Fire Impact Management Plan

30 Daisy St, Revesby NSW 2212

BSV Tyre Recycling Australia Pty Ltd
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Fire Impact Management Plan

30 Daisy St, Revesby NSW 2212

BSV Tyre Recycling Australia Pty Ltd

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Rev	Date	Remarks	Prepared By	Reviewed By
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0	20th September 2024	Final version		

Executive Summary

Background

BSV Tyre Recycling Australia Pty Ltd (BSV) has proposed to undertake alterations, additions and expansion of recycling facility in Revesby, NSW. The City of Canterbury Bankstown requires the preparation of a Fire and Incident Management Plan (FIMP) as part of the approval process. It has been proposed to prepare the FIMP in accordance with the Hazardous Industry Planning Advisory Paper (HIPAP) No. 2 (Ref.), the Fire & Rescue NSW (FRNSW) fire safety guidelines in waste facilities (Ref.), and the Fire Safety Guidelines for Bulk Storage of Rubber Tyres (GBSRT) (Ref.).

JEP Environment and Planning, on behalf of BSV, has commissioned Riskcon Engineering Pty Ltd (Riskcon) to prepare the FIMP. This document represents the assessment of the facility located at 30 Daisy St, Revesby NSW 2212 (Lot 198, DP7866).

Conclusions

The FIMP has been developed for the site at 30 Daisy St, Revesby NSW 2212 (Lot 198, DP7866) in accordance with HIPAP No. 2, Fire Safety Guidelines for Bulk Storage of Rubber Tyres and Fire Safety Guidelines in Waste facilities as part of the requirements in the SEARs to satisfy the fire and incident management requirements for the site.

The analysis performed in the FIMP was based on credible fire scenarios to assess whether the protection measures at the site were adequate to combat the hazards associated with the quantities and types of commodities being stored. Based on the review, the fire risks were identified and recommendations were made to be incorporated into the design to minimize the fire risks at the site.

Recommendations

Based on the analysis, the following recommendations have been made:

- Ensure appropriate fire prevention measures and emergency response strategies are in place.
- Allocate separate DG storage cabinets for flammable liquids and corrosive substances in accordance with AS 1940:2017 and AS 3780: 2023, respectively.
- Adequate spill kits are to be located adjacent to the combustible liquids storage area, flammable liquid cabinet and corrosive cabinet locations.
- The combustible liquid tanks are to comply with AS 1692.
- Two powder-type extinguishers are to be located within 15 m of the grease and engine oil store and not be located closer than 3 m and not further than 10 m from the flammable liquid and corrosive cabinets.
- Stockpile limits within the storage areas will be marked as per **section 4.11**.
- The site shall host FRNSW as a part of a site familiarisation to highlight the potential for tyre fires and potential for toxic smoke formation.
- A windsock shall be installed at the site to assist FRNSW in identifying the wind direction such that they do not establish a command centre downwind of the fire that may release toxic gases (i.e. Sulfur dioxide).

- Ensure all site attendees, staff, and drivers adhere to the no-smoking policy implemented on site.
- Develop a hot work permit system to control any hot work undertaken at the site.
- Consider installing CCTV to monitor for intruders.
- An Emergency Response Plan (ERP) shall be upgraded as per new proposal and process set up for the site in accordance with the Hazardous Industry Planning Advisory Paper No. 2.
- An Emergency Services Information Pack (ESIP) shall be developed for the site in accordance with the Fire & Rescue NSW fire safety guideline "*Emergency Service Information Pack and Tactical Fire Plans*".
- The requirement for smoke hazard management systems shall be reviewed by a fire engineer and confirmed whether smoke hazard management is required.
- A suitable fire extinguisher shall be available within 10 m of any area where rubber products are stored, sorted, or handled.
- The site is to replace the single head fire hydrants with dual fire hydrants near the tyre storage areas, within 60 m of each other as per **Figure 6-1** to ensure that each hydrant can be supported by an adjacent hydrant in the event of impact.
- The facility and / or site boundaries shall be capable of containing 108 m^3 which may be contained within the building footprint, site stormwater pipework, and any recessed docks or other containment areas that may be present as part of the site design.
- The civil engineers designing the site containment shall demonstrate the design is capable of containing at least 108 m^3.
- The existing isolation system, designed to prevent the external discharge of potentially contaminated firewater, should be regularly maintained and tested to ensure ongoing effectiveness.
- A hydraulic analysis of the hydrants shall be undertaken to confirm that the available pressure for the most hydraulically disadvantaged hydrant complies with AS 2419.1:2021.
- A fire hose reel system shall comply with AS 2441:2005.
- Portable fire extinguishers shall comply with AS 2444:2001.

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Abbreviations

Abbreviation	Description
AS	Australian Standard
BA	Breathing Apparatus
BCA	Building Code of Australia
BSV	BSV Tyre Recycling Australia Pty Ltd
CBD	Central Business District
DGs	Dangerous Goods
ERP	Emergency Response Plan
ESIP	Emergency Services Information Pack
FBIM	Fire Brigade Intervention Model
FIMP	Fire and Incident Management Plan
FRNSW	Fire and Rescue New South Wales
FSGBRT	Fire Safety Guidelines for Bulk Storage of Rubber Tyres
HIPAP	Hazardous Industry Planning Advisory Paper
IWTS	Integrated Waste Tracking System
MRV	Medium Ridged Vehicle
PHA	Preliminary Hazard Analysis
SEARs	Secretary Environmental Assessment Requirements
SEP	Surface Emissive Power
STEL	Short-Term Exposure Limit
TDF	Tyre Derived Fuel
WCCFS	Worst Credible Case Fire Scenario

1.0 Introduction

1.1 Background

BSV Tyre Recycling Australia Pty Ltd (BSV) has proposed to undertake alterations, additions and expansion of recycling facility in Revesby, NSW. The City of Canterbury Bankstown requires the preparation of a Fire and Incident Management Plan (FIMP) as part of the approval process. It has been proposed to prepare the FIMP in accordance with the Hazardous Industry Planning Advisory Paper (HIPAP) No. 2 (Ref. [1]), the Fire & Rescue NSW (FRNSW) fire safety guidelines in waste facilities (Ref. [2]), and the Fire Safety Guidelines for Bulk Storage of Rubber Tyres (GBSRT) (Ref. [3]).

JEP Environment and Planning, on behalf of BSV, has commissioned Riskcon Engineering Pty Ltd (Riskcon) to prepare the FIMP. This document represents the assessment of the facility located at 30 Daisy St, Revesby NSW 2212 (Lot 198, DP7866).

1.2 Objectives

The objectives of the FIMP are to:

- Review the site operations and storage for the potential to initiate or become involved in a fire including flammable or combustible materials which may be present at the site.
- Identify heat radiation impacts from potential fire sources at the site and determine the potential impacts on the surrounding areas and fire protection system.
- Review the proposed fire safety features and determine the adequacy of the fire safety systems based on the postulated fires.

1.3 Scope of Services

The scope of work is for the preparation of an FIMP for the facility to assess the potential hazards at the site to ensure the fire protection systems are commensurate with the identified hazards. This document follows the methodology recommended in HIPAP No.2 (Ref. [1]). A review of the following components of the FIMP are within the scope of work:

- Determination of risk and consequences from fire or explosion scenarios throughout the facility.
- The preparation of a report on fire prevention, fire detection, fire alarm and fire suppression systems for the site.
- Firewater storage capacity for compliance with Australian Standards and Regulations.
- Review of external fire hydrant configuration and locations.
- Recommendations based upon the study for implementation in the final design.

2.0 Methodology

2.1 Fire Incident Management Plan Approach

The following methodology was used in the preparation of the FIMP for the facility. The methodology is to follow items required by HIPAP No. 2 (Ref. [1]).

- The fire hazards associated with the facility were identified to determine whether any fire or explosion hazards may impact offsite or result in a potential to escalate. Where fire hazards with the potential to impact offsite or escalate were identified, these were carried forward for consequence assessment.
- The heat radiation impacts or overpressure impacts (consequences) from each of the postulated incidents from the proposed equipment were then estimated and potential impacts on surrounding areas assessed.
- Impacts of the fires from the proposed equipment were plotted on a layout plan of the proposed facility, to determine whether heat radiation impacts any critical areas (i.e. adjacent storage areas, fire services, safety systems, etc.) and whether such impact affected the ability of firefighters to respond to the postulated fire. The heat radiation impact from incidents at adjacent sites on the buildings and structures at the facility was then assessed against the maximum permissible levels in HIPAP No. 4 (Ref. [4]).
- The firefighting strategies were then assessed to determine whether these strategies require updating in light of the location of the proposed equipment and storage areas.
- The response times for Fire & Rescue NSW (FRNSW) in the immediate vicinity were assessed. In addition, further outlying FRNSW stations were included to provide a 'backup plan' in the event that the closest fire brigades were unable to attend.
- A report was then developed for submission to the client and the regulatory authority.

2.2 Limitations and Assumptions

In this instance, the FIMP is developed based on applicable limitations and assumptions for the development which are listed as follows:

- The report is specifically limited to the project described in **Section 2.1**.
- The report is based on the information provided.
- The report does not provide guidance in respect of incidents that relate to sabotage or vandalism of fire safety systems.
- The assessment is limited to the objectives of the FIMP as provided in the guidelines issued as HIPAP No. 2 (Ref. [1]) and does not consider property damage such as building and contents damage caused by fire, potential increased insurance liability and loss of business continuity.
- Malicious acts or arson with respect to fire ignition and safety systems are limited in nature and are outside the scope of this report. Such acts can potentially overwhelm fire safety systems and therefore further strategies such as security, housekeeping and management procedures may better mitigate such risks.
- This report is prepared in good faith and with due care for information purposes only and should not be relied upon as providing any warranty or guarantee that ignition or fire will not occur.

3.0 Site Description

3.1 Site Location

The site is located at 30 Daisy St, Revesby NSW 2212 which is approximately 20 km southwest of Sydney Central Business District (CBD). **Figure** 3-1 shows the regional location of the site in relation to the Sydney CBD.

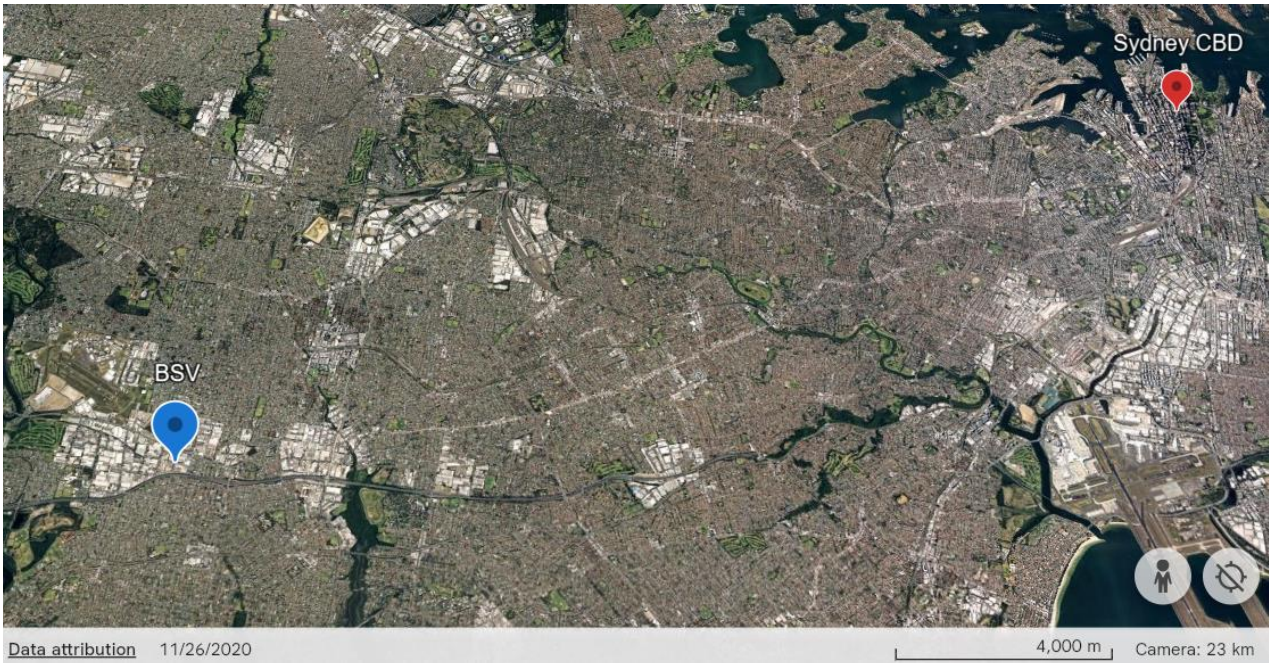


Figure 3-1: Site Location

3.2 Adjacent Land Uses

The site is zoned as IN1 general industrial zoning under LEP 1988. The lot is surrounded by the following land uses, which are adjacent to the site:

- North – IN1 General Industrial (Japan Ceramics, ceramic wholesaler)
- South – IN1 General Industrial (InForme Signs, Sign writers)
- West – IN1 General Industrial (U-Go Mobility - Revesby Bus Depot, transportation service)
- East – IN1 General Industrial (ECCOSIT; office furniture store)

Note that the Site has several nearby land use zones, including SP2 Infrastructure, R2 Low Density Residential, B2 Local Centre, and RE1 Public Recreation.

3.3 Project Background & Description

BSV Tyre Recycling Australia Pty Ltd operates an EPA licenced resource recovery facility for used tyres at 30 Daisy Street, Revesby NSW (EPL 20387). The company is accredited by Tyre Stewardship Australia (TSA), the peak industry body established to ensure the sustainable management of used tyres in Australia.

The site contains a single storey industrial building with associated mezzanine office level. The factory environment within this building is used for tyre shredding and crumbing with mechanical plant and equipment. A weighbridge is located on the southern boundary of the site. A large outdoor covered area at the rear eastern side of the site is used for tyre storage, baling and containerisation. The lot has a total area of approximately 4,000m^2.

BSV has development consent under DA843/2013 for the receipt, processing and production of various tyre derived products from used car and truck tyres received. The site has historically relied on the baling and export of used tyres. In 2019, the Council of Australian Governments (COAG) agreed to ban the export of a range of waste types including whole tyres (except truck, bus and aviation tyres being exported for re-treading), which commenced on 1 December 2021. Since this date, the facility has focused on crumb rubber production for use in asphalt making and sustainable children playground surfaces, and the production of a tyre chip which is exported as a coal replacement (referred to as a Tyre Derived Fuel or TDF).

Consequently, BSV is seeking approval for alterations and additions to its development consent to increase the production of TDF. The Proposal will increase the receival limit of tyres from 14,600 tonnes per year to 29,900 tonnes per year, whilst retaining the ability to manufacture rubber crumb when demand is displayed by the domestic market. Crumb rubber production capability will remain as approved in the shed under DA843/2013.

Two additional staff members will be employed, bringing the total staff from fifteen (15) to seventeen (17). Also, a maximum of nine (9) staff members will be on-site at any given time which ensures compliance with available parking spaces.

Tyres will be transported to the facility in medium rigid vehicles (MRV's) and in forty cubic foot shipping containers transported by side loading semi-trailers. All vehicles will enter the site in a forward direction over the weighbridge on the southern side of the site, and will exit in the forward direction over the weighbridge and out of the site. All product hauled off-site will be containerised in forty cubic foot shipping containers for transport via semi-trailers to Port Botany for export. The site is not subject to local flooding and is identified outside the Salt Pan Creek flooding area within the low flood risk precinct. The finished floor level of the development is above the 100-year flood level and can be adequately utilised to store goods above the 100-year flood level. The site does not include the storage of any polluting or potentially hazardous materials within the 100-year flood level. Provided in **Figure 3-2** and **Figure 3-3** are an aerial view of the Site boundary and site layout, respectively.

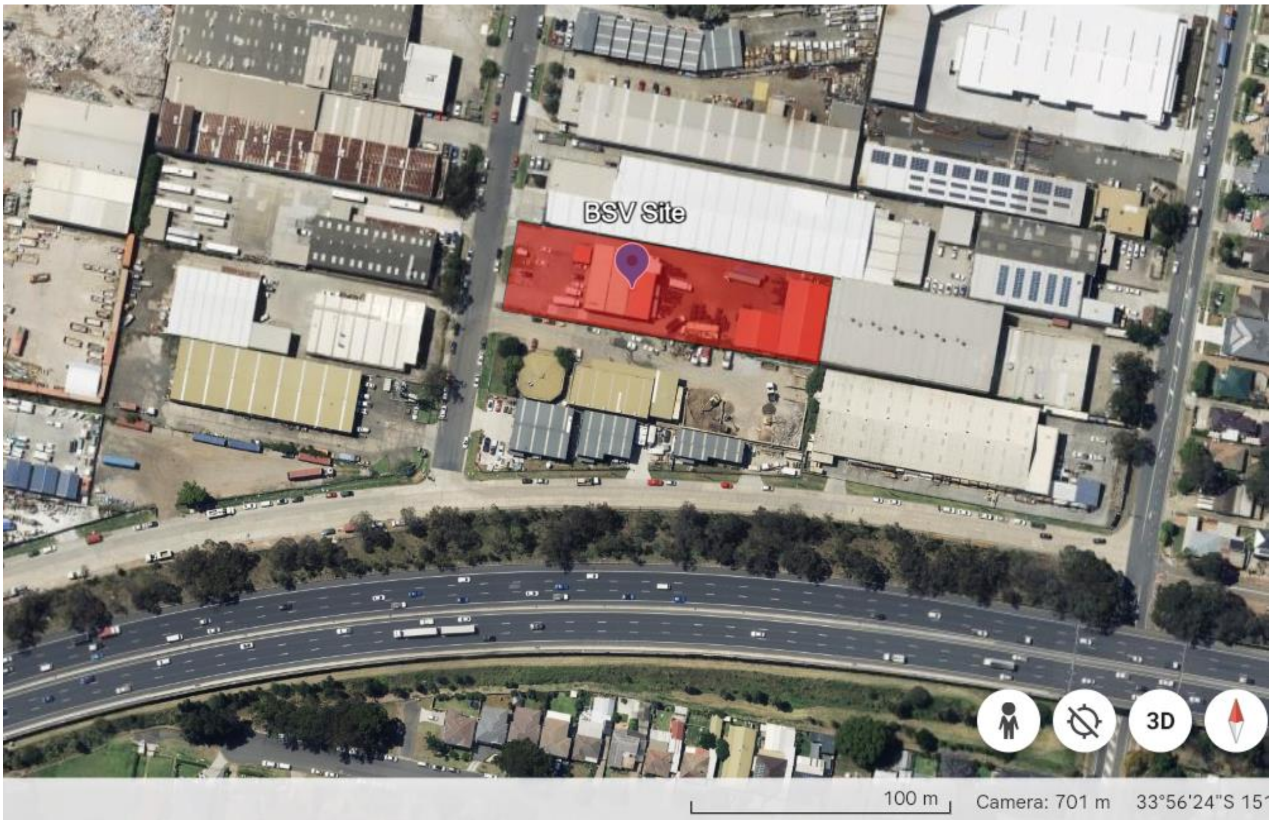


Figure 3-2: Areal View of showing the BSV site (pinned area), Lot 198 / DP 7866, (outlined in red)

The Facility operates as a recovery resource facility, processing up to 14,600 tonnes of tyres per year. BSV is seeking approval for alterations and additions to its development consent to increase the production of Tyre Derived Fuel (TDF).

The Proposal will increase the receival limit of tyres from 14,600 tonnes per year to 29,900 tonnes per year, whilst retaining the ability to manufacture rubber crumb when demand is displayed by the domestic market. The operation is wholly contained within existing buildings. Deliveries to the site will be received via Medium Rigid Vehicles (MRV) of up to 8.8m in length and in 40 foot shipping containers transported by 19m Semi-Trailers. Delivery vehicles enter the site from Daisy St in a forward direction and will proceed to the weighbridge.

Tyres will be unloaded using a forklift, and during this stage, they will be sorted by type, with any contaminants removed for proper recycling or disposal. Two temporary storage areas will be designated for tyres awaiting processing, in compliance with the NSW Fire and Rescue 2014 Fire Safety Guideline – Guideline for Bulk Storage of Rubber Tyres (GBSRT) (Ref. [3]). At the end of each working day, all tyres will be stored in shipping containers.

All vehicles entering the site will enter via Daisy Street in a forward direction. Except for staff operational vehicles, all vehicles will proceed to the weighbridge entrance for nett or gross weight recording in accordance with Clause 36 of the *Protection of the Environment Operations (Waste) Regulation* 2014. Based on an annual processing capacity of 29,900 tonnes, it is estimated that there will be daily incoming traffic of 13 loaded MRVs and 4 semi-trailers, and outgoing traffic of 1 loaded MRV and 4 semi-trailers for haulage of TDF and Crumb rubber. Upon completion of loading / unloading, trucks manoeuvre in the turning area towards the east of the site, weigh off the weighbridge and proceed to the exit to Daisy Street in a forward direction. the site tracks tyres using the NSW EPA's new integrated waste tracking system (IWTS).

The recycled crumb rubber product is used in the manufacture various rubber refined materials for construction industry such as asphalt and playground surfacing. The operation recycles all incoming tyres, assisting in maximising the diversion of these materials from landfill, and enabling their maximum re-use within the economy. Tyres for processing will be transferred from the storage area via a tyre trolley. Beads will be removed by a de-beader and cutter, and then the remaining rubber will be loaded onto a belt conveyor where material will be processed mechanically.

The tyre processing plant systematically and mechanically removes metals, cotton and fibre, and transfers these materials to bulka bags according to material type. The chipping system is fitted with a water-cooling system to reduce the risk of excess heat build-up and fire.

The recycling process produces crumbed rubber, which is packed directly into product bulka bags and transferred to a finished product storage area under the awning to the rear of the central shed building. Recovered cotton/fibre material and shredded steel are also transferred to the finished product storage area for dispatch. Outgoing haulage vehicles are loaded via forklift and weighed at the weighbridge prior to leaving the site in a forward direction. BSV Tyre Recycling also exports shredded tyres for TDF overseas. Tyres are received in storage shed, shredded and transferred to shipping containers. Once full, containers are weighed and transferred to shipping terminals for export. **Table 3-1** outlines the equipment utilised throughout the current and proposed production processes.

Table 3-1: Current and Proposed Production Equipment

Equipment item	Specifications	Make	Model	Capacity (tonnes/day)	Capacity (tonnes/hr)	Fuel Type
Crumb Rubber Plant 1(Current)	Grinder Mill 21" x 24" x 36" x 2	Perumacheril Casting Industries		3	0.125	Electric
	Conveyor System x 2					
	Block Cutter Machine x 4					
	Strip Cutter Machine x 2					
	Tyre Side Wall Cutter Machine x 3					
	Tyre Debeader Machine x 2					
	Fluff Extractor					
Shredder 1 (Current)	Belt Conveyor	Henan Honest Heavy Machinery Co. Ltd	HNSS1300	33	3	Electric
	Double Shaft Shredder with Rotary Sieve		SSJ1200	33	3	Electric
Shredder 2 (under rear awning)	Mobile shredder	Tana	TANA SHARK 440DT	132	12	Diesel
Shredder 3 (under rear awning)	Mobile shredder	Hammel	HAMMEL VB 950DK	220	20	Diesel
Bobcat (Proposed)	Bobcat	BOBCAT	T590 BOBCAT			Diesel
Forklift (Proposed)	Nissan	Hyster	HYSTER 2 TON/NISSAN 5 TON /LINDE 1.5 TON			LPG

The use of TDF as a coal replacement can assist industries including the cement and steel industry lower their emissions. At the same time, demand for crumb rubber domestically has been very low. Consequently, the company has been directing all tyres into TDF for export as a fuel replacement. To address the emerging market, BSV proposed to increase the receival limit of tyres from 14,600 tonnes per year to 29,900 tonnes per year, whilst retaining the ability to manufacture rubber crumb when demand is displayed by the domestic market. While, crumb rubber production capability will remain as approved in the shed, the following components proposed to implement.

- Decommissioning of the tyre baling machines located under the rear awning of the site;
- Amending location of existing shipping containers for storage of rubber products (whole tyres and TDF);
- Installation of two mobile diesel shredding units to increase the production of TDF on the rear hardstand of the site, to be located under the rear awning with local exhaust ventilation;
- Establishment of a dedicated area for tyre unloading and temporary storage prior to processing;
- Installation of a pre-cast concrete panel wall along the southern boundary of the site to improve fire safety and noise attenuation;
- Replace the single head fire hydrants with dual fire hydrants near the tyre storage area, including provision of fire extinguishers, fire hose reels and provision for at least 108m3 of fire water containment bunding;
- Installation of a new firewater isolation valve to the north-eastern side of the site; and
- Inclusion of a dedicated bicycle space

Table 3-2 and **Figure 3-3** outlines the maximum tyre storage area on-site as per new proposal.

Table 3-2: Proposed Trye Stored Onsite

Material	Quantity (Tonnes)	Storage area	Storage type
Crumb Rubber	10	South-East to Crumb Rubber Plant	1-tonne bulka bags
Tyre or TDF Container - 1	25	On the north-east and south-east sides of the facility	Containers
Tyre or TDF Container - 2	25		Containers
Tyre or TDF Container - 3	25		Containers
Tyre or TDF Container - 4	25		Containers
Loose Tyres awaiting processing	40	On the east side of the facility	Containers
		Total at any one time (in Tonnes)	150

The tyre recycling facility will operate 7 days a week, with times varying for deliveries and recycling operations. The facility's proposed operating hours are shown in **Table 3-3**.

Table 3-3: Operation Times and Processes

Day	Operation	Time
Monday – Friday	Crumb Rubber and TDF Production	07:00 – 18:00
	Tyre Delivery	06:00 – 23:00

Day	Operation	Time
Saturday	Crumb Rubber and TDF Production	08:00 – 17:00
	Tyre Delivery	
Sunday	Crumb Rubber and TDF Production	09:00 – 16:00
	Tyre Delivery	

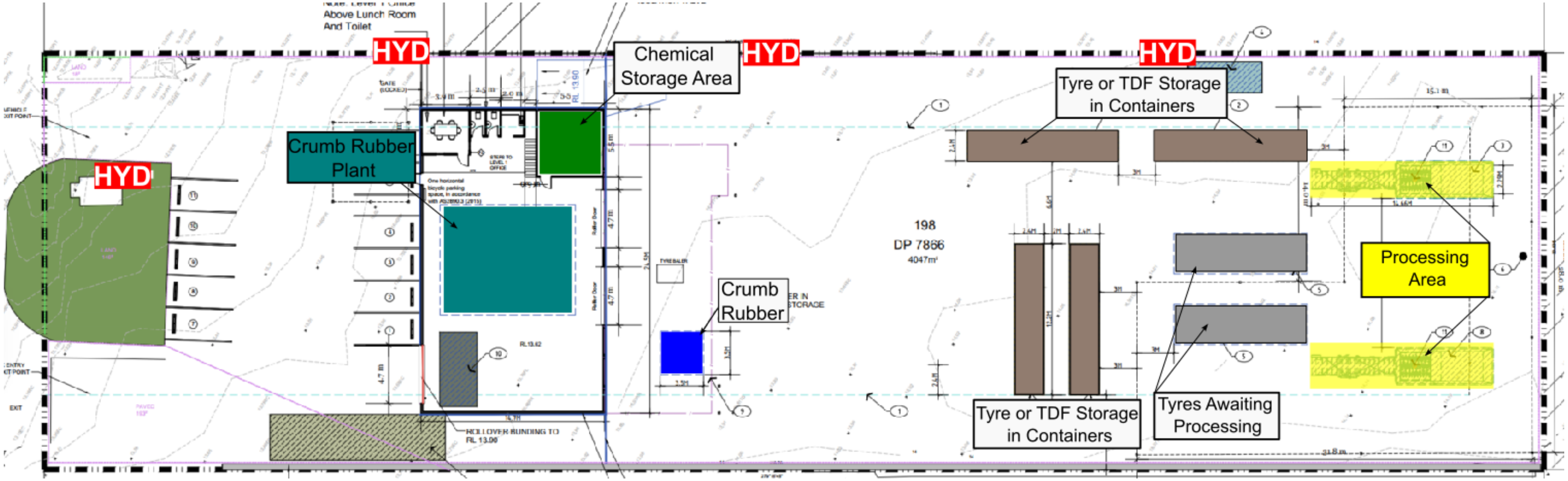


Figure 3-3: Site Layout

3.4 Quantities of Dangerous Goods Stored and Handled

Provided in **Table 3-4** is a summary of the goods that will be stored and handled at the facility.

Table 3-4: Goods Stored and Handled

Product	UN No.	DG Class	PG	Quantity	Type of Storage
Rubber tyres and TDF in Shipping containers	n/a	n/a	n/a	100 T	Shipping containers
Whole Tyre waiting for processing	n/a	n/a	n/a	40 T	Stacked in designated temporary storage area
Crumb Rubber	n/a	n/a	n/a	10 T	Crumb rubber in bulka bags.
LPG gas bottles	1075	2.1	n/a	0.5 T	15 kg Cylinders
Table/ Toilet Cleaners	1760	8	III	40 L	Retail packages (<20L)
Glass Cleaner	1987	3	III	20 L	Retail packages (<20L)
Engine oil	n/a	C2	n/a	240 L	240 L drum on a bunded pallet
Grease	n/a	n/a	n/a	240 L	240 L drum on a bunded pallet

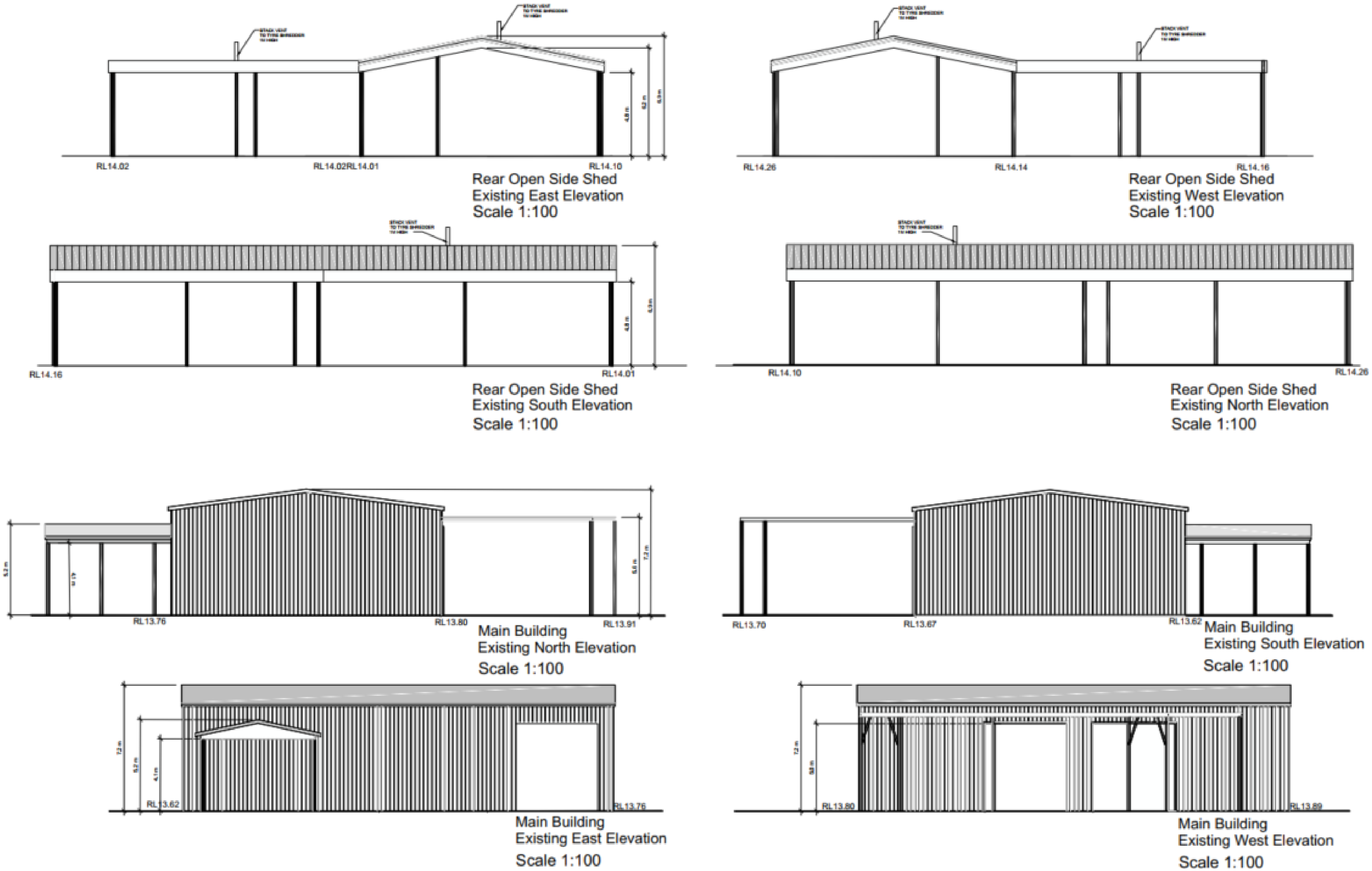


Figure 3-4: Alteration, Additions and Expansion of an Existing Building

4.0 Hazard Identification

4.1 Introduction

A hazard identification table has been developed and is presented in **Appendix A** as required by HIPAP No. 2 (Ref. [1]). Those hazards identified to have a potential fire or explosion impact are assessed in the following sections of this document.

4.2 Properties of Dangerous Goods

The type of DGs and quantities stored and used at the site has been described in **Section 3**. **Table 4-1** provides a description of the DGs stored and handled at the site, including the Class and the hazardous material properties of the DG Class.

Table 4-1: Properties* of the Dangerous Goods and Materials Stored at the Site

Class	Hazardous Properties
n/a – Rubber Tyres	Rubber tyres are not easily ignitable, however when alight, the high energy release rate results in a very hot fire (twice that of most combustible materials) and a considerable volume of smoke being generated, both of which present higher hazards to the community, environment, and firefighters. The physical properties of rubber tyres create difficulties in extinguishing burning tyres the shape of the tyres and the tyre stacking arrangement result in many different three-dimensional pockets that are difficult to access or penetrate with the extinguishing medium. Rubber also naturally repels water thus resulting in the extinguishing mediums shedding from the tyre and draining away.
2.1 –Flammable Gas	Class 2.1 includes flammable gases that are ignitable when in a mixture of 13 per cent or less by volume with air or have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Ignited gas may result in an explosion or flash fire.
3 – Flammable Liquids	Class 3 includes flammable liquids which are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc.) which give off a flammable vapour at temperatures of not more than 60ºC closed-cup test or not more than 65.6ºC open-cup test. Vapours released may mix with air and if ignited, at the right, concentration will burn resulting in pool fires at the liquid surface.
8 – Corrosive Substances	Class 8 substances (corrosive substances) are substances which, by chemical action, could cause damage when in contact with living tissue (i.e. necrosis), or, in case of leakage, may materially damage, or even destroy, other goods which come into contact with the leaked corrosive material. Releases to the environment may cause damage to sensitive receptors within the environment.
C1/C2 Combustible product	C1/C2 products are not classified as a DGs; however, they are combustible liquids. Therefore, it may sustain combustion although initial ignition is difficult due to the high flash point of the material. Combustible liquids do not generate flammable vapours which eliminates the potential for flash fire or explosions to occur when confined.

* Fire and Rescue NSW Fire Safety Guideline for Bulk Rubber Tyres (GBSRT)(Ref. [3])

4.3 Hazard Identification

Based on the hazard identification table presented in **Appendix A**, the following hazardous scenarios have been developed:

- Flammable liquid release, delayed ignition and flash fire or explosion.

- Flammable material spill, ignition and fire.
- LPG release (from bottles), ignition and flash fire, explosion, or fire.
- Corrosive substances release and environmental incident
- Ignition of engine oil or grease, combustible liquid fire
- Tyre ignition in delivery trucks, tyre fire in whole tyres storage area.
- Tyre contamination, tyre fire in loose tyres and TDF storage area.
- Tyre fire in the tyre drop off area and product storage area.
- Smoke dispersion from the tyre incoming area and outgoing storage area.
- Production line fault, tyre fire in the tyre processing area.
- Rubber fire, potentially contaminated fire water and environmental damage.

Each identified scenario is discussed in further detail in the following sections.

4.4 Flammable Liquid Release, Delayed Ignition and Flash Fire or Explosion

As noted in **Section 3.4**, flammable liquids are stored at chemical storage room located at crumb plant shed. There is potential that a flammable liquid spill could occur in the crumb plant area due to an accident (packages dropped from forklift, punctured by forklift tines) or deterioration of packaging. If a flammable liquid spill occurred, the liquid may begin to evaporate (depending on the material flashpoint and ambient temperature). Where materials do evaporate, there is a potential for accumulation of vapours, forming a vapour cloud above the spill.

If the spill is not identified, the cloud may continue to accumulate, eventually contacting an ignition source. If the cloud is confined (i.e. pallet racking and stored products) the vapour cloud may explode if ignited, or, if it is unconfined, it may result in a flash fire which would burn back to the flammable liquid spill, resulting in a pool fire.

A review of the quantities indicates that this storage area would be classified as a Minor Store and is subject to Section 2 of by AS 1940:2017 (Ref. [5]). Therefore, the associated vapour cloud formed by the release of flammable liquid or gas would be insufficient to result in offsite impacts from ignition.

Packages are inspected for damage upon receipt at the loading dock before being moved into the warehouse. This reduces the risk of a damaged package being stored incorrectly. Once inside the warehouse, the chances of deterioration or damage are minimal. It is advised that flammable liquid containers be stored in a DG cabinet. Because of the design of these cabinets, ventilation will be minimal. As a result, when the flammable liquid cabinet is closed, there will be no air circulation inside them. The following considerations should be taken into account regarding the placement of the DG cabinet:

- Cabinet shall be located to not impede escape.
- The flammable liquid cabinet shall be protected by a 4.5 kg powder-type fire extinguisher.
- The fire extinguisher shall not be located closer than 3 m and not further than 10 m from the cabinet.

To minimise the likelihood a flammable vapour cloud may contact an ignition source, the electrical equipment within the DG store hazardous zone will be installed according to the requirements of AS/NZS 60079.14:2022 (Ref. [6]).

In the event of spills, the liquids will be contained within the bunding of the Flammable Liquid cabinet, where the degree of ventilation will be poor. In addition, the site operates 7 days a week between 7 to 11 hrs per day. Therefore, if a spill occurred, it would be identified by personnel working in the warehouse where it could be immediately cleaned up. To ensure appropriate cleaning equipment is available, the following recommendation has been made:

- Flammable liquids are to be kept inside a DG cabinet
- Adequate spill kits be provided around the DG storage areas to ensure spills can be cleaned up immediately following identification.

Based on the warehouse design (controlled ignition sources, etc.), operation practices and the storage of minor packages in a DG cabinet, the risk of a vapour cloud being generated that is large enough to ignite and impact over the site boundary, by way of a vapour cloud explosion or a flash fire, is considered to be low (if not negligible); hence, this hazard has not been carried forward for further analysis.

4.5 Flammable Liquids Spill, Ignition and Fire

As noted in **Section 4.4**, it is considered that there is a low potential for a package to leak resulting in a flammable material spill. Provided the recommendation is complied with, in the event of a flammable liquid release, the liquid will be contained within the bunded section of the cabinet which will also provide protection against direct exposure to an ignition source. Based on the limited quantity and storage in a cabinet, the potential for a fire to occur of any significant consequence is considered negligible; hence, this incident has not been carried forward for further analysis.

4.6 LPG release (from bottles), Ignition and Flash Fire, Explosion, or Fire

As noted in **Section 3.4**, LPG gas bottles are stored in the chemical storage area of the tyre crumb plant. There is a potential risk of LPG release within the plant area due to an accident or deterioration of the cylinders. However, the likelihood of such a release is considered low due to the rigorous quality assurance testing performed on gas bottles during the filling process.

The most likely scenario for an LPG release would be from damage to a gas bottle during transport or storage rather than from cylinder deterioration. To mitigate this risk, packages are inspected upon delivery. Despite these precautions, there remains a possibility of an LPG release occurring within the storage racking. If a release were to occur, the LPG would evaporate, forming a flammable cloud that could potentially ignite.

A review of the storage areas indicates that the LPG bottles are not stored in confined spaces where the accumulation of flammable vapours could lead to an explosion. Therefore, while an explosion is unlikely, a flash fire could occur if the flammable vapour cloud contacts an ignition source. To minimize this risk, it is recommended that all electrical equipment within the Dangerous Goods (DG) store hazardous zone be installed in accordance with AS/NZS 60079.14:2022 (Ref. [6]). In the event of an ignition, a fire could result. However, given the location of the LPG bottles relative to site boundaries and sensitive receptors (e.g., residential areas), along with the low quantities stored, it is unlikely that an offsite impact would occur from these scenarios.

Considering the low probability of an incident and the strategic location of the storage area, this scenario has not been carried forward for further analysis. Nonetheless, the following recommendation is made to enhance safety.

- LPG gas bottles shall be stored in a dedicated storage area in accordance with AS/NZS 1596:2014.
- A hazardous area classification in accordance with AS/NZS 60079.10.1:2022 (Ref. [7]) shall be prepared for the LPG cylinder storage.

4.7 Corrosive Substances Release and Environmental Incident

Corrosive substances such are stored at the site for use as disinfection and cleaning. There is the potential for storage tanks to leak resulting in the loss of containment of the corrosive substances. If the spills are not contained, they could migrate into waterways which if discharged from the stie may result in environmental damage.

The corrosive substances will be stored in accordance with section 2 of AS 3780:2023 (Ref. [8]) which applies on minor storage area. Spill retention measurements shall be provided where the corrosive substances are located. It is advised that corrosive liquid containers to be stored in a DG cabinet that can meet the criteria for DG cabinet requirements. Therefore, mitigates the risk of entrain crossing materials into drain switch and neighbourhood lands. The following considerations should be taken into account regarding the placement of the corrosive DG cabinet:

- Cabinet shall be located to not impede escape.
- The corrosive cabinet should be at least 3 m away from flammable liquid cabinet.
- A 4.5 kg powder-type fire extinguisher shall be provided and it shall not be located closer than 3 m and not further than 10 m from the cabinet.

Given the warehouse design (including controlled ignition sources), operational practices, the storage of minor packages in a DG cabinet, and the strategic placement of the corrosive cabinet, the likelihood of an incident is considered low if not negligible. Therefore, this scenario has not been carried forward for further analysis. However, the following recommendations are made to further enhance safety:

- The corrosive substance storage area should undergo a design assessment to ensure compliance with AS 3780:2023 (Ref. [8]).
- Ensure a spill kit appropriate for the substances stored is readily available.
- Ensure water is available adjacent to the DG storage area.

4.8 Ignition of Engine Oil or Grease, Combustible Liquid Fire

The chemical storage area accommodates the following combustible liquids: 240 L of engine oil and 240 L of grease. There is a potential for a combustible liquid spill to occur due to an accident (such as vessel failure, operator error, or equipment failure). This hazard has been mitigated by storing oil and grease tanks in a bunded pallet which will contain any spills should a leak from the drums occur. Combustible liquids have a flash point >60.5^{o}C; hence, these do not emit flammable vapours at atmospheric conditions which eliminates the potential for flash fires. In addition, as vapours are not emitted, igniting combustible liquids is difficult and requires sustained contact with an ignition source to initiate ignition. Therefore, the potential for a fire to occur in the combustible liquid area is considered unlikely. Furthermore, these combustible liquids are C2 combustible liquids which are difficult to ignite without a sustained ignition source. Therefore, the potential for ignition is almost negligible.

To ensure risks associated with the storage of the combustible liquids is minimised as required by the Work Health and Safety Regulation 2017 (Ref. [9]) the following recommendation has been made:

- The combustible liquid storage area shall be assessed against AS 1940:2017 to identify the design requirements that need to be included in the area.

Due to the procedures and equipment installed in the combustible liquid area, there is a very low chance for a spill to occur, additionally, there are limited ignition sources in the area that may ignite a spill and cause a fire. Notwithstanding this, for conservatism, this incident has been carried forward for further analysis.

4.9 Tyre Ignition in Delivery Trucks, Tyre Fire in Whole Tyres Storage Area.

Rubber tyres, while not prone to easy ignition, pose significant challenges when alight, proving exceedingly difficult to extinguish. With a calorific value nearing 40,000 kJ/kg, approximately double that of other common materials, burning tyres release high energy rates, resulting in intense heat and substantial smoke generation. These factors collectively pose significant hazards to the community, environment, and firefighting efforts.

The physical characteristics of rubber tyres exacerbate the challenge of extinguishing fires. The three-dimensional arrangement of stacked tyres creates numerous inaccessible pockets, impeding the penetration of extinguishing agents. Additionally, rubber's inherent repellent nature causes extinguishing mediums to shed and drain away. Effective extinguishment often necessitates physically separating burning tyre stacks. Due to the hazardous properties attained by rubber tyres, the GBSRT outline maximum stacking sizes and minimum distances, aiding in fire containment and suppression efforts.

Incoming tyres, supplied by local tyre retailers, are transported to the site via MRVs and semi-trailers. The tyres are loaded onto the delivery trucks at the retailer's site. Upon arrival at BSV through Daisy Street, the trucks are guided by staff onto the weighbridge. BSV staff then unload the whole tyres outside the sheds and stack them in the designated whole tyre storage area. Depending on market demand, these tyres may also be stacked in the TDF containers storage area. After unloading, one of the 13 incoming MRVs and all four semi-trailers are loaded with the recycled materials produced by the plant, ready for transport off-site.

Through investigation, it was found that the transportation time is minimal, and it is highly unlikely that a tyre would be exposed to enough heat to ignite in this time frame. However, if a significant tyre fire were to occur upon arrival for delivery, it would be noticed by either the staff or the driver. In such a scenario, the delivery vehicles would not enter the site. This incident as a result would fall outside the scope of this report. Small ignitions discovered during unloading are little threat due to being localised and easily extinguished, hence, this incident has not been carried forward for further analysis.

4.10 Tyre Contamination, Tyre Fire in Loose Tyre and Container Storage Area

Rubber commonly absorbs fuels and solvents, greatly increasing the risk of a tyre catching fire if a source of ignition is available. Each tyre is assessed for contamination when unloaded. Extreme contamination is considered to be obvious and picked up on, lower levels of contamination are absorbed into the rubber and difficult to detect. If a tyre is suspected to be contaminated it is to be washed off and added to the storage. Due to the high turnover of material (short time stored) and the expected detection of high contamination, the incident has not been carried forward.

4.11 Tyre Fire in The Tyre Drop Off Area and Product Storage Area

4.11.1 Whole Tyre Storage

FRNSW has established specific guidelines for the bulk storage of tyres, aiming to facilitate easier control and extinguishing of fires. These guidelines dictate the arrangement of stockpiles to enhance manageability. The shed is classified as an unsprinklered building, falling within the scope of these guidelines. The recommended separation distances and layout for tyre storage in such buildings are illustrated in **Figure 4-1**.

According to the guidelines, there should be a minimum distance of 3 m between the top of the tyre stack and the building roof as well as the sides of the tyre stack to the building walls. The GBSRT limits tyre stockpiles to 3.7 m. The width of the stockpile is 2.4 m and the length is 12.2 m this results in an area of 29.28 m^2, therefore compliant and below the maximum allowable area specified in the GBSRT of 30 m^2.

The following recommendation has been made:

- Stockpile limits within the storage areas will be marked.
- Stockpile height to be limited to 3.7m

Figure 4-1 outlines the tyre storage area or TDF storage area and tyre drop off area and their relative position in the building which complies with the GBSRT.

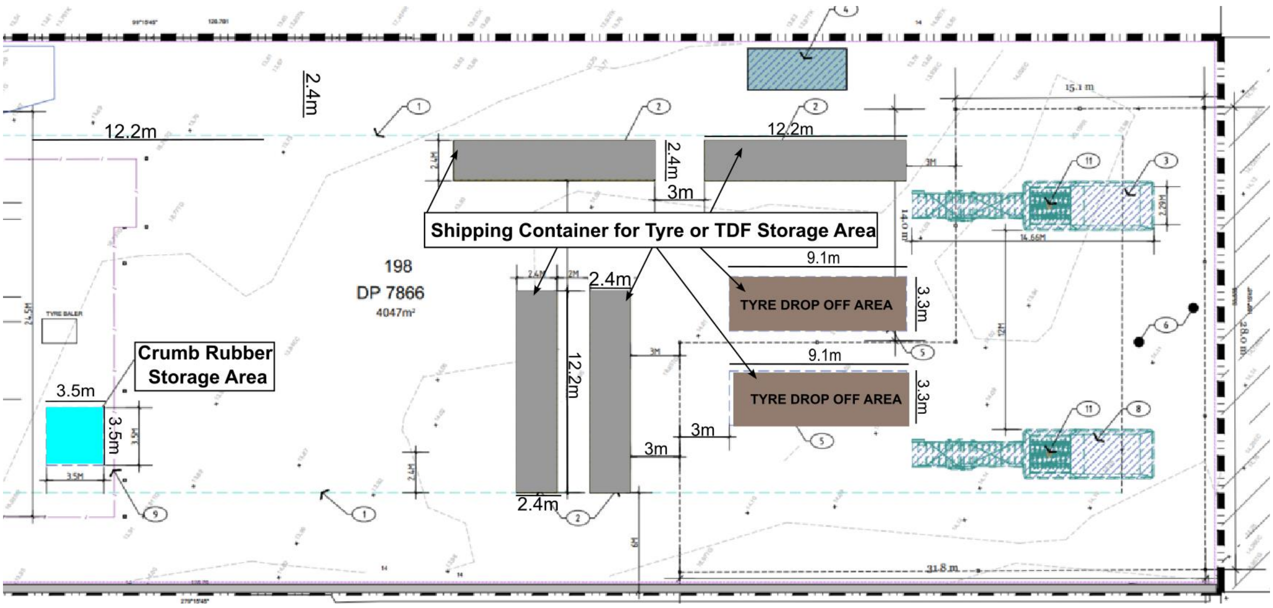


Figure 4-1: Storage Area Layout

4.11.2 Product Storage Including Cotton Steel and Crumb Rubber

The GBSRT does not comment on the storage of crumb rubber. As previously mentioned, the document highlights the hazards surrounding tyre stores, the geometry of tyre piles is well-ventilated meaning ignition can occur deep within the stockpile, and the tyre geometry also makes it difficult for water to penetrate deep into stockpiles. Other hazards are more specific to rubber rather than tyres alone which include the high calorific value that of other combustible products resulting in a high energy release and very hot fires. Rubber repels water making it difficult to extinguish the fire. Crumbed rubber shares two of the hazards rubber tyres present, a high energy release rate when burning and water repulsion making it difficult to extinguish.

The utilization of crumb rubber from waste tyres presents significant fire risks. When tyres are processed into small chips or particles, they become porous and possess a high surface area relative to their volume, rendering them a greater fire risk than whole tyres due to their susceptibility to spontaneous combustion because of their ability to permit airflow. Practical instances have evidenced spontaneous ignition, notably in large stockpiles exceeding three m in depth, with finely shredded tyres being particularly vulnerable. Warning signs such as a sulfureous odour, aerosols from vents, or evidence of oil contamination in rainwater passing through the tyre shred may indicate potential combustion. Laboratory experiments highlight the heightened susceptibility of rubber crumb and tyre shred to self-heating compared to other materials, particularly at elevated ambient temperatures. Controlled experiments reveal that even clean tyre shred piles deeper than a meter may ignite spontaneously under inadequate ventilation conditions, with initiation times extending over several weeks (Ref. [10]).

Crumb rubber is densely compacted into bulka bags and stored indoors, providing minimal ventilation throughout the inner material of the item reducing the chance of ignition. As a result, the material is stored in smaller individual stockpiles reducing the fire risks associated with crumb rubber stores at 3 m depths. The bagged crumb rubber would be considered low risk due to its storage and presents a similar fire hazard to that of the tyres stored. To adopt a conservative approach due to the intense burning capability of rubber and the difficulty in extinguishing such incidents, the incident scenario will be further assessed to evaluate fire propagation and how radiant heat levels interact with fire equipment.

The crumb rubber storage area has been assessed against the GBSRT due to the similar fire risks possessed by the two materials (crumb rubber and rubber tyres). The same stockpile dimensions have been applied to the Product Storage Area as that of the Whole Tyre Storage Area. The width of the stockpile is 3.5 m, the length is 3.5 m and the height is 3.5 m. The dimensions are outlined in **Figure** 4-1.

Although the site layout allows for compliance with GBSRT and the risk of fire is minimal due to the limited presence of ignition sources, the severity and complexities associated with tyre fires justify a conservative approach when evaluating the likelihood of ignition propagation. This incident is carried forward for further assessment to determine the likelihood of fire propagation between stores and the proximity of firefighting equipment to generated radiant heat contours.

4.12 Smoke Dispersion from The Tyre Incoming Area and Outgoing Storage Area Fire

Previous Sections highlight the potential chance of ignition to occur resulting in a tyre fire, **Section 4.12** assesses the possibility for toxic smoke dispersion to occur as a result of tyre combustion. A literature review was conducted on tyre fires to identify the toxic gases that may be generated in the event of a fire. The review identified the following gases or classes of gases that can form:

- Carbon Monoxide (CO);
- Carbon dioxide (CO_2);
- Sulfur Dioxide (SO_2)

Each of these has been discussed in further detail in the following subsections.

4.12.1 Carbon Monoxide

Carbon monoxide is an odourless, colourless gas that is slightly denser than air and occurs naturally in the atmosphere at concentrations around 80 ppb. Carbon monoxide is a toxic gas as it irreversibly binds with haemoglobin which prevents these molecules from carrying out the function of oxygen / carbon dioxide exchange. The loss of 50% of the haemoglobin may result in seizures, coma or death which can occur at concentration exposures of approximately 600 ppm (0.06%).

Carbon monoxide is a by-product of combustion if there is insufficient oxygen to enable complete combustion. The reaction pathway for the formation of carbon monoxide is provided in **Equation A- 1**.

$$2C_3H_8(g) + 7O_2(g) \rightarrow 6CO(g) + 8H_2O(g) \qquad \textbf{Equation A- 1}$$

There is potential for a tyre fire to occur within the facility. Given the size of the fuel load, it is expected that there would be sufficient oxygen available to prevent large volumes of carbon monoxide from being generated. Therefore, it is considered unlikely that the formation of carbon monoxide from the tyre storage area would result in sufficient concentrations to impact FRNSW personnel. Additionally, FRNSW will have breathing apparatus (BA) enabling them to breathe safe air. Hence, the potential impacts of carbon monoxide have not been carried forward for further analysis.

4.12.2 Carbon Dioxide

Carbon dioxide is a colourless, odourless, dense gas that is naturally forming and is present in the atmosphere at concentrations around 415 ppm (0.0415%). At low concentrations, carbon dioxide is physiologically impotent and does not appear to have any toxicological effects. However, as the concentration grows it increases the respiration rate with Short Term Exposure Limit (STEL) occurring at 30,000 ppm (3%), above 50,000 ppm (5%) a strong respiration effect is observed along with dizziness, confusion, headaches, and shortness of breath. Concentrations over 100,000 ppm (10%) may result in coma or death.

Carbon dioxide is a by-product of combustion where hydrocarbon or carbon-based materials are involved. A typical combustion reaction producing carbon from a hydrocarbon has been provided in **Equation A- 2**. This reaction proceeds when there is an excess of oxygen to the fuel being consumed and is known as complete combustion as it is the most efficient reaction pathway.

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g) \qquad \textbf{Equation A- 2}$$

During a fire event, the burning rubber from the tyres will liberate carbon dioxide. However, a review of the toxicological impacts indicates high concentrations would be required to result in injury or fatality. Hence, in the event of a tyre fire, the quantity of carbon dioxide that would be produced would be expected to be unlikely to create an environment that would prevent Fire & Rescue NSW (FRNSW) personnel from undertaking intervention activities. Carbon dioxide has been carried forward to assess the extent of the burning plume and the implications it may or may not have on FRNSW personnel.

4.12.3 Sulfur Dioxide

Sulfur dioxide is a colourless, dense gas with a strong bothering odour, naturally forming around geothermal activity. NSW Health states Sulfur dioxide irritates the nasal, throat, and lung linings, potentially aggravating pre-existing respiratory conditions such as asthma. Additionally, it has been linked to the worsening of cardiovascular diseases (Ref. [11]). This irritation is caused by Sulfur dioxide combining with water and air to form sulfuric acid. The National Environment Protection (Ambient Air Quality) Measure standards for Sulfur Dioxide are 0.10 ppm ($1x10^{-4}$%) for a 1-hour exposure period and 0.02 ppm ($2x10^{-5}$%) for a 24-hour exposure period.

Sulfur dioxide is a by-product of combustion where Sulfur-based materials are involved. A typical combustion reaction producing Sulfur dioxide has been provided in **Equation A- 3**. This reaction proceeds when there is an excess of oxygen to the fuel being consumed and is known as complete combustion as it is the most efficient reaction pathway.

$$\boldsymbol{S(s) + O_2(g) \rightarrow SO_2(g)} \qquad \textbf{Equation A- 3}$$

Sulfur dioxide poses a threat of irritation due to this the incident has been carried forward. been carried forward to assess the extent of the burning plume and the implications it may or may not have on FRNSW personnel.

During a fire event, the burning rubber from the tyres will liberate sulfur dioxide. However, a review of the toxicological impacts indicates high concentrations would be required to result in injury or fatality. Hence, in the event of a tyre fire, the quantity of sulfur dioxide that would be produced would be expected to be unlikely to create an environment that would prevent Fire & Rescue NSW (FRNSW) personnel from undertaking intervention activities. Sulfur dioxide has been carried forward to assess the extent of the burning plume and the implications it may or may not have on FRNSW personnel.

4.13 Production Line Fault, Tyre Fire in Tyre Processing Area

The tyre processing line described in **Section 3.3** primarily undertakes several key mechanical processes located within the crumb rubber plant on the west side of the facility. These processes include two Grinder Mills, four Block Cutter Machines, two Strip Cutter Machines, three Tyre Side Wall Cutter Machines, two Tyre Debeader Machines, a Fluff Extractor, and a Double Shaft Shredder with a Rotary Sieve. To further enhance the facility's capacity, BSV proposed to expand by adding two additional mechanical shredders on the east side of the facility.

The ignition temperature range of rubber tyres spans between 288°C to 343°C, indicating a relatively high threshold for ignition. Given the typical operating conditions, including proposed and all current tyre processing stages, it is not anticipated that rubber would ignite. Consequently, there is a low inherent risk of product ignition across the full spectrum of expected production processes. However, due to the difficulties in extinguishing a rubber fire as mentioned in **Section 4.11**, this incident shall be carried forward for further analysis to assess radiant heat impacts on firefighting equipment and fire propagation.

4.14 Rubber Fire, Potentially Contaminated Fire Water and Environmental Damage

In the event of a fire, FRNSW would need to extinguish the fire using water from street hydrants, which could become contaminated by the particles released from burning rubber. If this water is released from the site, there is a risk of environmental damage.

The storage and operational areas at the facility are limited to 24 m^2 for storage and 216 m^2 for operations. FRNSW, as per the GBSRT, anticipates that three hydrant hoses would suffice to combat a fire in either location, as the facility lacks sprinkler protection. Although tyre fires tend to burn with immense heat for extended periods, it's expected that propagation would be prevented due to the separation distances and stacking arrangements in place. Hence, it's estimated that 90 minutes of firewater would suffice to suppress, control, and contain the fire.

Each hydrant hose discharges at a rate of 10 L/s or 600 L/min. With 3 hoses operating, the total discharge would be 1800 L/min. Thus, for 90 minutes of operation, a total volume of 162 m^3 would need to be contained. To comply with the Best Practice Guidelines for Contaminated Water Retention and Treatment Systems (Ref. [12]), this volume must be contained.

The following recommendation has been made:

- To ensure compliance, it's recommended that the site be bunded to contain a minimum of 162 m^3 of potentially contaminated water within the site boundaries.

If this bunding is implemented, the environmental risks associated with incidents involving potentially contaminated water will be minimized. Therefore, this incident has not been carried forward for further analysis.

5.0 Consequence Analysis

5.1 Incidents Carried Forward for Consequence Analysis

The following incidents were identified to have the potential to impact off-site:

- Ignition of diesel or grease, combustible liquid fire
- Tyre fire in the tyre incoming area and outgoing storage area
- Heavy smoke dispersion in the tyre delivery area and outgoing storage area.
- Production line fault, tyre fire in the current and proposed tyre processing area.

Each incident has been assessed in the following sections.

5.2 Ignition of Diesel or Grease, Combustible Liquid Fire

There is the potential for a fire to occur within the combustible liquid area. In the event of a fire, it may impact fire protection systems at the site which would render them inoperable for use by FRNSW. A detailed analysis has been conducted in **Appendix B.** The radiant heat impact distances estimated for the grease drum and engine oil tank are presented in **Table** 5-1. Likewise, radiant heat contour diagrams are presented in **Figure 5-1.**

Table 5-1: Heat Radiation from a Combustible Liquids Area Fire

Radiant Heat (kW/m^2)	Distance (m)
23	2
3	5.2

Radiant heat impacts at 23 kW/m² can have significant consequences, including the potential for severe burns to exposed skin, ignition of combustible materials, and structural damage to buildings. At this intensity, unprotected materials can catch fire, and prolonged exposure could lead to serious safety hazards. It is to be noted, by looking at **Figure 5-1**, that there are no fire hydrants located within the 23 kW/m^2 radiant heat contour. Hence, there are no current hydrants that would be affected by the lateral impact from the fire documented in **Figure 5-1.**

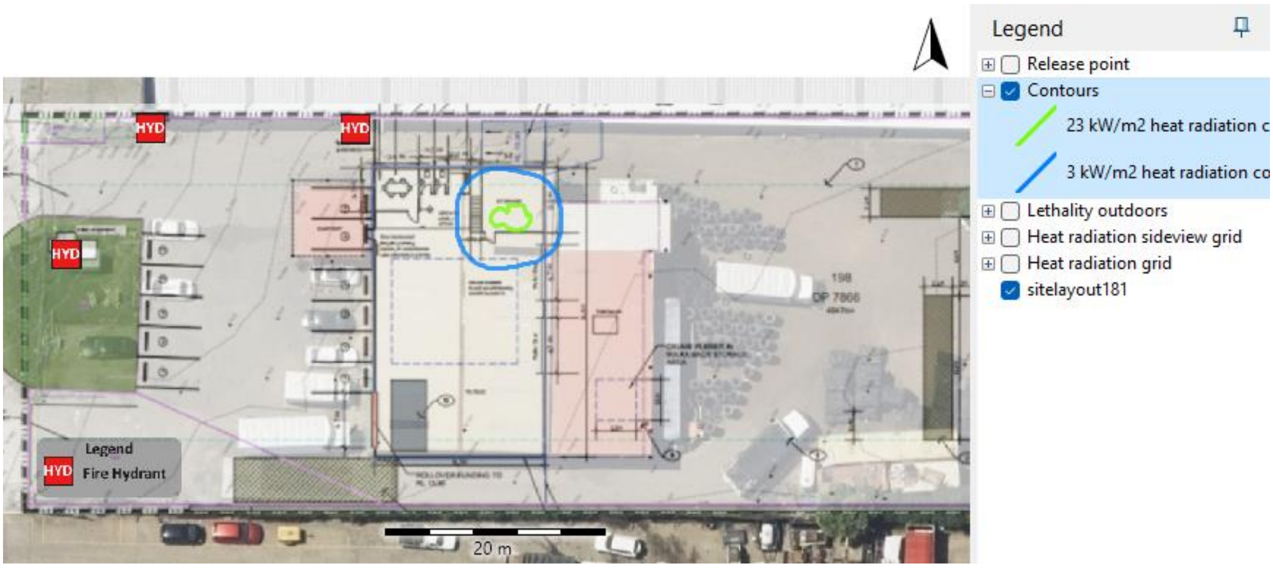


Figure 5-1: Heat radiation contours from grease fire and engine oil

5.3 Tyre Fire in The Tyre Incoming Area and Outgoing Storage Area

There is the potential for a fire to occur within the tyre incoming area and outgoing storage area. In the event of a fire, it may impact fire protection systems at the site which would render them inoperable for use by FRNSW. A detailed analysis has been conducted in **Appendix B.** The radiant heat impact distances estimated for the tyre delivery area and the outgoing storage area are presented in

Table 5-2. Likewise, radiant heat contour diagrams are presented in **Figure 5-2** and **Figure** 5-3**.**

Table 5-2: Heat Radiation from a Tyre Outgoing (Product) and Incoming (Drop off) Area Fire

Radiant Heat (kW/m^2)	Distance (m)	
	Outgoing (Product) Storage Area	Incoming (Drop off) Storage Area
23	9.4	9.5
3	16	18

Figure 5-2: Radiant Heat Contours from Fire in Drop off (Incoming) Storage Area.

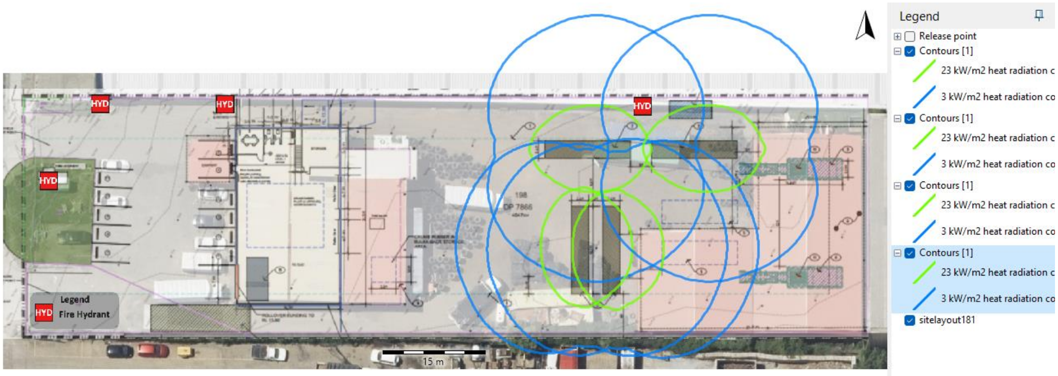


Figure 5-3: Radiant Heat Contours from Fire in Product (Outgoing) Storage Area

It is to be noted, by looking at the BSV site survey in **Appendix C**, **Figure 5-2** and **Figure 5-3**, that the closest hydrant to the incoming and outgoing storage areas has been impacted by radiant heat due to a potential fire event. Nonetheless, within 60 m of this affected hydrant, there is another hydrant available, capable of providing up to 70 m of protection when used with two lengths of hose, thereby ensuring adequate fire coverage even with the impacted hydrant. Hence, despite the potential impairment of the nearest hydrant, the backup hydrant's proximity and reach provide sufficient fire protection to manage the risks associated with the storage areas.

Figure 5-3 shows that for the most part the 23 kW/m^2 contours do not impact infrastructure that may allow the propagation of fire should a rubber storage become involved in a fire. However, the two parallel storages show a 23 kW/m^2 contour impacting each other which may result in incident propagation. However, the analysis presented is considered excessively conservative. The modelling assumes flame heights generated from liquids with higher burning rates than those of tyres, which tend to burn more slowly and with shorter flames.

As a result, the actual impact distances for radiant heat are expected to be less than those reported in the model. Therefore, the risk of fire propagation is not anticipated to be as severe as depicted in the modelled scenarios, suggesting that the real-world impact would be more contained and less threatening than initially indicated. In addition, the structure of the containment will prevent direct radiant heat impingement from the fire on the rubber which will delay the point where rubber may be heated to a point of ignition. Subsequently, it is considered that additional protection is not required to deal with incident propagation.

5.4 Smoke Dispersion from The Tyre Delivery Area and Outgoing Storage Area Fire.

A detailed analysis has been performed in **Appendix B** to estimate the impact of toxic products of combustion on the surrounding area. The modelling identified four (4) primary pollutants of concern that may result in downwind impacts; Sulfur dioxide, carbon dioxide, and soot (carbon) with soot being more for visual disturbance to the surrounding area. The pollutant rates calculated for each pollutant have been shown in **Table** 5-3.

Table 5-3: Tyre Outgoing (Product) and Incoming (Drop off) Area Fire Pollutant Release Rates

Pollutant	Release Rate (kg/s)	
	Tyre Outgoing (Product) Area	Incoming (Drop off) Area
Carbon Dioxide	0.19131	0.19131
Sulfur Dioxide	0.92724	0.92724
Water (H_2O)	0.22846	0.22846
Soot (Carbon)	0.20875	0.20875

The model calculates the interaction of the plume with the inversion layer to determine whether a ground-level impact would occur from a compartment fire. The results of the analysis indicate that the heat generated from the fire would be sufficient for the soot and carbon dioxide to pierce the inversion layer irrespective of the atmospheric stability as shown in the figures in **Appendix Figure B 5** and **Appendix Figure B 6** which shows the plumes rising above the mixing layer (inversion layer) and not returning below.

As the plume cools it will settle above the inversion layer but would not re-enter below the inversion layer. Therefore, the ground-level impact is not expected to occur from the fire compartment storage areas. As ground-level impact would not be able to occur within the immediate vicinity of the fire, FRNSW personnel would not be impacted and would be able to stage operations outside to combat the fire.

To illustrate the discussion, provided in **Figure 5-4** is a smoke plume from a stack where the smoke rises above the inversion layer and travels laterally downwind. The smoke punctures the inversion layer and then is unable to penetrate below the layer and runs across the boundary of the inversion.

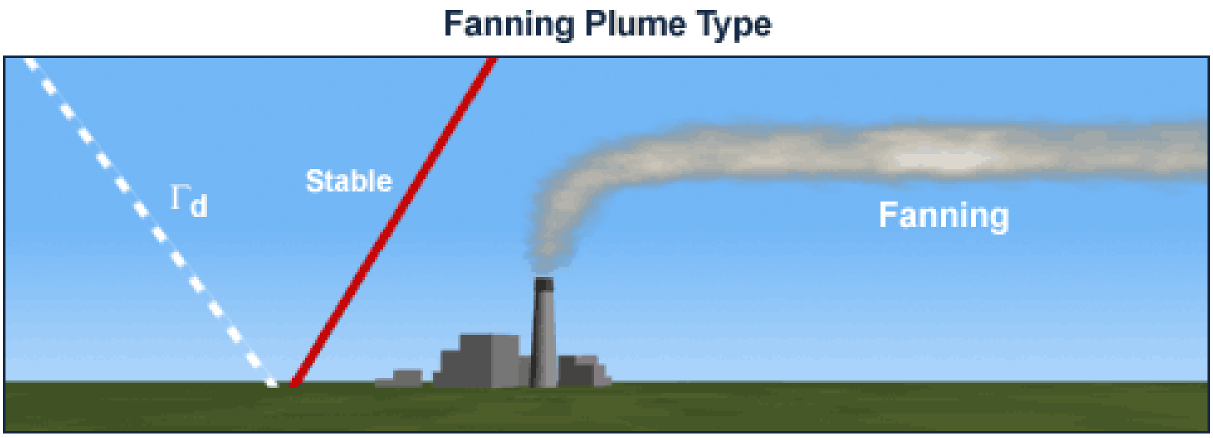


Figure 5-4: Smoke Rising Above Inversion Layer (Ref. [13])

As illustrated in **Appendix Figure** B-4, the heat generated by the fire would be sufficient for all sulfur dioxide to breach the inversion layer. It is noted that a portion of the EPRG 1 concentration aligns with the inversion layer. This alignment minimizes the likelihood of plume settling, and any trace amounts that do settle will disperse to ground level, where to further extend dilution will occur. As a result, the concentrations or exposure levels at ground level will be significantly lower, well below the EPRG 1 threshold.

The following recommendation has been made:

- The site shall host FRNSW as a part of a site familiarisation to highlight the potential for tyre fires and potential for toxic smoke formation.

5.5 Production Line Fault, Tyre Fire in Tyre Processing Area.

There is the potential for a fire to occur within the production area. In the event of a fire, it may impact fire protection systems at the site which would render them inoperable for use by FRNSW. A detailed analysis has been conducted in **Appendix B** and the radiant heat impact distances estimated for this scenario are presented in **Table** 5-4**,** along with a radiant heat contour diagram in **Figure** 5-5.

Table 5-4: Heat Radiation from a Production Area Fire.

Radiant Heat (kW/m^2)	Distance (m)	
	Current Set Up	Proposed Set Up
23	5	11
3	9	17

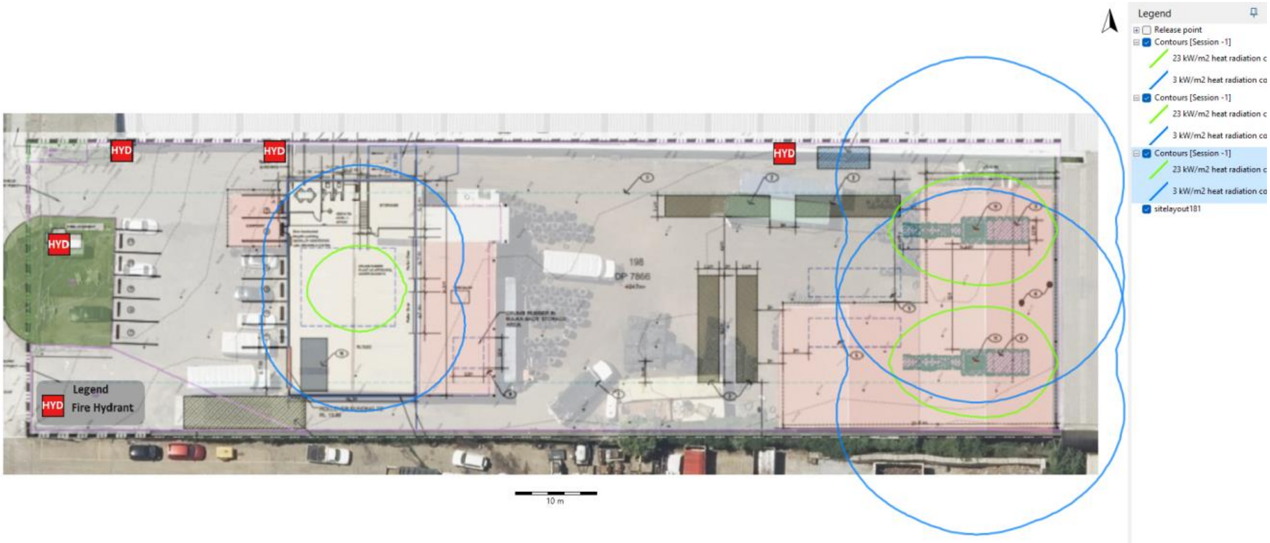


Figure 5-5: Radiant Heat Contours from Fire in Production Area

Based on the radiant heat impacts of 23 kW/m², there is a risk of fatality from both prolonged exposure, and unprotected steel can reach thermal stress temperatures, potentially leading to structural failure. However, in the context of the BSV site and considering the BSV site survey in **Appendix C**, **Figure 5-5**, where a potential fire event might impact the nearest hydrant, the risk of propagation and escalation seems manageable due to the presence of a backup hydrant within 60 meters. This backup hydrant, when utilized with two lengths of hose, can provide up to 70 meters of coverage, ensuring that the fire protection needs of the process area are met even if the nearest hydrant is impaired by the radiant heat.

The analysis, though, appears to be excessively conservative, as it is based on flame heights generated from liquids (assumption in modelling) with higher burning rates than tyres, which are present at the site. Tyres typically burn slower and generate shorter flames, which means that the actual distances for radiant heat impacts are expected to be less than those calculated in the model. As such, the 23 kW/m² contour may not extend as far, and the propagation impact may not be as severe as indicated by the conservative modelling assumptions. Therefore, while there is a potential for fire propagation from a 23 kW/m² contour, the effective reach of the backup hydrant mitigates this risk, suggesting that the situation can be effectively controlled, and the impact would likely be less significant than the modelled scenarios suggest.

6.0 Details of Prevention, Detection, Protection and Mitigation Measures

The fire safety systems at the site can be split into four main categories:

- **Fire Prevention –** systems, installed to prevent the conditions that may result in initiating fire.
- **Fire Detection –** systems installed to detect fire and raise alarms so that emergency response can be affected (both evacuation and firefighting)
- **Fire Protection** – systems installed to protect against the impacts of fire or explosion (e.g. firewalls)
- **Fire Mitigation** – systems installed to minimise the impacts of fire and to reduce the potential damage (e.g. fire water application)

Each category has been reviewed in the following sections, with respect to the existing systems incorporated into the design and those to be provided as part of the recommendations herein.

6.1 Fire Prevention

This section describes the fire prevention strategies and measures that will be undertaken at the site.

6.1.1 Control of Ignition Sources

The control of ignition sources reduces the likelihood of igniting a release of material. **Table** 6-1 presents the potential ignition sources and incidents for the facility that may lead to ignition and fire. The table also summarises the controls that will be used to reduce the likelihood of these potential sources of ignition and incidents resulting in a fire.

Table 6-1: Summary of Control of Ignition Sources

Ignition Source	Control
Smoking	No smoking policy for the site (i.e. within the warehouse) including processing and storage areas.
Housekeeping	The site will operate a housekeeping procedure to ensure accumulation of dust in delivery and processing areas does not occur. Limiting the accumulation of dust is an important method for minimising the potential for fires or dust dispersions.
Product Storage	Rubber Tyers and products will be stored in accordance with FSGBRT and FRNSW) fire safety guidelines in waste facilities.
Electrical	Fixed electrical equipment to be designed and installed to AS/NZS 3000:2018 (Ref. [14]).
Arson	The site will have a security fence and will be staffed during business hours. CCTV monitoring for intruders at the site.
Hot Work	A permit-to-work system and risk assessment before starting work will be provided for each job involving the introduction of ignition sources.

The following recommendations have been made:

- Identify a designated smoking area at the site and provide this on the site layout.
- Develop a hot work permit system to control any hot work undertaken at the site.

- Consider installing CCTV to monitor for intruders at the site.

6.1.2 Separation of Incidents

The whole rubber tyres are inspected when unloading before stacking in the Tyre storage area. This restricts the scale of a fire occurring within the separation unit and also minimises the potential for contaminated or alight tyres to enter the facility.

The tyres are stored in accordance with FSGBRT such that the storage area is below 30 m^2 and below 3.5 m in height. The Tyre store is not within 3 m of the building ceiling, the building walls / structure or the product storage area to prevent incident propagation from the storage area to other parts of the site.

6.1.3 Housekeeping

The risk of fire can be significantly reduced by maintaining high standards of housekeeping. The site shall maintain a high housekeeping standard, ensuring all debris (e.g. packaging, etc. etc.) that is released during transport, storage and processing is cleaned up and removed from the areas.

6.1.4 Work Practices

The following work practices will be undertaken to reduce the likelihood of an incident. They include:

- DG identification
- Placarding & signage within the site
- Forms of chemical and DG information
- Availability of Safety Data Sheets
- HAZCHEM code adherence
- Procedures for unlabelled containers
- Procedures for reporting damaged goods / accidents
- Safe work practices adhered to
- Personal Protective Equipment
- Emergency response plan and procedures
- First aid fire equipment
- Personal hygiene requirements
- Security
- Training of personnel
- Compatibility, segregation and safe storage of Dangerous Goods
- Compliance with the Work Health and Safety Regulation 2017 (Ref. [9]).

6.1.5 Emergency Plan

The site requires an emergency plan to outline the responses to emergency incidents at the site. The plan will include evacuation procedures and emergency contact numbers as well as an onsite emergency response structure with allocated duties to various personnel on site. This will provide a readiness response in the unlikely event of an incident at the site.

The following recommendations have been made:

- An Emergency Response Plan (ERP) shall be developed for the site in accordance with the Hazardous Industry Planning Advisory Paper No. 2.
- An Emergency Services Information Pack (ESIP) shall be developed for the site in accordance with the Fire & Rescue NSW fire safety guideline "*Emergency Service Information Pack and Tactical Fire Plans*".

6.1.6 Site Security

Maintaining a secure site reduces the likelihood either of a fire being started maliciously by intruders or by accident. Access to the site will be restricted at all times and only authorised personnel will be permitted within the site.

6.2 Detection Procedures and Measures

This section discusses the detection and protection from fires for the hazardous incidents previously identified. These include the detection of fire pre-conditions, detection of a fire suppression-activated condition and prevention of propagation. This assessment includes the identification of the detection and protection systems required.

6.2.1 Detection of Contamination

The Whole tyres received at the site will be subject to manual inspection to identify any tyres that may be contaminated. This will enable the removal of tyres that may escalate into a fire.

6.2.2 Detection of Fire

Site personnel are present during operational hours that can identify a fire and raise the alarm with FRNSW. Out of hours, fires are not expected to occur other than from malicious acts.

6.3 Fire Protection

6.3.1 Extinguishers

The site will be fitted with suitable extinguishers which are suitable for combatting rubber tyre fires.

The following recommendation has been made:

- A suitable extinguisher shall be available within 10 m of any area where rubber products are stored, sorted, or handled.

6.3.2 Fire Hydrants

The site is currently equipped with four fire hydrants, which meet the FSGBRT requirements that mandate three hydrants for areas not protected by sprinklers. Two of these hydrants are strategically positioned adjacent to the tyre storage area, with a maximum distance of 60 m between them, providing comprehensive coverage. Additionally, a fire hydrant is in place to cover the current process area and car park, and another hydrant is positioned in front of the premises on Daisy Street, as shown in **Figure 6-1**. These placements confirm that the site's hydrant locations satisfy the required criteria for effective fire protection. It is advised that the site be equipped with dual-head fire hydrants, as they offer higher capacity, greater operational flexibility, and redundancy, making them well-suited for areas with elevated fire risks or increased water supply needs.

Except for the hydrant closest to the incoming/ outgoing storage areas, all recommended hydrant locations fall outside the 3 kW/m² radiant heat contours and are therefore not at risk of being impacted by fire. In the event that the closest hydrant is affected by a fire in the proposed process area or incoming/outgoing storage areas, it can be supported by an adjacent hydrant to ensure continued fire protection.

A statement of available pressure and flow has been acquired from Sydney Water and is attached in **Appendix D**. The hydrants will be supplied by water mains and are capable of providing flow at 20 L/s at a pressure head of 26 m as shown in the pressure inquiry in **Appendix D**. This is the equivalent of 2 hydrants operating 254 kPa at once.

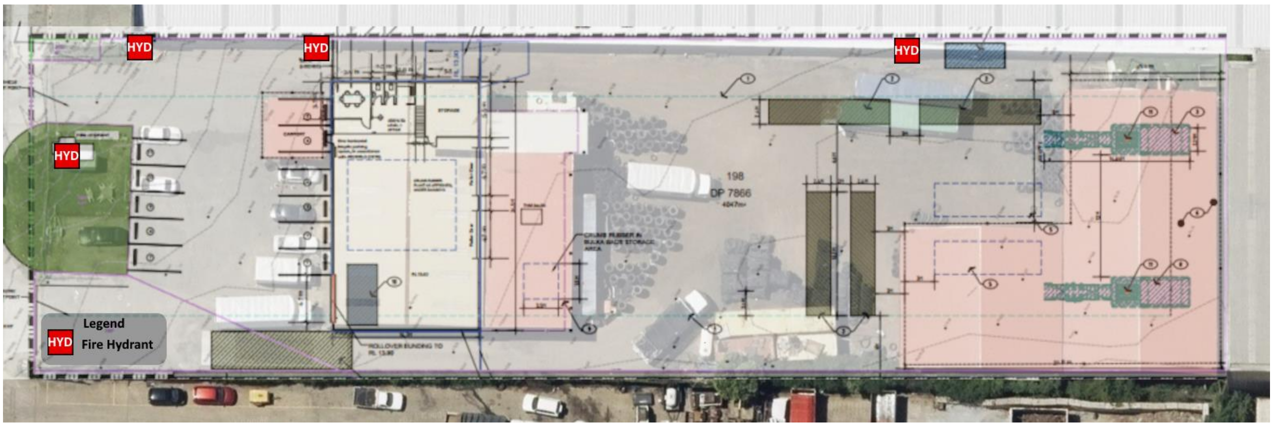


Figure 6-1: Proposed Hydrant Locations

The following recommendation has been made:

- The site to be equipped with dual head fire hydrants to facilitate higher capacity, operational flexibility, and minimise the risk of inadequate water supply during emergency situations.
- The hydrant system shall be subject to a hydraulic analysis to demonstrate that the most hydraulically disadvantaged hydrant complies with AS 2419.1: 2021.

6.3.3 Sprinklers

Sprinklers are not required for the facility according to FSGBRT.

6.4 Fire Mitigation

6.4.1 Fire Water Supply

The street mains will provide a fire water supply to the site hydrants with pressure availability guaranteed by Sydney Water. Based on the fire scenarios identified, it is expected that the water provided by the street hydrants shall be sufficient.

6.4.2 Smoke Hazard Management

Based on the building size, it is not expected that smoke hazard management would be required; however, this should be confirmed with a Fire Engineer. To ensure this is captured, the following recommendation has been made:

- The requirement for smoke hazard management systems shall be reviewed and confirmed whether smoke hazard management is required.

7.0 Local Brigade Access and Egress

7.1 Overview

To assess the likely fire brigade response times an indicative assessment of fire brigade intervention (FBIM) has been undertaken based on the methods defined in the FBIM, Ref. [15]). **Figure** 7-1 illustrates the site showing access available from the street.

Figure 7-1: Fire Brigade Access and Site Facilities

The closest FRNSW stations to the site are described in **Table** 7-1. The expected routes from the stations to the site are illustrated in **Figure** 7-2**.**

Table 7-1: Station Locations

Station Name	Station Address	Distance (km)
FRNSW Revesby Fire Station	60 The River Rd, Revesby NSW 2212	1.9
FRNSW Bankstown Fire Station	353 Hume Hwy, Bankstown NSW 2200	6.1
FRNSW Riverwood Fire Station	136A Belmore Rd, Peakhurst NSW 2210	6.7

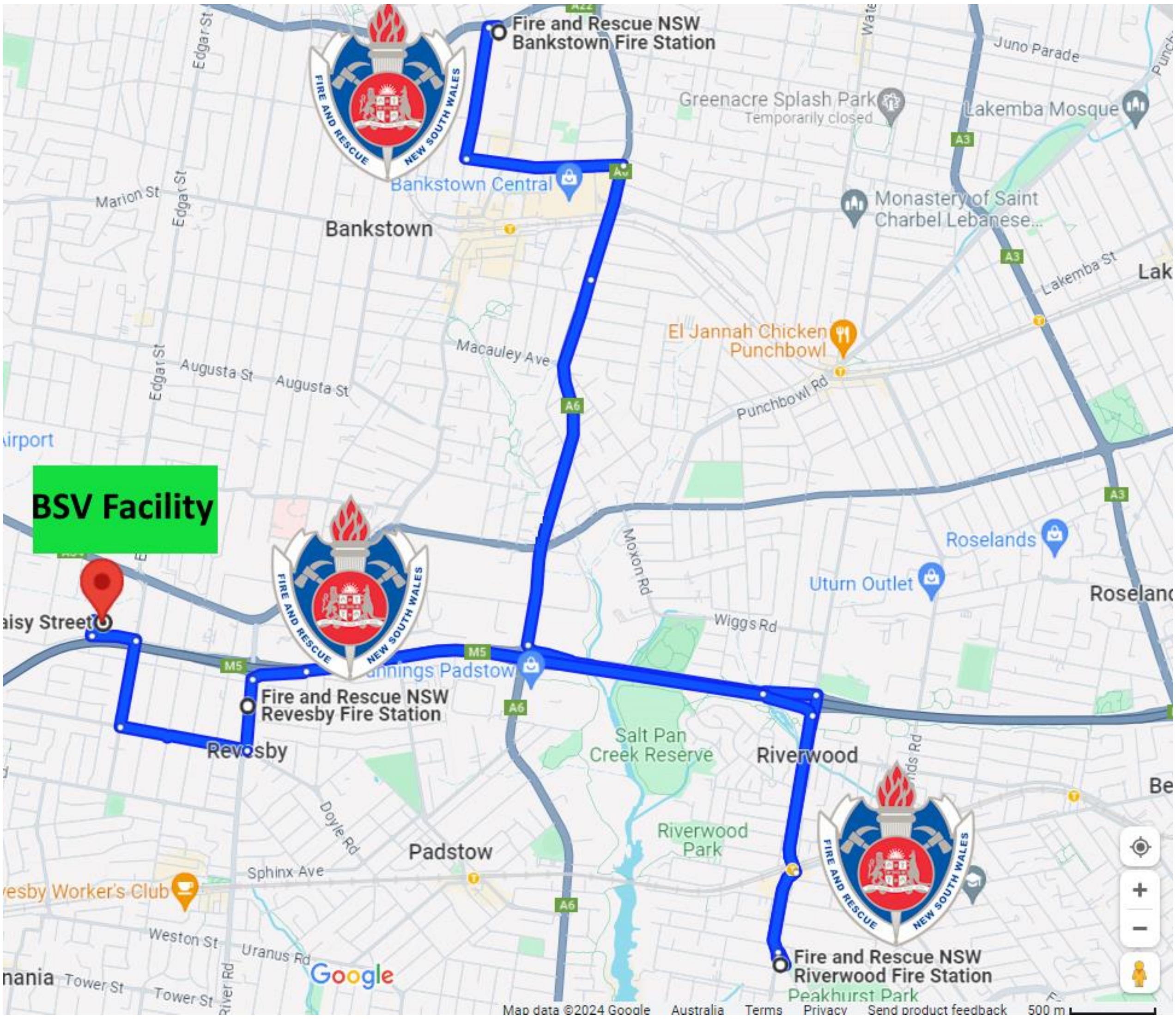


Figure 7-2: Location of Site with Respect to Closest Fire Brigade Stations

7.2 Response Time – Fire Brigade Intervention Model (FBIM)

Due to the nature of the FBIM, Ref. [15], it is necessary to justify the results through the inclusion of assumptions. The accuracy of results weighs heavily upon the measure of which assumptions are made and the sources from which they are derived. The model produced details the time it will take for brigade personnel within the aforementioned location to receive notification of a fire, the time to respond and dispatch resources, the time for resources to reach the fire scene, the time for the initial determination of the fire location, time to assess the fire, time for firefighter travel to the location of fire, and time for water setup such that suppression of the fire can commence. The following are details of the assumptions utilised in this FBIM:

7.2.1 Location of Fire

This FBIM will only be an indicative model of one fire scenario within the facility. For conservative purposes, the FBIM will consider a fire in the furthest incident from the point of entry.

7.2.2 Time between Ignition and Detection

- It is assumed that the initial brigade notification will occur by site personnel raising the alarm. It is expected that following ignition, site personnel would identify the fire within 5 minutes (300 s) of ignition due to the presence of a visible smoke plume.

7.2.3 Time for Initial Brigade Notification

- Fire brigade notification is expected to occur via a direct monitored alarm.
- Time for alarms / fire verification and any notification delays is 20 seconds based on Table B of the FBIM (Ref. [15]).
- Therefore, the time from ignition at which the fire brigade will be notified is (300+20) = 320 seconds after flaming combustion has commenced.

7.2.4 Time to Dispatch Resources

- The fire station is considered to be manned at the time of the fire.
- Based on FRNSW response times statistics from the 2022 / 2023 annual report (Ref. [16]), the 90th percentile of response time for the fire brigade to respond to an emergency call (including call processing, turnout time and travel time) is approximately 12 minutes as shown in **Figure** 7-3**.**

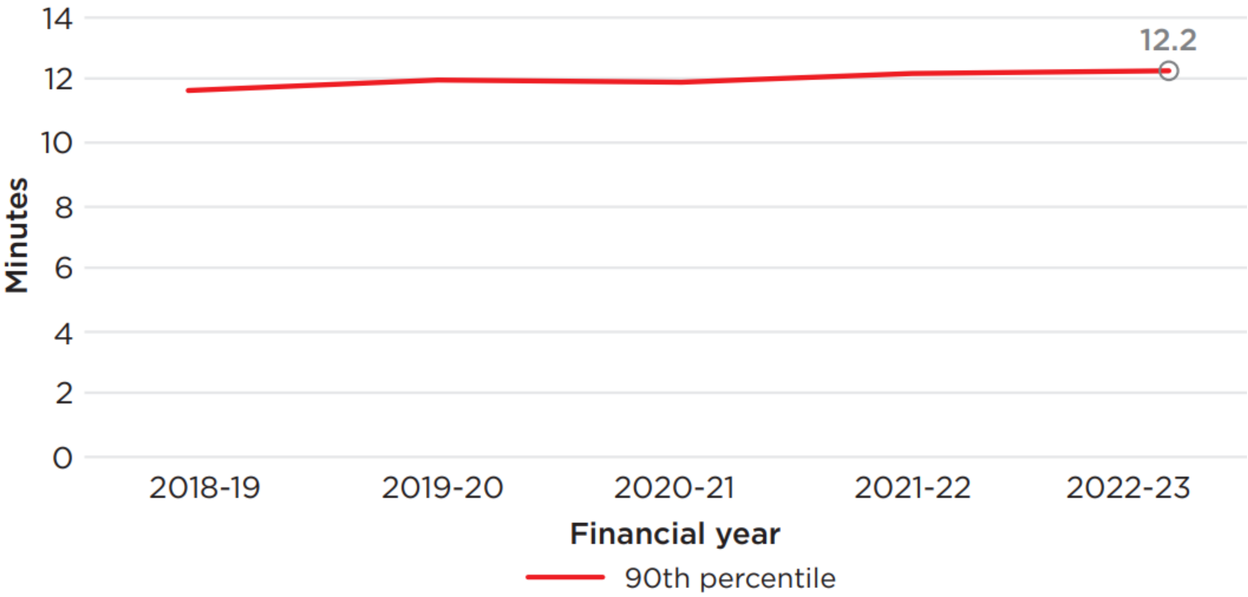


Figure 7-3: FRNSW Response Time from 2022 / 2023 Annual Report

- As the site is located within the FRNSW turnout districts it is expected that arrival at the site would be within the 90th percentile. The travel time has been assumed to be 12 minutes (720 seconds), as per **Figure 7-3.**
- Therefore, with a brigade call-out time of 320 seconds, the response time of 720 seconds, the fire brigade can be expected to arrive on site 1040 seconds after fire ignition.

7.2.5 Time for Initial Determination of Fire Location

- On arrival, the fire location may not be visible to the approaching brigade personnel, thus requiring information to be obtained from the site.
- Fire brigade personnel assemble in the site office area.
- Fire brigade tactical fire plans will be provided.
- It is assumed that a fire would occur during business hours and that staff are present on-site, providing assistance to fire brigade personnel in relation to identifying the fire location and entry into the building. As such, forced entry into the building is not required.

7.2.6 Time to Assess the Fire

- Horizontal egress speeds have been based on fire brigade personnel dressed in turnout uniform in Breathing Apparatus (BA). An average travel speed of 1.4 m / s with a standard deviation of 0.6 m/s as shown in **Table** 7-2. As such, for the calculations, a horizontal travel speed of 1.40 – (1.28x0.6) = 0.63 m / s is utilised.

Table 7-2: FBIM data for Horizontal Travel Speeds

Graph	Travel Conditions	Speed	
		Mean	SD*
Q1	Dressed in turnout uniform	2.3	1.4
Q2	Dressed in turnout uniform with equipment	1.9	1.3
Q3	**Dressed in turnout uniform in BA with or without equipment**	**1.4**	**0.6**
Q4	Dressed in a full hazardous incident suit in BA	0.8	0.5

*Standard Deviation

Horizontal travel distances will include the following:

- Travel from the kerb side adjacent to the main building and to the office is approximately 20 m.
- Travel from the office to the farthest point is 50 m along the most conservative route.
- Based on the above, the total horizontal travel distance of 70 m coupled with an egress speed of 0.63 m / s results in a horizontal travel time of up to 112 seconds.

7.2.7 Time for Water Setup

- The first appliance would be expected to commence the initial attack on the fire.
- Time taken to connect and charge hoses from on-site hydrants to the fire area is based on V3 Table V of the FBIM Guidelines, which indicates an average time of 45.3 seconds, and a standard deviation of 17.1 seconds. Using a 90th percentile approach as documented in the FBIM (Ref. [15]), the standard deviation is multiplied by a constant *k*, in this case being equal to 1.28. Therefore, the time utilised in this FBIM is 45.3 + (1.28x17.1) = 68 s.

7.2.8 Search and Rescue

Search and Rescue of the site will consist of a perimeter search of storage and processing areas. This will provide firefighting personnel with an additional 100 m of travel. At a speed of 0.63 m/s, this will take firefighting personnel approximately 159 seconds.

7.2.9 Summary

As summarised in **Table** 7-3 the FBIM (Ref. [15]) indicates that the arrival times of the brigade from the nearest fire stations is approximately 17.3 minutes after fire ignition, and it is estimated that it takes another 5.65 minutes for the fire brigade to carry out activities including the determination of fire location and preparation of firefighting equipment. As such, the initial attack on the fire is expected to commence approximately 22.98 minutes after fire ignition (note rounding affects the basic addition of the reported figures).

Table 7-3: Summary of the FBIM

Fire Station	Alarm Time	Travel Time	Time for Access & Assessment	Set-up Time	Time of Attack	Time for Search & Rescue
Revesby Fire Station	320 s	720 s	112 s	68 s	1,379 s (22.98) minutes)	159 s

8.0 Fire Water Supply & Contaminated Fire Water Retention

8.1 Detailed Fire Water System Assessment

It is considered that based on the restricted areas of the storage and operational areas that may be subject to fire, the Worst Credible Case Fire Scenario (WCCFS) would be managed by four hydrants. The current location of hydrants in the site have been provided in **Figure 6-1**.

A pressure inquiry confirms that the hydrants can discharge flow at 20 L/s at 26 m (255 kPa) of head, meeting the minimum requirements of AS 2419.1:2021 if 2 hydrant outlets required to flow simultaneously. This indicates that there is sufficient water supply to effectively combat potential fires at the facility. Notwithstanding this preliminary review, the following recommendation has been made:

- A hydraulic analysis of the hydrants shall be undertaken to confirm that the available pressure for the most hydraulically disadvantaged hydrant complies with AS 2419.1:2021.

8.2 Contaminated Water / Fire Water Retention

Where materials are combusted in a fire, they may become toxic (i.e. formation of volatile organic compounds and aromatic hydrocarbons). Hence, when fire water is applied the materials may mix with the water resulting in contaminated water which could impact offsite. The FSGBRT requires two (2) hydrant hoses operating at a combined total of 20 L/s for 90 minutes. This would generate approximately 108 m^3 of potentially contaminated water which would be required to be contained on site.

The following recommendation has been made:

- The facility and / or site boundaries shall be capable of containing 108 m^3 which may be contained within the building footprint, site stormwater pipework, and any recessed docks or other containment areas that may be present as part of the site design.
- The civil engineers designing the site containment shall demonstrate the design is capable of containing at least 108 m^3.
- An isolation system that will prevent the external discharge of potentially contaminated fire water is to be installed.

A recommendation has been made to provide bunding such that the water would be retained within the site boundaries preventing offsite impact. Provided this recommendation is adopted, the potential for contaminated water to be released from the site is considered to be adequately mitigated as required by the *Best Practice Guidelines for Contaminated Water Retention and Treatment Systems* (Ref. [12]).

9.0 FRNSW Fire Safety in Waste Facility Guidelines Review

It is necessary to review the facility against the Fire & Rescue NSW (FRNSW) Fire Safety in Waste Facilities Guidelines, to ensure the facility is designed with the appropriate fire protection. A summary review of the guidelines can be seen in **Table** 9-1**.** A detailed review of the guidelines has been carried out in **Appendix E** in **Appendix Table** E-1.

Table 9-1: Summary of FRNSW Fire Safety in Waste Facility Guidelines Requirements

Clause	Waste Facility Guidelines Requirement	Details of Compliance
7.2	Preparation of an FIMP	This report satisfies the requirement for an FIMP.
7.4	Firefighting Intervention Firefighter access should be provided to the facility, including to any fire safety system or equipment provided for firefighting intervention. The facility should cater for large emergency service responses, including containment of fire water run-off.	These requirements have been addressed in the following sections: • **Section 7.0** – Brigade access • **Section 6.2** – Fire detection and alarm • **Section 6.3** – Fire protection .
7.5	Fire Hydrant System The fire hydrant system should consider facility layout and operations, with fire hydrants being located to provide compliant coverage and safe firefighter access during a fire. The fire hydrant system is to have a minimum water supply and capacity providing the maximum hydraulic demand (i.e. flow rate) for not less than four hours.	The consequences and risk contours of credible fire scenarios have been outlined in **Section 5.0**, indicating recommended areas in which hydrants should not be located. The details of the fire water supply have been outlined in **Section 6.4.1.** A hydraulic demand assessment has been prepared and documented in **Section 8.1**.
7.6	Automatic Fire Sprinkler Systems The waste facility is to have an automatic fire sprinkler system installed in any fire compartment that has a floor area greater than 1,000 m^2 and contains combustible waste materials. The fire sprinkler system is to have minimum water supply and capacity providing maximum hydraulic demand for not less than two hours.	n/a
7.7	Fire Detection and Alarms The waste facility is to have a fire detection and alarm system installed appropriate to the risks and hazards identified. The alarm should activate any required alarm (warning occupants of fire, evacuation etc.), and activate the fire suppression system and warn all occupants of the fire.	Details of detection have been outlined in **Section 6.3.**
7.8	Smoke Hazard Management Buildings containing combustible waste material are to have an automatic smoke hazard management system appropriate to the potential fire load and smoke production rate installed within the building.	It has been recommended that compartments be protected by smoke hazard management subject to review by a fire engineer.

Clause	Waste Facility Guidelines Requirement	Details of Compliance
7.9	Fire-Water Run-off Containment The facility should have effective and automatic means of containing fire water run-off, with primary containment having a net capacity not less than the total hydraulic demand of installed fire safety systems.	Details of containment and recommendations have been outlined in **Section 8.0.**
8.2 / 8.3	Storages and Stockpiles The guidelines limit the size, volume and location of combustible waste stockpiles to ensure FRNSW access in the event of a fire. It also outlines requirements for monitoring the temperature of self-heating stockpiles to minimise the risk of autoignition	The size, volume and location of stockpiles is compliant.
8.4	External Stockpiles	As per **Section 3.0** external stockpiles are storage meets the criteria clarified in FSGBRT
8.5	Internal Stockpiles The guidelines limit the size, volume and location of combustible waste stockpiles to ensure FRNSW access in the event of a fire. It also outlines requirements for monitoring the temperature of self-heating stockpiles to minimise the risk of autoignition	The size, volume and location of stockpiles is compliant.
9.3	Emergency Plan The PCBU is required to develop an emergency plan for the waste facility, in accordance with AS 3745-2010.	An Emergency Response Plan (ERP) shall be prepared, as recommended in **Section 6.1.5**
9.4	Emergency Services Information Package (ESIP) An ESIP, as detailed in the FRNSW guideline Emergency services information package and tactical fire plans, should be developed and provided by the PCBU.	An ESIP shall be prepared, as recommended in **Section 6.1.5.**
9.5	Fire safety certificate requirements	Fire safety certificates are required for the facility and will be assessed annually as required.

10.0 Conclusion and Recommendations

10.1 Conclusions

The FIMP has been developed for the site at 30 Daisy St, Revesby NSW 2212 (Lot 198, DP7866) in accordance with HIPAP No. 2, Fire Safety Guidelines for Bulk Storage of Rubber Tyres and Fire Safety Guidelines in Waste facilities as part of the requirements in the SEARs to satisfy the fire and incident management requirements for the site.

The analysis performed in the FIMP was based on credible fire scenarios to assess whether the protection measures at the site were adequate to combat the hazards associated with the quantities and types of commodities being stored. Based on the review, the fire risks were identified and recommendations were made to be incorporated into the design to minimize the fire risks at the site.

10.2 Recommendations

Based on the analysis, the following recommendations have been made:

- Ensure appropriate fire prevention measures and emergency response strategies are in place.
- Allocate separate DG storage cabinets for flammable liquids and corrosive substances in accordance with AS 1940:2017 and AS 3780: 2023, respectively.
- Adequate spill kits are to be located adjacent to the combustible liquids storage area, flammable liquid cabinet and corrosive cabinet locations.
- The combustible liquid tanks are to comply with AS 1692.
- Two powder-type extinguishers are to be located within 15 m of the grease and engine oil store and not be located closer than 3 m and not further than 10 m from the flammable liquid and corrosive cabinets.
- Stockpile limits within the storage areas will be marked as per **section 4.11**.
- The site shall host FRNSW as a part of a site familiarisation to highlight the potential for tyre fires and potential for toxic smoke formation.
- A windsock shall be installed at the site to assist FRNSW in identifying the wind direction such that they do not establish a command centre downwind of the fire that may release toxic gases (i.e. Sulfur dioxide).
- Ensure all site attendees, staff, and drivers adhere to the no-smoking policy implemented on site.
- Develop a hot work permit system to control any hot work undertaken at the site.
- Consider installing CCTV to monitor for intruders.
- An Emergency Response Plan (ERP) shall be upgraded as per new proposal and process set up for the site in accordance with the Hazardous Industry Planning Advisory Paper No. 2.
- An Emergency Services Information Pack (ESIP) shall be developed for the site in accordance with the Fire & Rescue NSW fire safety guideline "*Emergency Service Information Pack and Tactical Fire Plans*".

- The requirement for smoke hazard management systems shall be reviewed by a fire engineer and confirmed whether smoke hazard management is required.
- A suitable fire extinguisher shall be available within 10 m of any area where rubber products are stored, sorted, or handled.
- The site is to replace the single head fire hydrants with dual fire hydrants near the tyre storage areas, within 60 m of each other as per **Figure 6-1** to ensure that each hydrant can be supported by an adjacent hydrant in the event of impact.
- The facility and / or site boundaries shall be capable of containing 108 m^3 which may be contained within the building footprint, site stormwater pipework, and any recessed docks or other containment areas that may be present as part of the site design.
- The civil engineers designing the site containment shall demonstrate the design is capable of containing at least 108 m^3.
- The existing isolation system, designed to prevent the external discharge of potentially contaminated firewater, should be regularly maintained and tested to ensure ongoing effectiveness.
- A hydraulic analysis of the hydrants shall be undertaken to confirm that the available pressure for the most hydraulically disadvantaged hydrant complies with AS 2419.1:2021.
- A fire hose reel system shall comply with AS 2441:2005.
- Portable fire extinguishers shall comply with AS 2444:2001.

11.0 References

[1] Department of Planning, "Hazardous Industry Planning Advisory Paper No. 2 - Fire Safety Study Guidelines," Department of Planning, Sydney, 2011.

[2] Fire and Rescue NSW, "Fire Safety Guideline: Fire Safety in Waste Facilities," Fire and Rescue NSW, Sydney, 2020.

[3] Fire and Rescue NSW, "Fire Safety Guideline for Bulk Storage of Rubber Tyres," Fire and Rescue NSW, Sydney, 2014.

[4] Department of Planning, "Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning," Department of Planning, Sydney, 2011.

[5] Standards Australia, AS 1940:2017 - Storage and Handling of Flammable and Combustible Liquids, Sydney: Standards Australia, 2017.

[6] Standards Australia, AS/NZS 60079.14:2022 - Explosive Atmospheres Part 14: Electrical Installations, Design, Selection and Erection, Sydney: Standards Australia, 2022.

[7] Standards Australia, AS/NZS 60079.10.1:2022 - Explosive Atmospheres Part 10.1: Classification of Areas, Explosive Gas Atmospheres, Sydney: Standards Association of Australia, 2022.

[8] S. Australia, "AS 3780:2023 - The storage and handling of corrosive substances," Standards Australia, Sydney, NSW, 2023.

[9] SafeWork NSW, "Work Health and Safety Regulation," SafeWork NSW, Lisarow, 2017.

[10] H. a. S. Executive, "Spontaneous heating of piled tyre shred and rubber crumb - Briefing note," Healkth and Safety Executive, 2024. [Online]. Available: https://www.hse.gov.uk/rubber/spontaneous.htm.

[11] NSW Health, "Health.nsw.gou.au," 2024. [Online]. Available: https://www.health.nsw.gov.au/environment /air/Pages/sulphur-dioxide.aspx. [Accessed 18 Feb 2024].

[12] NSW Department of Planning, "Best Practice Guidelines for Contaminated Water Retention and Treatment Systems," NSW Department of Planning, Sydney, 1994.

[13] The Comet Program, "Supporting Military Emergency Response During Hazardous Releases," [Online]. Available: http://stream1.cmatc.cn/pub /comet/Emergency Management /afwa_dis/comet/dispersion /afwa/txt/sect3.htm. [Accessed 27 July 2023].

[14] Standards Australia, "AS/NZS 3000:2018 - Wiring Rules," Standards Australia, Sydney, 2018.

[15] Australasian Fire Authorities Council, "Fire Brigade Intervention Model V2.2," Australasian Fire Authorities Council, 2004.

[16] Fire & Rescue NSW, "Annual Report 2022/2023," Fire & Rescue NSW, Sydney, 2023.

[17] I. Cameron and R. Raman, Process Systems Risk Management, San Diego: Elsevier, 2005.

[18] F. P. Lees, Loss Prevention in the Process Industries, London: Butterworth-Heinemann, 2005.

Appendix A

Hazard Identification Table

Appendix A

A1. Hazard Identification Table

Area / Operation	Hazard Cause	Hazard Consequence	Safeguards
Combustible Liquid storage area	• Combustible Liquid Fire in combustible liquid storage area	• Ignition of grease or engine oil leading to a fire. • Incident propagation from radiant heat.	• Combustible Liquids stored in accordance with AS1940:2017 • Two Powder-type fire extinguishers stored within 15 m combustible liquid stores • A spill kit located adjacent to combustible liquids • Adequate separation from nearby stores • Grease and engine oil to store in drum and on pallet bund.
Whole Tyre / Product and Waste Storage	• Tyre fire in Tyre Delivery Area and Tyre Outgoing Storage Area	• Tyre ignition resulting in very hot fire and difficult to put out. • Incident propagation through rolling tyres or radiant heat • Large volumes of smoke	• Tyres stored in accordance with Fire Safety Guideline for Bulk Storage of Rubber Tyres 2014 (Ref. [3]). • Tyre inspection • High material turnover • Suitable fire extinguishers • Hose reels. • Smoke detection. • Fire hydrants.
	• Smoke dispersion in Tyre Delivery Area and Tyre Outgoing Storage Area	• Potential toxic gasses released to the surrounding environment. • Environmental damage • Irritation	• Windsock to show the direction of the plume.
Processing / Production	• Production line fault	• Tyre fire in the tyre processing area • tyre ignition resulting in a very hot fire and difficult to put out. • Incident propagation through rolling tyres or radiant heat	• Tyres stored by Fire Safety Guideline for Bulk Storage of Rubber Tyres 2014 (Ref. [3]). • Store Separation. • Suitable fire extinguishers. • Hose reels.

Area / Operation	Hazard Cause	Hazard Consequence	Safeguards
		• Large volumes of smoke	• Smoke detection. • Street hydrants.
Storage and processing areas	• Firewater contamination	• Potentially contaminated fire water. • Environmental damage.	• Bunded site
Dangerous Goods	• Storage of minor quantities of flammable liquids and corrosive substances.	• Potential for a spill of flammable liquid or corrosive substance and environmental impact. • Spill of flammable liquid and fire, explosion, or flash fire.	• Minor quantities • Stored in DG cabinets in accordance with AS 1940:2017 and AS 3780:2023. • Bunded cabinets prevent external spills. • Ignition source control.

Appendix B

Consequence Analysis

B1. Incidents Assessed in Detailed Consequence Analysis

The following incidents are assessed for consequence impacts.

- Ignition of diesel or grease, combustible liquid fire
- Tyre fire in the tyre incoming area and outgoing storage area
- Heavy smoke dispersion in the tyre delivery area and outgoing storage area.
- Production line fault, tyre fire in tyre processing area.

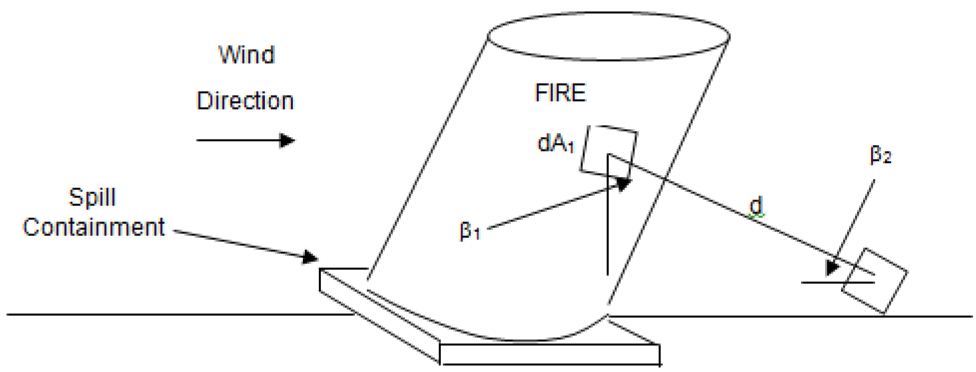
Each incident has been assessed in the sections below.

B2. Gexcon - Effects

The modelling was prepared using Effects which is proprietary software owned by Gexcon which has been developed based upon the TNO Coloured books and updated based upon CFD modelling tests and physical verification experiments. The software can model a range of incidents including pool fires, flash fires, explosions, jet fires, toxic dispersions, warehouse smoke plumes, etc.

B3. Fire Physical Effects

This section provides an overview of how radiant heat modelling of fires occurs from a first principles approach which is the underlying information that is used in Gexcon effects / TNO coloured books. The liquid flame area is calculated as if it is a circle to find the radius for input into the model. **Appendix Figure** B-1 shows a typical pool fire, indicating the target and fire impact details.



Appendix Figure B-1: Heat Radiation on a Tangent from a Cylindrical Flame

The fire is modelled as a cylinder with the heat from the cylindrical flame radiating to the surrounding area. A number of mathematical models may be used for estimating the heat radiation impacts at various distances from the fire. The point source method is adequate for assessing impacts in the far field; however, a more effective approach is the view factor method, which uses the flame shape to determine the fraction of heat radiated from the flame to a target. The radiated heat is also reduced by the presence of water vapour and the amount of carbon dioxide in air. The formula for estimating the heat radiation impact at a set distance is shown in **Equation B-1** (Ref. [17]).

$$Q = EF\tau \quad \textbf{Equation B-1}$$

Where:

- Q = incident heat flux at the receiver (kW / m^2)
- E = surface emissive power of the flame (kW / m^2)
- F = view factor between the flame and the receiver
- τ = atmospheric transmissivity

The calculation of the view factor (F) in **Equation B-2** depends upon the shape of the flame and the location of the flame to the receiver. F is calculated using an integral over the surface of the flame, S (Ref. [17]). The formula can be shown as:

$$F = \int\int s \frac{\cos\beta_1 \cos\beta_2}{\pi d^2}$$ **Equation B-2**

Equation B-2 may be solved using the double integral **or** using a numerical integration method.

For the assessment of pool fires, the model calculates the view factor based on the basis of finite elements. The liquid flame area is calculated as if the fire is a vertical cylinder, for which the flame diameter is estimated based on the fire characteristics (e.g. contained within a bund). Once the flame cylindrical diameter is estimated, it is input into the model or is calculated based on the polygon of the fire dimensions. The model then estimates the flame height, based on diameter, and develops a flame geometric shape (cylinder) on which is performed the finite element analysis to estimate the view factor of the flame. **Appendix Figure** B-1 shows a typical pool fire, indicating the target and fire impact details.

The model integrates the element dA_1 by varying the angle theta θ (the angle from the centre of the circle to the element) from zero to 90^o in intervals of 2.5 degrees. Zero degrees represents the straight line joining the centre of the cylinder to the target (x0, x1, x2) while 90^o is the point at the extreme left-hand side of the fire base. In this way the fire surface is divided up into elements of the same angular displacement. Note the tangent to the circle in plan. This tangent lies at an angle, gamma, with the line joining the target to where the tangent touches the circle (x4). This angle varies from 90^o at the closest distance between the liquid flame (circle) and the target (x0) and gets progressively smaller as θ increases. As θ increases, the line x4 subtends an angle phi Φ with x0. By similar triangles we see that the angle gamma γ is equal to 90- θ - Φ . This angle is important because the sine of the angle gives the proportion of the projected area of the plane. When γ is 90^o, sin(γ) is 1.0, meaning that the projected area is 100% of the actual area.

Before the value of θ reaches 90^o the line x4 becomes tangential to the circle. The fire cannot be seen from the rear and negative values appear in the view factors to reflect this. The model filters out all negative contributions.

For the simple case, where the fire is of unit height, the view factor of an element is simply given by the expression in **Equation** B-3 (Derived from **Equation** B-2):

$$VF = \Delta A \frac{\sin\gamma}{\pi \times X4 \times X4}$$ **Equation B-3**

Where ΔA is the area of an individual element at ground level.

Note: the denominator (π. x4. x4) is a term that describes the inverse square law for radiation assumed to be distributed evenly over the surface of a sphere.

Applying the above approach, we see the value of x4 increase as θ iincreases and the value of sin(γ) decreases as θ iincreases This means that the contribution of the radiation from the edge of the circular fire drops off quite suddenly compared to a view normal to the fire. Note that the model adds up the separate contributions of **Equation** B-3 for values theta between zero until x4 makes a tangent to the circle.

It is now necessary to do two things: (i) to regard the actual fire as occurring on top of a firewall (store) and (ii) to calculate and sum all of the view factors over the surface of the fire from its base to its top. The overall height of the flame is divided into 10 equal segments. The same geometric technique is used. The value of x4 is used as the base of the triangle and the height of the flame, as the height. The hypotenuse is the distance from the target to the face of the flame (called X4'). The angle of elevation to the element of the fire (alpha α) is the arctangent of the height over the ground distance. From the cos(α) we get the projected area for radiation. Thus, there is a new combined distance and an overall equation becomes in **Equation** B-4 **(**(Derived from **Equation** B-3):

$$VF = \Delta A \frac{\sin\gamma \times \cos\alpha}{\pi \times X4 \times X4}$$ **Equation B-4**

The model now turns three-dimensional. The vertical axis represents the variation in θ from 0 to 90^{o} representing half a projected circle. The horizontal axis represents increasing values of flame height in increments of 10%. The average of the extremes is used (e.g. if the fire were 10 m high then the first point would be the average of 0 and 1 i.e. 0.5 m), the next point would be 1.5 m and so on).

Thus, the surface of the flame is divided into 360 equal area increments per half cylinder making 720 increments for the whole cylinder. Some of these go negative as described above and are not counted because they are not visible. Negative values are removed automatically.

The sum is taken of the View Factors in **Equation** B-3. The sum is taken without the ∆A term. This sum is then multiplied by ∆A which is constant. The value is then multiplied by 2 to give both sides of the cylinder. This is now the integral of the incremental view factors. It is dimensionless so when we multiply by the emissivity at the "face" of the flame (or surface emissive power, SEP), which occurs at the same diameter as the firebase (pool), we get the radiation flux at the target.

The SEP is calculated using the work by Mudan & Croche (Ref. [18] & Ref. [17]) which uses a weighted value based on the luminous and non-luminous parts of the flame. The weighting is based on the diameter and uses the flame optical thickness ratio where the flame has a propensity to extinguish the radiation within the flame itself. The formula is shown in **Equation** B-5.

$$SEP = E_{max}e^{-sD} + E_s(1 - e^{-sD})$$ **Equation B-5**

Where;

E_{max} = 130

S = 0.12

E_s = 20

D = pool diameter

The only input that is required is the diameter of the pool fire which is automatically calculated in the model.

The flame height is estimated using the Thomas Correlation (Ref. [17]) which is shown in **Equation** B-6.

$$H = 42d_p\left[\frac{\dot{m}}{\rho_a\sqrt{gd_p}}\right]^{0.61}$$ **Equation B-6**

Where;

d_p = pool diameter (m)

ρ_a = density of air (1.2 kg / m^3 at 20ºC)

$\dot{m}$ = burning rate (kg / m^2.s)

g = 9.81 m / s^2

B4. Radiant Heat Physical Impacts

Appendix Table B-1 provides noteworthy heat radiation values and the corresponding physical effects of an observer exposed to these values (Ref. [4]).

Appendix Table B-1: Heat Radiation and Associated Physical Impacts

Heat Radiation (kW / m^2)	Impact
35	• Cellulosic material will pilot ignite within one minute's exposure • Significant chance of a fatality for people exposed instantaneously
23	• Likely fatality for extended exposure and chance of a fatality for instantaneous exposure • Spontaneous ignition of wood after long exposure • Unprotected steel will reach thermal stress temperatures which can cause failure • Pressure vessel needs to be relieved or failure will occur
12.6	• Significant chance of a fatality for extended exposure. High chance of injury • Causes the temperature of the wood to rise to a point where it can be ignited by a naked flame after long exposure • Thin steel with insulation on the side away from the fire may reach a thermal stress level high enough to cause structural failure
4.7	• Will cause pain in 15-20 seconds and injury after 30 seconds exposure (at least second-degree burns will occur)
3.0	• FRNSW criteria for accessing equipment

B5. Ignition of Engine Oil or Grease, Combustible Liquid Fire

The combustible liquids area contains 240 L of grease and 240 L of engine oil, each stored in separate drums on a 1 m² bunded pallet. Since both drums are mutually bunded, a single fire pool has been modelled to assess the potential impact on firefighting equipment and the risk of fire spreading to surrounding storage areas. To adopt a more conservative approach, the fire modelling in this section uses the calorific value of gasoline, which is 49,000 kJ/kg.

The dimensions and area of the fires modelled in this section are summarized in **Appendix Table** B-2**.**

Appendix Table B-2: Fire Dimension and Area for Combustible Liquids Storage Area

Combustible Liquid Item	Location	Dimensions (m)	Area (m^2)
Engine Oil	bunded pallet	1.23 x 1.23	1.5
Grease Drum			

The model was run to calculate the radiant heat values for each of the fires. The results are presented in **Appendix Table** B-3.

Appendix Table B-3: Radiant Heat from Combustible Liquids in Chemical Storage Area

Radiant Heat (kW/m^2)	Distance (m)
23	2
3	5.2

B6. Tyre Fire in The Tyre Delivery Area and Outgoing Storage Area.

Two fires are analysed in this vicinity: one in the tyre incoming area and another in the outgoing storage area. Upon delivery, whole tyres are unloaded from trucks and stacked in the designated whole tyre storage area as depicted in **Figure 4-1**. These tyres remain here temporarily before being moved for processing. Nearby rubber stores include both the product storage area and the processing area. The whole tyres being assessed have a minimum steel composition of 6% and 2% cotton. Analysing this minimum steel composition allows for a conservative analysis, considering it represents the highest plausible percentage by mass in the rubber store.

The maximum volume of tyres stored at any given time in the whole tyre storage area within the tyre delivery area is 84 m^3, weighing approximately 23 tonnes. Excluding steel and cotton the maximum amount of rubber stored within the whole tyre storage area is approximately 22 tonnes of rubber.

Once the tyres are processed and separated into crumb rubber, steel, and cotton, the resulting products are stored in the product storage area. The rubber stored in this area amounts to 22 tonnes, comprising rubber matting, rubber pavers, and crumb rubber.

Understanding the calorific value is crucial for assessing the energy released during a fire, which in turn is utilised to model the radiant heat impacts. Rubber, when burning, emits a substantial amount of energy, with a calorific value of 40,000 kJ/kg. For modelling the fire in the tyre storage area, the calorific value of gasoline, at 49,000 kJ/kg, is employed.

The dimensions and area of each fire that were inputted into the model are summarized in **Appendix Table** B-4**.**

Appendix Table B-4: Fire Dimension and Area for Whole Tyre Storage Area and Product Storage Area

Location	Dimensions (m)	Area (m^2)
Incoming Storage Area	2x (3.25x9.1)	2x (30)
Outgoing Storage Area	4x (2.4x12.2)	4x (29.3)

The model was run to calculate the radiant heat values for each of the fires. The results are presented in **Appendix Table** B-5.

Appendix Table B-5: Radiant Heat from Outgoing (Product) and Incoming (Drop off) Storage Area

Radiant Heat (kW/m^2)	Distance (m)	
	Outgoing (Product) Storage Area	Incoming (Drop off) Storage Area
23	9.4	9.5
3	16	18

B7. Smoke Dispersion from The Tyre Delivery Area and Outgoing Storage Area Fire.

B7.1 Atmospheric Conditions

During the fire, toxic by-products may be generated which will be dispersed in the smoke plume. It is necessary to assess the associated impacts of the smoke plume downwind of the facility as it may have far-reaching impacts on the wider community. When assessing the downwind impacts of the fire plume, the main contributors to the dispersion are:

- The fire size (diameter) and energy released as convective heat.
- The atmospheric conditions such as wind speed, relative humidity, atmospheric stability and ambient temperature.

These param interact to determine the buoyancy of the smoke plume (vertical rise) which is controlled by the convective energy within the smoke plume in addition to the atmospheric conditions. The atmospheric conditions will vary from stable conditions (generally nighttime) to unstable conditions (high insolation from solar radiation) which results in substantial vertical mixing which aids in the dispersion. Contributing to this is the impact of wind speed which will limit the vertical rise of a plume but may exacerbate the downwind impact distance.

The atmospheric conditions are classified as Pasquill Guifford's Stability categories which are summarised in **Appendix Table** B-6 (Ref. [17]).

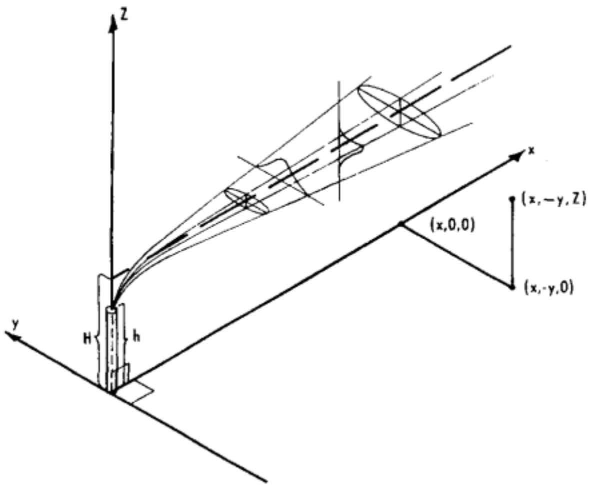
Appendix Table B-6: Pasquill's Stability Categories

Surface wind speed at 10 m height (m / s)	Insolation			Night	
	Strong	Moderate	Slight	Thinly overcast or ≥50% cloud	<50% cloud.
<2	A	A-B	B	-	-
2-3	A-B	B	C	E	F
3-5	B	B-C	C	D	E
5-6	C	C-D	D	D	D
>6	C	D	D	D	D

Generally, the most onerous conditions are F1.5 conditions which result in stable air masses and typically have inversion characteristics. Inversion characteristics occur when a warm air mass sits above a cold air mass. Typically, hot air will rise due to lower density than the bulk air; however, in an inversion, a warm air mass sits above the cooler denser air; hence, as the warm air rises through the cold mass it hits a 'wall' of warmer air preventing vertical mixing above this point. In a fire scenario, the hot smoke plume will cool as it rises; however, if it encounters an inversion, it will begin to run along this boundary layer preventing vertical mixing and allowing the smoke plume to spread laterally for substantial distances.

B7.2 Dispersion Model Selection

A smoke plume is buoyant and will disperse laterally and vertically as it rises essentially following a Gaussian dispersion as shown in **Appendix Figure** B-2 (Ref. [17]).



Appendix Figure B-2: Co-ordinant System for Gas Dispersion

Gexcon Effects has been used to model a smoke plume arising from the compartment. The model has been developed based on a Gaussian dispersion model accounting for modifications to the plume drag coefficients required to model a plume dispersion from a compartment fire.

The model requires several inputs which have been summarised in **Appendix Figure** B-3 with the associated value input as part of this modelling exercise. F1.5 conditions have been used to model the plume dispersion. It is noted that the mass entered into the model only affects the duration of a release and not the peak combustion rate. The modelling has been based on the peak rate assuming this runs for the length of the dispersion; hence, the mass entered is not important to the results.

The justification for values is as follows:

- NO2 Conversion: Yellow book value for warehouse fires
- Fraction combusted radiated: General rule of thumb assumption that 1/3 of the heat generated is radiated with the remainder being heat and light.
- Fraction soot unburned: Yellow book default.
- Ambient temperature: 20^{o}C a reasonable approximation for average temperature across winter / summer / day / night
- Conditions: F1.5 (F stability at 1.5 m / s wind speed)

The fires that have been modelled are based on the full compartment Tyre Delivery Area fire and an Outgoing Storage Area Fire. The material modelled has been based on the mass being 100%

styrene-butadiene rubber (SBR) with the presence of Sulfur, (C8H8)(C4H6)S8. SBR is the most common material comprising a rubber tyre. This represents a simplified version of the molecular formula for the tyre compound, indicating the presence of both SBR polymer chains and Sulfur crosslinking agents. However, in a real-world tyre compound, there would be additional components such as fillers, antioxidants, plasticizers, and other additives, making the molecular formula much more complex. It is assumed the molecules not present in the model would follow a similar dispersion path to that of the material assessed.

Parameters	
Inputs	
Process Conditions	
Phase	Solid
Average molecular formula	(C8H8)(C4H6)S8
Calculation Method	
NO2 conversion fraction (-)	0.35
Fraction combustion heat radiated (-)	0.35
Fraction of soot (unburned carbon) (-)	0.8
Source Definition	
Total mass released (kg)	25000
Surface area of the fire (m2)	30
Environment	
Ambient temperature (°C)	20

Appendix Figure B-3: Input Data for Plume Gaussian Dispersion - Tyre Delivery Area and Outgoing Storage Area

B7.3 Dispersion Results

Provided in **Appendix Table** B-7 is a summary of the pollutant release rates generated by the model.

Appendix Table B-7: Pollutant Release Rates

Pollutant	Release Rate (kg/s)	
	Tyre Outgoing (Product) Area	Incoming (Drop off) Area
Carbon Dioxide	0.19131	0.19131
Sulfur Dioxide	0.92724	0.92724
Water ($H_2$0)	0.22846	0.22846
Soot (Carbon)	0.20875	0.20875

Each of the pollutants was modelled to determine their plume shape and determine whether the plume would puncture through an inversion layer and what the downwind dispersion would look like as the plume cools and settles in the atmosphere. The plume shapes are the same for both the two different stores (tyre store and product store) as seen by the release rates present in **Appendix Table** B-7 due to this the following plumes represent both scenarios.

The key values that determine the dispersion have been summarised below:

- Atmospheric stability: F
- Wind speed: 1.5 m/s

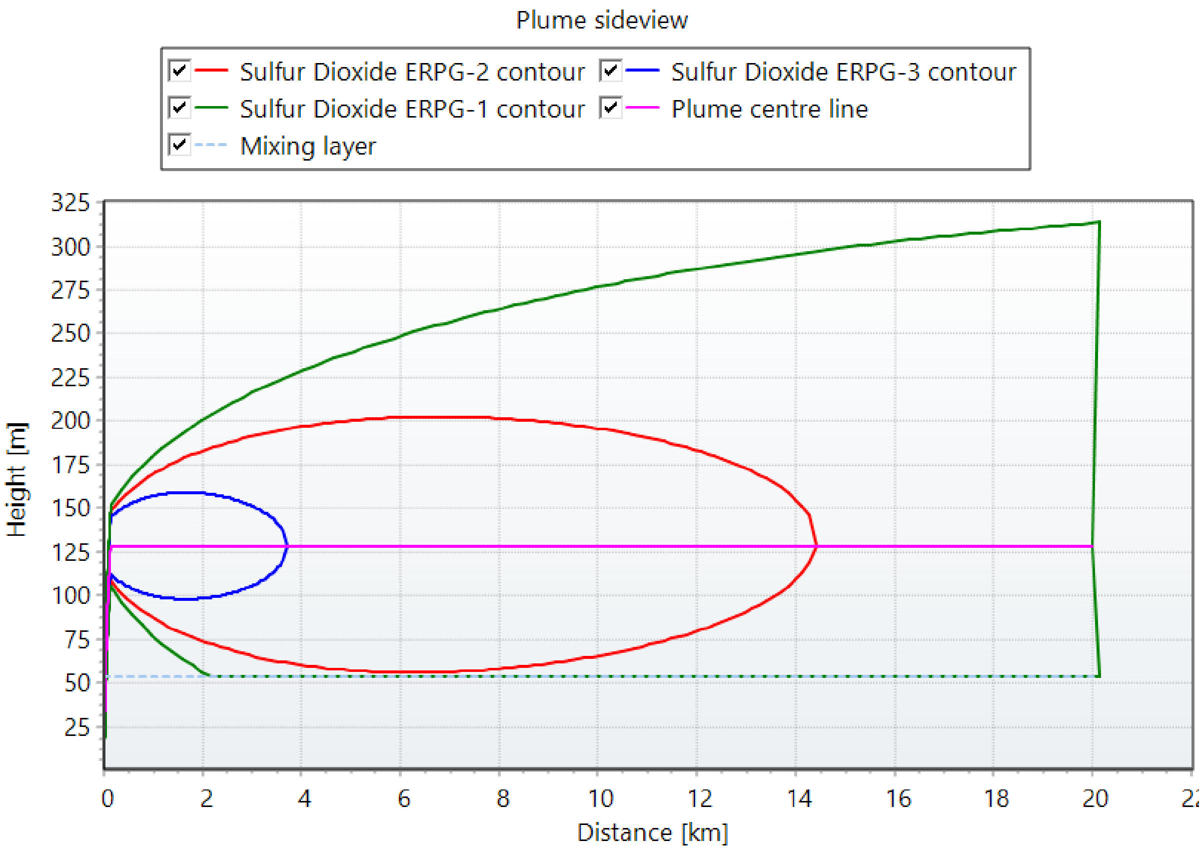
- Release rates: Per **Appendix Table** B-7

The soot and carbon dioxide concentrations have been selected at 1, 5, and 10 mg/m^3 to outline the various plume shapes at different concentrations.

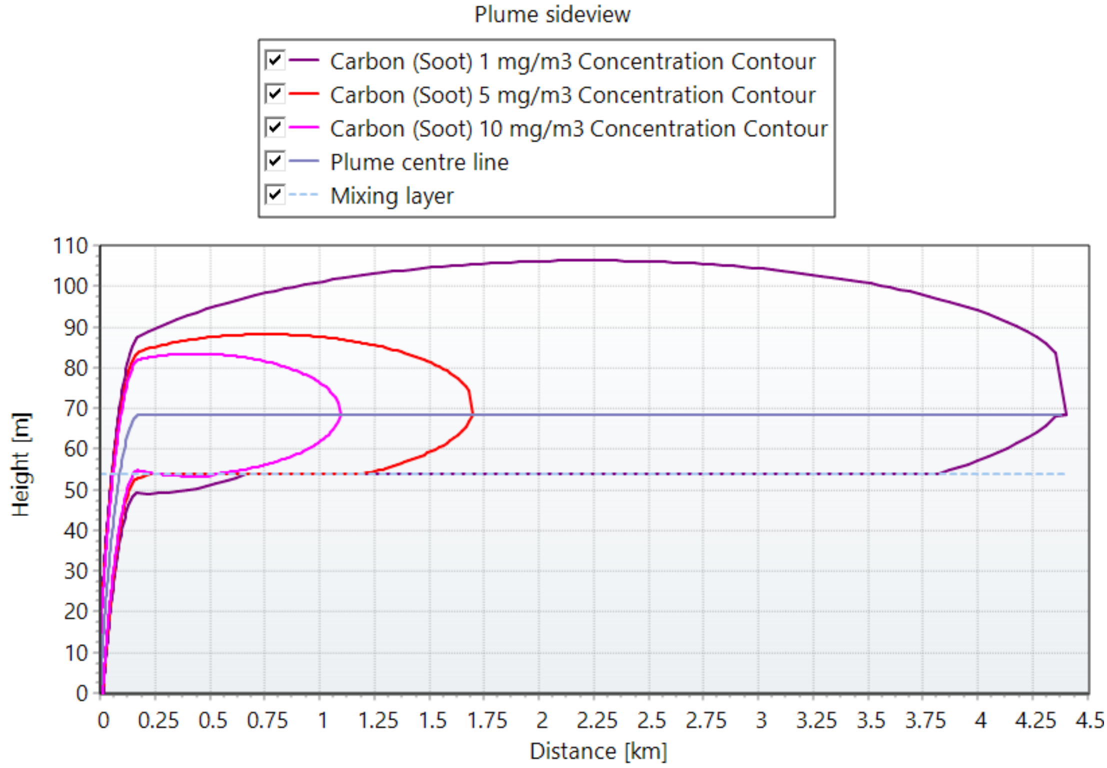
The impacts associated with exposure to a toxic gas are broken down based on the effects which occur when exposed to a concentration. The values used in this analysis are based upon the Emergency Response Planning Guidelines (ERPG) tiers which are summarised below.

- **ERPG-3** is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.
- **ERPG-2** is the maximum airborne concentration below which 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.
- **ERPG-1** is the maximum airborne concentration below which 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.

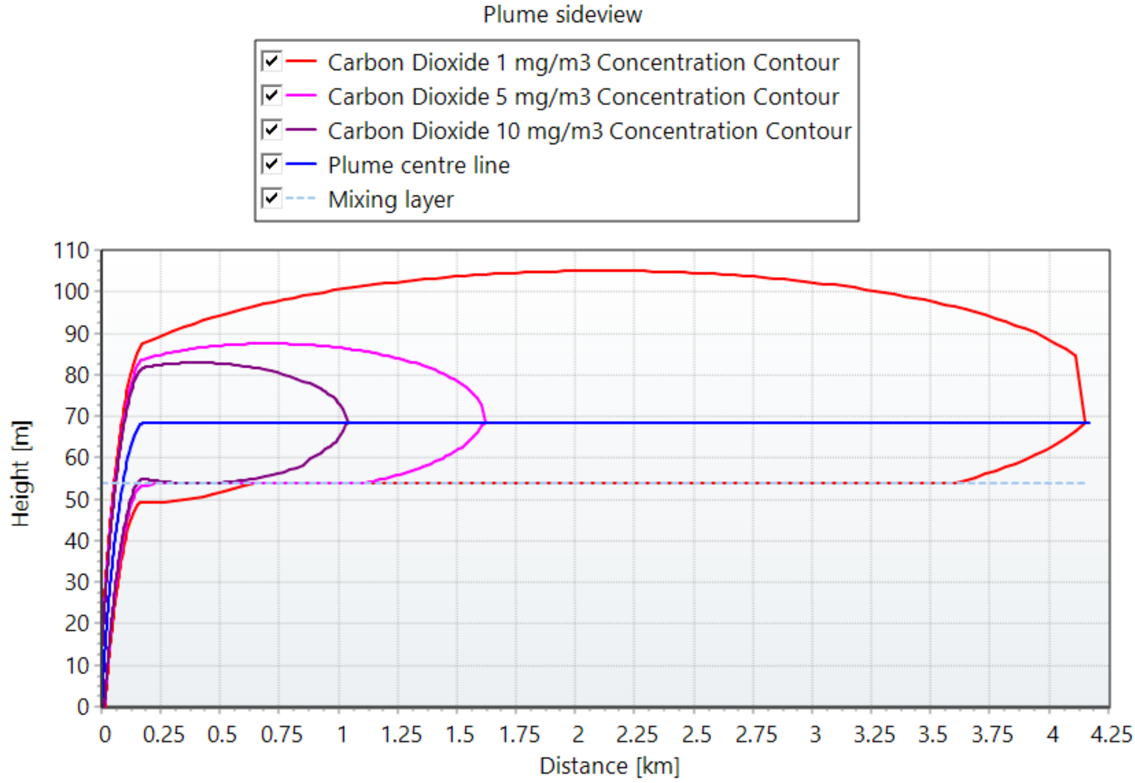
The graphs show the smoke plume from the side view such that the height and length of the dispersion can be viewed.



Appendix Figure B-4: Sulfur Dioxide Downwind Plume Dispersion Storage Fire



Appendix Figure B-5: Soot (Carbon) Downwind Plume Dispersion – 1, 5 and 10mg/m3



Appendix Figure B-6: Carbon Dioxide Downwind Plume Dispersion – 1, 5 and 10mg/m3

B8. Production Line Fault, Tyre Fire in Processing Area.

The production area processes entire tyres to create crumb rubber, rubber pavers, and rubber matting. Although the risk of fire in this area is low, the potential consequences and challenges of extinguishing a tyre fire have been considered. To simulate such a scenario, the calorific value of gasoline, 49,000 kJ / kg is used, similar to modelling fires in the tyre storage area and product storage area.

Since the amount of rubber varies in mass and volume at different processing stages, it's challenging to model a fire across the entire system accurately. Thus, the production line is divided into modules for assessment. Radiant heat contour lines are extended over conveyor belts to enhance accuracy.

The production line is divided into four sections: the single hook tyre de-beader, the whole tyre shredder, the double roller rubber breaker, the crumb rubber bagging area, and the vulcanizing machine. The mass of burning material in each section is conservatively estimated at 30 minutes of throughput where a single mass is not provided, as determining the instantaneous mass is difficult. **Appendix Table** B-8 summarizes the mass of rubber and the fire area entered into the model.

Appendix Table B-8: Current and Proposed Production Line Modules Fire Area

Process line	Section	Quantity	Area (m^2)
Current	Grinder Mill	2	0.6
	Block Cutter Machine	4	0.5
	Double Shaft Shredder with Rotary Sieve	1	8
Proposed line	Mobile shredder	1	34
	Mobile shredder	1	34

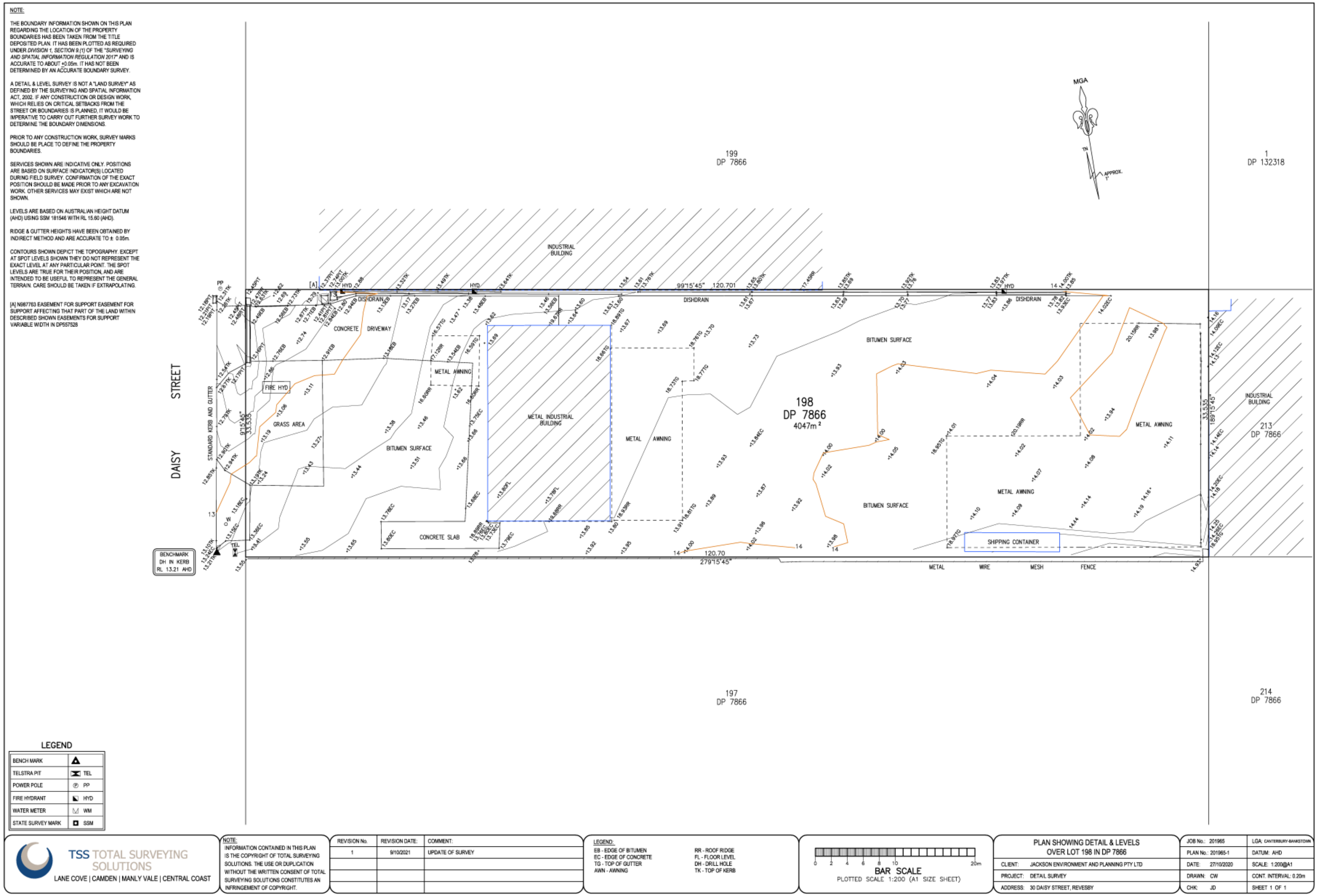
The model was then run to calculate the radiant heat values for each of the fires. The results are presented in **Appendix Table** B-9.

Appendix Table B-9: Radiant Heat Values for Production Line Fire Model

Radiant Heat (kW/m^2)	Distance (m)	
	Current Set Up	Proposed Set Up
23	5	11
3	9	17

Appendix C

Site Survey of Watermains and Fire Hydrants


NOTE:
THE BOUNDARY INFORMATION SHOWN ON THIS PLAN REGARDING THE LOCATION OF THE PROPERTY BOUNDARIES HAS BEEN TAKEN FROM THE TITLE DEPOSITED PLAN. IT HAS BEEN PLOTTED AS REQUIRED UNDER DIVISION 1, SECTION 9.(1) OF THE "SURVEYING AND SPATIAL INFORMATION REGULATION 2017" AND IS ACCURATE TO ABOUT +0.05m. IT HAS NOT BEEN DETERMINED BY AN ACCURATE BOUNDARY SURVEY.
A DETAIL & LEVEL SURVEY IS NOT A "LAND SURVEY" AS DEFINED BY THE SURVEYING AND SPATIAL INFORMATION ACT, 2002. IF ANY CONSTRUCTION OR DESIGN WORK, WHICH RELIES ON CRITICAL SETBACKS FROM THE STREET OR BOUNDARIES IS PLANNED, IT WOULD BE IMPERATIVE TO CARRY OUT FURTHER SURVEY WORK TO DETERMINE THE BOUNDARY DIMENSIONS.
PRIOR TO ANY CONSTRUCTION WORK, SURVEY MARKS SHOULD BE PLACE TO DEFINE THE PROPERTY BOUNDARIES.
SERVICES SHOWN ARE INDICATIVE ONLY. POSITIONS ARE BASED ON SURFACE INDICATOR(S) LOCATED DURING FIELD SURVEY. CONFIRMATION OF THE EXACT POSITION SHOULD BE MADE PRIOR TO ANY EXCAVATION WORK. OTHER SERVICES MAY EXIST WHICH ARE NOT SHOWN.
LEVELS ARE BASED ON AUSTRALIAN HEIGHT DATUM (AHD) USING SSM 181546 WITH RL 15.60 (AHD).
RIDGE & GUTTER HEIGHTS HAVE BEEN OBTAINED BY INDIRECT METHOD AND ARE ACCURATE TO ± 0.05m.
CONTOURS SHOWN DEPICT THE TOPOGRAPHY. EXCEPT AT SPOT LEVELS SHOWN THEY DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT. THE SPOT LEVELS ARE TRUE FOR THEIR POSITION, AND ARE INTENDED TO BE USEFUL TO REPRESENT THE GENERAL TERRAIN. CARE SHOULD BE TAKEN IF EXTRAPOLATING.
[A] N987763 EASEMENT FOR SUPPORT EASEMENT FOR SUPPORT AFFECTING THAT PART OF THE LAND WITHIN DESCRIBED SHOWN EASEMENTS FOR SUPPORT VARIABLE WIDTH IN DP557528
199 DP 7866
1 DP 132318
MGA
INDUSTRIAL BUILDING
DAISY STREET
STANDARD KERB AND GUTTER
CONCRETE DRIVEWAY
DISHDRAIN
FIRE HYD
GRASS AREA
BITUMEN SURFACE
METAL AWNING
METAL INDUSTRIAL BUILDING
CONCRETE SLAB
198
DP 7866
4047m²
SHIPPING CONTAINER
99°15'45" 120.701
120.70
279°15'45"
METAL WIRE MESH FENCE
213 DP 7866
BENCHMARK DH IN KERB RL 13.21 AHD
197 DP 7866
214 DP 7866
LEGEND
BENCH MARK
TELSTRA PIT TEL
POWER POLE PP
FIRE HYDRANT HYD
WATER METER WM
STATE SURVEY MARK SSM
TSS TOTAL SURVEYING SOLUTIONS
LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST
NOTE:
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REVISION No. 1 REVISION DATE: 9/10/2021 COMMENT: UPDATE OF SURVEY
LEGEND:
EB - EDGE OF BITUMEN
EC - EDGE OF CONCRETE
TG - TOP OF GUTTER
AWN - AWNING
RR - ROOF RIDGE
FL - FLOOR LEVEL
DH - DRILL HOLE
TK - TOP OF KERB
BAR SCALE
PLOTTED SCALE 1:200 (A1 SIZE SHEET)
PLAN SHOWING DETAIL & LEVELS OVER LOT 198 IN DP 7866
CLIENT: JACKSON ENVIRONMENT AND PLANNING PTY LTD
PROJECT: DETAIL SURVEY
ADDRESS: 30 DAISY STREET, REVESBY
JOB No.: 201965
PLAN No.: 201965-1
DATE: 27/10/2020
DRAWN: CW
CHK: JD
LGA: CANTERBURY-BANKSTOWN
DATUM: AHD
SCALE: 1:200@A1
CONT. INTERVAL: 0.20m
SHEET 1 OF 1

Appendix D

Pressure Statement

Statement of Available Pressure and Flow

Jill Lethlean
8 Norman Street
St James, 6102

Attention: Jill Lethlean Date: 03/08/2021

Pressure & Flow Application Number: 1194527
Your Pressure Inquiry Dated: 2021-07-16
Property Address: 30-32 Daisy Street, Revesby 2212

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Daisy Street	Side of Street: East
Distance & Direction from Nearest Cross Street	68 metres North from Gordan Parker Street
Approximate Ground Level (AHD):	15 metres
Nominal Size of Water Main (DN):	150 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	47 metre head
Minimum Pressure	26 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	26
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5	26
	10	26
	15	26
	20	25
	26	24
	30	23
	40	21
	50	18
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5	25
	10	25
	15	25
	20	24
	26	23
	30	22
	40	20
	50	17
Maximum Permissible Flow	67	10

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

swtapin@sydneywater.com.au

Sydney Water Corporation ABN 49 776 225 038
1 Smith St Parramatta 2150 | PO Box 399 Parramatta 2124 | DX 14 Sydney | T 13 20 92 | www.sydneywater.com.au
Delivering essential and sustainable water services for the benefit of the community

Appendix E

Fire and Rescue NSW Fire Safety in Waste Facilities Guidelines

E1. Review of FRNSW Fire Safety in Waste Facility Guidelines

Appendix Table E-1: Detailed Review of FRNSW Fire Safety in Waste Facility Guidelines

Clause	FRNSW Waste Facility Guideline Requirement	Details of Compliance
	7.2 Designing for Special Hazard	
7.2.1	Combustible waste should be considered a special hazard and consent authorities should impose the conditions on development that Clause E1.10 and E2.3 of the NCC be complied with to the satisfaction of the fire brigade.	Noted
7.2.3	All fire risks and hazards of the waste facility should be identified. A FIMP is to be done in accordance with HIPAP No. 2 if deemed appropriate by the relevant consent authority.	This report satisfies the requirement for an FIMP. **Sections 4.0** and **Section 5.0** identify and assess all fire risks and hazards
7.2.4	The development proponent is encouraged to engage a fire safety engineer or other suitably qualified consultant to develop a performance solution specific to the waste facility and its proposed operations.	Fire engineers have been engaged for the facility as part of the FEB / FER process. This report has not been provided in this document as it is considered not necessary for the reading of this report.
7.2.5	All reasonable and foreseeable combustible waste materials should be identified and considered in any performance solution.	Combustible materials have been identified in **Section 3.0** and assessed.
7.2.6	For simplification in designing for special hazards, the following surface burning temperatures and fire risk rating should be applied to stockpiles of common combustible waste materials (table in the guideline)	These values do not apply to the assessments conducted within a FIMP which does not require flame temperature as input to determine the outputs required by HIPAP No. 2
7.2.7	Where a stockpile contains a mixture of combustible waste materials, the burn temperature and fire risk of the most predominant waste material should be used for the whole stockpile, and in the case of no clear majority then the worst-case material should be used.	Not applicable as above.
	7.4 Firefighting Intervention	
7.4.1	The waste facility is to provide safe, efficient, and effective access as detailed in FRNSW guideline *Access for fire brigade vehicles and firefighters*.	Brigade access is provided in **section 7.0.**
7.4.2	Performance requirement CP9 of the NCC requires access to be appropriate to the building function / use, fire load, potential fire intensity, fire hazard, active fire safety systems and fire compartment size	Brigade access is provided in **section 7.0.**
7.4.3	Enhanced fire brigade vehicle access should be provided for firefighting intervention, including a permitter ring road around any large non-sprinklered building and access roads between external stockpiles.	Brigade access is provided in **section 7.0.**
7.4.4	The facility should cater for large emergency service response, if the potential hazard may result in a large emergency, including containment of fire water run-off.	The facility has been designed to cater for large fires by providing water volumes and flows in accordance with the waste guidelines "*Fire Safety in Waste Facilities*". The site has also been

Clause	FRNSW Waste Facility Guideline Requirement	Details of Compliance
		designed to contain potentially contaminated water to prevent offsite discharge.
7.4.6	Any development application should be accompanied by a flow rate and pressure test of the water main connected to the fire hydrant system.	Sydney Water pressure inquiry has been provided in **Appendix D** along with a detailed hydraulic analysis.
7.4.7	Firefighter access should be provided to buildings, structures, and storage areas, including to any fire safety system or equipment provided for firefighting intervention	Details of brigade access have been outlined in **Section 7.0.**
	7.5 Fire Hydrant System	
7.5.1	The waste facility is to have a fire hydrant system installed appropriate to the risks and hazards for the waste facility.	The site has a hydrant system designed for the waste stored.
7.5.2	The fire hydrant system should consider facility layout and operations, with fire hydrants being located to provide compliant coverage and safe firefighter access during a fire, including having external fire hydrants to protect any open yard storage	The hydrants have been reviewed to confirm that there are accessible hydrants in the event of fires that may occur at the site. Furthermore, full hydrant coverage to the site has been provided.
7.5.3	The design of the fire hydrant system is to have an enhanced standard of performance when combustible waste material is not protected by a fire sprinkler system, including having an additional fire hydrant outlet required to flow simultaneously for any open yard storage and for any non-sprinklered internal stockpiles as given in Table 2 (of guideline)	n/a
7.5.4	Fire hydrants are not to be located within 10 m of stockpiled storage and must be accessible to firefighters entering from the site and / or building entry points.	Compliant
7.5.5	Where appropriate to protect against high risks and hazards, suitable on-site fixed external fire monitors may be provided as part of the fire hydrant system	N/a
7.5.6	The fire brigade booster assembly is to be located within sight of the designated site entry point, or other location approved by the fire brigade, and be protected from radiant heat from any nearby stockpile	N/a
7.5.7	The fire hydrant system is to have a minimum water supply and capacity providing the maximum hydraulic demand (i.e. flow rate) for not less than four hours.	The details of the fire water supply have been outlined in **Section 8.0.**
7.5.8	The fire hydrant system should incorporate fire hose reels installed in accordance with Clause E1.4 of the NCC to enable effective first attack of fires by appropriately trained staff.	It has been recommended that a fire engineer is to review the site for compliance based on the requirements from the NCC for Clause E1.4.
	7.6 Automatic Fire Sprinklers Systems	

Clause	FRNSW Waste Facility Guideline Requirement	Details of Compliance
7.6.1	The waste facility is to have an automatic fire sprinkler system installed in any fire compartment that has a floor area greater than 1000 m^2 and contains combustible waste materials	n/a
7.6.2	The fire sprinkler system should be demonstrated as being appropriate to the risks and hazards identified for buildings, including externally as necessary (e.g. drenchers to protect plant / equipment, exposures, high-risk external storage)	n/a
7.6.4	To protect visual systems, storages or equipment or protect against high-risk hazards, a deluge, drencher, fast response, mist or foam system should be provided.	n/a
7.6.5	The fire brigade booster assembly for the fire sprinkler system should be co-located with the fire hydrant system booster within sight of the designated site entry point, or in a location approved by the fire brigade	n/a
7.6.6	The fire sprinkler system is to have minimum water supply and capacity providing maximum hydraulic demand for not less than two hours.	n/a
	7.7 Fire Detection and Alarms	
7.7.1	The waste facility is to have a fire detection and alarm system installed appropriate to the risks and hazards identified for each area of the building.	It has been recommended that the facility installs fire detection and alarm systems.
7.7.2	The fire detection and alarm system should warn all occupants of the fire and evacuate the facility, with each component being appropriate to the environment.	It has been recommended that the fire detection and alarm systems be designed to alert occupants to the presence of smoke/fire.
7.7.3	Upon positive detection of fire, the system is to activate any required alarm, fire suppression system, passive measures (e.g., fire door, fire shutter) or plant / machinery override as appropriate to the detector.	It has been recommended that the fire detection systems will notify FRNSW via the FIP of the presence of smoke/fire.
7.7.4	Manual alarm points should be provided in clearly visible locations as appropriate to the environment so that staff can initiate early alarms of fire.	It has been recommended that manual call points are to be installed and be located in clearly visible locations.
	7.8 Smoke Hazard Management	
7.8.1	Buildings containing combustible waste material are to have an automatic smoke hazard management system appropriate to the potential fire load and smoke production rate installed within the building	Roller shutter doors and emergency egress doors can be opened to provide openings to enable additional airflow into the space; however, it is expected that the extraction rates of the system will achieve the intent of preventing smoke from falling below 4 m as required such that minimum visibility is maintained. It has been recommended that a fire engineer is to review the site and the current smoke exhaust system of the warehouse.
7.8.2	Under Clause E2.3 of the NCC, additional smoke hazard management measures should be provided to vent or exhaust smoke so that in at least 90% of the compartment, the smoke layer does not descend below 4 m above floor level	
7.8.3	Natural low-level openings, either permanent or openable such as roller doors, should be provided on two or more walls to assist with venting de-	

Clause	FRNSW Waste Facility Guideline Requirement	Details of Compliance
	stratified (i.e. cooled) smoke and ensure minimum visibility is maintained during a fire.	
7.8.4	Any smoke exhaust system installed should be capable of continuous operation of not less than two hours in a sprinkler-controlled fire scenario, or four hours in any non-sprinkler-controlled fire scenario.	
	7.9 Fire water run-off containment	
7.9.1	The waste facility should have effective and automatic means of containing fire water run-off, with primary containment having a net capacity not less than the total hydraulic demand of installed fire safety systems	The site has been designed to contain potentially contaminated water.
7.9.4	The containment system, which includes the base of any storage area, should be impermeable (i.e. sealed) and prevent fire-water run-off from entering the ground or any surface water course.	The site has been designed to contain potentially contaminated water to prevent external discharge.
7.9.5	The containment system should include secondary/tertiary facilities such as impermeable bunds, storage lagoons, isolation tanks or modified site design (e.g. recessed catchment pit, drainage basin) as appropriate to the facility	The containment system is composed of a primary containment area to capture the potentially contaminated water before discharge from the site.
7.9.6	Pollution control equipment such as stormwater isolation valves, water diversions, booms, and drain mats, should be provided as necessary for the facility's emergency response procedures, and be kept readily accessible in the event of a fire.	It has been recommended that the site has an isolation system that will prevent the external discharge of potentially contaminated fire water.
	Bushfire Prone Land	
7.10.1	The NSW RFS Planning for Bush Fire Protection – A Guide for Councils, planners, Fire Authorities and Developers apply to all development on bushfire-prone land	**Appendix F**; the site is not located in bushfire prone land
7.10.2	Bush fire prone and s mapped by each respective council under Section 146 of the Environmental Planning and Assessment Act 1979	Noted.
7.10.3	Suitable fire brigade vehicle access is to be provided to within 4 m of any static water supply if no reticulated water supply is otherwise available (e.g. bulk water tank, dam).	N/a - Reticulated water system provided.
	8.2 Storages and Stockpiles / 8.3 Movement of Stockpiles	
8.2.1	Storage and stockpiling of combustible waste material should be limited in size and volume appropriate to the given combustible waste material, fire risks, building design and installed fire systems	The waste has been stored in compliance with the GBSRT to prevent propagation between storage areas.
8.2.3	The maximum height of any stockpile, loose piled or bales, should not exceed 4 m.	The stockpiles are limited to 3.5 m high, less than 30 m^2 and are separated from other stockpiles by a distance of greater than 3 m.

Clause	FRNSW Waste Facility Guideline Requirement	Details of Compliance
8.2.4	The uncontained vertical face of any stockpile (i.e. any face not being retained by a masonry wall) should recede on a slope no greater than 45º to minimise the risk of collapse and fire spread	Stockpiles are stacked in accordance with the GBSRT.
8.2.5	The storage method and arrangement of stockpiles is to minimise the likelihood of fire spread and provide separation which permits access for firefighting intervention	Stockpiles are stacked in accordance with the GBSRT.
8.2.6	A separating masonry wall, revetment or pen should extend at least 1 m above the stockpile height and at least 2 m beyond the outermost stockpile edge.	n/a
8.2.7	Stockpile boundary limits should be permanently marked to identify the limits that maintain maximum stockpile sizes and / or minimum separations	It has been recommended that the stockpile limit will be marked.
8.3.1	Stockpiles of combustible waste material should be rotated to dissipate any generated heat and minimise the risk of auto-ignition as required.	n/a
8.3.2	Any stockpile of combustible waste material prone to self-heating should have appropriate temperature monitoring to identify localised hotspots; procedures outlined in the operations plan should be implemented to reduce identified hotspots.	n/a
8.3.3	Any processed or treated waste material, such as chipping, shredding, baling or producing crumb should be cooled before being stockpiled	It has been recommended that crumb rubber, pavers and matting are to be cool before being stockpiled.
8.3.4	Procedures for stockpile rotation and monitoring of temperature during hot weather are to be included in the operations plan.	n/a
	8.4 External Stockpiles	
8.4	Clauses specific to external stockpiles	No external stockpiles at the site.
	8.5 Internal Stockpiles	
8.5.1	Internal stockpiles of combustible waste material should be maintained as determined by the operations plan, and appropriate to the building size / layout, compartmentation, installed safety systems, process equipment and plant	The internal stockpiles will be operated per the operational plans to restrict waste to the defined storage areas
8.5.2	The maximum internal stockpile size in a building fitted with an automatic fire sprinkler system should be 1,000 m^3	n/a
8.5.3	Internal stockpiles should have a minimum of 6 m unobstructed access on each accessible side in a building fitted with an automatic fire sprinkler system, or 10 m in a building not fitted with an automatic fire sprinkler system.	n/a
8.5.4	Internal stockpiles may be located side by side when separated by a masonry wall	The stockpiles are separated by 5 m
8.5.5	The internal stockpile of a building not fitted with an automatic fire sprinkler system should limited in size	Stockpiles are stored in accordance with GBSRT

Clause	FRNSW Waste Facility Guideline Requirement	Details of Compliance
	to be able to be moved to the dedicated external quarantine area using onsite resources only within one hour or less	
8.5.7	Internal stockpiles should be maintained so that all building egress points and required paths of travel are not blocked or impeded at any time	Stockpiles are stored in accordance with GBSRT
8.5.8	Internal stockpiles should be maintained so that access to the dedicated external quarantine area is always kept clear and unobstructed	Stockpiles are stored in accordance with GBSRT
	8.6 Operations Plan	
8.6.1	The waste facility should develop and implement a written operations plan outlining the daily operations of the waste facility, including describing the combustible waste materials likely, and the method of storage, handling or processing at the facility.	An operations plan has been prepared in the scoping statement prepared by Jackson Environment and Planning. This is summarised in **Section 3.0.**
	9.3 Emergency plan	
9.3.1	The PCBU is required to develop an emergency plan for the waste facility, in accordance with AS 3745-2010	An ERP shall be prepared, as recommended in **Section 6.1.5**.
	9.4 Emergency Services Information Package (ESIP)	
9.4.1	An ESIP, as detailed in FRNSW guideline Emergency services information package and tactical fire plans, should be developed and provided by the PCBU	An ESIP shall be prepared, as recommended in **Section 6.1.5**.
	9.5 Fire Safety Statements	
9.5.1	Under Clause 177 and Clause 180 of the EP&A Reg the premises owner is to have fire safety systems inspected and maintained by a competent fire safety practitioner, then issue a fire safety statement to the local Council and provide a copy to FRNSW.	These are regulatory requirements that BSV will have to comply with to be operational.
9.5.2	An annual fire safety statement must be completed once every year for all essential fire safety measures installed, and where applicable, a supplementary fire safety statement completed for all critical fire safety measures installed (e.g. every six months)	These are regulatory requirements that BSV will have to comply with to be operational.
9.5.3	The premises owner is responsible for choosing the competent fire safety practitioner to undertake the inspection and maintenance and must provide a written opinion that the person or persons chosen are competent to perform the fire safety inspection	These are regulatory requirements that BSV will have to comply with to be operational.
9.5.4	The PCBU is to make allowance for the premises owner to arrange the inspection and maintenance of fire safety systems for a fire safety statement.	These are regulatory requirements that BSV will have to comply with to be operational.

Appendix F

Site Location and Bushfire Prone Land

Appendix F


Imagery
Site Location
500 m
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