads through facility causing significant harm to human health property and environment.	Strict ignition control in all areas containing packaging. Fire service provided Emergency response team in place
WWTP	Spill of wastewater	Wastewater release into creek or stormwater.	Bunding Stormwatering isolation Emergency response team in place Spill control kits available Preventive maintenance programme in place

5.6.3 Hazards Identified for Further Investigation

Given the information listed in Table 5-3, the potential hazards identified for further investigation to determine credibility of risk:

- Spill of Phosphoric Acid
  - Potential release of toxic gas
- Spill of Lactic Acid
  - Potential release of toxic gas
- Spill of Caustic Soda
  - Potential release of toxic gas
- Reaction of Phosphoric Acid and Caustic Soda
  - Potential release of toxic gas
  - Potential heat release
- Reaction of Lactic Acid and Caustic Soda
  - Potential release of toxic gas
  - Potential heat release

5.6.3.1 Toxic Gas Release

Phosphoric Acid
The vapour pressure of the phosphoric acid solution is not available. Its boiling point is 138-171°C and has a decomposition temperature of 300°C. The SDSs state it is harmful if inhaled, may release hydrogen gas in contact with metals. Given the high boiling point and decomposition temperature and limited data available for vapour pressure it is not considered credible that a spill of phosphoric acid could release toxic gases/fumes that would generate offsite impacts.

Phosphoric acid comes in contact with metals when it is mixed in the mixing tank and processing tank (these are metal) it is highly diluted in this process and is unlikely to generate hydrogen gas that represents a risk to personnel and would not have any offsite impacts.

Lactic Acid
The vapour pressure of the lactic acid is 0.0813 mm Hg @ 25°C (0.01kPA) (water has a vapour pressure of 2.4kPA). Its boiling point is 112°C and has a decomposition temperature of 300°C. The SDSs state it is harmful if inhaled and is incompatible with metals. Given the high boiling point, decomposition temperature and very low vapour pressure it is not considered credible that a spill of lactic acid could release toxic gases/fumes that would generate offsite impacts.

Lactic acid comes in contact with metals when it is mixed in the mixing tank and processing tank (these are metal) it is highly diluted in this process and is unlikely to represents a risk to personnel and would not have any offsite impacts.

Caustic Soda
The vapour pressure of the lactic acid is 1.34 mm Hg Hg @ 20°C (0.18kPA) (water has a vapour pressure of 2.4kPA). Its boiling point is 145°C. It is not known for hazardous decomposition products. It reacts exothermally on dilution with water. The SDSs state it is harmful if inhaled. Given the high boiling point, low vapour pressure it is not considered credible that a spill of lactic acid could release toxic gases/fumes that would generate offsite impacts.

Incompatible Substance Reaction
In accordance with the SDSs these acids may react violently with bases. However, the bioproducts of this reaction is not considered a significant risk:

- Caustic soda (NaOH) and phosphoric acid react to make sodium phosphate and water. Sodium phosphate is a substance ingested to empty the colon prior to a colonoscopy (FDA approved and low risk).
- Caustic soda (NaOH) and lactic acid react to make sodium lactate and water. Sodium lactate is non-toxic and biodegradable and is used for electrolyte replenishment and as a systemic alkaliser.

These reactions do not generate toxic substances or release gaseous emissions.

5.6.3.2 Heat Release

Caustic soda may react exothermally with incompatible substance (see reactions above), and also may react exothermally when diluted with water. Given that the enthalpy of formation for sodium lactate is unavailable and lactic acid is the weaker acid, the reaction between caustic soda and phosphoric acid will be examined for potential heat release.

$Q=mc\Delta T$
$Q=\Delta H$

Where m is the mass, ΔT is the change in temperature and Q is the heat energy released and ΔH is the change in enthalpy.

Enthalpies of formation
Sodium Hydroxide = -425.93kJ/mol
Phosphoric Acid = -1287.38kJ/mol
Water=-292.74 kJ/mol
Sodium Phosphate = -3210kJ/mol

$3\ NaOH + H3PO4 \rightarrow Na3PO4 + 3\ H2O$

The energy released in the equation above based on the enthalpies of formation:

ΔH = ((-3210)+ 3(-292.74))-((3(-425.93)+(-1287.38)) = -1544.05kJ/reaction => 514.7 kJ/Mol NaOH released (exothermal)

Assuming all moles of NaOH stored on site react to release this energy:
Q=45,000,000(g)*0.5(50% solution)/39.997(g/mol)*514.7(kJ)=2.9*10^8kJ

Number of moles of phosphoric acid in reaction is 187514mole => mass 1913g => 6.378kg/L of 30% solution

ΔT = 2.9*10^11(J)/45,006,378(g)/3.9(J/g) = 1660°C

While in practice there would be many mitigating factors that would not cause such an extreme increase in temperature, this level of energy release would result in a rupturing of the vessels.

The violent release of chemicals would be hazardous to any personnel caught near the event and a further assessment of offsite impacts from vessel failure is warranted.

Unpressurised liquid storage tanks typically fail at pressures well below 1 bar and are not considered a credible overpressure risk.

5.7 CONSEQUENCE ANALYSIS

A scenario for heat of radiation from a violent reaction of incompatible substances has been considered for further analysis:

Using TNO Effects 7.6.0 safety modelling software, the heat of radiation pool fire model has been utilised to simulate the heat generated from an exothermal reaction with caustic soda and phosphoric acid. Utilising formic acid as a proxy due to it's similar heat of combustion properties (J/kg) to heat energy released calculated in section 5.6.3.2. A 20 sqm pool fire has been modelled. Heat of radiation effects vs distance are as follows:

- 3 kW/m^2: 7.6 m
- 4.7 kW/m^2: 6.8 m
- 12.6 kW/m^2: 4.3 m
- 23 kW/m^2: 3.9 m

Contours are shown in the following figure.

Figure 5-2: Heat of Radiation Contours

The heat of radiation contours are contained well within the site boundary and present no offsite risks.

5.8 FINAL RISK REGISTER

The following sections present discussion of the results. Table 5-4 presents the final risk register.

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
1. Hazardous Chemicals															
1	Violent release of energy	Tanker collision	Forklift collision Collision with other truck Collision with building or object -speeding/driver fatigue/intoxication	Trained drivers, Preventive maintenance programme in place vehicles registered , DG licensed drivers, inspected vehicles,	Large spill outside bunded area entering stormwater system and receiving waterways. Injury or harm to personnel due to contact or exposure to chemical.	Spill control kits available Stormwater isolation Emergency response team in place	Significant	Unlikely	III	Yes		Significant	Unlikely	III	Yes
2	Violent release of energy	Corrosive tank failure	Tanker truck connects and delivers hose to incompatible substance tank	Clear signage at fill point Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good	Severe injury or death to personnel in close proximity. Escape to stormwater	Spill control kits available Bunding Safety showers Emergency response team in place	Severe	Possible	II	No	Access control in chemical tanker unloading area. Dual locks for compatible/incompatible coupling adaptors for acid and bases (one at the connection point and one at the adapter storage location).	Severe	Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
2. Processing Activities															
3	Violent release of energy	Processing tank failure	Vent blockage, structural failure	Emergency vent installed in addition to operational odour control vent. Preventive maintenance programme in place Staff trained in the storage and handling of stored dangerous good	Large quantity of boiling liquid release Severe injury or death to personnel in close proximity.	Bunding Emergency response team in place	Severe	Unlikely	III	Yes		Severe	Unlikely	III	Yes
3. General Site Risks															
4	External Fire / Explosion	Vehicle fire	Brake fire. Tyre fire. Fuel leak (e.g. truck use and fire. Batteries short-circuiting. Packaging fires	Vehicle design and maintenance, vehicles registered , DG licensed drivers, inspected vehicles, no smoking on site (except in the designated area), hot work permit	Damage to the vehicle, propagation to package goods storage and property damage	Operator response to oil leaks, fire extinguishers, fire water available from hydrants and hand-held hoses, emergency response plan includes actions to take if a fire occurs	Significant	Unlikely	III	Yes		Significant	Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
5	Environmental Pollution	Potential for environmental impact from vehicle fuel or oil leaks	Fuel or oil leaks from vehicles, i.e. leaching through the bitumen or entering the stormwater system with the ultimate potential to flow off-site to the local creeks.	Vehicle design and maintenance, vehicles registered, DG licensed drivers, inspected vehicles	Impact to the aquatic life in the local creeks.	Spill kit on DG vehicle, emergency response plan with sand bags and the requirement to close the stormwater isolation valve to the local creeks.	Significant	Possible	III	No	Obtain hydrocarbon spill kits for the site	Significant	Unlikely	III	Yes
					Potential for a fine (business impact)		Minor	Possible	III			Minor	Unlikely	III	Yes
6	Transport Hazards	Impact from FLT	Driver error. Excessive speed. Poor visibility, e.g. corners of warehouses	All FLT drivers licensed, site speed limit, observations of work practices by management, mirrors on warehouse corners	Injury to personnel	Trained First Aider on site, First Aid facilities	Severe	Possible	II	No	Formalise work practice reviews by management, e.g. via an audit program. Include in the site induction the site speed limit	Severe	Unlikely	III	Yes
					Damage to property, e.g. FLT rollover	Maintenance and repair	Minor	Possible	III	No		Minor	Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
7	Transport Hazards	Loss of load whilst using a FLT	Rough floor surface. Tynes piercing containers and packages. Driver error. Excessive speed. Poor visibility	All FLT drivers licensed, site speed limit, observations of work practices by management, mirrors on warehouse corners	Injury to personnel if pallet dropped from a height	Routine maintenance of the roads to fix cracks and holes, trained First Aider on site, First Aid facilities	Ex. Serious	V. Unlikely	III	Yes		Ex. Serious	V. Unlikely	III	Yes
					Release of materials leading to environmental impact	Housekeeping and spill response including isolation of the spill using spill control kits	Severe	Ex. Unlikely	III	Yes		Severe	Ex. Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
8	External Fire / Explosion	Warehouse fire	Ignition of packaging (i.e. cardboard), plastic wrap, wooden pallets, Vehicles fires. Conveyor fires. Smoking. Lightning strike. Grass fires. Adjacent property fires. Arson. Broken fluorescent light. Appliance fire.	Vehicle design and maintenance, licensed FLT drivers, no smoking on site (except in the designated area), hot work permit, landscaping to keep grass level low, security system including fully fenced site, locked gates when facility not in use, smoke detectors within selected buildings	This can result in toxic products of combustion equipment and property damage from radiant heat, missiles (e.g. LPG cylinders), rupturing of containers and contaminated fire water runoff.	Fire sprinkler systems installed, fire water from hydrants, emergency response including off-site evacuations, hand held hoses and extinguishers for small fires	Ex. Serious	Unlikely	II	No	Provide covers over all lights within the warehouse. Provide routine electrical testing for all electrical leads and earth leakage detectors at the site. Incompatible materials should not be stored in the same area.	Ex. Serious	Unlikely	II	Yes
9	Activity Hazards	Manual handling injuries due to personnel lifting containers and boxes	Inadequate lifting techniques, one person lifting a 40 kg container (a two person activity)	Training program on correct lifting techniques, signage, observations by management, toolbox talks on issues such as correct lifting techniques, job rotation	Injuries, e.g. back injuries, and chemical exposure injuries (skin and eyes). Potential for spillage of solutions.	Medical treatment required	Severe	Probable	II	Yes		Severe	Probable	II	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
10	Activity Hazards	Personnel exposed to dust	Spill cleaning. Disposing of empty packaging	Skin protection via sprayed on barrier cream	Harm to skin, lungs, eyes	Medical treatment required	Minor	Probable	III	No		Minor	Probable	III	Yes
11	Violent Release of Energy	Warehouse racking collapse	Impact from FLT. Excessive weight. Corrosion. Fire. Fatigue. Poor lighting in warehouses	Licensed FLT drivers, site speed limit, racking designed for single pallet stacking only, Dexion perform a routine racking audit, job rotation, FLT fitted with lights	Potential for spills within the bunded warehouses and injury to personnel	Medical treatment required	Ex. Serious	V. Unlikely	III	Yes		Ex. Serious	V. Unlikely	III	Yes
12	Natural and Other Occurrences	Aircraft crash	Pilot error, plane failure	Aviation standards for aircraft design, maintenance and safe operation (not relevant to site design)	Significant damage and injury toll across the site	Emergency response	Catastrophic	Ex. Unlikely	III	Yes		Catastrophic	Ex. Unlikely	III	Yes
13	Activity Hazards	Lone workers	Activities on site where personnel are working in isolation	Supervisors conduct regular visits to all work areas	In an emergency, assistance may be inadequate	Emergency response	Serious	Possible	II	No	Implement means for detecting when lone workers are in need of emergency assistance	Serious	Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
14	Harmful Exposure	Flammable materials.	Ignition of packaging (i.e. cardboard), plastic wrap, wooden pallets, Vehicle fires. Conveyor fires. Hot work. Smoking. Lightning strike. Grass fires. Adjacent property fires. Arson. Broken fluorescent light. Appliance fire.	Vehicle design and maintenance, licensed FLT drivers, no smoking on site (except in the designated area), hot work permit, landscaping to keep grass level low, security system including fully fenced site, locked gates when facility not in use, smoke detectors within selected buildings.	Potential to release decomposition products	Fire water from hydrants, emergency response including off-site evacuations, hand held hoses and extinguishers for small fires	Severe	V. Unlikely	III	Yes		Severe	V. Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
15	Exposure to Damaging Energy	Electrocution	Contact with electricity due to poor quality electrical lead, damaged conduits, e.g. submersible pump for the waste liquid concrete underground tank	Earth leakage protection on all GPOs	Fatality	Emergency response	Ex. Serious	Unlikely	II	No	As above, implement electrical safety testing	Ex. Serious	V. Unlikely	III	Yes
16	Activity Hazards	Contact with moving parts	Motors/conveyors	Observations by management, operator training and awareness, guards, covers and protection on rotating parts an inter-locks where possible	Injury if clothing and body caught in the machines	Trained First Aider on-site and First Aid facilities	Severe	Possible	II	No	As above, include formal reviews of machine safety	Severe	Unlikely	III	Yes
17	Violent Release of Energy	Compressed air hose failure	Inadequate connection, hose degradation, coupling failure	Hoses inspected annually and replaced as required, operators respond to leaking hoses for maintenance, low pressure in the hoses, hoses tied when in use	Injury to personnel if struck with a flaying hose	Medical treatment required	Significant	Unlikely	III	Yes		Significant	Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
18	Activity Hazards	Confined space entry	Person enters a tank or pit	Work permits, all confined spaces to be marked with signs and entry by permit only	Potential for fatality		Ex. Serious	V. Unlikely	III	No	Review means to prevent people falling through tank manholes. Identify all confined spaces on the site and then produce confined space risk assessments	Ex. Serious	V. Unlikely	III	Yes
19	Natural and Other Occurrences	Software theft	Hacking	Firewalls	Loss of company confidential information		Serious	V. Unlikely	III	Yes		Serious	V. Unlikely	III	Yes
4. Front Gate Activities															
20	Transport Hazards	Heavy vehicle movement resulting in impact	Heavy vehicle brake failure (i.e. unplanned movement down the slope). Driver error	Modern vehicle design includes brakes being locked when the motor is off	Injury to people and/or damage to equipment (including other vehicles). This could also result in pallets falling off the heavy vehicle resulting in spills and/or injury	Medical treatment	Ex. Serious	V. Unlikely	III	No	Use wheel chocks to prevent trucks rolling down the slope	Ex. Serious	V. Unlikely	III	Yes

Table 5-4: Hazard and Risk Register

Event Number	Hazard Identification Guide Word	Hazardous Event	Causes	Prevention Safeguards	Consequences	Mitigation Safeguards	Consequences	Likelihood	Existing Risk Rating	Is the risk ALARP?	Additional Safeguards	Consequence	Likelihood	Residual Risk Rating	Is the risk ALARP?
21	Transport Hazards	Forklift truck operations when pallet loaded onto a truck (applies for all similar operations across the site)	Dropping pallets off tynes. Impact with people, heavy vehicle and/or property. Piercing of containers. Pinch hazards	Licensed FLT drivers, site speed limit, observation by management, stretch wrap around the packages on the pallets	Injury to people and/or damage to equipment	Medical treatment	Ex. Serious	V. Unlikely	III	Yes		Ex. Serious	V. Unlikely	III	Yes
					Spilt material could cause environmental impact if it flows off-site through the stormwater system	Spill response	Severe	Unlikely	III	Yes		Severe	Unlikely	III	Yes
22	Environmental Pollution	Raw materials or products on a vehicle's wheels and driven off-site	Vehicles drive through a spill and material sticks to the wheels of the vehicles	Housekeeping and spill response, small size of the packages limits amount involved, stretch wrapping provides some containment	Potential for materials to pollute the environment when washed into the off-site stormwater drains	Off-site response to contaminants on the roads	Significant	Possible	III	Yes		Significant	Possible	III	Yes

6. RECOMMENDATIONS

After having examined the potential hazardous scenarios that could occur on site, the following recommendations are considered to be fundamental in aiding the control of risks presented by the proposed development:

- Dangerous good storage areas are to comply with the following standards:
  - AS3780-2008 – The storage and handling of corrosive substance
  - AS/NZS 3833:2007 – The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers

Access control in chemical tanker unloading area. Dual locks for compatible/incompatible coupling adaptors for acid and bases (one at the connection point and one at the adapter storage location).

- Overpressure vents to be installed on all tanks. Ensure tanks required to be vented to odour control system have an additional emergency overpressure release vent.

- Site management to routinely review and maintain operational procedures to minimise the number of hazardous incidents and accidents on site and to mitigate the consequences of incidents regarding the handling of dangerous goods and chemicals.

- Site employees and truck drivers shall be trained in the Spill Management Plan prepared for the site.

- Preparation of a manifest and site manifest plan and notification is required.

- An Emergency Plan is to be prepared and implemented this needs to include (not limited to):
  - Fire Emergency Information Package (undertaken in accordance with the NSW Fire and Rescue Fire safety guideline – Emergency services information package and tactical fire plan).
    - Site plan showing fire services
    - Site plan showing location of the dangerous goods on site
    - Dangerous Goods Register
    - Evacuation overview
    - Tactical check list and fire plans
  - Emergency and evacuation procedures
  - Emergency contact details of key personnel
  - Contact details of local emergency services
  - Description of emergency or possible emergency alert mechanism

7. CONCLUSION

A preliminary hazard analysis (PHA) has been carried out for the proposed pet food ingredient manufacturing facility located at Lot 206, 91 Gardiner Street, Rutherford 2320.

in accordance with the Multi-Level Risk Assessment and Hazardous Industry Planning Advisory Papers (HIPAPs) guidelines. The results from this assessment determined that the site's proposed operations are not an offensive or hazardous industry.

There are no credible events that would generate any offsite risks to the residents or neighbouring existing or future occupants.

It is the conclusion of this assessment that the proposed site and its operations would meet all the safety requirements. The proposed additions would not be an offensive or hazardous development.

Approval is requested.

Prepared by:

Emma Hansma
Senior Engineer

R T Benbow
Principal Consultant

8. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of SPF Diana Australia Pty Ltd, as per our agreement for providing environmental services. Only SPF Diana Australia Pty Ltd is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by SPF Diana Australia Pty Ltd for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

9. REFERENCES

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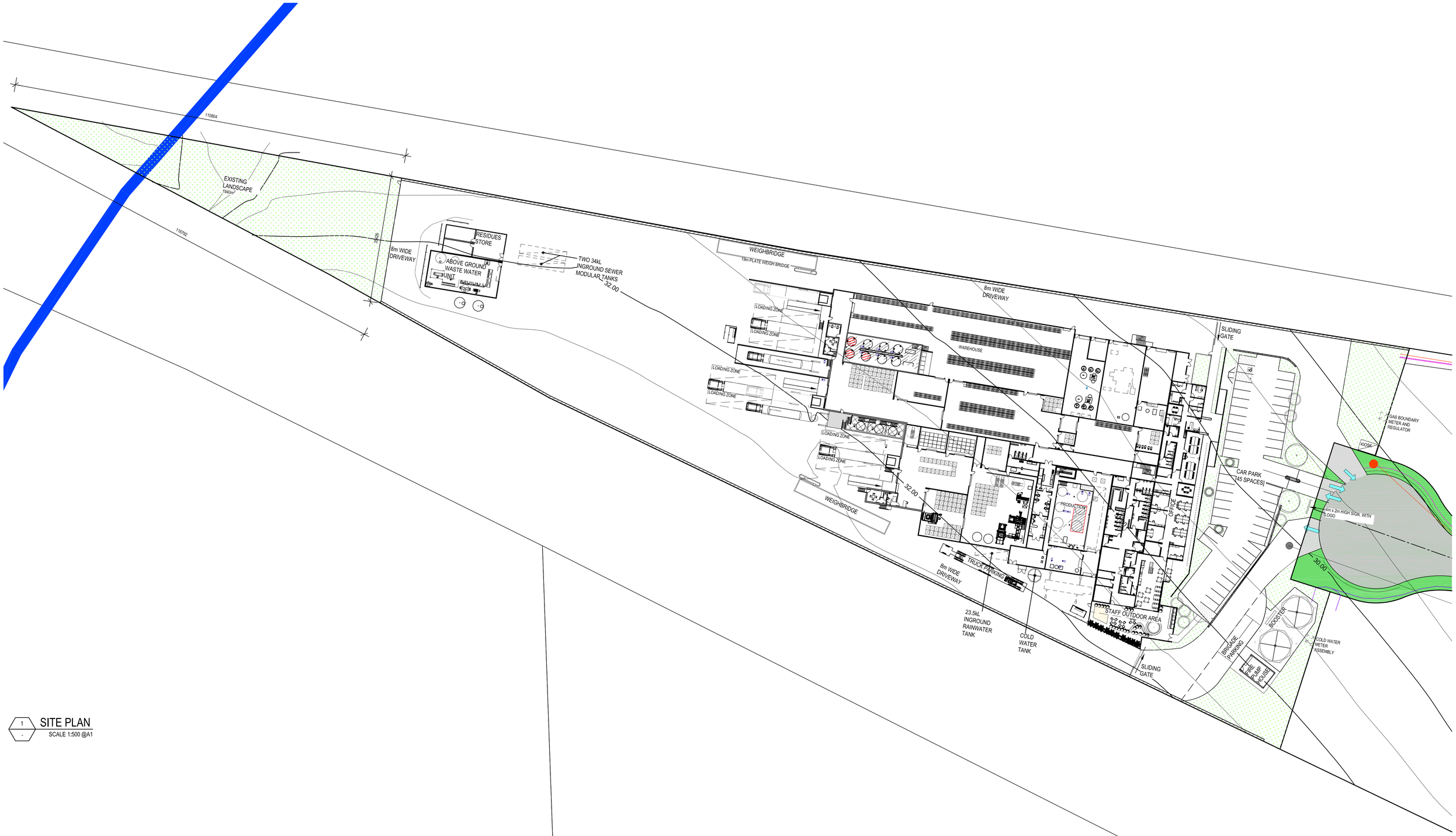
ATTACHMENTS

Attachment 1: Site Plans

dianapetfood



1 SITE PLAN
SCALE 1:500 @A1

SK-0009 PROPOSED SITE PLAN - OPTION 7 REV S7 28.02.2022 DO'D BAS210121-LCI - DIANA PET FOOD, RUTHERFORD NSW

0 5 10 15 20 25m
Scale 1:500

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