Fire Impact Management Plan

9 Burlington Place, Rutherford (Lot 3005 DP1040568)

Rutherford Tyre Recycling
Document No. RCE-24022_RutherfordTyreRecyclers_FIMP_Final_3June24_Rev(1)
Date 3/06/2024

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Quality Management

Rev	Date	Remarks	Prepared By	Reviewed By
A	12th April 2024	Draft issue for comment	Isaac Gates	Renton Parker
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Executive Summary

Background

Rutherford Tyre Recyclers (RTR) has proposed to develop a new recycling facility in Rutherford, NSW. Secretary Environmental Assessment Requirements (SEARs) require 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.).

Jackson Environment and Planning Pty Ltd, on behalf of RTR, has commissioned Riskcon Engineering Pty Ltd (Riskcon) to prepare the FIMP. This document represents the assessment of the facility located at 9 Burlington Place, Rutherford (Lot 3005 DP1040568).

Conclusions

The FIMP has been developed for the site at 9 Burlington Place, Rutherford (Lot 3005 DP1040568) 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:

- A Spill kit is to be located adjacent to the combustible liquids storage area
- The diesel storage tank is to comply with AS1692
- Two powder-type extinguishers are to be located within15m of the grease and diesel store
- Stockpile limits within the storage areas will be marked.
- That crumb rubber, pavers and matting are to be cool before being stockpiled.
- 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).
- 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.
- Install CCTV monitoring for intruders at the site.
- 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*".
- Carbon dioxide detection shall be installed in the production area and in the storage area(s) to identify potential tyre fires.
- Detection of carbon dioxide at the site shall result in a local alarm at the site and shall be sent to site personnel that can enact a response after hours (i.e. notify FRNSW).
- Manual call points are to be installed and be located in clearly visible locations.
- The evacuation signal 1 shall include words such as "Fire" and "Evacuate" inserted in the period provided in ISO 8201, or a site-specific voice message as provided for in AS 4428.16.
- 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 have three dual fire hydrants installed as per **Figure 6-1** sourcing water from the main supply.
- The facility and / or site boundaries shall be capable of containing 162 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 162 m^3.
- An isolation system that will prevent the external discharge of potentially contaminated fire water is to be installed.
- A fire engineer is to review the site and the current smoke exhaust system of the warehouse.
- A fire hydrant system shall comply with Clause E1.3 of the BCA and the relevant provisions of AS 2419.1:2021. A fire engineer is to review fire systems and confirm compliance and performance solutions required.
- A fire hose reel system shall comply with Clause E1.4 of the BCA and the relevant provisions of AS 2441:2005. A fire engineer is to review fire systems and confirm compliance and performance solutions required.
- Portable fire extinguishers shall comply with Clause E1.6 of the BCA and the relevant provisions of AS 2444:2001. A fire engineer is to review fire systems and confirm compliance and performance solutions required.

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Abbreviations

Abbreviation	Description
AS	Australian Standard
BA	Breathing Apparatus
BCA	Building Code of Australia
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
MRV	Medium Ridged Vehicle
PHA	Preliminary Hazard Analysis
RTR	Rutherford Tyre Recyclers
SEARs	Secretary Environmental Assessment Requirements
SEP	Surface Emissive Power
SEPP	State Environmental Planning Policy
STEL	Short-Term Exposure Limit
WCCFS	Worst Credible Case Fire Scenario

1.0 Introduction

1.1 Background

Rutherford Tyre Recyclers (RTR) has proposed to develop a new recycling facility in Rutherford, NSW. Secretary Environmental Assessment Requirements (SEARs) require 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]).

Jackson Environment and Planning Pty Ltd, on behalf of RTR, has commissioned Riskcon Engineering Pty Ltd (Riskcon) to prepare the FIMP. This document represents the assessment of the facility located at 9 Burlington Place, Rutherford (Lot 3005 DP1040568).

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.
- Hydrant hydraulic design screening calculations for the fire water system.
- Review of external fire hydrant configuration and locations.
- Recommendations based upon the study for implementation in the final design.

1.1 Secretary's Environmental Assessment Requirements

Provided in **Table 1-1** are the SEARs for the project.

Table 1-1: SEARs

SEAR	Requirement	Report Location
Fire and Incident Management	An assessment of bushfire risks and asset protection zones (APZ) in accordance with NSW Rural Fire Service guidelines	**Appendix F**
	Technical information on the environmental protection equipment to be installed on the premises such as air, water and noise controls, spill clean-up equipment, fire management (including the location of fire hydrants and water flow rates at the hydrants) and containment measures.	Throughout the report
	Details of the size and volume of stockpiles and their arrangements to minimise fire spread and facilitate emergency vehicle access.	Section 3
	The measures that would be implemented to ensure that the proposed development is consistent with the aims, objectives and guidelines in the NSW Fire and Rescue guideline Fire Safety in Waste Facilities dated 27 February 2020.	Section 9

*The bushfire risk assessment has been completed by Newcastle Bushfire Consulting, and the recommendations of this report have been considered in this study.

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 9 Burlington Place Rutherford NSW 2320 (Lot 3005 DP1040568) which is approximately 30 km Northwest of Newcastle. **Figure 3-1** shows the regional location of the site in relation to the Newcastle.

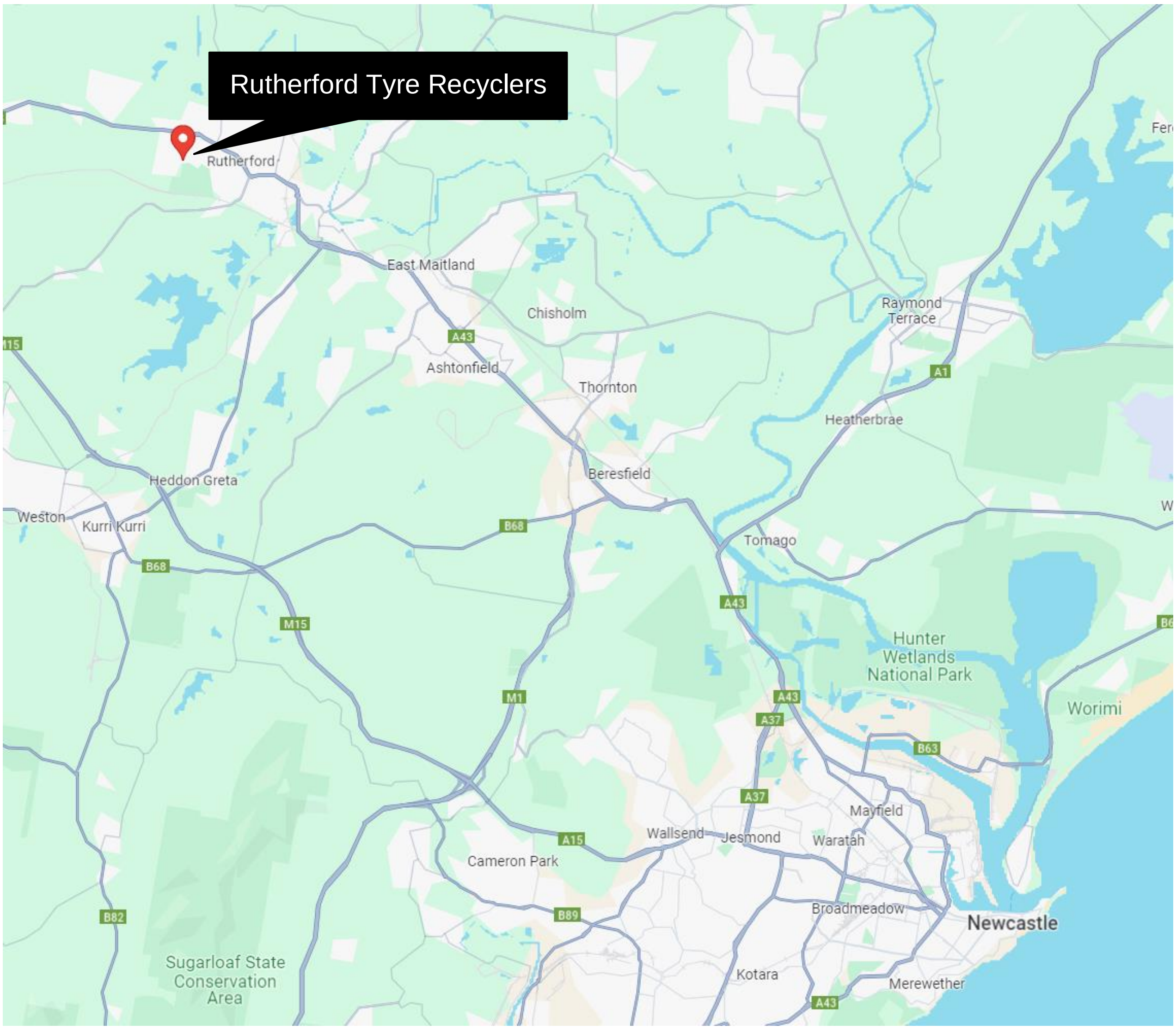

Figure 3-1: Site Location

3.2 Adjacent Land Uses

The site is zoned as General Industrial under Maitland LEP 2011. The lot is surrounded by the following land uses, which are adjacent to the site:

- North – E4 General Industrial (Hunter Powder and Paint)
- South – E4 General Industrial (Sharps Workshop)
- West – E4 General Industrial (RSPCA NSW Hunter Shelter)
- East – E4 General Industrial (S.R.Horder Monumental Masons)

It is to be noted that Oak Tree Retirement Village, zoned RE2 Private Recreation, is located 257 m to the southeast from boundary to boundary.

3.3 Project Background & Description

RTR is proposing the establishment and operation of a small tyre recycling facility at 9 Burlington Place, RUTHERFORD NSW 2320 within the Maitland City Council area. Situated in an E4 General Industrial zone, the site is positioned adjacent to RE2 Private Recreation zoned lands at its southeast corner. The plan involves processing approximately 4,500 tonnes of tyres annually sourced from Tyres & More in Rutherford, all operations are to be conducted indoors in an existing industrial shed. Given the Council of Australian Government's ban on the export of whole-used tyres starting from 1 December 2021, RTR is seeking approval to establish and operate a new crumb rubber production plant. The ban has increased the volume of waste material remaining in the country to be recycled / repurposed and aimed to boost innovation and job creation within the waste management sector. As a result of the ban on tyre export, there is an immediate need to develop local tyre recycling and reuse infrastructure.

The total area of the entire lot is 1,655 m^2 . The Site comprises an existing shed, an open awning, a concrete-sealed hardstand, and some landscaping at both the front and back. The existing shed spans approximately 638 m^2, with an attached office space of about 35 m^2, including two bathrooms, an office area, and a foyer. There are five available car parking spaces on site. The industrial shed will undergo minimal alterations, primarily enclosing the open awning at the back, removing a dividing wall, and installing two roller doors to create a larger fully enclosed space. In addition, a small grass area in the northeast corner of the site will be changed to concrete.

The designated flood planning area of Maitland City Council is around 650 m northeast of the Site, while the buffer zone of bushfire-prone lands is about 575 m away from the site. **Figure 3-2** provides an aerial view of the Site boundary and layout.

Figure 3-2: Areal View of Site 9 Burlington Place, RUTHERFORD, NSW 2320 (Lot 3005 / DP1040568) and Boundary Highlighted Red

The Site will receive an average of 15 tonnes of used whole tyres per day. No other material will be received on-site. All incoming whole tyre deliveries are delivered to the Site by a 7.5 tonne medium rigid vehicle (MRV), with access to the Site from Burlington Place. There will be four (4) deliveries of tyres per day. The MRV will proceed to the 9m above ground weighbridge to be weighed before proceeding to the loading area. The loading area is located outside the roller doors to the industrial shed and tyres will be unloaded by hand and immediately stacked in the Whole Tyre Storage Area. The tyres are to be stacked in accordance with NSW Fire and Rescue 2014 Fire Safety Guideline – Guideline for Bulk Storage of Rubber Tyres (GBSRT) (Ref. [3]) in accordance with an unsprinklered building as seen in **Figure 3-3**.

The MRV will be backloaded with products produced onsite before exiting the Site by proceeding further onto site, reversing back through the industrial building roller doors and turning right onto the weighbridge. The MRV will be weighed on the weighbridge to track the amount of product being removed from Site and will then exit the Site via the driveway access onto Bulington Place. An average of 18 vehicle movements (9 inbound and 9 outbound) will be generated by the Site per day. This includes up to five (5) staff vehicles and two trips by two 7.5 tonnes medium rigid vehicle (MRV) trucks. There will be one weekly waste collection on site.

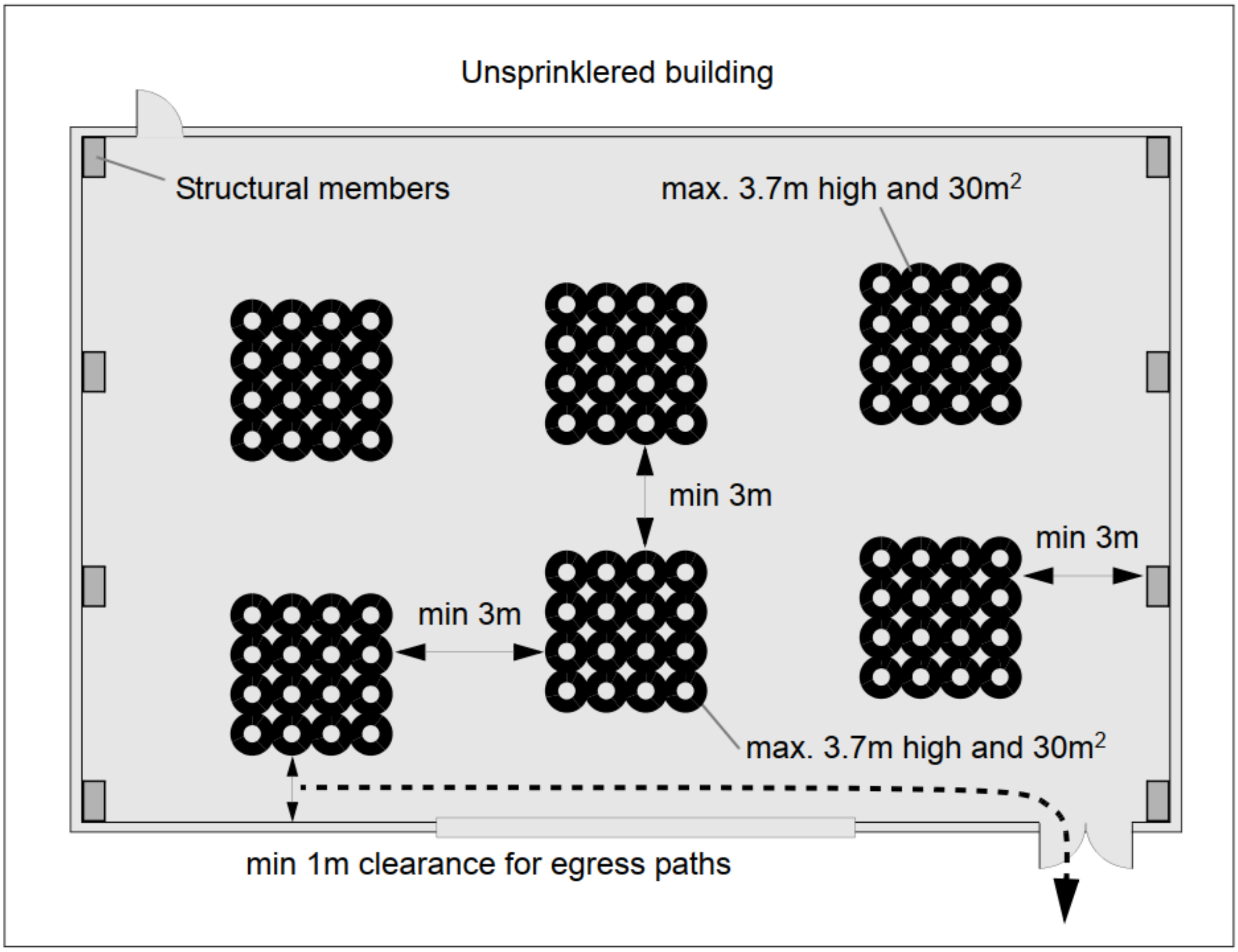

Figure 3-3: Minimum Clearance Distances for an Unsprinklered Building

All tyre recycling activities will occur inside the shed, including storage of all materials. No tyres or residual materials will be stored outside on the hardstand area. The used whole tyres are turned into crumb rubber on the Waste Tyre Recycling Production Line, which has a 98% efficiency. The first step involves the tyre de-beader to remove the metal wiring from inside the tyre. The tyre is then cut into a long rubber strip using the tyre strip cutter before being placed onto a conveyor belt and loaded into the whole tyre shredder. The next stage involves crushing the rubber blocks into mesh rubber powder using the double roller rubber breaker. A vibration screen is then used to separate the different sized pieces of crumb rubber. The Waste Tyre Recycling Production Line produces crumb rubber, residual steel and residual cotton from the whole tyres.

Some of the crumb rubber produced on-site will be used to produce rubber tiles and rubber mats in the Rubber Tiles Production area. This involves a small thermal-moulding process that coverts crumb rubber into rubber matting or rubber tiles. The first step involves mixing the rubber crumb with glue to create the bottom of the rubber tile. The top part of the rubber tile involves mixing rubber crumb, pigment and glue together in a barrel mixer. A vulcanizing machine is used to create vulcanized rubber tiles by compressing the rubber into dense, ultra durable, non-porous rubber tiles. The production of tiles or mats depends on the size of the mould used. **Table 3-1** and **Table 3-2** outlines the equipment utilised and the material states throughout the proposed production processes.

Table 3-1: Tyre Crumb Production Line

Step	Equipment	Process	Capacity
1	Single Hook Tyre De-beader	Removal of bead wires from inside tyre sidewalls, Processing capability of 20-40 tyres per hour	2.5 tonnes/hour
2	Tyre Cutter	The tyre is cut into a long rubber strip with a width of between 3-8mm.	n/a
3	Whole Tyre Shredder	The conveyor feeds whole tyres to the machine, 60x60mm rubber crumb is output. Processing capacity of 3,500-4,000 kg / hour.	4 tonnes / hour
4	Double Roller Rubber Breaker	Two rollers within the machine rotate at different velocities crushing 60x60mm cubes to output between 1-30 mesh powder.	1 tonne / hour
5	Vibration Screen	Separate the different-sized pieces of rubber crumb	n/a
6	Magnetic Separator	Separate the small steel wire from the mixed rubber granules	n/a
7	Fibre Separator	A high-speed fan creates negative pressure, resulting in the fluff rising and the rubber crumb falling. One outlet collects tyre crumb, another for the fibre and fluff.	n/a
8	Final Product	Pure Crummer Rubber bagged and stored	6 tonnes

Table 3-2: Rubber Tile Production Line

Step	Equipment	Process	Capacity
1	Rubber Mixer	The rubber crumb is mixed with glue for the bottom section of the tyle.	180 L
2	Barrel mixer	Rubber crumb, pigment and glue are mixed for the top section of the tile.	50 L
3	Vulcanizing Machine	The rubber mixes are compressed into vulcanised dense, ultra-durable, non-porous rubber tile.	< 0.25 m^3

Step	Equipment	Process	Capacity
4	Rubber Tyre Molds	Four Molds are utilised and interchanged depending on the product.	< 0.25 m^3

The facility will have two storage areas, both located on the eastern side of the industrial building. The Whole Tyre Storage Area will be used to stack the whole tyres after they have been delivered to the Site. The area capacity is 24m^3 with a maximum height of 3.5m. The Crumb Rubber Storage Area is used to store materials produced on site, including crumb rubber, recovered steel and cotton from the tyre recycling process and rubber tiles and mats produced on site. The rubber tiles and mats will be stored on pallets. The area capacity is 24m^3 with a maximum height of 3.5m. The storage areas will be marked on the concrete floor using hard wearing paint. **Table 3-3** outlines the maximum waste storage on-site for each product.

Table 3-3: Waste Quantities and Locations Stored Onsite

Material	Quantity (Tonnes)	Storage area	Storage type
Whole rubber tyres	25.2	Tyre Delivery Area – Whole Rubber Tyre Storage Area	Stacked tyres
Steel	2.63	Product Storage and Load Out Area – Crumb Rubber Storage	1-tonne bulka bags
Cotton	1.83		1-tonne bulka bags
Crumb rubber	36.75*		1-tonne bulka bags
Rubber pavers	12.6		Stacked on palates
Rubber matting	12.6		Stacked on palates

*Combined total of crumb products, individual quantities vary according to different stages of production.

A combustible materials storage area is located in the southeast corner of the warehouse. The combustible materials area stores 200 L of diesel stored in an integrally bunded tank, as well as a 205 L drum of grease stored on a palet bund. Bollards surrounding the supply provide impact protection to the store. AS 1940:2017 classifies the combustible liquids storage area as a minor store. This restricts the indoor storage of the facility to 2000 L of combustible liquid for every 500 m^2 of indoor floor space. The volume stored complies with AS1940:2017 as the volumes do not exceed the maximum threshold outlined.

The tyre recycling facility will operate 6 days a week, with times varying for deliveries and recycling operations. The facility's operating hours are conveyed in **Table 3-4**.

Table 3-4: Operation Times and Processes

Time	Day	Operation
05:00 – 18:00	Monday – Friday	Crumb Rubber Production
08:00 – 13:00	Saturday	Crumb Rubber Production
07:00 – 18:00	Monday – Friday	Tyre Delivery
08:00 – 13:00	Saturday	Tyre Delivery
–	Sunday & Public Holidays	Closed

3.4 Quantities of Dangerous Goods Stored and Handled

Provided in **Table 3-5** is a summary of the goods that will be stored and handled at the facility.

Table 3-5: Goods Stored and Handled

Product	UN No.	DG Class	PG	Quantity (tonnes)	Type of Storage
Rubber tyres	n/a	n/a	n/a	25.2	• Stacked tyres
Crumb Rubber	n/a	n/a	n/a	36.75	• Crumb rubber in bulka bags. • Rubber paves / matting on pallets
Diesel	n/a	C1	n/a	200 (L)	• 200 L Self bunded Steel Tank
Glue	n/a	n/a	n/a	2	• 1 tonne IBC stored on bunded pallets
Pigment	n/a	n/a	n/a	1	• 1 tonne IBC stored on bunded pallets
Grease	n/a	n/a	n/a	205 (L)	• 205 L drum on a bunded pallet

*Products are not classified as dangerous goods under the Australian Dangerous Goods Code.

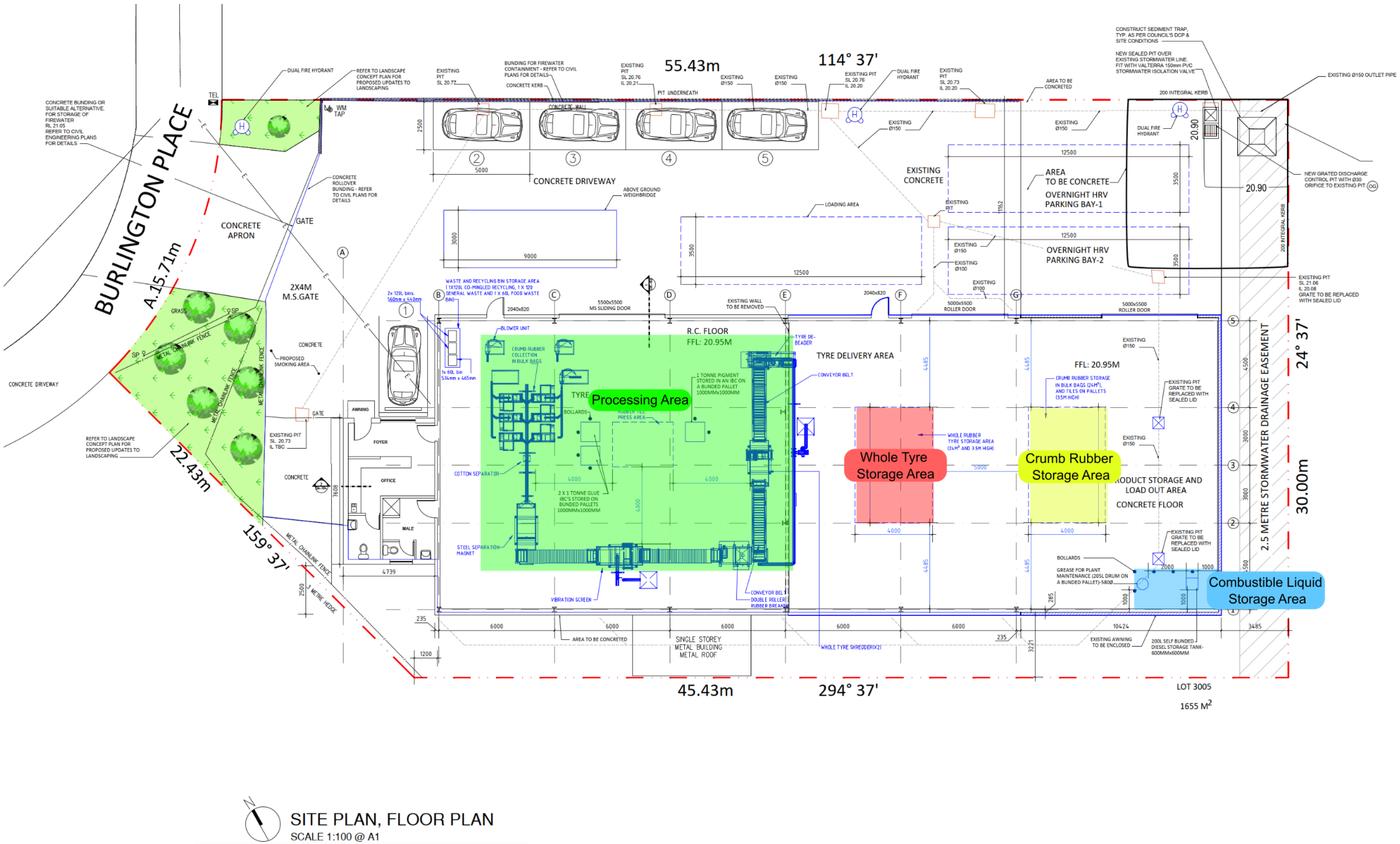

Figure 3-4: Site Layout

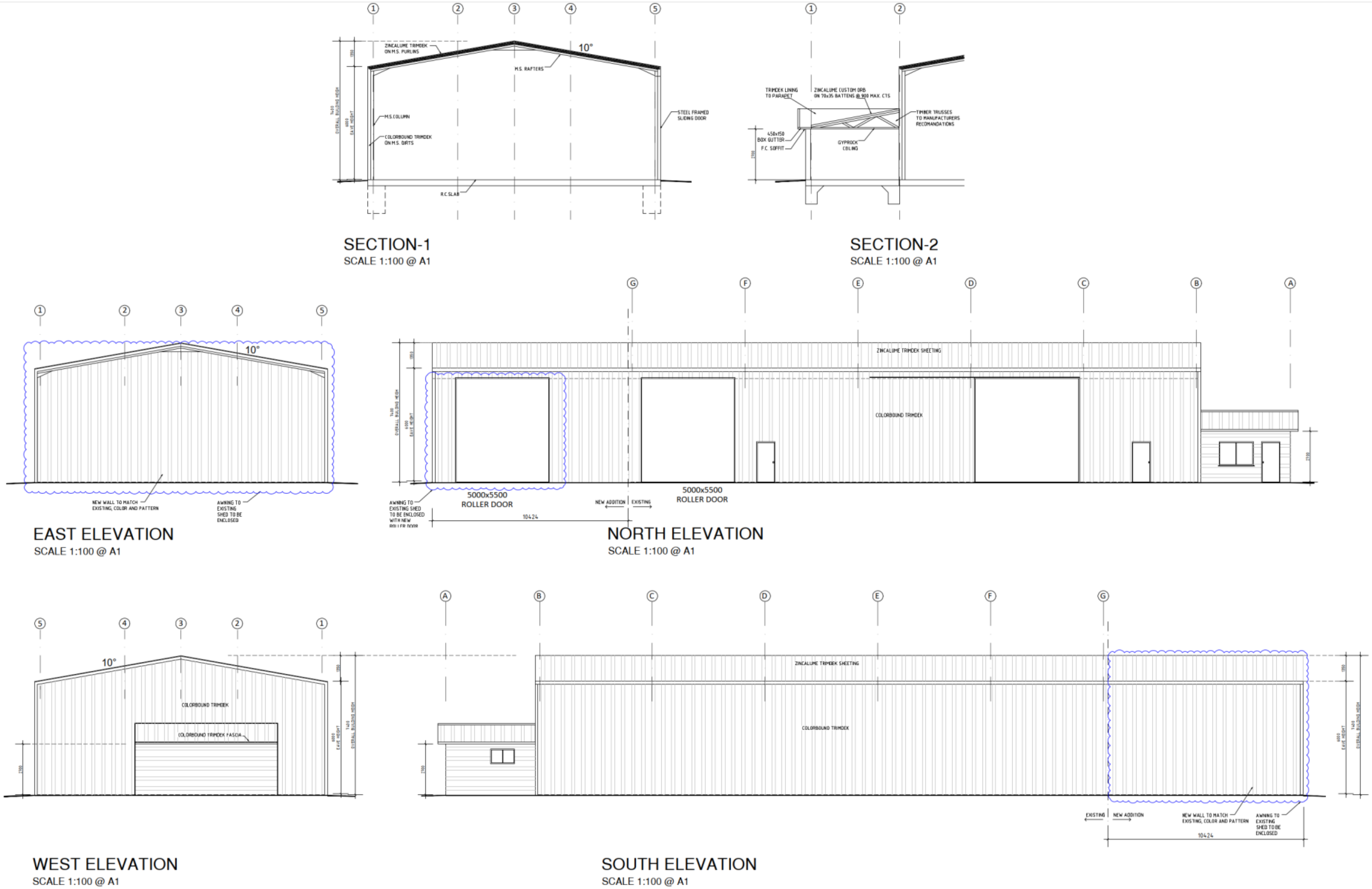

Figure 3-5: Proposed Site Elevation Plan with Amendments to Building

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.

* 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:

- Ignition of diesel or grease, combustible liquid fire
- Tyre ignition in MRV, tyre fire in whole tyre / product and waste storage area.
- Tyre contamination, tyre fire in whole tyre / product and waste storage area.
- Tyre fire in the tyre delivery area and outgoing storage area.
- Smoke dispersion in the tyre delivery 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 Ignition of Diesel or Grease, Combustible Liquid Fire

The Combustible Liquid Storage area stores 200 L of diesel and 205 L of Grease. Due to the proximity of the store to the loading zone adjacent to the product storage area, there is a chance for the combustible liquid store to be impacted by a collision with a loading truck. This hazard has been reduced with the addition of bollards that shall protect the store in the form of impact protection. Additionally, the grease drum is stored on a bunded palate and the diesel is stored in an integrally bunded tank which provides further protection against spills and colissions. To provide further compliance with AS1940:2017 the following recommendations have been made:

- A Spill kit is to be located adjacent to the combustible liquids storage area.
- The diesel storage tank is to comply with AS1692.
- Two powder-type extinguishers are to be located within 15m of the grease and diesel store.

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. Regardless of the low chance of a fire to occur in the area a conservative approach has been utilised to determine the adequacy of separation between the product storage area and the combustible liquid storage area. Due to the severity of a tyre fire, this incident has been carried forward.

4.5 Tyre Ignition In MRV, Tyre Fire in Whole Tyre / Product and Waste 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 kilojoules per kilogram, 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 Tyres and More in Rutherford (T&M) and other tyre retailers in the region, are transported via two medium rigid vehicles (MRVs). The MRV's are to be loaded with whole tyres at the tyre retailer. The MRV's enter RTR through Burlington Place and are supervised by staff onto the portable weighbridge. RTR staff unloading whole tyres from the MRV outside the shed and stacking them in the designated whole tyre storage area. Following unloading, MRVs are loaded with the recycled materials produced by the plant for transport off-site two trucks complete the process each day one arriving at 7:00 am and the other at 11:00 am.

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 tire fire were to occur upon arrival for delivery, it would be noticed by either the staff or the driver. In such a scenario, the MRV 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.

4.6 Tyre Contamination, Tyre Fire in Whole Tyre / Product and Waste 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.

4.7 Tyre Fire in The Tyre Delivery Area and Outgoing Storage Area

4.7.1 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 3-3**.

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, however, the building height does not allow for this to be reached due to the ceiling encroaching on the required separation distance. Due to this, the stacked height is limited to 3.5 m. The width of the stockpile is 4 m and the length is 6 this results in an area of 24 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.

Figure 4-1 outlines the Tyre Storage Area, Product Storage Area and Combustible Liquid Storage Area and their relative position in the building which complies with the GBSRT and AS1940:2017.

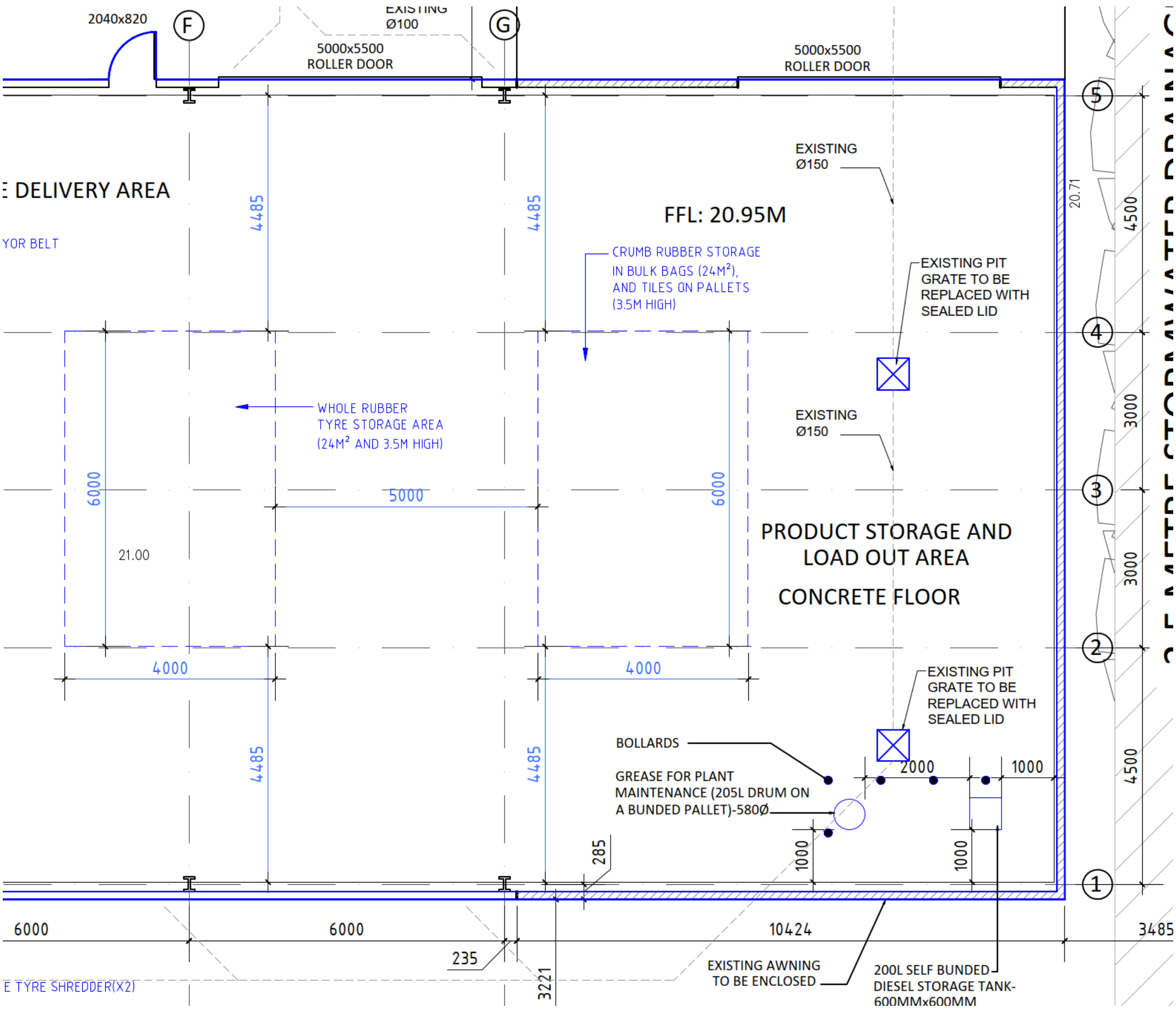

Figure 4-1: Storage Area Layout

4.7.2 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 double 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 meters in depth, with finely shredded tires being particularly vulnerable. Warning signs such as a sulfureous odour, aerosols from vents, or evidence of oil contamination in rainwater passing through the tire 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 tire shred piles deeper than a meter may ignite spontaneously under inadequate ventilation conditions, with initiation times extending over several weeks (Ref. [5]).

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 three 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. Rubber mats like crumb rubber present different geometry to tyres and present limited fire risks in regard to auto-ignition. However, similar to the conservative approach addressed in **Section 4.7.1,** the intense burning capability of rubber and difficulty to extinguish the incident will be carried on further to asses 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 4 m, the length is 6 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.

4.8 Smoke Dispersion from The Tyre Delivery Area and Outgoing Storage Area Fire

Previous Sections highlight the potential chance of ignition to occur resulting in a tyre fire, **Section 4.8** 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.

4.8.1 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**.

$$2C_3H_8(g) + 7O_2(g) \rightarrow 6CO(g) + 8H_2O(g)$$ **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.

4.8.2 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.

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$$ **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.

4.8.3 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. [6]). 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.

$$S(s) + O_2(g) \rightarrow SO_2(g)$$ **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.

4.9 Production Line Fault, Tyre Fire in Tyre Processing Area

The tyre processing line described in **Section 3.3** primarily undertakes mechanical processing methods (i.e. shredding, magnetisation and screening) with the exception of the vulcanising machine. Vulcanisation is a chemical process that involves cross-linking rubber molecules with organic or inorganic substances under the influence of heat and pressure. Typically, this process occurs at relatively elevated temperatures ranging between 140°C to 200°C. A glue-like crosslinking agent is introduced to facilitate and expedite the vulcanization process (Ref. [7]).

The following recommendation has been made:

- That crumb rubber, pavers and matting shall be allowed to cool prior to being stockpiled.

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 vulcanisation and all other 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 4.7**, this incident shall be carried forward for further analysis to assess radiant heat impacts on firefighting equipment and fire propagation.

4.10 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 / minute. With 3 hoses operating, the total discharge would be 1800 L / minute. 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. [8]), 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 delivery area and outgoing storage area
- Heavy smoke dispersion in the tyre delivery area and outgoing storage area.
- Production line fault, tyre fire in the 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 Greease rum and Diesel Tank are presented in **Table 5-2**. Likewise, radiant heat contour diagrams are presented in **Figure 5-1** and **Figure 5-2**.

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

Radiant Heat (kW/m^2)	Distance (m)	
	Grease Drum	Diesel Tank
23	0.3	0.3
3	1.3	1.6

It is to be noted, by looking at **Figure 5-1** and **Figure 5-2** , that there are no fire hydrants located within the 3 kW/m^2 radiant heat contour. Hence, there are no current hydrants that would be affected by the lateral impact from the two fires documented in **Figure 5-1** and **Figure 5-2**.

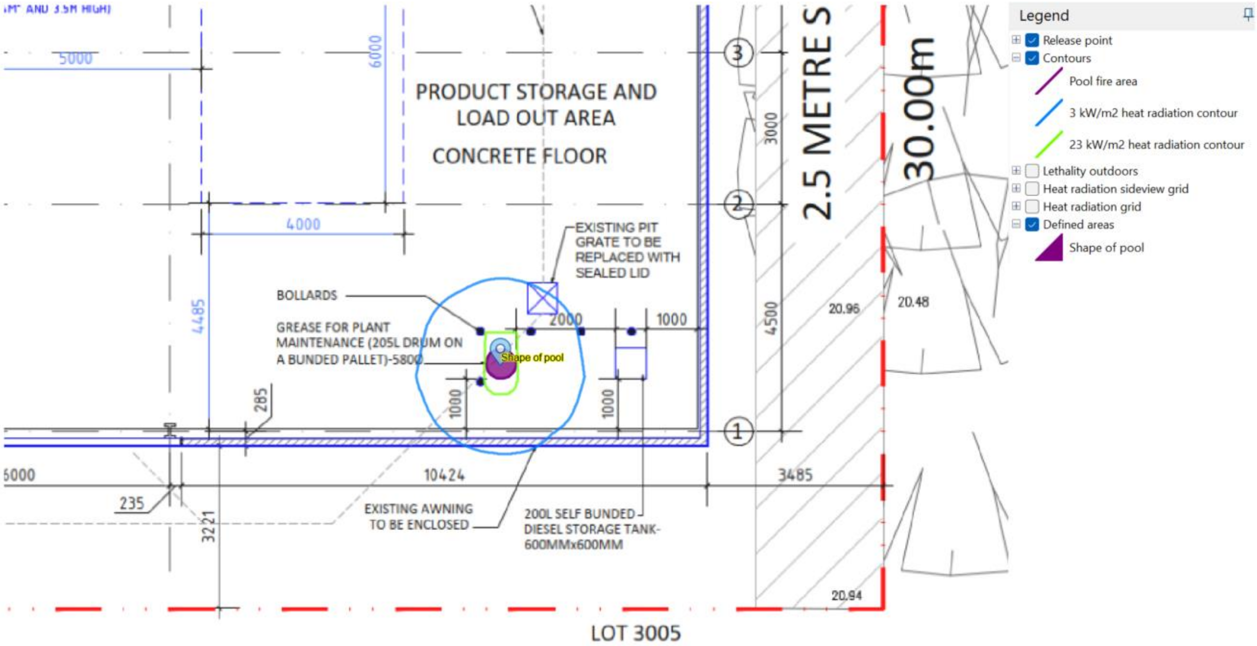

Figure 5-1: Heat radiation contours from grease fire

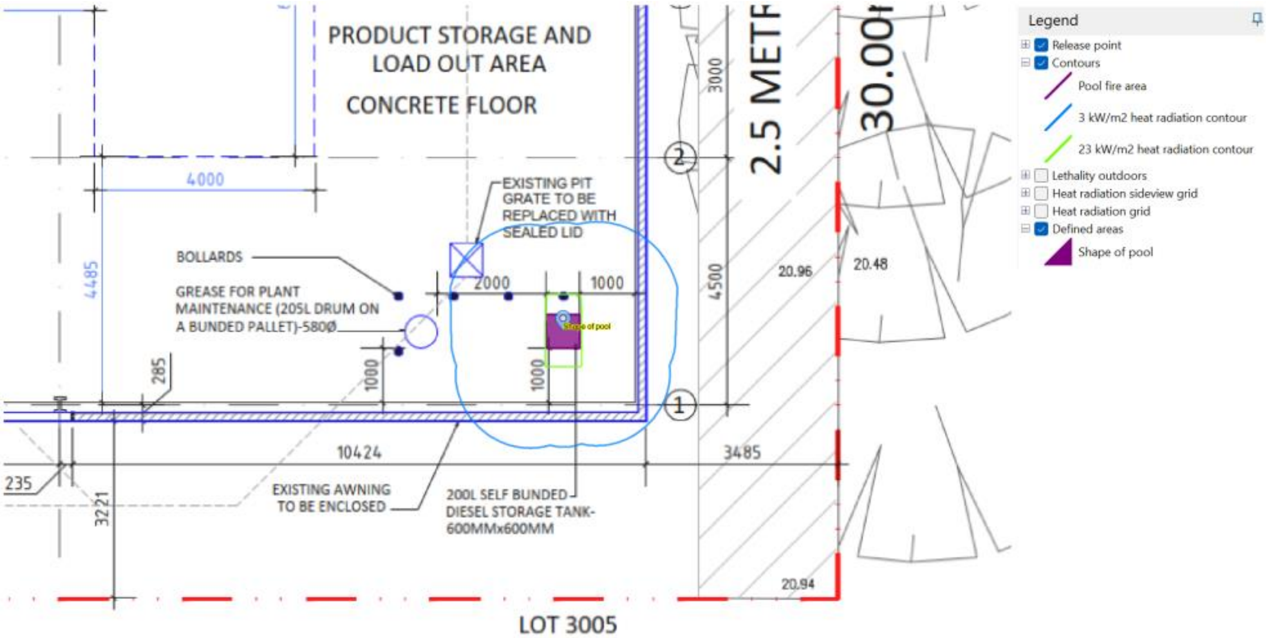

Figure 5-2: Heat radiation contours from diesel fire

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

There is the potential for a fire to occur within the tyre delivery 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 5-3** and **Figure 5-4.**

Table 5-2: Heat Radiation from a Tyre Delivery Area Fire

Radiant Heat (kW/m^2)	Distance (m)	
	Whole Tyre Storage Area	Product Storage Area
23	4	4
3	13	13

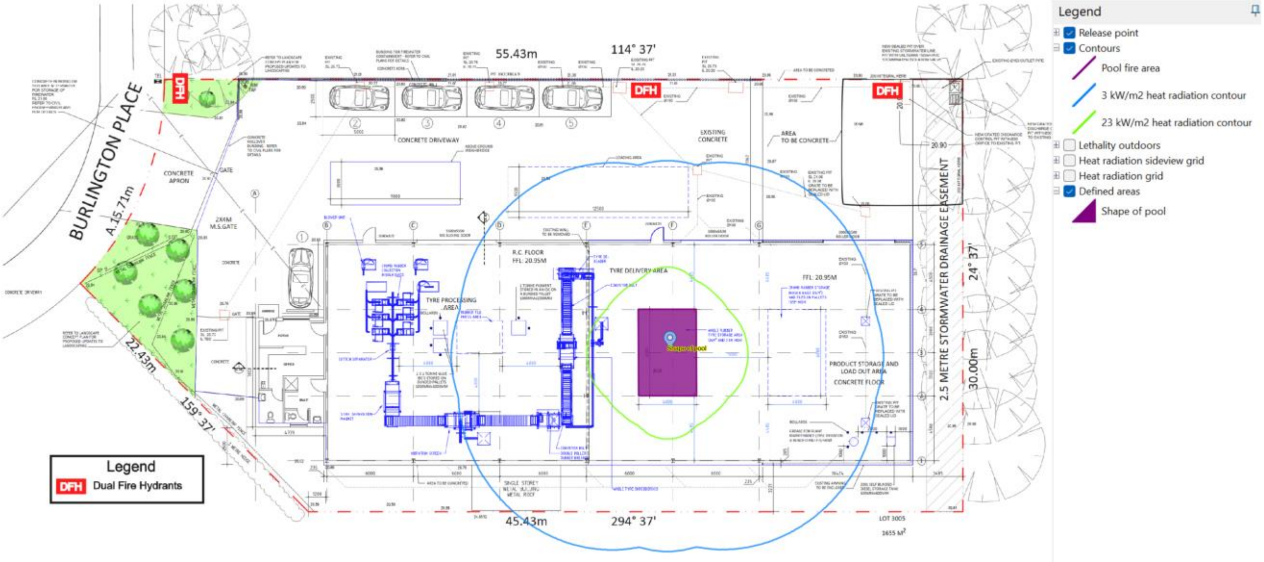

Figure 5-3: Radiant Heat Contours from Fire in Whole Tyre Storage Area.

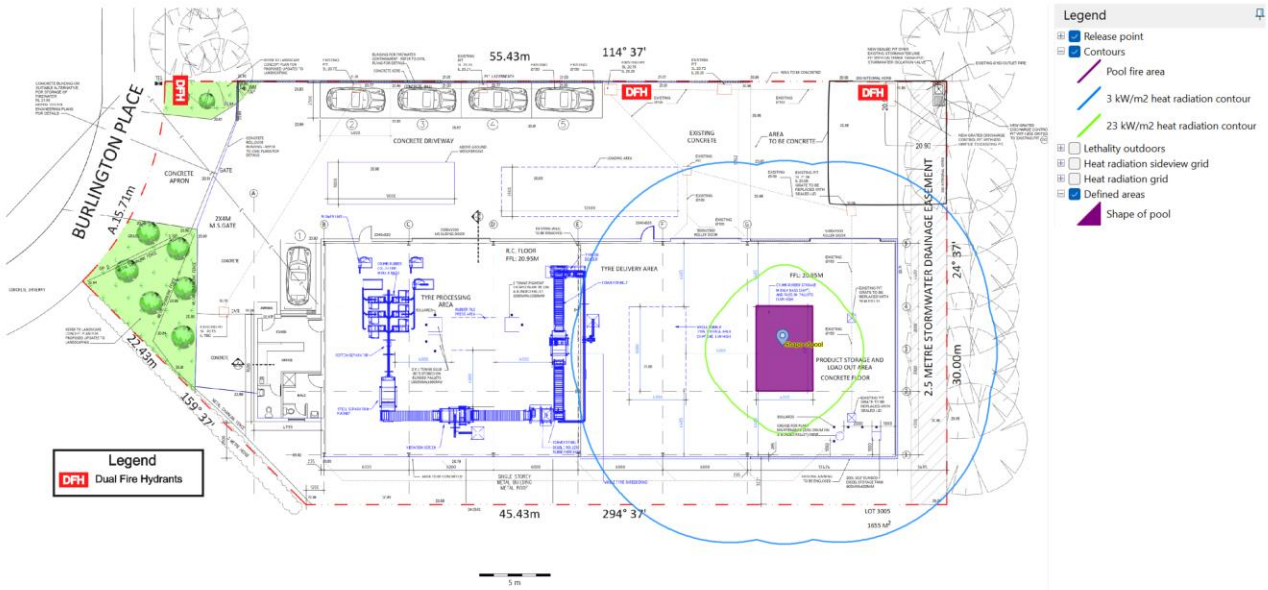

Figure 5-4: Radiant Heat Contours from Fire in Product Storage Area

It is to be noted, by looking at the Rutherford site survey in **Appendix C**, that there are no fire hydrants located on-site nor in close enough proximity to the site to be effective. Hence, there are no current hydrants that would be affected by the lateral impact from the two fires documented in **Figure 5-3** and **Figure 5-4**.

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 Delivery Area and Outgoing Storage Area Fire Pollutant Release Rates

Pollutant	Release Rate (kg/s)	
	Tyre Delivery Area	Outgoing Storage Area
Carbon Dioxide	0.13775	0.13775
Sulfur Dioxide	0.66761	0.66761
Water (H_2O)	0.16449	0.16449
Soot (Carbon)	0.1503	0.1503

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-7** and **Appendix Figure B-10** 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 5-5** 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.

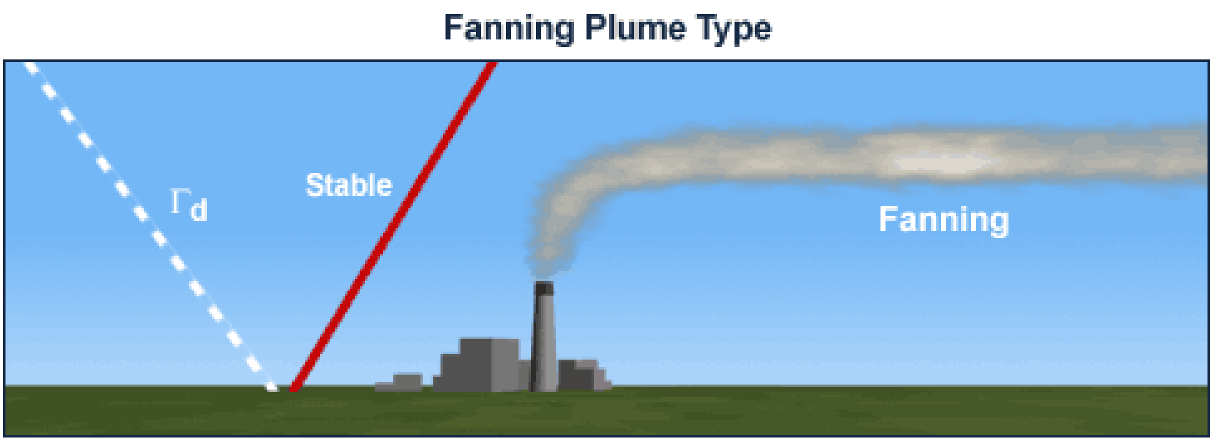

Figure 5-5: Smoke Rising Above Inversion Layer (Ref. [9])

However, **Appendix Figure B-4** illustrates that the heat generated from the fire would not be sufficient for all sulfur dioxide to pierce the inversion layer. It is noted that a fraction of the EPRG 1 and EPRG 2 contour lines fall below the inversion layer. EPRG 1 falls to 25 m in elevation and EPRG falls to 40 m in elevation at 1.1 m from the fire location. The perimeter of the zone is conveyed in **Figure 5-6** along with areas of high concern, which include the Rutherford RSPCA and Oak Tree Retirement Village Rutherford. It is to be noted that the concentrations which do not breach the Inversion layer, reach a minimum height of 20 m. The concentrations experienced at these heights are expected not to cause the development of irreversible or serious health effects, or symptoms that could impair an individual's ability to take protective action. Additionally, as the settling plume component disperses to ground level, dilution will occur leading to significantly lower concentrations or exposure (significantly lower than EPRG 1).

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.
- 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).

Figure 5-6: Sulfur Dioxide EPRG 1 and 2 Below Inversion Layer

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 5-7**.

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

Radiant Heat (kW/m^2)	Distance (m)	
	max	min
23	2.5	1
3	6	2

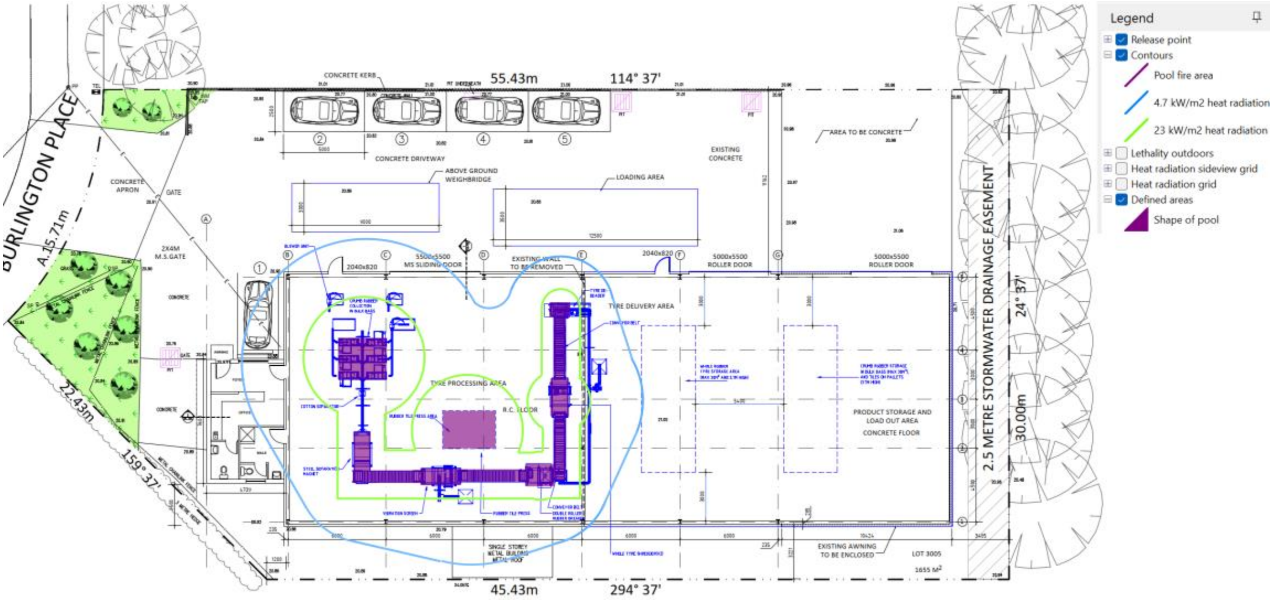

Figure 5-7: Radiant Heat Contours from Fire in Production Area

As previously noted in **Section 5.3,** there are no fire hydrants located on-site nor in close enough proximity to the site to be effective. Hence, there are no current hydrants that would be affected by the lateral impact from the production area fire documented in **Figure 5-7**.

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. Note: A designated smoking area is provided.
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. [10]).
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.
- Install CCTV monitoring 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 24 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. [11]).

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 Carbon Dioxide

Rubber Tyres produce large amounts of smoke and carbon dioxide when burning which can be detected be detected to raise an alarm.

The following recommendation has been made:

- Carbon dioxide detection shall be installed in the production area and in the storage area(s) to identify potential tyre fires.
- Detection of carbon dioxide at the site shall result in a local alarm at the site and shall be sent to site personnel that can enact a response after hours (i.e. notify FRNSW).

6.2.3 Detection and notification measures

It is important to notify the members of the facility of emergencies in the case of a fire to follow emergency procedures.

It has been recommended that:

- Manual call points are to be installed and be located in clearly visible locations.
- The evacuation signal 1 shall include words such as "Fire" and "Evacuate" inserted in the period provided in ISO 8201, or a site-specific voice message as provided for in AS 4428.16.

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 not currently protected by hydrants. The FSGBRT requires the site to have three hydrants at the site that are not sprinkler-protected. Hydrants come as dual headed hydrants. It is required that two dual head hydrants are to be installed adjacent to the tyre storage area roller door and the product storage and load out area roller door, as well as an additional dual head hydrant installed in front of the premise along Burlington Place, as depicted in **Figure 6-1**. The hydrant locations are outside the 3 kw radiant heat contours and are not affected.

A statement of available pressure and flow has been acquired from Hunter Water and is attached in **Appendix D.** The hydrants will be supplied by water mains and are capable of providing flow at 30 L / s at a pressure of 515 kPa as shown in the pressure inquiry in **Appendix D** This is the equivalent of 3 hydrants operating 515 kPa at once.

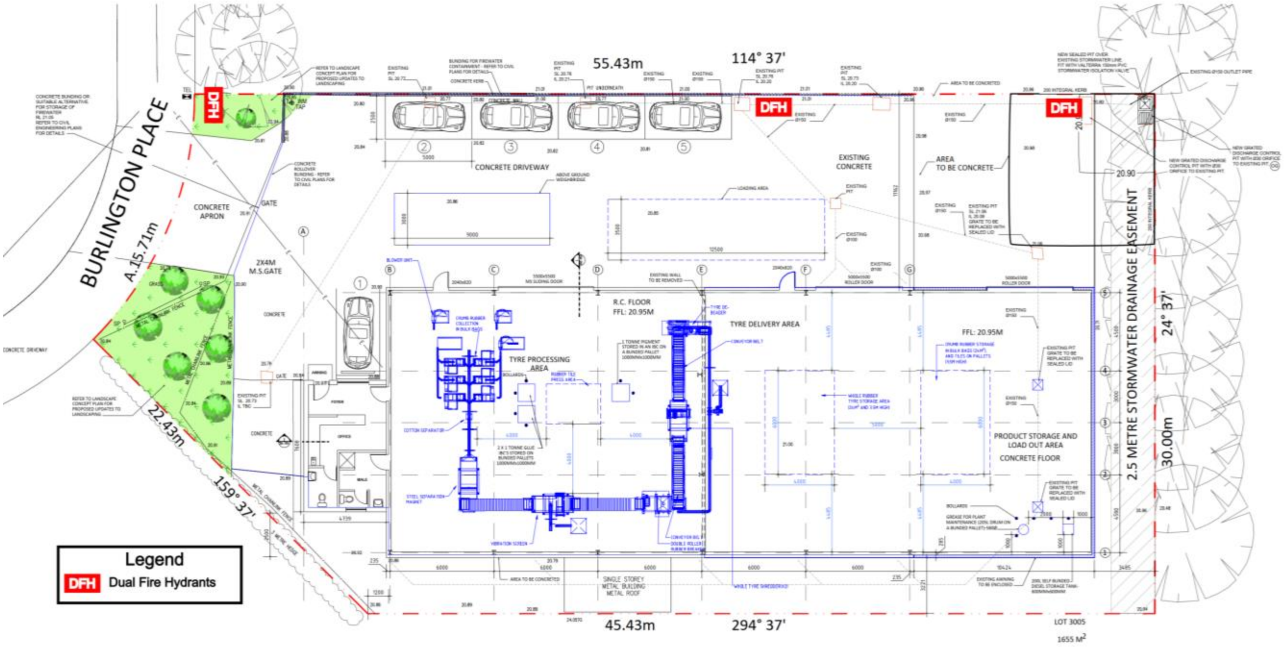

Figure 6-1: Proposed Hydrant Locations

The following recommendation has been made:

- The site is to have three dual fire hydrants installed as per **Figure 6-1** sourcing water from the main supply.

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 Hunter Water. Based on the fire scenarios identified, it is expected that the water provided by the street hydrants shall be sufficient.

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. [12]). **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 Rutherford Fire Station	2 Mustang Dr, Rutherford NSW 2320	2
FRNSW Maitland Fire Station	14 Church St, Maitland NSW 2320	7.7

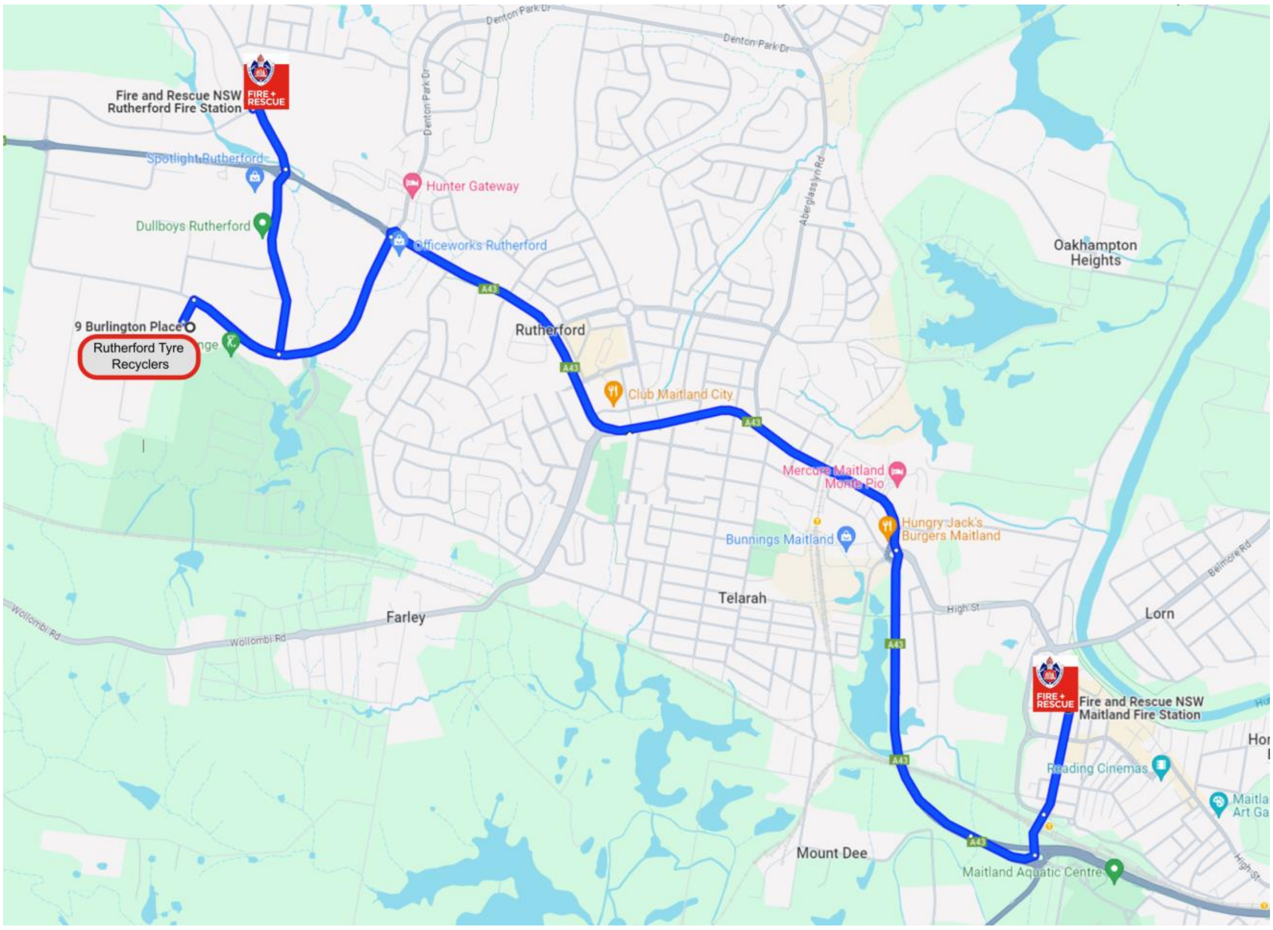

Figure 7-2: Location of Site with Respect to Closest Fire Brigade Stations

7.2 Response Time – Fire Brigade Intervention Model (FBIM)

Due to the nature of the FBIM, Ref. [12], 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. [12]).
- 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. [13]), 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.**

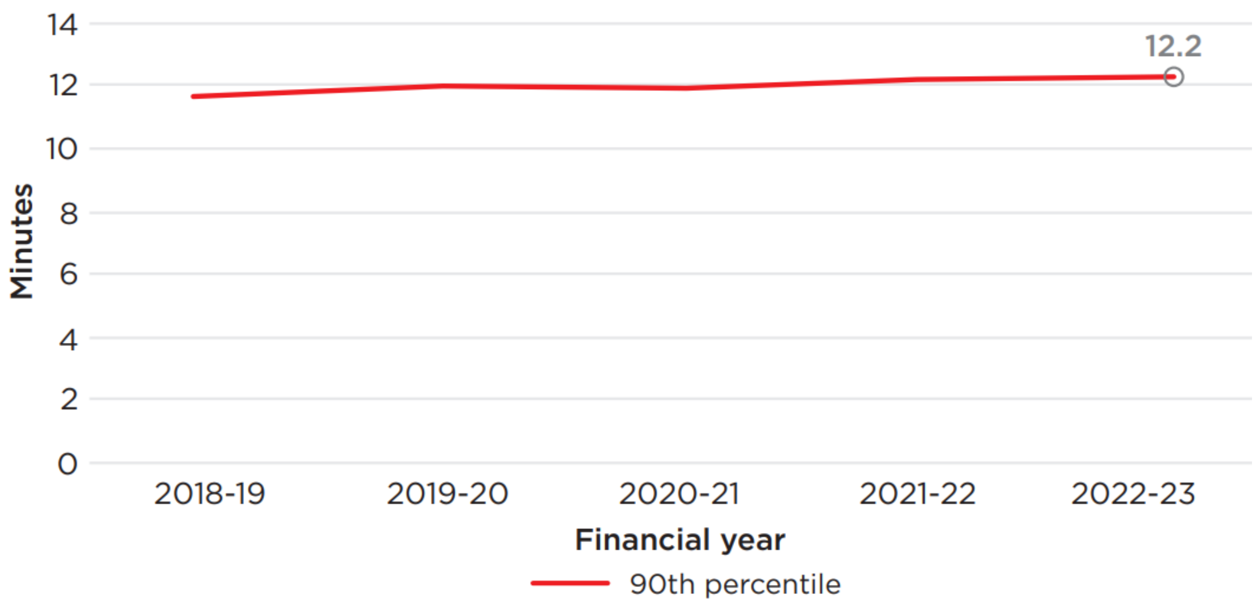

Figure 7-3: FRNSW Response Time from 2022 / 2023 Annual Report

- 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. [12]), 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. [12]) 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
Rutherford 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 three hydrants. There are no current hydrants on or located near the site, recommended hydrant locations have been provided in **Figure 6-1**.

A pressure inquiry is provided in **Appendix D** which shows that the hydrants can discharge flow at 30 L / s at 515 kPa which exceeds the minimum requirements of AS 2419.1. Therefore, it is considered that there is sufficient water to be able to combat the fires expected at the facility.

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 three (3) hydrant hoses operating at a combined total of 30 L / sec for 90 minutes. This would generate approximately 162 m^3 of potentially contaminated water which would be required to be contained on site. **Appendix G** outlines the site containment which complies with the recommendations provided.

The following recommendation has been made:

- The facility and / or site boundaries shall be capable of containing 162 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 162 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. [8]).

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 in **Appendix D** 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	No external stockpiles.
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 9 Burlington Place, Rutherford (Lot 3005 DP1040568) 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:

- A Spill kit is to be located adjacent to the combustible liquids storage area
- The diesel storage tank is to comply with AS1692
- Two powder-type extinguishers are to be located within15m of the grease and diesel store
- Stockpile limits within the storage areas will be marked.
- That crumb rubber, pavers and matting are to be cool before being stockpiled.
- 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).
- 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.
- Install CCTV monitoring for intruders at the site.
- 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*".
- Carbon dioxide detection shall be installed in the production area and in the storage area(s) to identify potential tyre fires.
- Detection of carbon dioxide at the site shall result in a local alarm at the site and shall be sent to site personnel that can enact a response after hours (i.e. notify FRNSW).
- Manual call points are to be installed and be located in clearly visible locations.

- The evacuation signal 1 shall include words such as “Fire” and “Evacuate” inserted in the period provided in ISO 8201, or a site-specific voice message as provided for in AS 4428.16.
- 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 have three dual fire hydrants installed as per **Figure 6-1** sourcing water from the main supply.
- The facility and / or site boundaries shall be capable of containing 162 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 162 m^3.
- An isolation system that will prevent the external discharge of potentially contaminated fire water is to be installed.
- A fire engineer is to review the site and the current smoke exhaust system of the warehouse.
- A fire hydrant system shall comply with Clause E1.3 of the BCA and the relevant provisions of AS 2419.1:2021. A fire engineer is to review fire systems and confirm compliance and performance solutions required.
- A fire hose reel system shall comply with Clause E1.4 of the BCA and the relevant provisions of AS 2441:2005. A fire engineer is to review fire systems and confirm compliance and performance solutions required.
- Portable fire extinguishers shall comply with Clause E1.6 of the BCA and the relevant provisions of AS 2444:2001. A fire engineer is to review fire systems and confirm compliance and performance solutions required.

11.0 References

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Appendix A

Hazard Identification Table

Appendix A

A1. Hazard Identification Table

Area / Operation	Hazard Cause	Hazard Consequence	Safeguards
Combustabkle Liquid storage area	• Combustible Liquid Fire in combustible liquid storage area	• Ignition of grease or Diesel leading to a fire. • Incident propagation from radient heat.	• Combustible Liquids stored in accordance with AS1940:2017 • Two Powder-type fire extinguishers stored with in 15 m combustiblele liquid stores • A spil kit located adjacent to combustible liquids • Adequate separation from nearby stores • Diesel stored in intergraly bunded tank a • Grease stored in drum and on palate 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

Appendix B

Consequence Analysis

Appendix B

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 delivery 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.

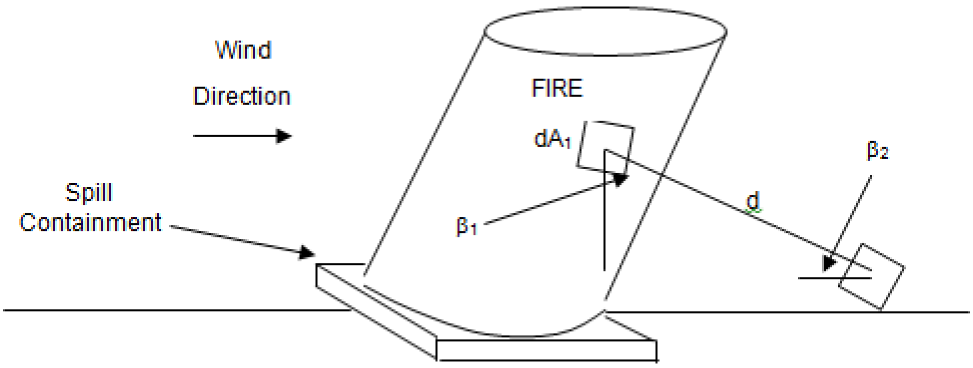
Each incident has been assessed in the sections below.

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. [14]).

$$Q = EF\tau$$ **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. [14]). 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° 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° 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° 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°, sin(γ) is 1.0, meaning that the projected area is 100% of the actual area.

Before the value of θ reaches 90° 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 ∆A 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. [15] & Ref. [14]) 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. [14]) which is shown in **Equation B-6**.

$$H = 42d_p \left[\frac{\dot{m}}{\rho_a \sqrt{g d_p}}\right]^{0.61}$$ **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 Diesel or Grease, Combustible Liquid Fire

The combustible liquids area contains 205 L of grease stored in a drum on a palate bund and 200L of diesel stored in an integrally bunded tank. As the two stores are individually bunded two separate fires have been moddled to determine the effects each store would have on firefighting equipment and propagation to surrounding stores. The modelling of the firese specified in this section, utilises the calorific value of gasoline, at 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

Location	Dimensions (m)	Area (m^2)
Diesel Tank	1.315 x 1.06	1.4
Grease Drum bunded palate	1.23 x 1.23	1.5

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 Combustasble Liquids Storage Area

Radiant Heat (kW/m^2)	Distance (m)	
	Diesel Tank	Grease Drum
23	0.3	0.3
3	1.5	1.3

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

Two fires are analysed in this vicinity: one in the tyre delivery 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 3-4**. 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)
Whole Tyre Storage Area	6 x 4	24
Product Storage Area	6 x 4	24

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 Whole Tyre Storage Area and Product Storage Area

Radiant Heat (kW/m^2)	Distance (m)	
	Whole Tyre Storage Area	Product Storage Area
23	4	4
3	13	13

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

B6.1 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 parameters 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. [14]).

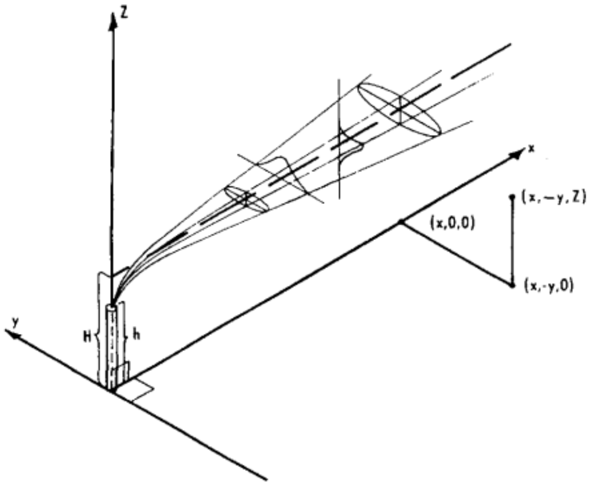
Appendix Table B-6: Pasquill's Stability Categories

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.

B6.2 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. [14]).



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°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	Translation for "ParameterValues.C8H8C4H6S8" is missing!
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)	30000
Surface area of the fire (m2)	21.6
Environment	
Ambient temperature (°C)	20

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

B6.4 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 Delivery Area	Outgoing Storage Area
Carbon Dioxide	0.13775	0.13775
Sulfur Dioxide	0.66761	0.66761
Water (H_20)	0.16449	0.16449
Soot (Carbon)	0.1503	0.1503

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

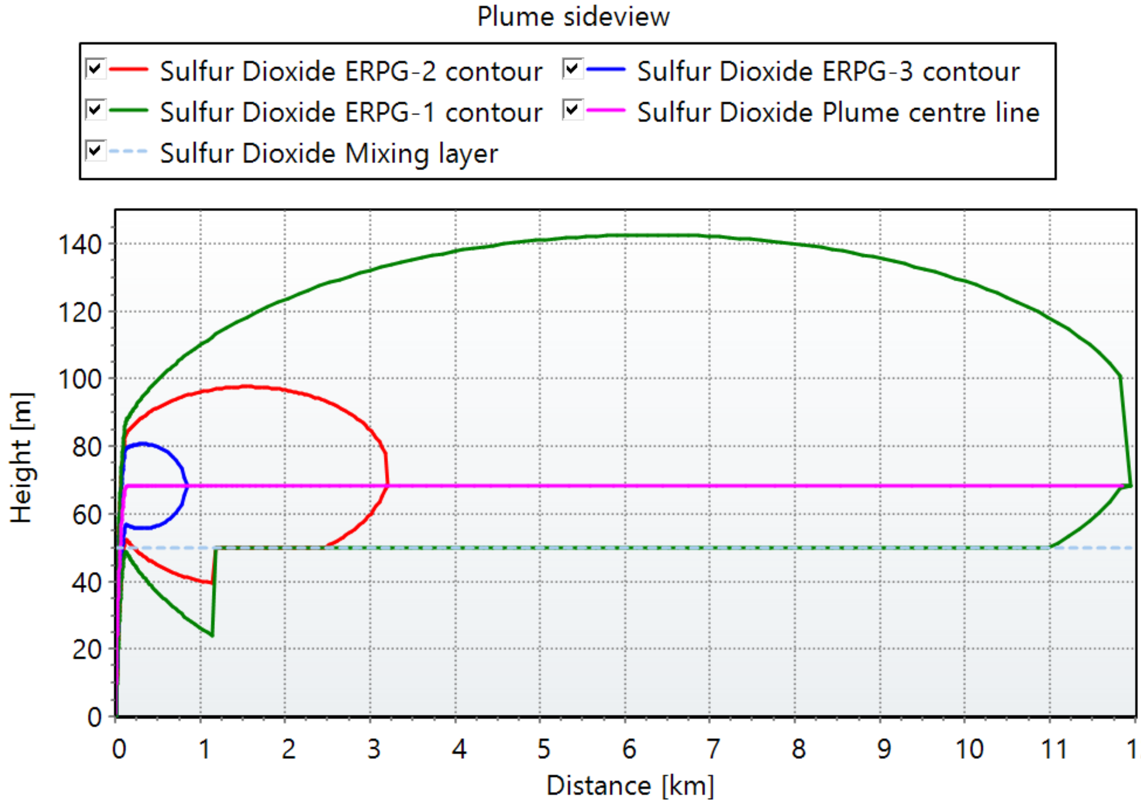
- Release rates: Per **Appendix Table B-7**

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.

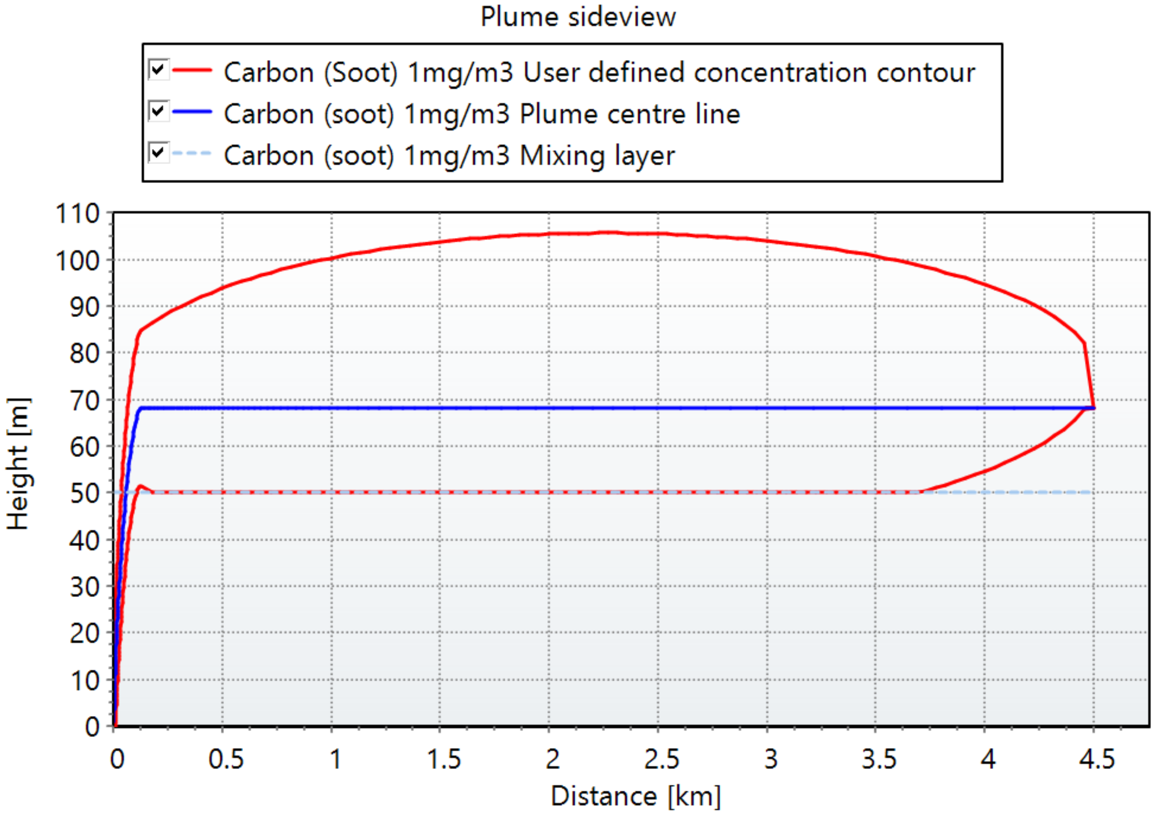
The impacts associated with exposure to a toxic gas are broken down based on the effects which occur when exposed to a concentration. The values used in this analysis are based upon the Emergency Response Planning Guidelines (ERPG) tiers which are summarised below.

- **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.

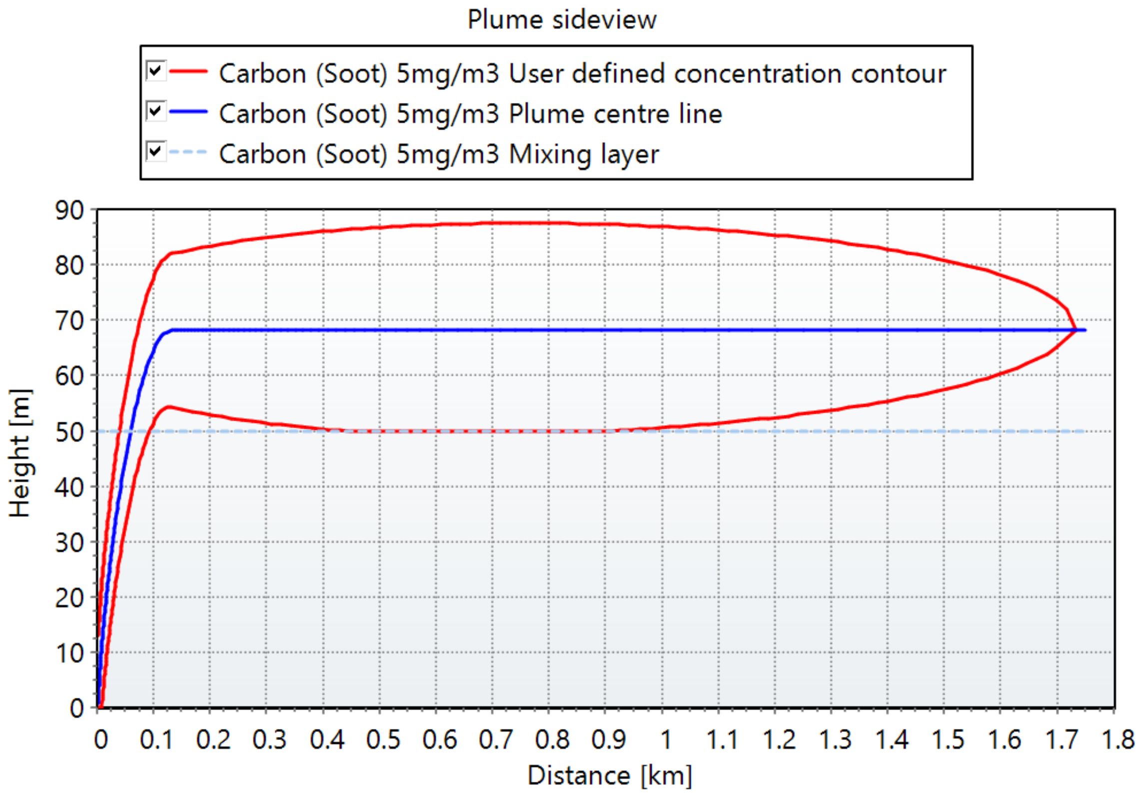
The graphs show the smoke plume from the side view such that the height and length of the dispersion can be viewed.



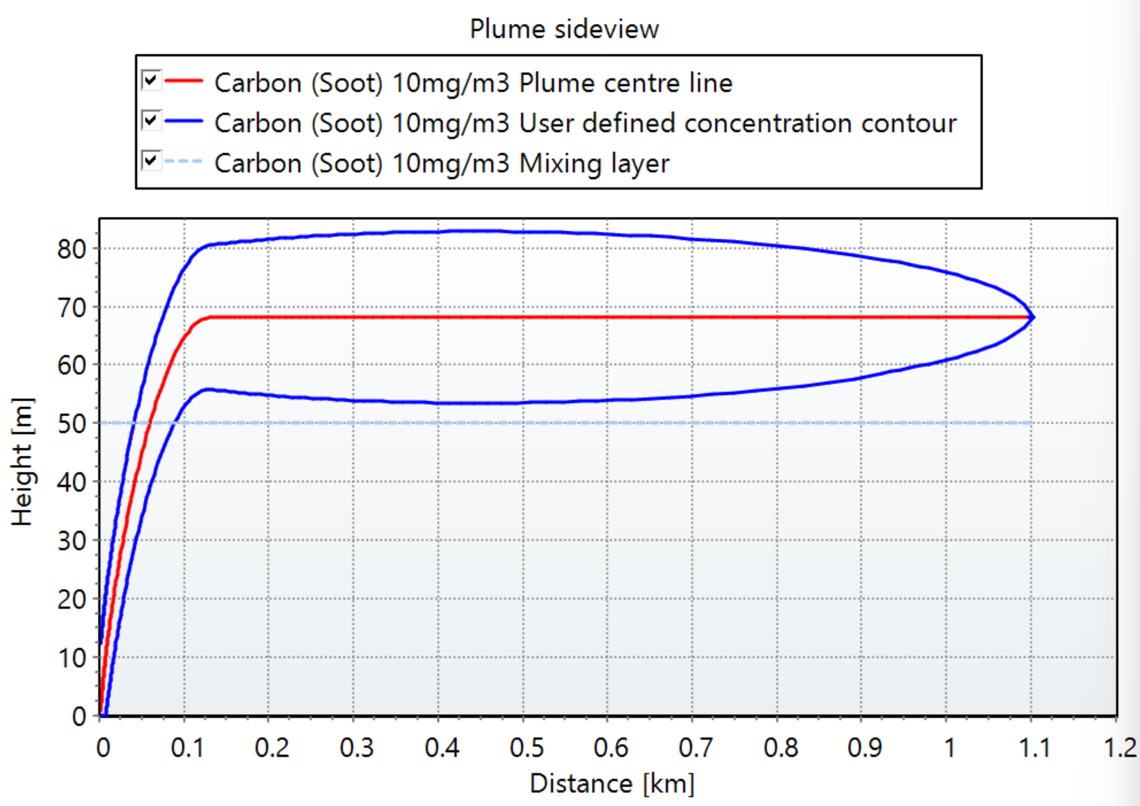
Appendix Figure B-4: Sulfur Dioxide Downwind Plume Dispersion Storage Fire



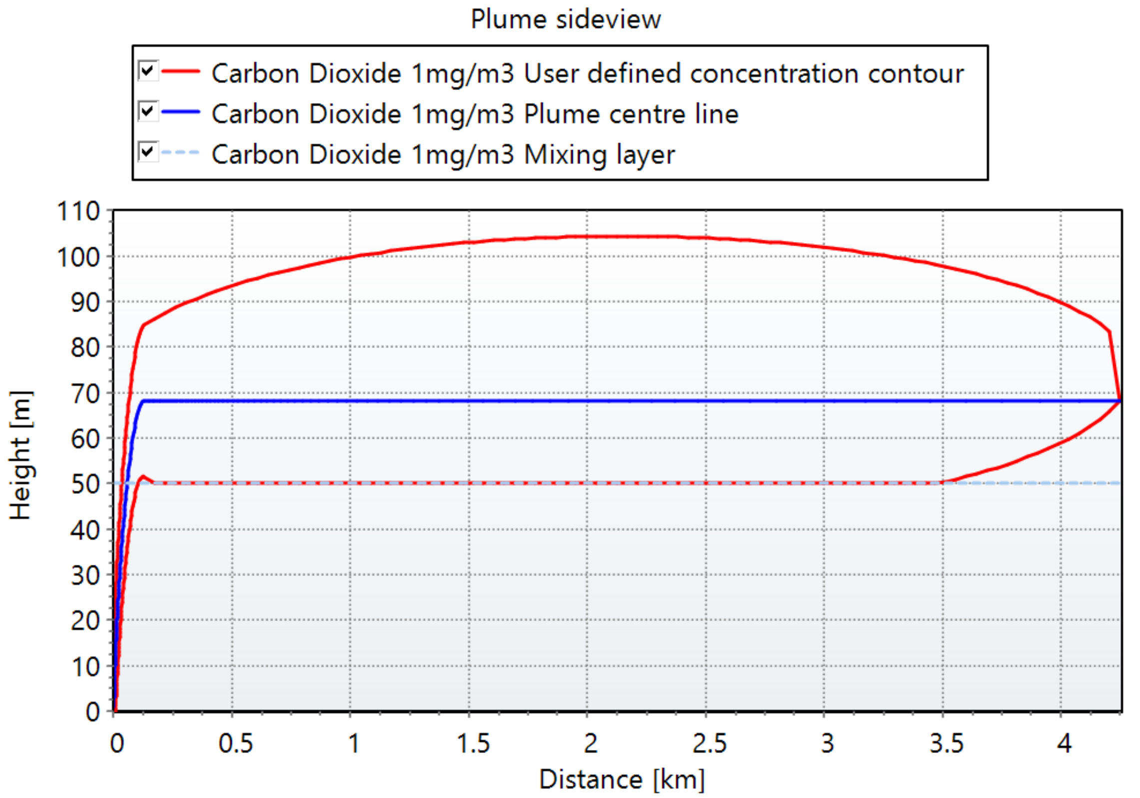
Appendix Figure B-5: Soot (Carbon) Downwind Plume Dispersion - 1mg/m3



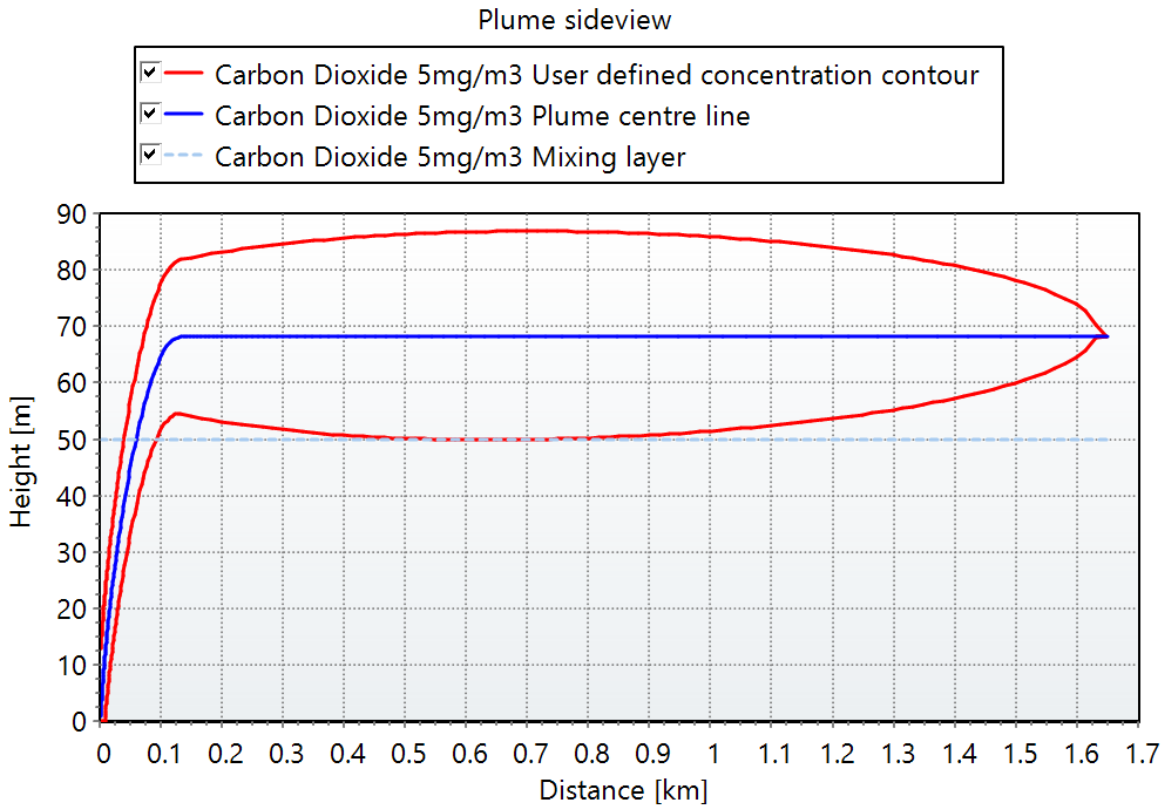
Appendix Figure B-6: Soot (Carbon) Downwind Plume Dispersion - 5mg / m3



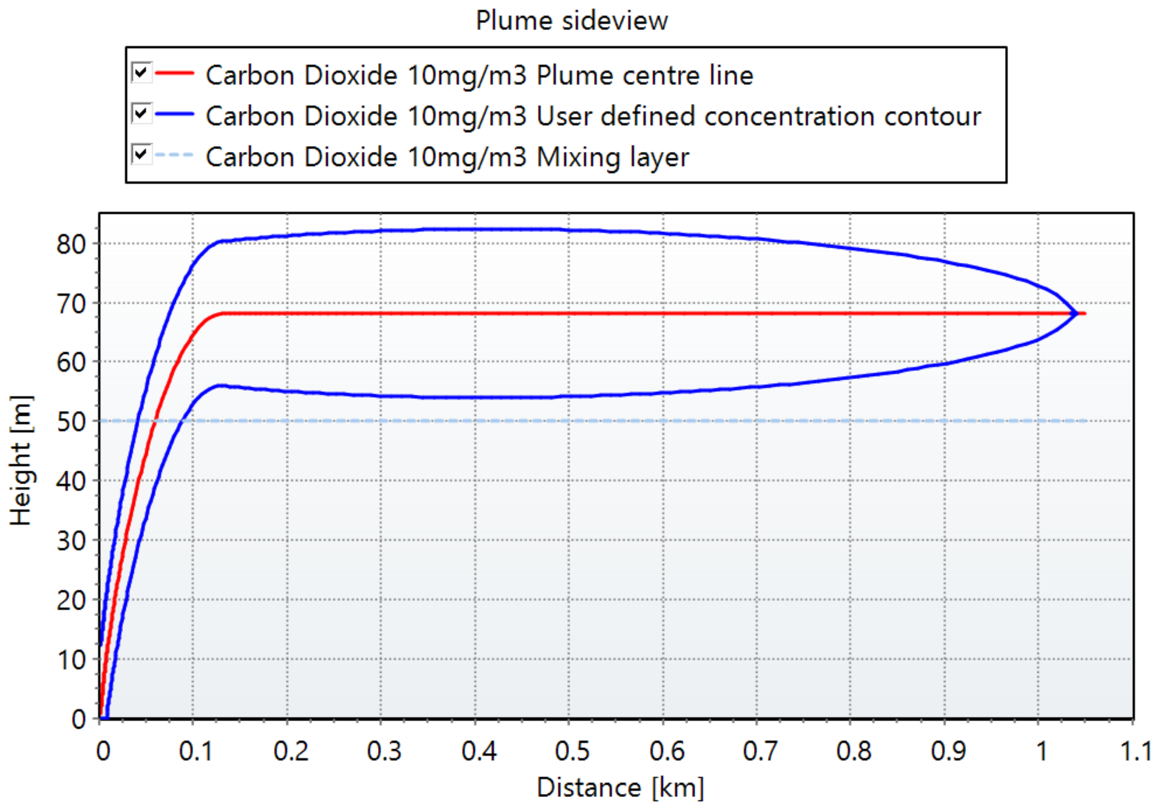
Appendix Figure B-7: Soot (Carbon) Downwind Plume Dispersion - 10mg / m3



Appendix Figure B-8: Carbon Dioxide Downwind Plume Dispersion - 1mg / m3



Appendix Figure B-9: Carbon Dioxide Downwind Plume Dispersion - 5mg / m3



Appendix Figure B-10: Carbon Dioxide Downwind Plume Dispersion - 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: Production Line Modules, Respective Rubber Mass and Fire Area

Section	Mass (tonnes)	Area (m^2)
Single Hook Tyre De-Beader	1.25	1
Whole Tyre Shredder	2	2.5
Double Roller Rubber Breaker	0.5	2
Crumb Rubber Bagging Area	6	10
Vulcanising Machine	1	7.5

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**.

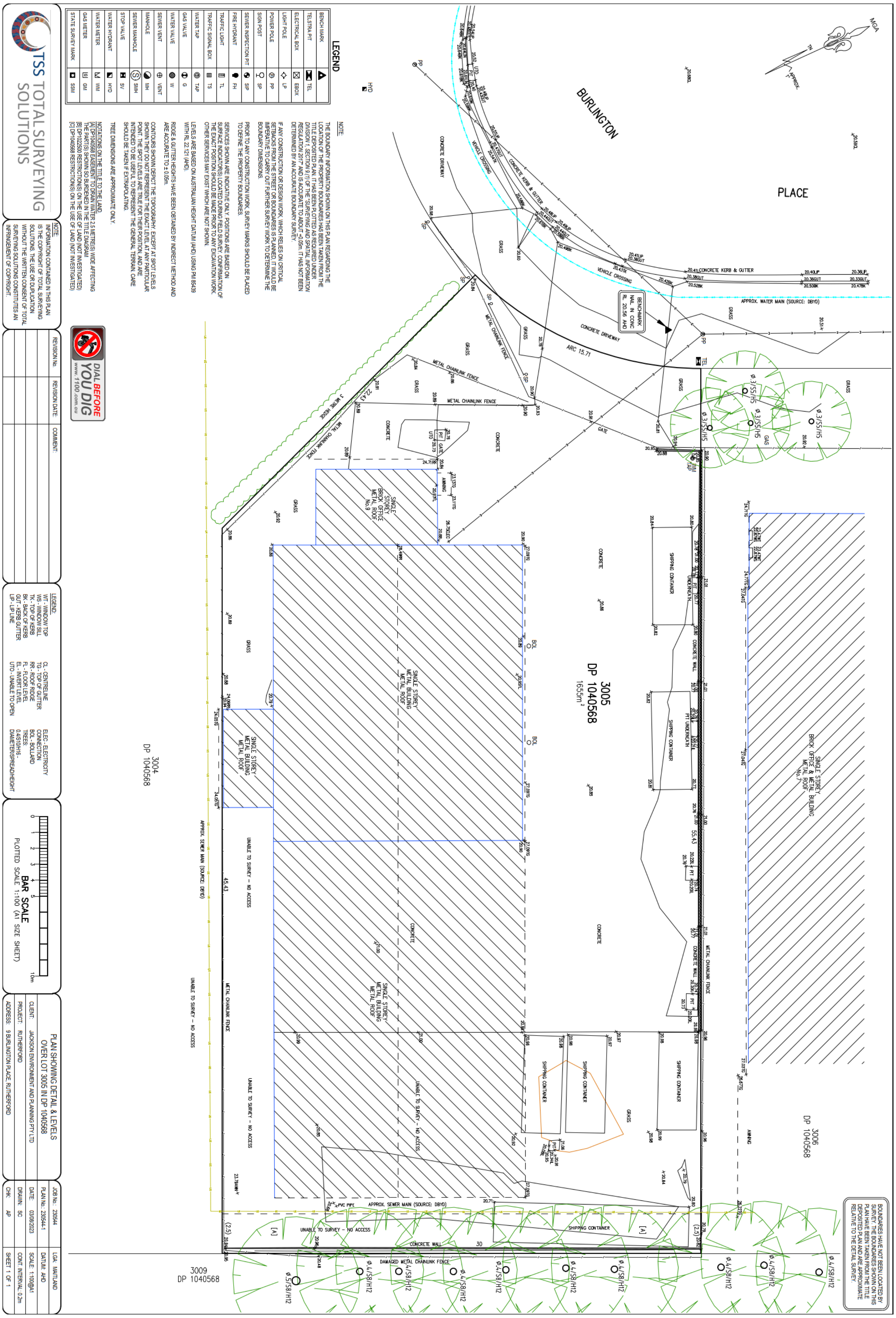
Appendix Table B-9: Radiant Heat Values for Production Line Fire Model

Radiant Heat (kW/m^2)	Distance (m)	
	max	min
23	2.5	1
3	6	2

Appendix C

Site Survey of Watermains and Fire Hydrants

Appendix C


BURLINGTON
PLACE
LEGEND
3005
DP 1040568
TSS TOTAL SURVEYING SOLUTIONS
DIAL BEFORE YOU DIG

Appendix D

Hydraulic Analysis

Appendix D

HUNTER WATER
love water

Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Dr
NEWCASTLE NSW 2300
1300 657 657 (T)
enquiries@hunterwater.com.au
hunterwater.com.au

12 February 2024

C & N YOUNG INVESTMENTS PTY LIMITED
C/- Riskcon Engineering Pty Ltd
31 ANNANDALE ST
ANNANDALE NSW 2038

Statement of Available Pressure and Flow

Property address:	9 BURLINGTON CL, RUTHERFORD NSW 2320
Lot & Plan number:	Lot 3005 DP 1040568
Hydrant No.	10152461
Approximate Ground Level:	20.61 m AHD
Water Main Size and Location:	DN150 mm PVC-M(SER2) located in BURLINGTON CL, RUTHERFORD NSW 2320
Hunter Water reference:	2024-168

Thank you for your application for a Statement of Available Pressure and Flow. We have assessed the pressure expected to be available at the nearest hydrant under the demand conditions identified in the table below.

The pressure and flow information provide in the table is to be read in conjunction with notes on the following page.

Expected Pressure at Hydrant	Additional Fire Flow (L/s)	Pressure (kPa)
Maximum pressure (Average Day Demand)	0	690
Minimum pressure (Peak Day Demand)	0	525
Pressure expected under peak day demand conditions		
Fire hose reel (x2)	0.66	525
Pressure expected under 95%ile peak day demand conditions		
Fire hydrant /sprinkler installations	10.0 L/s	545
Fire hydrant /sprinkler installations	20.0 L/s	530
Fire hydrant /sprinkler installations	30.0 L/s	515
Max available flow	50.0 L/s	470

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**
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, 24 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 RTR 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 RTR 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 RTR 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 RTR will have to comply with to be operational.

Appendix F

Assessment of Bushfire Risks and Protection Zones

Appendix F

BUSHFIRE ASSESSMENT

PROPOSED TYRE RECYCLING FACILITY

LOT 3005 DP 1040568
9 Burlington Place, Rutherford

Date:	**26/03/2024**
Prepared for:	**Rutherford Tyre Recyclers Pty Ltd**

NEWCASTLE BUSHFIRE CONSULTING
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I hereby declare that I am a BPAD accredited bushfire practitioner.

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Signature

Date 26/03/2024

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Document Status

Revision No.	Issue	Description	Reviewed	Approved by Director
1	27/02/2024	Draft	E. Davis	P. Couch
2	26/03/2024	Final	E. Davis	P. Couch

Prepared By:

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Bach Info Science
Grad Dip Design for Bushfire Prone Areas
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1.0 EXECUTIVE SUMMARY AND COMPLIANCE TABLES

This report has assessed the proposed tyre recycling facility against the requirements of the Environmental Planning and Assessment Act 1979, AS3959 (2018) Construction of buildings in bushfire-prone areas and Planning for Bush Fire Protection (2019).

This report establishes that the building change of use complies with the acceptable solutions of Planning for Bush Fire Protection (2019).

TABLE 1 – PROPERTY DETAILS AND TYPE OF PROPOSAL

Applicant Name	Rutherford Tyre Recyclers Pty Ltd		
Site Address	9 Burlington Place, Rutherford	**Lot/Sec/DP**	Lot 3005 DP 1040568
Local Government Area	Maitland	**FDI**	100
Bushfire Prone Land	No, not mapped bushfire prone land		
Type of development	Tyre recycling facility within existing shed	**Type of Area**	Industrial
Special Fire Protection Purpose	No	**Flame Temperature**	1090K
Application Complies with Acceptable Solutions	Yes	**Referral to NSW Rural Fire Service (NSW RFS) required**	Council determination on referral

TABLE 2 – BUSHFIRE THREAT ASSESSMENT

	North	East	South	West
Vegetation Structure	Maintained Land	Maintained Land	Grassland	Maintained Land
Distance to Vegetation	140 metres	140 metres	102 metres	140 metres
Accurate Slope Measure	N/A	N/A	N/A	N/A
Slope Range	N/A	N/A	N/A	N/A
AS3959 (2018) Bushfire Attack Level (BAL)	BAL-LOW	BAL-LOW	BAL-LOW	BAL-LOW

TABLE 3 – PLANNING FOR BUSH FIRE PROTECTION (2019) COMPLIANCE

Performance Criteria	Proposed Development Determinations	Method of Assessment
Asset Protection Zone	Asset protection zones have been determined in accordance with Planning for Bush Fire Protection (2019). The asset protection zone will be maintained for the life of development and defendable space is provided on-site.	Acceptable Solution
Siting and Design	Buildings have been designed to minimise the risk of bushfire attack.	Acceptable Solution
Construction Standards **AS3959 (2018)**	Bushfire Attack Levels have been determined in accordance with Planning for Bush Fire Protection (2019) and AS3959 (2018). The highest BAL to the proposed building was determined to be **BAL-LOW**.	Acceptable Solution
Private and/or Public Road Infrastructure	The public road system is not affected or changed as part of this application.	Acceptable Solution
Property Access	The existing property access complies.	Acceptable Solution
Water and Utility Services	Water, electricity and gas services offer compliance with Planning for Bush Fire Protection (2019) Section 7.	Acceptable Solution
Landscaping	Landscaping to comply with Planning for Bush Fire Protection (2019) Appendix 4.	Acceptable Solution

The Planning Secretary's Environmental Assessment Requirements, SEAR Number 1810 dated 29/09/23, has requested an assessment of bushfire risks and asset protection zones (APZ) in accordance with NSW Rural Fire Service guidelines. This report addresses that request.

2.0 INTRODUCTION

2.1 PURPOSE OF REPORT

The purpose of this report is to establish suitable bushfire mitigation measures for the proposed tyre recycling facility within an existing industrial shed located at Lot 3005 DP 1040568, 9 Burlington Place, Rutherford, in order for the planning secretary to make determination of the proposed development pursuant to the requirements of Section 4.12(8) of the Environmental Planning and Assessment Act 1979.

Features on or adjoining the site that may mitigate the impact of a bushfire on the proposed development
There is significant development and road network surrounding the site in all directions. The site is not bushfire prone land and there is no mapped bushfire prone land within 500 metres of the site.

Likely environmental impact of any proposed bush fire protection measures
No clearing of native vegetation is required for the proposed development.

The site is not bushfire prone land and National Construction Code structural fire compliance will be adequate for this building.

2.2 PROPOSED DEVELOPMENT

Rutherford Tyre Recyclers Pty Ltd are seeking approval to establish a tyre recycling facility within an existing shed located at 9 Burlington Place, Rutherford (Lot 3005/DP1040568) (the Proposal). The operation can be defined as a 'resource recovery facility'. The materials produced will be crumb rubber, recovered steel, recovered cotton, rubber pavers and rubber matting.

The site covers an area of 1,655m^2, with a ~290m^2 existing shed on the site that has a ~35m^2 office attached on the eastern side of it. The site is supported by an outdoor concrete hardstand area with access from Burlington Place via a driveway. The driveway provides access to the outdoor hardstand area which has access to the shed, open awning and office. The office contains staff amenities and is located on the western side of the site, near the site entrance.

Prior to operations, minor infrastructure changes to the industrial shed and site are proposed to enable the fit-out and use of the site as a best practice tyre recycling facility. This will involve enclosing the existing open awning at the back of shed, removing the dividing wall and installing two roller doors, creating a larger, fully enclosed industrial shed on-site. The total area of the new shed will be ~638m^2. The two new roller doors will allow access into the industrial shed. A 9m above-ground weighbridge will be installed on the hardstand area close to the access point of the site. The site will have new markings to show the loading bay area and five car spaces for staff.

The site will receive an average of 15 tonnes of used whole tyres per day, approximately 4,500 tonnes per annum. No other material will be received on-site. All incoming whole tyre deliveries are made into the site by a 7.5-tonne medium rigid vehicle (MRV), with access onto the site from Burlington Place. There will be 2 deliveries of tyres per day. The MRV will proceed to the 9m above-ground weighbridge to be weighed before proceeding to the loading area. The loading area is located outside the roller doors to the industrial shed and tyres will be unloaded by hand and immediately stacked in the Whole Tyre Storage Area. The MRV will be backloaded with items produced on-site before exiting the site by proceeding further onto it, reversing back through the industrial building roller doors and turning right onto the weighbridge. The MRV will be weighed on the weighbridge to track the amount of products being removed from the site and will then exit via the driveway access onto Burlington Place. An average of 12 vehicle movements (6 inbound and 6 outbound) will be generated by the site per day. This includes up to 4 staff vehicles as well as two MRV truck deliveries.

All tyre recycling activities will occur inside the shed, including storage of all materials. No tyres or residual materials will be stored outside on the hardstand area. The used whole tyres are turned into crumb rubber on the Waste Tyre Recycling Production Line, which has a 98% efficiency. The first step involves the tyre de-beader to remove the metal wiring from inside the tyre. The tyre is then cut into a long rubber strip using the tyre strip cutter before being placed onto a conveyor belt and loaded into the whole tyre shredder. The next stage involves crushing the rubber blocks into mesh rubber powder using the double roller rubber breaker. A vibration screen is then used to separate the different sized pieces of crumb rubber. The Waste Tyre Recycling Production Line produces crumb rubber, residual steel and residual cotton from the whole tyres.

Some of the crumb rubber produced on-site will be used to produce rubber tiles and rubber mats in the Rubber Tiles Production area. This involves a small thermal-moulding process that coverts crumb rubber into rubber matting or rubber tiles. The first step involves mixing the rubber crumb with glue to create the bottom of the rubber tile. The top part of the rubber tile involves mixing rubber crumb, pigment and glue together in a barrel mixer. A vulcanizing machine is used to create vulcanized rubber tiles by compressing the rubber into dense, ultra durable, non-porous rubber tiles. The production of tiles or mats depends on the size of the mould used.

The facility will have two storage areas, both located on the eastern side of the industrial building. The Whole Tyre Storage Area will be used to stack the whole tyres after they have been delivered to the site. The area capacity is 30m^3 with a maximum height of 3.7m. The Crumb Rubber Storage Area is used to store materials produced on-site, including crumb rubber, recovered steel and cotton from the tyre recycling process and rubber tiles and mats produced on-site. The rubber tiles and mats will be stored on pallets. The area capacity is 30m^3 with a maximum height of 3.7m. The storage areas will be marked on the concrete floor using hard wearing paint.

The tyre recycling facility will operate 6 days a week, with times varying for deliveries and recycling operations. A breakdown of the weekly operation is as follows:

- Crumb Rubber Production
  - Monday – Friday: 5am – 6pm
  - Saturday: 8am – 1pm
  - Sunday & Public Holidays – Closed

- Tyre Delivery
  - Monday – Friday: 7am – 6pm
  - Saturday: 8am – 1pm
  - Sunday & Public Holidays – Closed

It is noted that landscaping at the front of the property facing Burlington Place has also been considered in this assessment.

3.0 BUSHFIRE ATTACK ASSESSMENT

3.1 VEGETATION CLASSIFICATION

Potential bushfire hazards were identified from Maitland Council's Bushfire Prone Mapping as occurring within the investigation area. Aerial mapping and inspection of the site reveals that the bushfire prone land map is reasonably accurate in respect to the current bushfire hazard.

The major vegetative threats have been determined using Planning for Bush Fire Protection (2019).

Primary vegetation structures have been identified in Figure 1 – Site Constraints Map and separation distances shown in Table 2 – Bushfire Attack Assessment.

PHOTO 1 - SITE PHOTO LOOKING EAST

View of the subject site looking east. Established industrial/commercial development surrounds the site.

PHOTO 2 - SOUTHWESTERN GRASSLAND

View of grassland located more than 100 metres south of the site. The grassland is punctuated by storage of industrial equipment and access trails.

FIGURE 1 – SITE CONSTRAINTS MAP

FIGURE 2 – LOCALITY MAP
Courtesy of OpenStreetMap

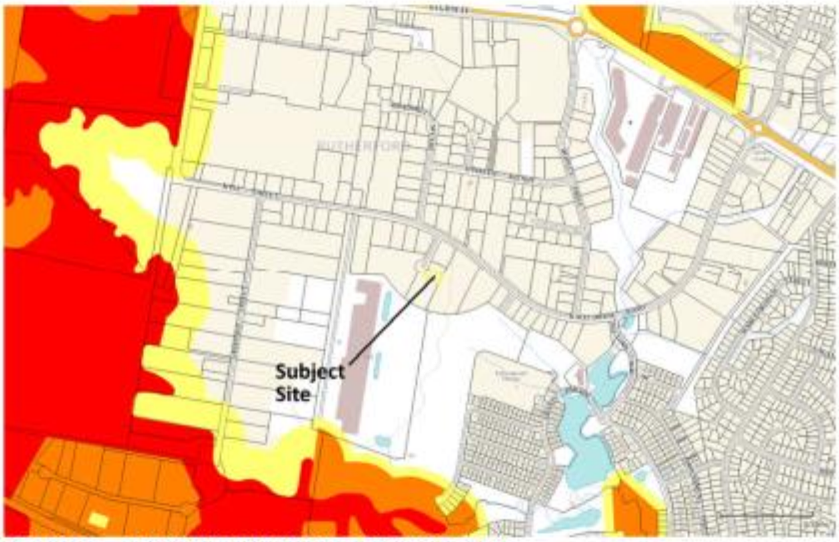


FIGURE 3 – COUNCIL'S BUSHFIRE PRONE LAND MAP

3.2 EFFECTIVE SLOPE

Effective Slope was measured using 2-metre contour data obtained from the Department of Lands and verified by a laser hypsometer on site. The laser hypsometer verified slope within the vegetation, calculating effective fire run slope from 5 separate measurements in each dominant direction.

Effective Slopes have been identified in Figure 1 – Site Constraints Map and slope ranges are shown in Table 2 – Bushfire Threat Assessment.

3.3 BUSHFIRE ATTACK LEVELS

BALs and relevant construction levels in accordance with Planning for Bush Fire Protection (2019) have been demonstrated in Section 1 Executive Summary and Compliance Tables.

3.4 COMPLIANCE WITH AIMS AND OBJECTIVES OF PLANNING FOR BUSH FIRE PROTECTION (2019)

The aims and objectives of Planning for Bush Fire Protection (2019) for the proposed development are addressed below.

Afford occupants of any building adequate protection from exposure to a bushfire
There are building exits facing away from the grassland and the southern shed will offer significant radiant heat shielding.

Evacuation planning in the event of bushfire should clearly indicate to building occupants to evacuate in a direction away from the fire.

Provide for a defendable space to be located around buildings
Defendable space is available surrounding the building.

Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevents direct flame contact and material ignition
There are significant expanses of managed land surrounding the building and no potential for direct flame contact. The building could be exposed to BAL-LOW. The site is not bushfire prone land and no landscape specific measures apply.

Ensure that safe operational access and egress for emergency service personnel and building users are available

The primary access to the facility offers compliance with Planning for Bush Fire Protection (2019) access requirements.

Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the Asset Protection Zone

The site is not bushfire prone land and no landscape specific measures apply. A review of the landscape plan has been made as optional compliance.

Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting)

Hydrant spans are compliant with AS2419.1. Electrical supplies to the local area are overhead with management of obstructions currently complying.

PHOTO 3 - SOUTHERN GRASSLAND

View of grassland located more than 100 metres south of the site. The grassland is punctuated by storage of industrial equipment and access trails.

4.0 UTILITY SERVICES AND INFRASTRUCTURE

4.1 WATER SERVICES

A reticulated water supply and street hydrant access are available providing coverage of the development in accordance with AS 2419.1, relevant to Planning for Bush Fire Protection.

4.2 ELECTRICITY SERVICES

The existing electrical transmission lines are located overhead. No part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

4.3 GAS SERVICES

- Reticulated or bottled gas to be installed and maintained in accordance with AS1596 (2002) and the requirements of the relevant authorities. Metal piping is to be used.
- Fixed gas cylinders to be kept clear of flammable material by a distance of 10 metres and shielded on the hazard side of the installation.
- Gas cylinders close to the building are to have the release valves directed away from the building and be at least 2 metres from flammable material with connections to and from the gas cylinder being of metal.
- Polymer-sheathed, flexible gas supply lines to gas meters adjacent to the buildings are not to be used.

5.0 PROPERTY ACCESS

Property access is by way of Burlington Place providing access from the public road system directly to the private land, giving firefighters access to the building.

The existing property access road complies with Section 7 of Planning for Bush Fire Protection (2019).

6.0 LANDSCAPING MAINTENANCE

The site is not mapped bushfire-prone land, however, landscape measures have been based on the below as a conservative measure. A review of the landscape plans identifies them to comply with the below.

Trees should be located greater than 2 metres from any part of the roofline of a building. Garden beds of flammable shrubs are not to be located under trees and should be no closer than 10 metres from an exposed window or door. Trees should have lower limbs removed up to a height of 2 metres above the ground.

The landscaped area should be maintained free of leaf litter and debris. The gutter and roof should be maintained free of leaf litter and debris.

Landscaping should be managed so that flammable vegetation is not located directly under windows.

Ground fuels such as fallen leaves, twigs (less than 6 millimetres in diameter) and branches should be removed on a regular basis, and grass needs to be kept closely mown and, where possible, green.

7.0 RECOMMENDATIONS

Based upon an assessment of the plans and information received for the proposal, it is recommended that development consent be granted subject to the following conditions:

1. The site is not bushfire prone land and is located a considerable distance from mapped bushfire prone land.
2. Any building modifications shall comply with National Construction Code 2019 Structural Fire Safety requirements.

8.0 CONCLUSION

The final recommendation is that the site is not bushfire prone land but can offer compliance with Planning for Bush Fire Protection (2019). There is limited potential for bushfire attack at this site and National Construction Code 2019 Structural Fire Safety requirements are adequate to reduce that risk.

9.0 REFERENCES AND DISCLAIMER

References

Standards Australia AS3959 (2018) Construction of buildings in bushfire-prone areas.

Keith D. "Ocean Shores to Desert Dunes", Department of Environment and Conservation, Sydney, (2004).

Environmental Planning and Assessment Act 1979.

New South Wales Rural Fire Service Planning for Bush Fire Protection (2019).

Disclaimer

Despite the recommendations in this report, it is impossible to remove the risk of fire damage to the building entirely. This report assesses and provides recommendations to reduce that risk to a manageable level. It is of paramount importance that the recommendations are adhered to for the life of the structure and that all maintenance is performed to ensure a level of protection is provided to the building, occupants and firefighters.

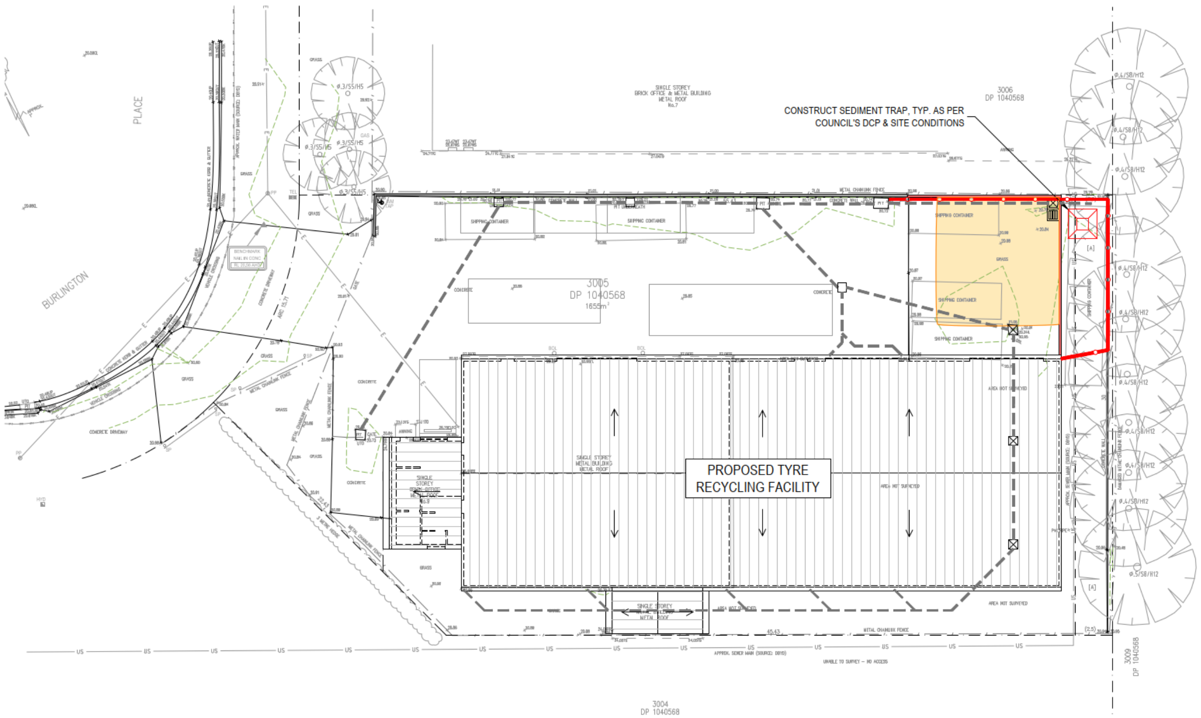
Planning for Bush Fire Protection (2019) states that notwithstanding the precautions adopted, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small, always remains.

AS3959 (2018) Construction of buildings in bushfire-prone areas states that the standard is designed to lessen the risk of damage to buildings occurring in the event of the onslaught of bushfire. There can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion. External combustible cladding is not recommended.

Appendix G

Site Fire Water Containment

Appendix G



SEDIMENT & EROSION CONTROL PLAN
1:150

- DENOTES SEDIMENT FENCE

SEDIMENT AND EROSION CONTROL NOTES

SEDIMENT AND EROSION CONTROL SHALL BE EFFECTIVELY MAINTAINED AT ALL TIMES DURING THE COURSE OF CONSTRUCTION AND SHALL NOT BE REMOVED UNTIL THE SITE HAS BEEN STABILISED OR LANDSCAPED TO THE SUPERINTENDENT'S SATISFACTION.

A SINGLE ALL WEATHER ACCESS WAY WILL BE PROVIDED AT THE FRONT OF THE PROPERTY CONSISTING OF 50-75 AGGREGATE OR SIMILAR MATERIAL AT A MINIMUM THICKNESS OF 150 LAID OVER NEEDLE-PUNCHED GEOTEXTILE FABRIC AND CONSTRUCTED PRIOR TO COMMENCEMENT OF WORKS.

THE CONTRACTOR SHALL ENSURE THAT NO SPOIL OR FILL ENCROACHES UPON ADJACENT AREAS FOR THE DURATION OF WORKS.

THE CONTRACTOR SHALL ENSURE THAT KERB INLETS AND DRAINS RECEIVING STORMWATER SHALL BE PROTECTED AT ALL TIMES DURING DEVELOPMENT. KERB INLET SEDIMENT TRAPS SHALL BE INSTALLED ALONG THE IMMEDIATE VICINITY ALONG THE STREET FRONTAGE.

ALL TOPSOIL STRIPPED FROM THE SITE AND STOCKPILED DOES NOT INTERFERE WITH DRAINAGE LINES AND STORMWATER INLETS AND WILL BE SUITABLY COVERED WITH AN IMPERVIOUS MEMBRANE MATERIAL AND SCREENED BY SEDIMENT FENCING.

SOIL CONSERVATION NOTE:

PRIOR TO COMMENCEMENT OF CONSTRUCTION PROVIDE 'SEDIMENT FENCE,' 'SEDIMENT TRAP' AND WASHOUT AREA TO ENSURE THE CAPTURE OF WATER BORNE MATERIAL GENERATED FROM THE SITE.

MAINTAIN THE ABOVE DURING THE COURSE OF CONSTRUCTION, AND CLEAR THE 'SEDIMENT TRAP AFTER EACH STORM.

SEDIMENT TRAP
1000 x 1000 WIDE 500 DEEP PIT, LOCATED AT THE LOWEST POINT TO THE TRAP SEDIMENT AND IN ACCORDANCE WITH LOCAL COUNCIL'S DCP AND SITE CONDITIONS.

SEDIMENT FENCE

PROVIDE 'SEDIMENT FENCE ON DOWN SLOPE BOUNDARY AS SHOWN ON PLAN. FABRIC TO BE BURIED BELOW GROUND AT LOWER EDGE.
REFER TO SD 6-8

BUILDING MATERIAL STOCKPILES

ALL STOCKPILES OF BUILDING MATERIAL SUCH AS SAND AND SOIL MUST BE PROTECTED TO PREVENT SCOUR AND EROSION.

THEY SHOULD NEVER BE PLACED IN THE STREET GUTTER WHERE THEY WILL WASH AWAY WITH THE FIRST RAINSTORM.
REFER TO SD 4-1

GENERAL NOTES

THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH OTHER SUCH WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DIMENSIONS ARE IN MILLIMETRES & ALL LEVELS ARE IN METRES, UNO (UNLESS NOTED OTHERWISE).

NO DIMENSION SHALL BE OBTAINED BY SCALING THE DRAWINGS.

ALL LEVELS AND SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE CHECKED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORK.

DURING EXCAVATION WORK THE STRUCTURE SHALL BE MAINTAINED IN A STABLE AND NO PART SHALL BE OVERSTRESSED.

ALL WORK IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS & THE SPECIFICATION.

EXISTING SERVICES WHERE SHOWN HAVE BEEN PLOTTED FROM SUPPLIED DATA AND SUCH THEIR ACCURACY CAN NOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH THE LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF WORK.

ALL SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACK FILLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL COUNCIL.

ALL TRENCH BACK FILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.

ON COMPLETION OF STORMWATER INSTALLATION, ALL DISTURBED AREAS MUST BE RESTORED TO ORIGINAL CONDITION, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AND GRASSED AREAS AND ROAD PAVEMENTS, UNLESS DIRECTED OTHERWISE.

CONTRACTOR TO OBTAIN ALL AUTHORITY APPROVALS UNLESS DIRECTED OTHERWISE.

STORMWATER DRAINAGE

THE STORMWATER DRAINAGE DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH AS/NZS 3500.3 - 1990 "STORMWATER DRAINAGE" & AS/NZS 3500.3.2-1998 "STORMWATER DRAINAGE - ACCEPTABLE SOLUTIONS".

ANY VARIATIONS TO THE NOMINATED LEVELS SHALL BE REFERRED TO ENGINEER IMMEDIATELY.

ANY VARIATIONS TO SPECIFIED PRODUCTS OR DETAILS SHALL BE REFERRED TO THE ENGINEER FOR APPROVAL.

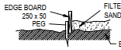
DOWN PIPES SHALL BE A MINIMUM OF DN100 SW GRADE UPVC OR 100X100 COLORBOND/ZINCALUME STEEL, UNO.

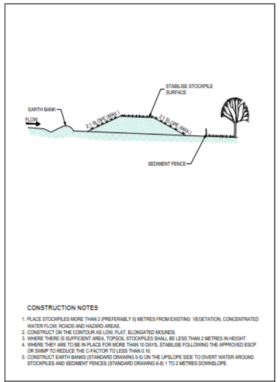
BOX COLORBOND OR ZINCALUME STEEL. GUTTERS SHALL BE A MINIMUM OF 450 WIDE X 150 DEEP.

EAVES GUTTERS SHALL BE A MINIMUM OF 125 WIDE X 100 DEEP (OR OF EQUIVALENT AREA) COLORBOND OR ZINCALUME STEEL.

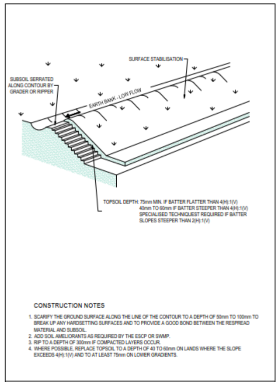
SUBSOIL DRAINAGE SHALL BE PROVIDED TO ALL RETAINING WALLS & EMBANKMENTS, WITH THE LINES FEEDING INTO THE STORMWATER DRAINAGE SYSTEM.

WASHOUT AREA
TO BE 1800 x 1800 ALLOCATED FOR THE WASHING OF TOOL & EQUIPMENT.

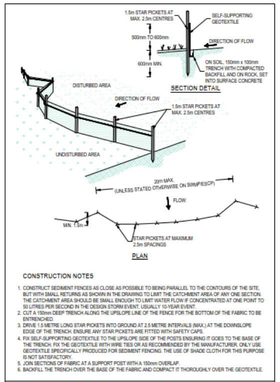




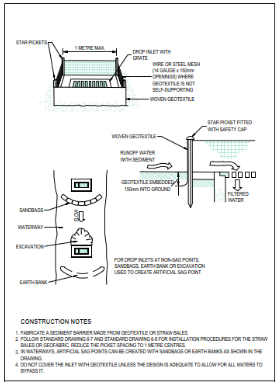
STOCKPILES SD 4-1



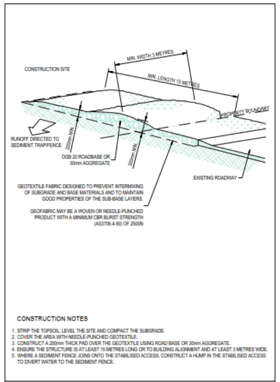
REPLACING TOPSOIL SD 4-2



SEDIMENT FENCE SD 6-8



GEOTEXTILE INLET FILTER SD 6-12



STABILISED SITE ACCESS SD 6-14

FOR APPROVAL

A1 ORIGINAL SIZE

REVISION	DATE	AMENDMENT DESCRIPTION
A	16.04.24	ISSUED FOR APPROVAL

ECLIPSE | CONSULTING ENGINEERS
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PROPOSED TYRE RECYCLING FACILITY
9 Burlington Place, Rutherford
For Jackson Environment and Planning

SEDIMENT AND EROSION CONTROL PLAN

DESIGN	DRAWN	DATE	PROJECT No.
SWH	RCL	MAR 2024	10775
CHECKED	APPROVED	SCALE	DRG No.
		1:150	C02 - A