ARUP

Tyrecycle

Tyrecycle Erskine Park

Fire Risk Assessment

Reference: 283146-10 FRA I1 Tyrecycle Erskine Park

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Executive Summary

Fire Risk Assessment – Tyrecycle Erskine Park

The intent of this report is to provide additional information to the EPA regarding the Statement of Environmental Effects (SEE) for the Tyrecycle facility at 21 Grady Crescent, Erskine Park (subject site)

This fire assessment will include the following:

- Identification of possible fire hazards and their potential causes at the premises;
- Assess the risks to human health and the environment from identified hazards;
- Identify adequate controls to minimise the risk of harm from fire; and
- Describe how controls will be checked for their effectiveness, and actions to improve the site's risk management and how this process will be verified.

To meet these requirements the following activities have been undertaken:

- Undertaken site visits and met with key Tyrecycle personnel to review the relevant site and process documentation;
- Identification of additional fire hazards of increased tyre storage, including exposures, potential causes of ignition, and potential fire growth and spread rates;
- Management plan for critical controls and functional tests reviewed and verified;
- Assess the risks of significant tyre fires based upon the consequences of tyre fires and the management of the controls to prevent, reduce and mitigate fire risks;
- Review of appropriate codes and standards and guidelines, including the NSW Tyre Guidelines.

Based on the assessment undertaken within this report, the maximum storage capacity will be conditional on the requirements and restrictions outlined in Section 9 within this report being met. i.e. the amount of tyre (and associated components) stored may be increased up to the amount where the restrictions can no longer be met, it is expected this is ultimately determined by available floor space within the facility.

Amongst other requirements outlined in Section 9, the following key requirements are to be noted:

Primary Pre-processed Tyre Stockpile

- The total tyre storage stockpile area of each pen are to be no greater than 60m^2
- The total storage stockpile height of each pen are to be no greater than 3.7m
- The storage pen are to be bound by construction achieving an FRL of 120 minutes on three sides.
- The construction is to extend 1m above the stockpile height and at least 2m beyond the outermost stockpile edge.
  - This is dependent on the preferred nominated stockpile limits.
- Construction and management of the pens is to be in accordance with Clause 8.2 of FRNSW Fire Safety Guideline – Fire Safety in Waste Facilities

Tyre crumb storage racking

- an ESFR sprinkler system per AS2118.1-1999 is provided to serve the building throughout. It is recognised that this system is considered to be an enhanced system over a typical AS2118.1 sprinkler system used in general warehouses. The racking (and associated storage) is installed so that it complies with the restrictions/ limitations of the ESFR system.
- thermal cameras will be (if not already) used to provide constant monitoring of the racking areas and will notify staff members in the event that a 'hot spot' is identified.

- The racking is to be provided with a minimum 6m of unobstructed access on the accessible side to facilitate the use of machinery with ease. This will also provide spatial separation from the pre-processed tyre stockpiles mentioned above.

Tyre Derived Fuel Storage (TDF) or WIP Stock (Granules)

- TDF pile or granule bags to be grouped such that each 'group' does not have an area of over 50m^2 to be arranged in 7m x 7m piles with a height no greater than 3.7m.
- Groups of TDF piles or granule bags are to be spatially separated from each other by a minimum distance of 6m.
- However, the TDF or granule storage need not be located more than 2.5m of the loadbearing columns provided that the loadbearing columns are provided with an FRL of 120 minutes.
- If the TDF or granule storage is located within 6m of the workshop, the external wall of the workshop is to be bound by fully non-combustible and enclosed walls (i.e. no meshing permitted). In addition, the workshop may not be used for storage of goods other than minor tools.

An indicative markup of the key tyre (and associated products) storage location is provided in Figure 33.

The current existing EPA License applicable to the subject site is attached in Appendix F.1.

1. Abbreviations

The following abbreviations have been used in this report.

Abbreviation	Meaning
CCTV	Closed-circuit Television
CHF	Critical Heat Flux
CRWM	Combustible Recyclable and Waste Material
DG	Dangerous Goods
EPA	Environment Protection Authority Victoria
EPU	Equivalent Passenger Unit
ERP	Emergency Response Plan
ESFR	Early Suppression Fast Response
FEMA	Federal Emergency Management Agency
FER	Fire Engineering Report
FIP	Fire Indicator Panel
FRNSW	Fire & Rescue New South Wales
HRR	Heat Release Rate
MoC	Management of Change
MRP	Multi-Purpose Rasper
NSW	New South Wales
PAN	EPA Pollution Abatement Notice
PtW	Permit to Work
SBR	Styrene Butadiene Rubber
SEE	Statement of Environmental Effects
SFPE	Society of Fire Protection Engineers
SMS	Safety Management System
TBD	Threat Barrier Diagram
TDF	Tyre Derived Fuel
TRP	Thermal Response Parameter
WIP	Work in Progress

2. Introduction

2.1 Scope of Report

The intent of this report is to provide additional information to the EPA regarding the Statement of Environmental Effects (SEE) for the Tyrecycle facility at 1-21 Grady Crescent, Erskine Park (subject site).

Tyrecycle proposes to increase the storage capacity of tyre storage (and associated components such as TDF, shred and granules etc.) within the subject processing plant.

The purpose of the fire risk assessment is to develop a clear understanding of the fire risks associated with the proposed increase in storage capacity at the Tyrecycle site at Erskine Park in order to allow Tyrecycle to manage any fire risks.

The assessment within this report will also determine the maximum increase in tyre storage capacity permitted within the subject site.

2.2 Existing Performance Solution Captured in Previous FER/FEA

The below list of non-compliances are captured within the FER by Exova WarringtonFire (Report No. 2320004-RPT02-1 Issue 1 dated 30/10/2013) associated with the original warehouse base building.

The Performance Solutions and associated non-compliances captured in the existing report are shown in abstract below:

OVERVIEW

Exova Warringtonfire Aus Pty Ltd has been engaged by FDC Construction & Fitout Pty Ltd for professional fire engineering services to formulate a fire safety design solution against stakeholder agreed fire safety objectives defined in the Fire Engineering Brief process. This is in relation to the development at Grady Crescent, Erskine NSW.

The following variations have been identified:

1) The access road for fire brigade vehicles being more than 18m from the building to the north east corner of the building due to the distance of the driveway from the proposed office area.

2) Exit travel distances within the warehouse of more than 40m (approximately 65m) to an exit.

3) Travel distances between alternative exits of more than 60m (approximately 130m).

4) The provision of suppression mode (ESFR) sprinklers throughout the warehouse storage areas with smoke clearance fans for FRNSW use, in lieu of a control mode sprinkler system throughout with a smoke exhaust system or smoke-and-heat vents.

The existing alternative solutions for the existing building from the existing FER[1] that do not form part of this report are as follows:

1) Suppression mode (ESFR) sprinklers being provided throughout the warehouse storage areas, with smoke clearance fans for NSWFB use, in lieu of a control mode sprinkler system throughout with a smoke exhaust system or smoke-and-heat vents.

2) Provision for an access road for fire brigade vehicles as follows:

   - Stage 1: The southern side and to the S/E corner (adjacent to the staff carparking) features restricted access, due to the first floor office over the car parking area and as such, access is further than 18 m from the building. A temporary access road is to be constructed adjacent to Lenore Drive whilst the road extension works to Lenore Drive are being carried out at the same time as the building. Also, a temporary access road is to be constructed to the north at GL 17.
   - Stage 2: For the construction of Stage 2, the Stage 1 temporary access road (GL 17) is to be demolished and relocated further north to the edge of the Stage 2 warehouse (GL 22).

3) The variation to the BCA DtS Provision is based on exit travel distances within the warehouse as follows:

   - Stage 1 - up to 65 m to an exit (GL B/8-11); and
   - Stage 2 - up to 70 m to an exit (GL B/19-20)

4) Travel distances between alternative exits within the building as follows:

   - up to 130 m within the warehouse area; and
   - up to 75 m within the basement car park

5) Fire hydrant fire brigade booster assembly not being located at the boundary of the site or within sight of the main entrance of the building.

6) Fire hose reels within the building part being located more than 4 m from an exit.

Note1: In addition to the above, comment will be required from the Fire Safety Engineer that confirms that the deletion of the exit door in the northern wall of the existing PMA facility has no impact on the worst case egress distances in the PMA warehouse area and as such does not impact on the existing FER that applies to that building.

Note2: The perimeter vehicular access during construction will not be provided to the existing warehouse.

Figure 1: Exova WarringtonFire FER No. 2320004-RPT02-1 Issue 1 dated 30/10/2013 – Abstract of Performance Solutions

Note that the above is for information only. This report does not undertake a review of the building with respect to compliance with the BCA DtS provisions. Any review of the BCA DtS provisions should be undertaken by a qualified Building Certifier. It is assumed that there are no additional BCA DtS non-compliances associated with the Tyrecycle tenancy.

3. Methodology

The key elements in Arup's fire risk assessment process includes:

- Understand the site, tyre storage and recycling process to set the context for fire risk assessment through meetings with key Tyrecycle personnel, and review of the relevant site and process documentation.
  - Identify additional fire hazards of indoor tyre storage (tyres and associated components such as tyre shred), including exposures, potential causes of ignition, and potential fire growth and spread rates
  - Management plan for controls and functional tests, such as Management of change (MoC), permit to work (PtW) and other safety management system (SMS) critical procedures.
  - Multiple site visits.
- Assess the risks of significant tyre fires based upon the likelihood of fires starts and the management of the controls to prevent, reduce and mitigate fire risks.
- Assess the risks of significant tyre fires based upon the consequences of tyre fires and the management of the controls to prevent, reduce and mitigate fire risks.
- Review workshop with key Tyrecycle personnel to review maintenance systems, records around existing controls and audit program assessment.
- Review of appropriate codes and standards and guidelines, including current NSW Guideline for Bulk Storage of Tyres [1] and FRNSW – Fire Safety Guideline, Fire safety in waste facilities [2].
- Recommendations on improvements to mitigate risks, incorporate in an updated bowtie diagram, based on the standard hierarchy of risk controls.

4. Description of the Facility

4.1 Site Location

The site address of subject Tyrecycle facility is 21 Grady Cres, Erskine Park, NSW. The site has been operational since October 2021

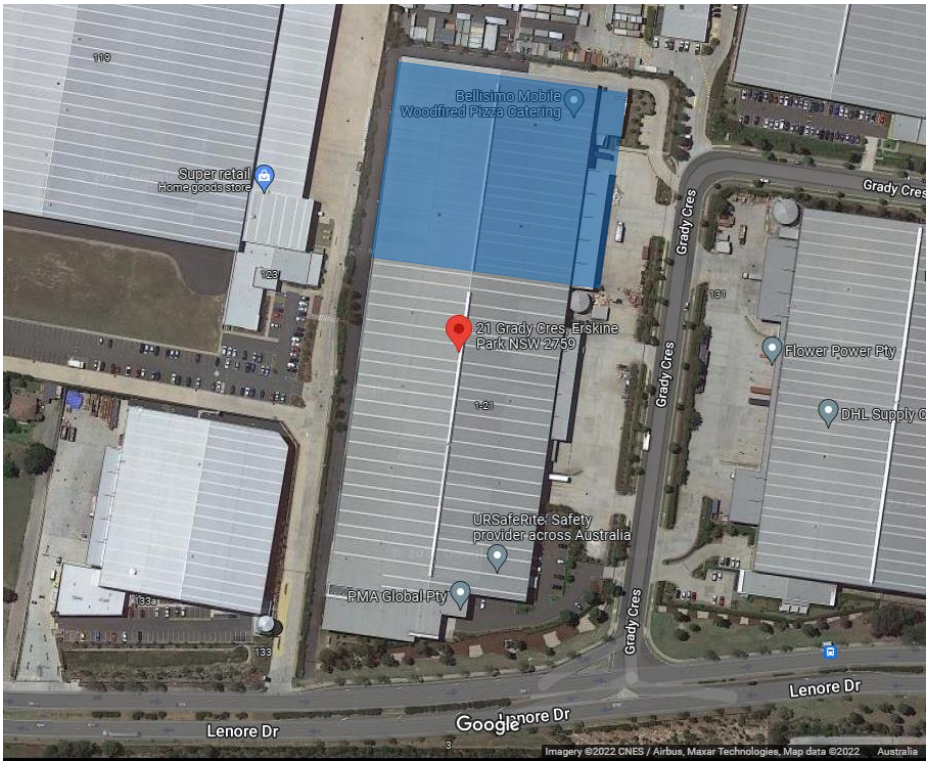


Figure 2: Tyrecycle Erskine Park Site View - 21 Grady Cres, Erskine Park

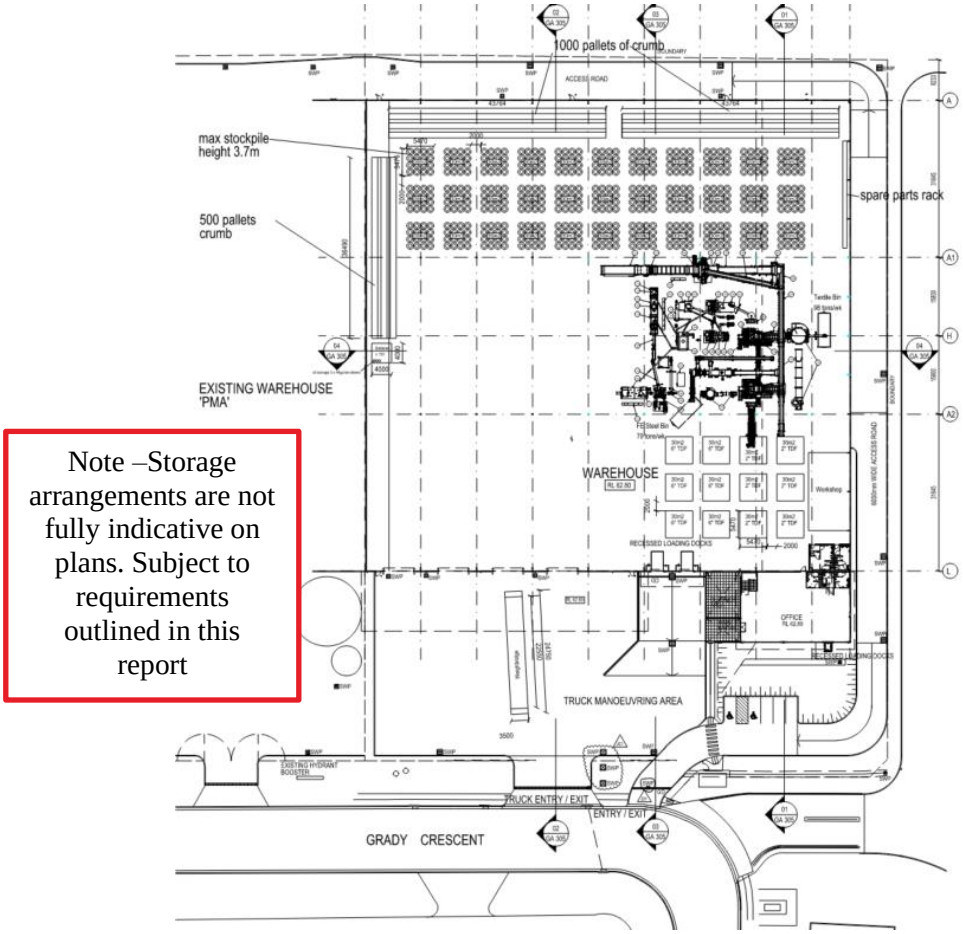


Figure 3: Tyrecycle Erskine Park Site Drawing - 21 Grady Cres, Erskine Park

4.1.1 Fire Brigade Access

The fire brigade access to the site is off Grady Crescent, the truck entrance provides access to the front of the Tyrecycle tenancy (south elevation), the office/ carpark entrance provides access to the sites perimeter access road and the Tyrecycle tenancy's north and east sides. The three nearest fire stations have been identified below:

Fire station	Distance (Google maps)
Ropes Crossing Fire Station 1a Ellsworth Dr, Tregear NSW 2770	13.0 km
St. Marys Fire Station 1 Marsden Rd, St Marys NSW 2760	7.0 km
Mount Druitt Fire Station 81 Railway Street, Mount Druitt NSW 2770	10.0km

4.2 Site Layout

Broadly, the site consists of the northern section of a partitioned multi-occupancy warehouse building with adjoining office block..

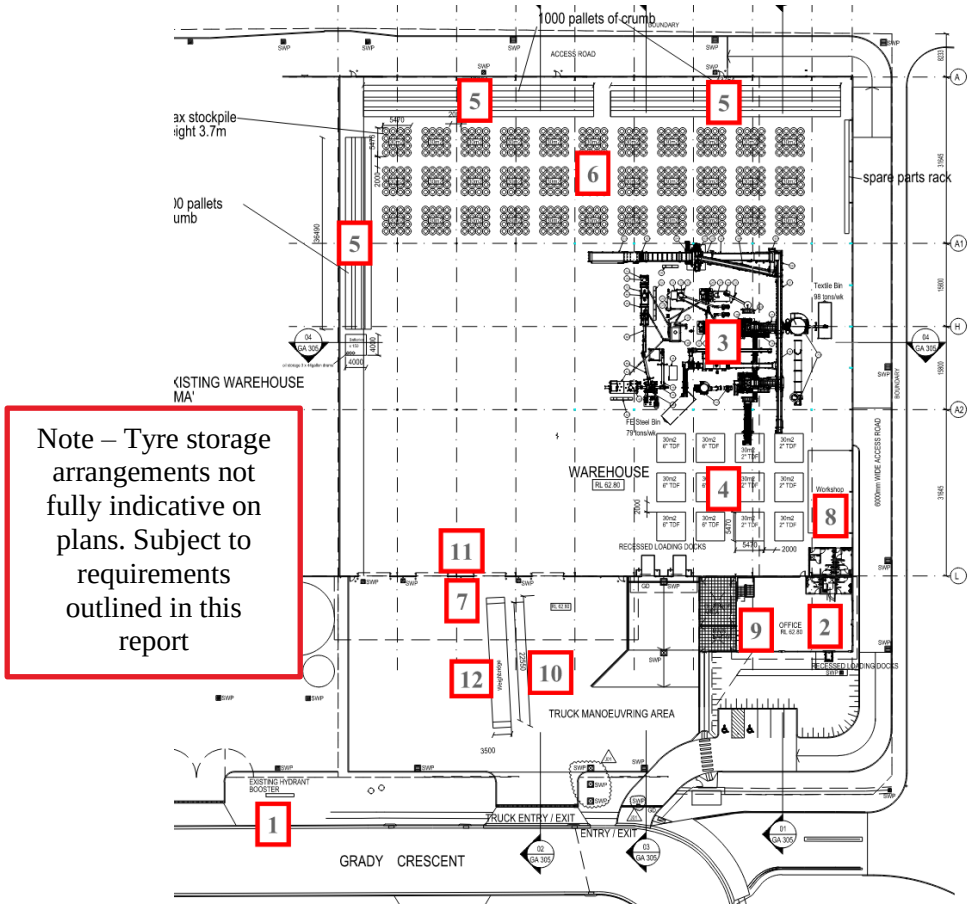


Figure 4: Current Site Layout – Key Features

Key:

1. Hydrant Booster
2. Office area
3. Primary plant & Equipment area (Tyre shredded and processor)
4. Tyre Derived Fuel (TDF) Storage
5. Tyre crumb rack storage
   - Whilst largely comprised of tyre crumb, note that some TDF and WIP stock may also be stored
6. Pre-processed tyre storage area
7. Loading / entry roller doors
8. Internal workshop space
9. Mimic Panel Location (FIP located in the main entry lobby of the warehouse in accordance with BCA Spec E1.8 in the southern occupancy of the partitioned warehouse)
10. Hardstand location / Truck area
11. Lead acid battery storage
12. Weighbridge

The main road leading into the site is Grady Crescent, however the subject building is also bound by internal access roads providing access to the north and west sides of the building.

4.2.1 Site Activities

The Tyrecycle site primarily receives waste tyres (whole) and recycles them either by shredding or crumbing, the product of which is then on-sold to others.

Tyrecycle stores a maximum of 970 tonnes of tyres (and associated products) on site as permitted under the current license. Stocktake is done monthly by the operation team and is recorded in a spreadsheet system. It is expected that Tyrecycle would stop receiving any incoming truckloads when they exceed the storage limits.

A brief high-level description of the current site processes are as follows:

1. Trucks carrying tyres arrive and are measured on the weighbridge
2. Tyres are deposited onto a general stockpile in the designated area within the warehouse floor
    a. As it currently stands, these stockpiles are generally stored randomly or thread on thread
    b. Refer Section 4.2.4
3. Large truck tyres are shipped to Melbourne for processing
    a. Truck tyres are piled in a tread-on-tread manner at the end of the day for overnight storage. Note that stock may build up due to transport delays.
4. The tyres are processed through the Superchopper (which has shredding and crumbing capabilities) which will produce a number of products:
    a. Tyre crumbs, shred, TDF, WIP stock, waste steel and general waste material.
    b. It is noted that stockpile of tyre shred will generally build up faster than tyre crumbs due to different rates of production.
5. The TDF / WIP stock are stored in piles on the ground or into bags stored on the ground.
    a. Refer Section 4.2.4
    b. This can also include some piles of processed waste material.
6. Some tyre crumbs will also be bagged and stored onto dedicated storage racks.
    a. Refer Section 4.2.4
7. The post-processed materials (Tyre crumbs, TDF etc…) will then be moved into shipping containers where they will be shipped off to external facilities.

Note that some of the occurrences listed above can happen concurrently or independently. The overall presence of rubber fuel loads within the subject facility will ultimately be down to the rate of incoming stock, processing capacity/rate and outgoing stock.

The amount of storage to be permitted within the subject facility will ultimately be limited to storage of tyres within the restrictions outlined in Section 9 of this report. Restrictions will include:

- Limited storage pile sizes
- Spatial separation between pile sizes
- Construction of fire-rated storage bays
- Available floor space
- Rack storage configuration compliant with the fire sprinkler system limitations

The estimated storage provided by Tyrecycle based on the expected restrictions are as follows:

Storage Type	Existing Storage Capacity	Proposed Storage Capacity	Increase in Capacity
Pre-processed tyre stacks	Up to 300 Tonnes	Up to 700 Tonnes	+400 Tonnes
Crumb storage (Stored in bags within racking)	Up to 500 Tonnes	Up to 650 Tonnes	+150 Tonnes
TDF storage	Up to 140 Tonnes	Up to 150 Tonnes	+10 Tonnes
WIP Stock (Granules) In bulk bags (Stored alongside TDF Storage)	Up to 100 Tonnes	Up to 100 Tonnes	No increase
TOTAL Note 1	**<970 Tonnes** Note 2	**Up to 1,600 Tonnes**	+620 Tonnes (+ ~63%)

Note 1: This total is not cumulative of the above, as some of the storage will need to be balanced with others. E.g. TDF storage may be reduced if WIP Stock is at full capacity.

Note 2: The current licence for the subject Tyrecycle facility permits storage of up to 970 Tonnes of Tyres (and associated materials).

Based on the above, it is estimated that the tyre storage capacity (including associated tyre products) will increase from 1,040 to 1,600 Tonnes.

Note that the above is intended to provide an estimation of the possible storage capacity based on restrictions outlined in Section 9 of this report. It is not intended to permit or limit the amount of storage noted. The storage capacity may change based on different storage configurations whilst meeting the outlined requirements / restrictions within this report.

Tyrecycle have their own fleet of trucks that collect scrap tyres and bring them to site for processing. Trucks enter the site and are weighed at the weighbridge prior to offloading their contents typically into the primary stockpile. Overflow is currently stored in the general floorspace as part of a stockpile.

In general, tyres are received during the day shift with unloading occurring from morning until evening (approx. 8am-3pm Monday to Friday) with processing ongoing throughout site operating hours, and stock is outgoing in the afternoon. The site receives approximately 20 truckloads of incoming tyres a day and approximately 2 truckloads outgoing from the facility.

The operation of the plant facilities are generally as follows:

- Shredding Operations – Occurs 24 hours
- Granulation Operations – 1pm to 6am
- Cracker Mill Operations – 24 Hours

4.2.2 Site Personnel

The site currently operates 24 hours 5 days a week and over the weekend a 12 hour shift each day as listed in Table 1.

Table 1: Typical staff numbers within facility

Shift	Office	Plant
Morning Shift – 5am- 1pm	6	5
Afternoon Shift 1pm – 9pm	6	5
Night Shift 9pm – 5am	-	3

During these shifts, the plant staff will be on site and provides an inherent level of security and monitoring throughout the day.

The site is provided with an outer entry gate which will be closed and locked between 5pm and 5am Monday to Friday and fully secured over the weekend.

Free access to the building itself are only available between 7.30am to 4.30pm on weekdays (noting staff will be present on site), outside these times, an access key would be required.

In general, tyres are received during the day shift with unloading occurring from morning until evening (approx. 8am-3pm Monday to Friday) with processing ongoing throughout site operating hours, and stock is outgoing in the afternoon. The site receives approximately 20 truckloads of incoming tyres a day and approximately 2 truckloads outgoing from the facility.

As per the Emergency Response Plan, the approximate minimum and maximum populations on site are 3 persons and 25 persons (and up to 10 contractors/visitors) respectively.

4.2.3 Used Tyres/Tyre Composition

The typical composition of tyres is outlined in Table 1 below. Multiple references including [3] and [4] refer to the Scrap Tire Management Council (now Rubber Manufacturers Association: www.RMA.org)

Table 2: Typical tyre composition

Composition	Passenger Tyre	Truck Tyre
Natural rubber	14 %	27 %
Synthetic rubber	27%	14%
Carbon black	28%	28%
Steel	14 - 15%	14 - 15%
Fabric, fillers, accelerators, antiozonants, etc.	16 - 17%	16 - 17%
Average weight - New:	11.3 kg	54.4 kg
Average weight - Scrap:	9.1 kg	45.4 kg

Based on the Tyre Stewardship Australia Guidelines [5], one end-of-life Equivalent Passenger Unit (EPU) is taken to be 8 kg. The EPU for some of the different types of tyres is listed below:

Tyre Type	EPU
Motorcycle	0.5
Passenger Car (excludes people movers, 4WD, & 1 tonne commercials etc.)	1
Light Truck (1 tonne vans, 4WD, people mover, campervans)	1.5
Truck Small (2-10 tonne rigid truck)	2
Truck Large (prime movers & semi trailers)	5
Super Single (replaces a double wheel on a semi or prime mover)	10
Small Solid OTR Truck Tyre	3
Medium Solid OTR Truck Tyre	5
Large Solid OTR Truck Tyre	7
Extra Large OTR Truck Tyre	9
Small Tractor Tyre	15
Large Tractor Tyre	25
Standard 1.5T Forklift Tyre (solid)	2
Medium (2-4 tonne) Forklift Tyre (solid)	4
Large (5-10 tonne) Forklift Tyre (solid)	6
Grader Tyre	15

The tyres on site are currently stored in loose piles. The number of tyres in a pile depends on the type of tyre, the length of time the tyres have been on the pile and the height of the pile. The longer tyres are in a pile and the higher the storage, the more tyres are likely to be in the pile and the effective number of tyres per cubic

metre is likely to be higher due to higher compressive forces on the tyres at the base. This is demonstrated clearly by [6] which provides estimates of the number of whole tyres stored, for example for loose storage types like the storage type at Tyrecycle:

Table 3: Number of tyres per cubic metre

Storage Height	< 3.0 m	3.0m – 4.6 m	> 4.6 m
Passenger / light truck tyres stored less than 15 years	7.6 tyres/m³	9.2 tyres/m³	10.7 tyres/m³
Passenger / light truck tyres stored 15 years or more	9.2 tyres/m³	10.7 tyres/m³	12.2 tyres/m³
Semi truck tyres stored less than 15 years	1.9 tyres/m³	2.1 tyres/m³	2.3 tyres/m³
Semi truck tyres stored 15 years or more	2.3 tyres/m³	2.7 tyres/m³	3.1 tyres/m³

4.2.4 Primary Storage

The primary storage areas within the building are #4, 5 & 6 from Figure 4. Specifically:

Tyre Derived Fuel (TDF) Storage

The TDF storage area is an area designated within the floor space of the subject warehouse for processed tyre products (i.e. TDF) straight off the plant and initially stored as piles on the floor. Following this, the TDF will be either moved into shipping containers to be transported off site/ sold, or stored in 1T bags as WIP stock to be crumbed

Figure 5: TDF storage

Tyre crumb storage

This storage comprises of bags of tyre crumbs approximately1 tonne of material each.

Each 'vertical shelf' comprises of 4 deep bags of crumbs and 3 bags high. Each bag of crumb weighs approximately 1 tonne.

It is noted that whilst the rack storage largely comprised of tyre crumb, note that some TDF and WIP stock may also be stored in this area as well.

Figure 6: Tyre crumb rack storage

Primary tyre stockpile

This is essentially a designated area where tyres are unloaded and stored, either by hand or machinery. Typically, tyres are arranged as one large pile, however the size of the piles need to be controlled to limit the fuel load exposed to an ignition source/ fire event , as such multiple smaller sized piles may be required for processing.

The tyres stored in this area include randomly stacked tyres for processing and tread-on-tread truck tyres for external delivery.

The tyre pile is central to the operations on site and generally has the highest concentration of tyres at any given time, see Figure 7. Currently, the tyre pile(s) are stacked up to approximately 3 m high. The area is generally bound by concrete barriers (approx. 1m high) to maintain some distance from the rack storage and provide vehicle access. Whilst generally designated for pre-processed tyre pile storage, the pile area may occasionally be used interchangeably to store either in transit truck tyres, bag storage on the floor or TDF piles depending on the make-up of stock at the time of processing.

Due to the high concentration of storage in these areas, they do not currently comply with the recommendations under the NSW Guideline for Tyre Storage for the following key reasons:

- Current unconstrained tyre storage arrangements (i.e. thread to thread and random stacking) are not in accordance with the guideline.
- Insufficient spatial separation between tyre piles (minimum 2m recommended).

- Tyres stacked more than 1.5m in height without being in a constrained stacking system.
- Tyre stacks exceeding 30m^2 in area

For a typical month, the incoming (received) tyres closely matches the quantity of outgoing (exported) material. However, accumulation of stocks can occur and may include storage of finished product (TDF or tyre crumb) or whole tyres which have not been processed. Accumulation can be due to a number of or a combination of factors including:

- Plant down time due to breakdown,
- Maintenance,
- Availability of containers; and
- Rate of incoming stock much greater than outgoing stock or capacity to process stock.

During operation of the shredder there are staff constantly within and around the periphery of the pre-processed tyre stockpile. The pre-processed tyre stockpile is also monitored by CCTV from cameras mounted in various areas of the building.

Figure 7: Primary Tyre Storage Area

Figure 8: Various smaller tyre storage piles

5. Standards and Guidelines

As a result of major fire incidents around the world involving extremely large piles of tyres and the resulting difficulty in extinguishing the fires within piles once a fire has taken hold, there are a number of standards and guidelines available both nationally and internationally with respect to the storage of tyres. A summary of these standards and guidelines is captured in Section 11.1.

Generally, the main focus is on fire prevention and then minimising the size and impact of any fires should any develop. Central to all these guidelines is:

- Limiting the size of storage piles and adequate separation of piles.
- Fire lanes to provide access for effective firefighting operations.
- Clearance from other storage piles and other combustible materials.

The pre-planning and firefighting requirements in the standards and guidelines include:

- First aid firefighting equipment, extinguishers and fire hose reels
- Protection of buildings that contain the shredding or tyre rubber crumb machines with systems such as automatic sprinkler systems, and with a fire water supply adequate both to supply the fire sprinkler system and to provide water for fighting tyre pile fires.
- Additional equipment for removing fuel load not involved in the fire (tyres not on fire)
- Training requirements
- Pre-planning and Emergency Response Plan.

The review of national and international standards and guidelines shows a considerable variation in the acceptable area of externally stored tyre pile from 60 m² in NSW to 5,700 m² in parts of the US. Although this is not directly relevant to the subject building, it is nonetheless worth noting that there would be considerable variation in separation distances between piles, numbers of piles in a cluster, and distances of piles to a boundary.

This wide variation suggests there is no fundamental or theoretical size of tyre pile but that an acceptable size is one that will depend on a range of risk factors, including operational procedures, prevention measures and management of consequences.

As such, the assessment methodology approach taken in this assessment also considered the range of risk factors present in this site. This is discussed and assessed in more detail in Sections 6 and 7.

6. Fire Hazards Identified and Consequences

The principal fire event of interest in this fire risk assessment is an internal tyre fire (inclusive of loose tyre or TDF) within one of the storage piles.

The fire hazards are reviewed in detail in this section:

- Identification of potential ignition and fuel sources
- Understand the behaviour of the tyre fires in relation to its ignition, fire growth and fire suppression method
- Review of the major fire incidents that has occurred in Australia and internationally
- Impact of a tyre fire

6.1 Potential Ignition and Fuel Sources

As there is no centralised dataset on the frequency and type of waste fire in Australia, there is no collated information on the main cause of tyre pile fire and its frequency of the tyre pile fire incidents that has occurred in Victoria.

However, based on available US data, it has been identified that the leading cause of fire in tyre piles is arson, including juvenile arson.

Aside from arson, some other sources of ignition, applicable to the subject site include:

- Adjacent hot works, e.g., welding, cutting and grinding activities
- Delivery of already smouldering incoming loads
- Fire originating from accumulation of fine fuels around the stored tyres
- Ignited machinery equipment and vehicles on-site
  - It is noted that diesel-powered machinery are used on site.
- Lightning strikes
- Smoking
- Spontaneous combustion of the finer rubber stockpiles, e.g., crumbs, TDF, etc.
- Wind-borne embers from close proximity grass or bushfire from neighbouring site

Some of the potential fuel sources present on the subject sites could be from:

- Tyre stockpiles – e.g., loose tyre, TDF etc.
- Machinery or vehicles on-site in close proximity to the fire.
- Adjacent shed/building structures in close proximity to the fire.

6.2 Behaviour of a Tyre Fire

6.2.1 Tyre Ignition

Tyres (inclusive of car and truck tyres) are relatively difficult to ignite compared with timber and other plastic and cellulosic materials. This is because of the tyre's ability to absorb radiant heat and then transfer that heat to the internal steel belts and bead wires found in most modern tyres.

When tyres are shredded, this reduces the particles size and produces a lower density, porous material through which air may percolated. Total surface area of tyre shred may be large compared with the volume occupied. Both of these factors in combination leads to these shredded tyres being more susceptible to spontaneous combustion [7]. Albeit from a different state, EPA Victoria [8] has also identified that the particle size of stored combustible recyclable and waste material (CRWM) will influence the potential for spontaneous combustion, with smaller particle sizes having a higher risk, as shown in Figure 9. Hence, risk of spontaneous combustion would be higher in shredded type compared to loose tyres.

As noted by the Scottish Home Office [9] there is potential for smouldering ignition of a tyre rim from a fire source as small as a match. However, the size of the ignition source will greatly affect the length of the smouldering/ignition phase prior to the propagation stage and the other combustion stages as outlined below. Anecdotally, tyres can smoulder for a significant length of time (days) before developing into a tyre fire where there is flame propagation.

The State of California Guidelines [10] indicate that that tyres will typically begin to decompose at between 410 °C and 538 °C in the presence of radiant heat.

The received radiation flux which would cause ignition after 5 minutes and 10 minutes of exposure is estimated to be a minimum of 29 kW/m² and 24 kW/m² respectively (refer Appendix A.1). Prior to this flaming ignition, tyres may heat up to a point where they decompose, smoulder and begin to give off smoke in a pre-ignition phase. This can be detected by olfactory cues by occupants on site.

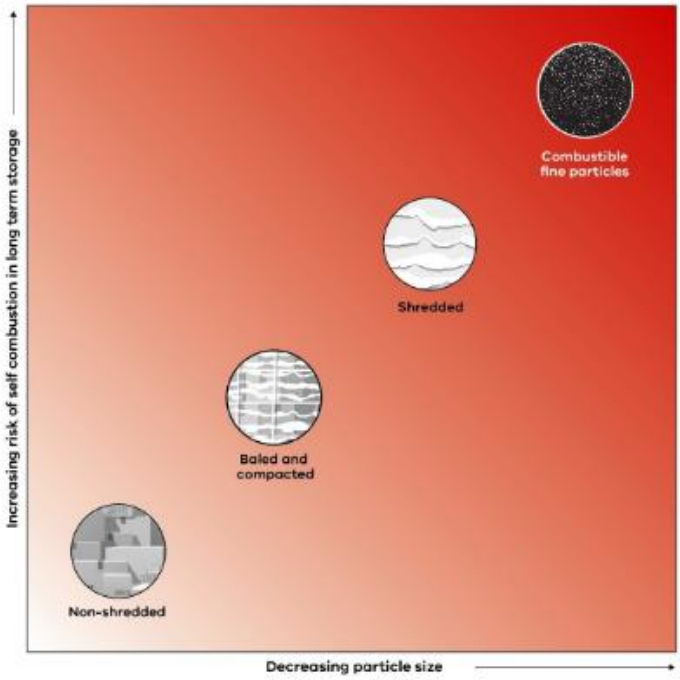


Figure 9: Illustration of correlation between particle size against risk of self-combustion in long term storage particle size [8]

6.2.2 Fire Growth

The following table is replicated from USFA-TR-093 [11]. The table summarises the combustion stages of whole tyre fires chronologically.

Table 4: Combustion phases of tyre pile fires

Stages of Tyre Combustion	Time	Whole Tyre Fire Progress	Action
Ignition/ Propagation Stage	0 to 5 minutes	Active tyre burning of individual tyres but has not extended to the entire pile.	Early extinguishment with water, class A foam or wetting agents may be possible.
	15 to 30 minutes	Once fire extends to the pile, the flame spread is two square feet every five minutes	Separate unburned tyre/product from the burning pile; downwind direction first.
Compression Stage	30 to 60 minutes	The top layers of the tyres will collapse on themselves. The visible flaming is reduced. The fire then is seated deep in the pile.	Focus efforts on separation; build containment berms and oil run-off collection ponds.
Equilibrium/ Pyrolysis and Smouldering Stages	60 minutes and beyond	Fuel consumption and heat production equalizes. Combustion is efficiently producing sufficient heat to consume most combustion products. Downward pressure of the encompassing pile causes the run-off oil flow to increase.	Contain fire spread Contain run-off oil Option 1 – using the excavator separate burning debris into manageable piles and extinguish with fog streams. Option 2 – allow tyre/product fire to burn until the pile can be buried.

The ignition and propagation phase represents the highest risk phase for fire spread from the pile of origin to adjoining storage, buildings, equipment and property. This is when the flaming is at its highest as is the radiant heat flux, there may also be embers which can contribute to piloted ignition. As such the ignition and propagation phase and corresponding risk of fire spread from an incident radiant heat flux has been analysed further below.

6.2.3 Fire Suppression

A significant factor in dealing with the fire risk of tyre piles is the tyre's geometry. Their hollow doughnut shape traps oxygen and allows flames to develop on the inner surface. This geometry also shields the deep-seated tyre fire from extinguishing agents. The tyres shape and the fact that they are water repellent means that most extinguishing agents like water and foam are relatively ineffective against large tyre fires.

As stated previously, the very early extinguishment in the first 5-10 minutes may be possible using water, Class A foam or other suitable extinguishing agents. However, removal and separation of any burning tyres from the remaining non-burning tyres is generally the most effective strategy.

Once any significant number of tyres in the pile are burning, the Federal Emergency Management Agency (FEMA) advice is that ***"the direct application of water and/or foams generally does not provide effective extinguishment in tyre fires. Rather, water is best used to keep the unburned tyres from igniting".***

This is similar to piles of shredded tyres and rubber crumb, once the fire is established, combustion within these large piles is difficult to suppress [7]. However, fires in piles of shredded tyres are reportedly less intense and produce less smoke since shredded piles tend to burn at the surface [5].

The only effective approach for a larger scale burning pile of tyres (loose tyres, shredded tyres or rubber crumbs) is separation of the unburnt tyres from the non-burning tyres. They will then need to be submerged under water or be buried under soil to complete extinguishment.

6.3 Review of the Major Tyre Fire Incidents

There have been some high-profile large waste tyre fires across Australia and internationally over the years as shown in the summary table in Appendix B.1.

There is limited information publicly available, however the tyre fire was often caused by arson or was a secondary fire event from machinery, building fire or bush/grass fire.

The majority of major fire events have been at sites with storage greatly in excess of both the FRNSW guidance and the intended proposed storage capacity at the Tyrecycle site.

In general, it can be seen from Appendix B.1 that major tyre fires can continue for hours, or days before extinguishment is complete, which again is why surveillance, early detection, and rapid intervention are the most critical elements of any fire risk management plans for outdoor tyre storage.

6.4 Impact of a Tyre Fire

While the tyres themselves are reasonably difficult to ignite, the presence of quantities of other cellulosic fuels or flammable liquids in or around the tyre piles may provide the initial path to fire ignition of these materials, and subsequently lead to secondary ignition of tyres. Once there is substantial flaming combustion of a significant number of tyres (as per Table 4), a fire can spread along the surface of a tyre pile rapidly and can be difficult to extinguish.

A major tyre fire can generate a range of products of combustion which can impact on personnel, property and the environment. These impacts could be in the form of:

- Heat – convective and radiated heat, leading to ignition of other materials and facilities
- Smoke, carrying a range of toxic materials, which can contaminate air
- Contaminated water from run-off, carrying a range of toxic and corrosive materials
- Pyrolytic oil, produced by heating of tyres

The generation of these combustion products from tyre fires can lead to consequences in terms of:

- Risks to life of site personnel, neighbours
- Risk to life of attending fire brigade personnel
- Asset damage to the site and/or neighbouring property
- Interruption to Tyrecycle operations
- Environmental damage (air, water, soil)
- Increased insurance premiums or additional policy conditions

Therefore, this highlights one of the critical approaches to management of tyre storage is to have in place strict mitigation measures to minimize the likelihood of fire ignition, deal with any ignitions before spread occurs, and avoid the consequences of a major tyre fire.

7. Fire Risk Assessment

7.1 General

The risk of fire is a combination of the likelihood of fire and the consequences of fire. To identify and understand better the fire risk involved, a review is conducted on the following list of factors that influence the level of fire risk associated with the subject site:

- Review of past Tyrecycle fire incidents
- Review of the identified additional risk factors to the likelihood and consequences of a tyre fire
- Review of the existing fire safety measures
- Recommendation of required additional fire safety measures

7.2 Review of Past Tyrecycle Fire Incidents

The subject Erskine Park site has been operational since October 2021. A site incident report provided by Tyrecycle (see Appendix C.1) between the dates 01/03/22 to 08/08/22 indicates that there have been no smouldering/fire incidents related to the tyre piles. However, there are reported fires from machinery ignition:

1. 02/08/22 – Small flame produced by MPR (i.e. plant).
   - It is noted that spark detection automatically activated, extinguishing the small fire.
   - In this case, the spark and subsequent flame had been automatically detected by a spark detection system attached to the rasper. and subsequently extinguished at an early stage by the building fire suppression system.
2. 28/07/22 – Fires from the Rasper work platform
   - A small fire had been identified by an afternoon shift operator
   - The staff's intervention was able to prevent the incident from becoming a larger fire.

Refer to following section for more details on the fire prevention measures that are implemented on site.

7.3 Existing Fire Prevention Measures

Based on the workshop discussion held with Tyrecycle, the following list details the existing fire prevention controls that are provided on site which help to minimise the likelihood of fire ignition of tyres piles.

- ESFR Sprinkler (AS2118.1) fitted throughout the building. Refer Section 9.1.10.
- Warehouse is secured from general public access. Only authorised personnel permitted access into the storage building after hours. Building will always be staffed.
- Inward (and outbound) trucks are all measured on the weighbridge, which is an inherent control point. Note, no thermal checks are completed at the weighbridge.
- Manual unloading of tyres provides inherent check by truck drivers for smouldering tyres
- CCTV cameras provided throughout the building.
- Thermal cameras for finding hot spots in tyre piles if a smouldering fire is detected by occupants via olfactory cues
- Hot work permit system – refer to document R613 Reference Sheet & Permit - Hot Works V2.0.pdf
- Ad hoc monitoring of tyre piles
- Visitors accompanied on site or inducted on the site fire risks

- Regular maintenance of plant, equipment and vehicles
- Thermal scans of switchboards, control panels and operating plant seeking areas of elevated temperatures for repair before they become ignition sources
- Operating procedure: Regular inspections and audits of the plant and yard storage
- Procedure (SOP-COL-002) Unloading Truck Procedure

7.4 Assessment of Tyre Storage Configurations

Based on the contents stored within the subject Tyrecycle Erskine Park warehouse, it is recognised that the key storage loads posing the highest fire risks are as below:

1. Primary pre-processed tyre stockpile
2. Tyre crumb storage racking
3. Tyre Derived Fuel storage
4. Other storage present within facility

Of relevance to this assessment, the NSW Tyre Storage guidelines [1] provide the following recommendations (amongst others) for tyre (and related subsidiary products such as tyre crumbs and shreds) storage in a sprinkled building:

- Tyres are generally to be stacked in a constrained manner and is not to be loosely stacked or thread-on-thread. i.e.
  - Bundled Tyres
  - Pallet Systems
  - Horizontal Systems
  - Portable systems
- Each tyre stacks are to be no greater than 3.7m in height.
- Each tyre stack is to be no greater than 30m^2 in area.
- A minimum clearance of 2m should be provided between tyre stacks.
- A minimum clearance of 1.5m should be provided between tyre stacks and any building structural members.

The primary fire risks and subsequent protection measures for each of the three storage types will be discussed further below.

7.4.1 Primary Pre-processed Tyre Stockpile

The subject Tyrecycle Erskine Park warehouse will feature a large amount of pre-processed tyres in various stockpiles within the floor space of the warehouse. As the intent is to increase the stockpile capacity, the existing arrangement of tyre storage will be adjusted based on our recommended requirements.

These include randomly stacked tyres for processing and tread-on-tread truck tyres for external delivery.

The location of the current stockpile arrangement are shown in the figures below

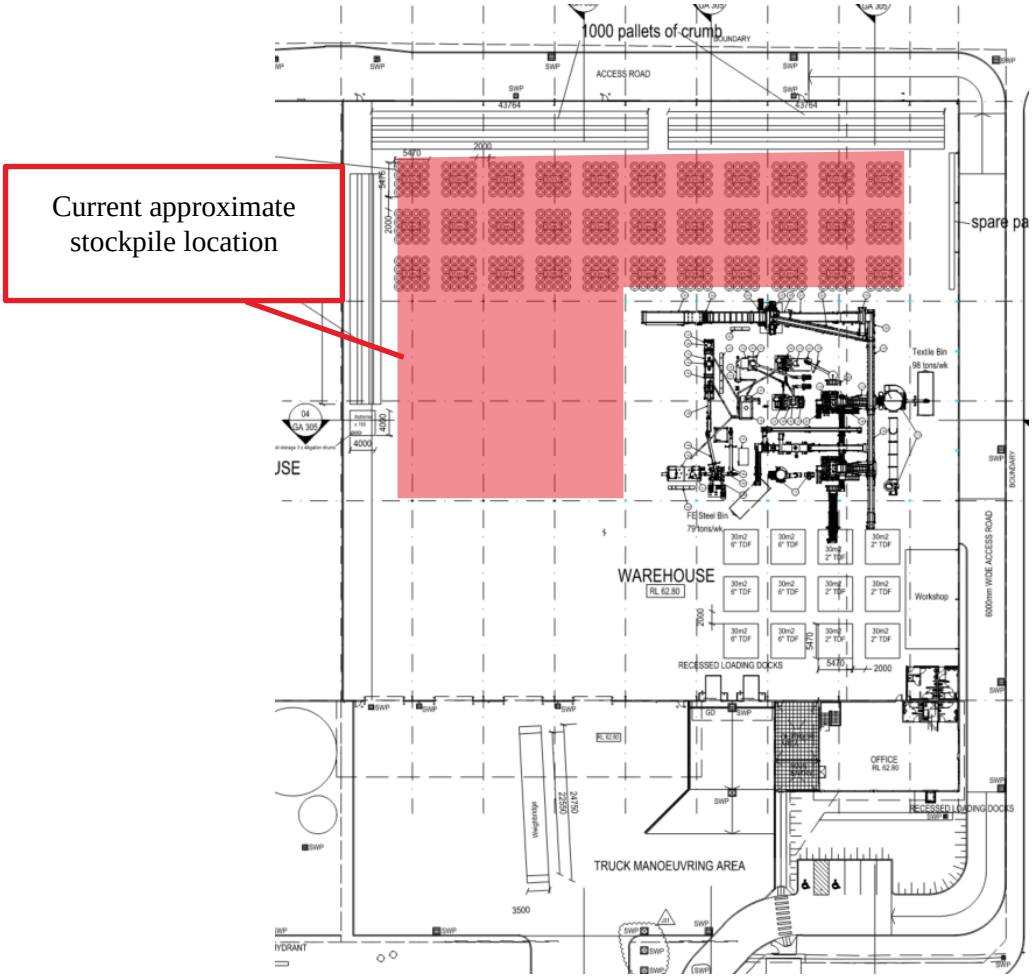


Figure 10: Current Site Layout – Truck tyre stockpile (only indicative for current arrangement)

Figure 11: Site Photo 1 – Truck Tyre storage – Existing Condition to be revised

Figure 12: Site Photo 2 – Various Tyre stockpile storage – Existing Condition to be revised

In its current arrangement, the general floor space of the warehouse is used to store pre-processed tyres. These tyres are typically stored in the following:

- Truck tyres stacked in a thread-to-thread manner for delivery to Melbourne or
- Various tyre stockpiles randomly piled within a designated area bound by 1m high concrete barriers.

Contrary to recommendations by the NSW Tyre Storage Guideline, the current tyre stockpile storage is:

- Not stored in a constrained manner as recommended within the guidelines.
- Stacks of tyres are much greater than 30m^2
- No minimum 2m separation between stacks of tyre stockpile.

It is recognised that as these tyres are not stored in a constrained manner and are in high volumes, in the event of a fire, the stockpile may easily spread to other areas and storages within the building.

Thus, in order to mitigate the risk of fire as low as reasonably practicable, in addition to the full list of requirements outlined in Section 9, the following key requirements to address this fire hazard is outlined below:

- The total tyre storage stockpile area of each pen are to be no greater than 60m^2
- The total storage stockpile height of each pen are to be no greater than 3.7m
- The storage pen are to be bound by construction achieving an FRL of 120 minutes on three sides.
- The construction is to extend 1m above the stockpile height and at least 2m beyond the outermost stockpile edge.
  - This is dependent on the preferred nominated stockpile limits.

- Construction and management of the pens is to be in accordance with Clause 8.2 of FRNSW Fire Safety Guideline – Fire Safety in Waste Facilities

An indicative stockpile pen is shown below:

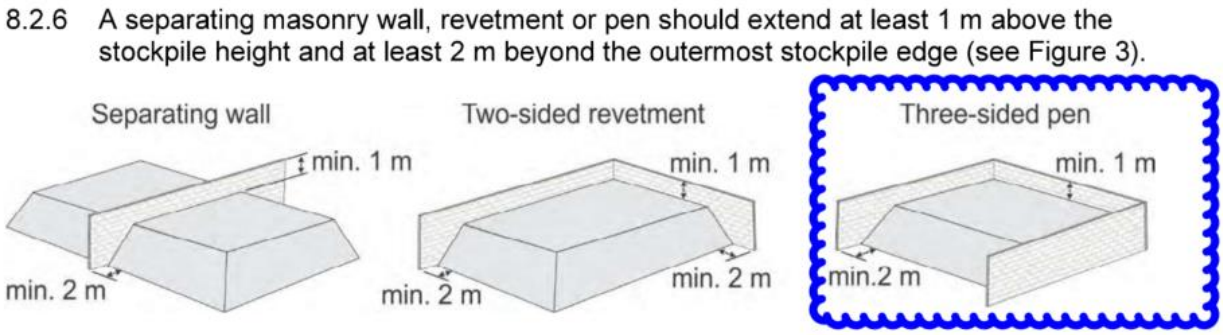


Figure 3 Example separating masonry wall, revetment or pen

Figure 13: Based on FRNSW Fire Safety Guideline – Fire Safety in Waste Facilities

It has been proposed that the fire-rated storage pens be constructed and located in the following locations:

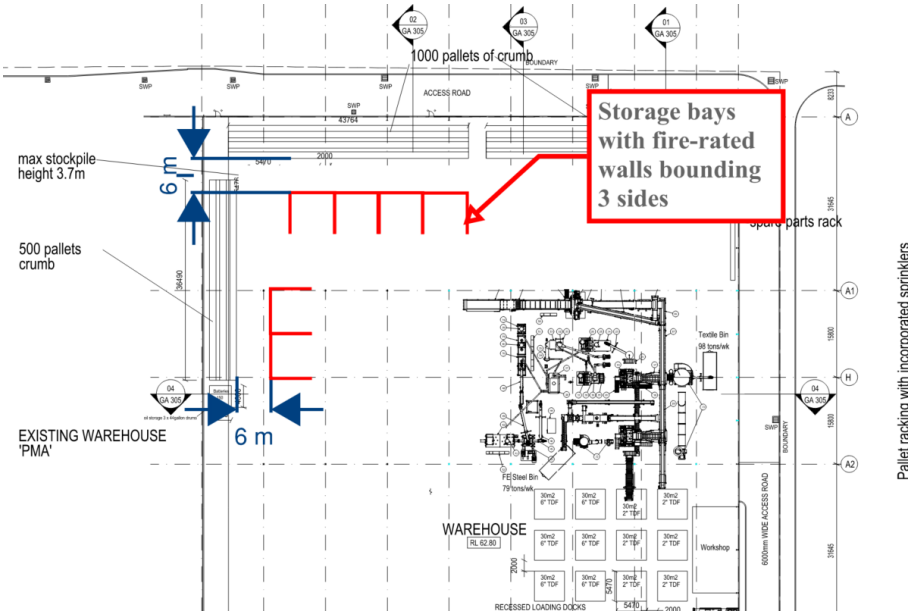


Figure 14: Location of proposed fire-rated storage pens

To minimise the risk of fire spread, the measures outlined in Section 9 are also implemented. In addition, an ESFR sprinkler system per AS2118.1-1999 is provided to serve the building throughout. It is recognised that this system is considered to be an enhanced system over a typical AS2118.1 sprinkler system used in general warehouses. Furthermore, the sprinkler system is understood to be designed with the key features outlined in Section 9.1.10.

It is noted that the coverage of the sprinkler system over a given area is broadly represented in the simplified diagram in Figure 15.

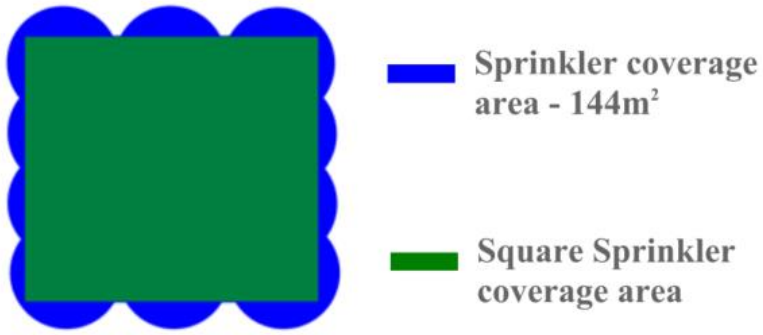


Figure 15: Simplified sprinkler coverage diagram

For the purposes of this evaluation and based on an operating sprinkler coverage area of 144m^2, it is assumed conservatively to be a circular coverage, a square area (i.e. shape of the proposed storage arrangement) within this circular coverage area is expected be approximately 91.5m^2. This is considered to be a conservative approximation, as in reality the 'square sprinkler coverage area' will be a greater proportion of the circular sprinkler coverage area.

A visual representation of this is shown below.

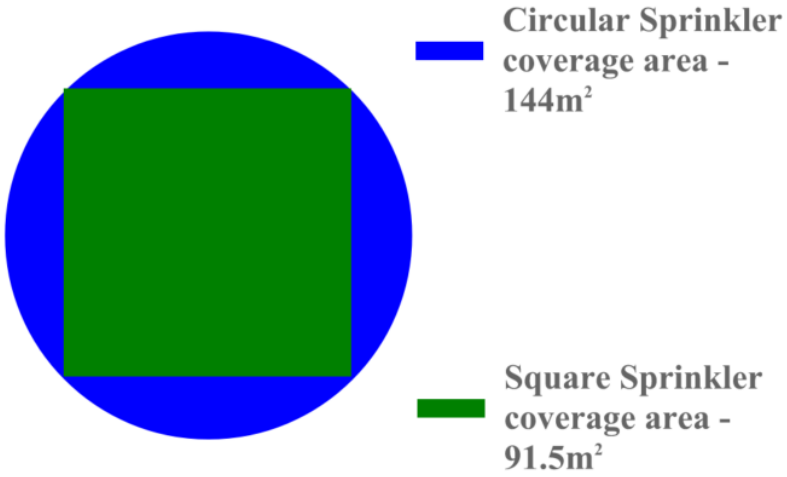


Figure 16: Simplified sprinkler coverage diagram

To further offset any uncertainties, a safety factor or 1.5 will be applied. Therefore, a reliable sprinkler coverage area of 60m^2 is assumed. Thus, in the unlikely event of a fire (noting there are preventative measures in place), the ESFR sprinkler system within the building is expected to be capable in controlling a fire seat of up to 60m^2, which is restricted size of each storage bay. Such that fire will not spread out of the storage pile of fire origin if not extinguish it entirely.

Further to the above, the fire separated walls provided will serve to minimise spread of fire between adjoining stockpile groups, such that in an unlikely event a bay is fully fire compromised (noting there are preventative measures in place), it will be contained by the fire-rated wall construction.

With the measures above in place, it is expected that the risk of fire spread due to the storage of the tyre stockpile are managed as low as reasonably practicable.

Based on the restrictions above, it has been advised by Tyrecycle that up to an estimated 700 Tonnes of pre-processed tyres will be possible. Note that this value is conditional on the tyres being stored as per the restrictions noted in this section.

7.4.2 Tyre crumb storage racking

The subject Tyrecycle Erskine Park warehouse will feature storage of tyre crumb bags located towards the west and southwest side of the warehouse. The location of these racking are shown in the figures below.

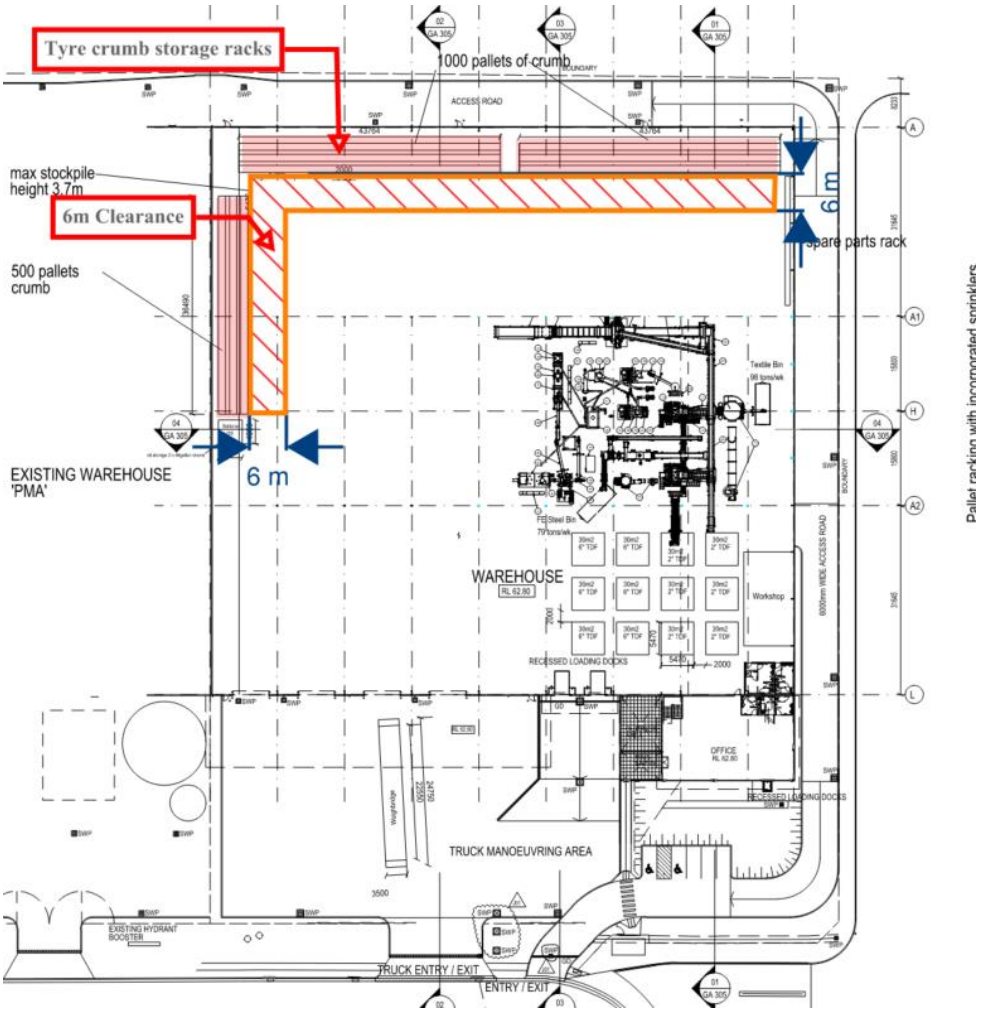


Figure 17: Current Site Layout – Location of crumb storage racking

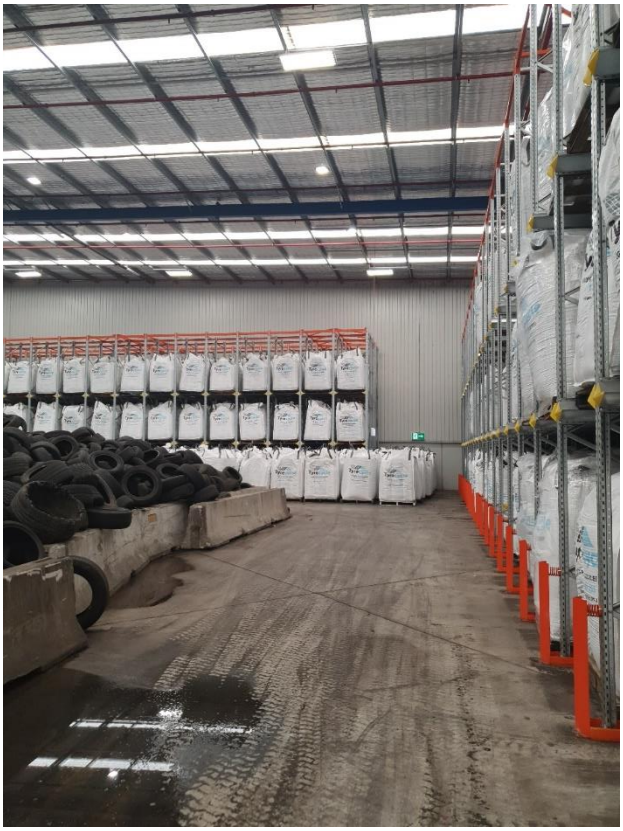


Figure 18: Site Photo 1 – Location of crumb storage racking

Each 'vertical shelf' comprises of 4 deep bags of crumbs and 3 bags high. Each bag of crumb weights approximately 1 Tonne.

Although not strictly tyres, they effectively comprise of the same material, however given that there is less air gaps (when compared to tyres), the fuel load density is significantly higher. On the other hand, reduced gaps reduces the amount of oxygen available for combustion and is expected fire will be largely limited to the top and outer surfaces of each bag.

Contrary to recommendations by the NSW Tyre Storage Guideline, these crumb storage is:

- Stacked greater than 3.7m in height
- No minimum 2m separation between stacks of no greater than 30m^2.

As a result, it is recognised that this may increase the risk of a fire spread in the event that a fire occurs in any of the crumb bags.

To minimise the risk of fire spread, the measures outlined in Section 9 are implemented. In addition, an ESFR sprinkler system per AS2118.1-1999 is provided to serve the building throughout. It is recognised that this system is considered to be an enhanced system over a typical AS2118.1 sprinkler system used in general warehouses. The racking (and associated storage) is installed so that it complies with the restrictions/ limitations of the ESFR system.

Further, thermal cameras will be (if not already) used to provide constant monitoring of the racking areas and will notify staff members in the event that a 'hot spot' is identified. Following that, trained staff will be able to investigate and undertake early fire intervention actions which may include, utilising forklifts (or similar machinery) to remove the affected bags as well as utilising early fire suppression provisions such as hose reels or fire extinguishers.

The racking is to be provided with a minimum 6m of unobstructed access on the accessible side to facilitate the use of machinery with ease. This will also provide spatial separation from the pre-processed tyre stockpiles mentioned above. The spatial separation, sprinklers and fire-rated wall construction is expected to minimise the risk of fire spread between the two different stockpile types.

With the measures above in place, it is expected that the risk of fire spread due to the tyre crumb storage racking is managed. Based on the restrictions above, it has been advised by Tyrecycle that up to 650 Tonnes of crumb storage will be possible.

7.4.3 Tyre Derived Fuel Storage (TDF) or WIP Stock (Granules)

The subject Tyrecycle Erskine Park warehouse currently features storage of tyre derived fuel storage (TDF) in piles or WIP stock (granules) in bags located next to the plant area of the warehouse. The location of these storages is shown in the figures below:

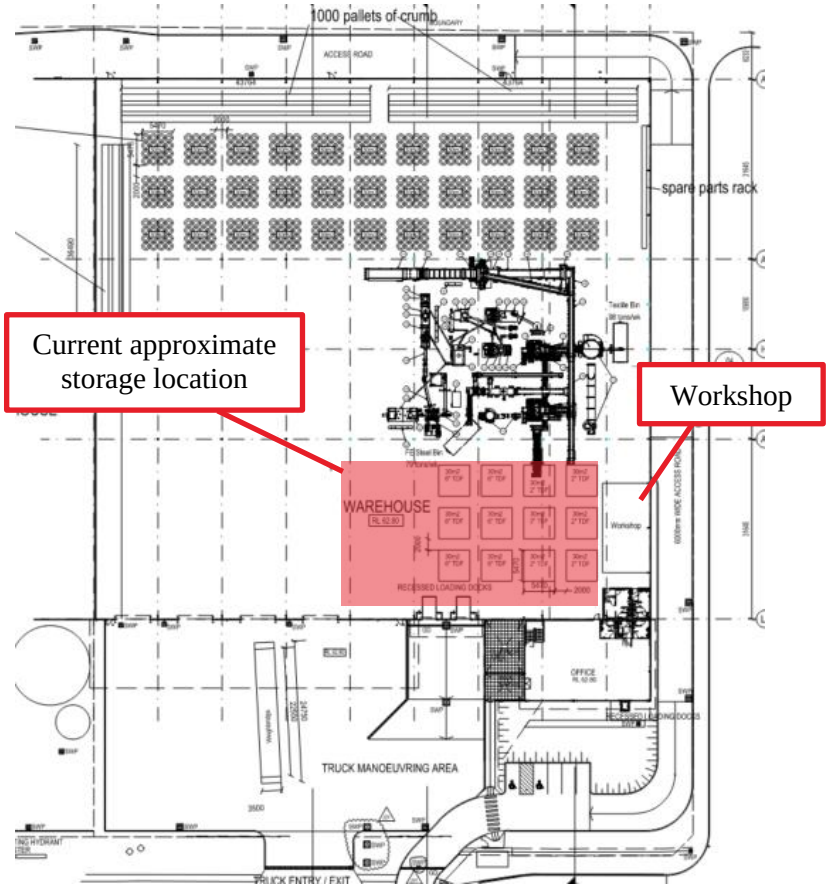


Figure 19: Current Site Layout – Location of TDF Pile / Granule Bag storage

Figure 20: Site Photo 1 – Granule storage in bags – Existing condition to be revised

Figure 21: Site Photo 1 – TDF storage in piles – Existing condition to be revised

Although not strictly tyres, they effectively comprise of the same material, however given that there is less air gaps (when compared to tyres), the fuel load density is significantly higher. On the other hand, reduced gaps also reduces the amount of oxygen available for combustion and fire is expected to be largely limited to outer surfaces of each pile or bag.

Contrary to recommendations by the NSW Tyre Storage Guideline, these TDF/granule storage has:

- No minimum 2m separation between stacks of no greater than 30m^2; and
- Located within 2.5m of loadbearing columns

Thus, in order to mitigate the risk of fire as low as reasonably practicable, in addition to the full list of requirements outlined in Section 9, the following key recommendations are made to address this fire hazard is outlined below:

- TDF pile or granule bags to be grouped such that each 'group' does not have an area of over 50m^2 to be arranged in 7m x 7m piles with a height no greater than 3.7m.
- Groups of TDF piles or granule bags are to be spatially separated from each other by a minimum distance of 6m.
- However, the TDF or granule storage need not be located more than 2.5m of the loadbearing columns provided that the loadbearing columns are provided with an FRL of 120 minutes.
- If the TDF or granule storage is located within 6m of the workshop, the external wall of the workshop is to be bound by fully non-combustible and enclosed walls (i.e. no meshing permitted). In addition, the workshop may not be used for storage of goods other than minor tools.

To minimise the risk of fire spread, the measures outlined in Section 9 are also implemented. In addition, an ESFR sprinkler system per AS2118.1-1999 is provided to serve the building throughout. It is recognised that this system is considered to be an enhanced system over a typical AS2118.1 sprinkler system used in general warehouses. Furthermore, the sprinkler system is understood to be design with the key features outlined in Section 9.1.10.

It is noted that the coverage of the sprinkler system over a given area is broadly represented in the simplified diagram in Figure 15 above.

For the purposes of this evaluation and based on an operating sprinkler coverage area of 144m^2, it is assumed conservatively to be a circular coverage, a square area (i.e. shape of the proposed storage arrangement) within this circular coverage area is expected be approximately 91.5m^2. This is considered to be a conservative approximation, as in reality the 'square sprinkler coverage area' will be a greater proportion of the circular sprinkler coverage area.

A visual representation of this is shown below.

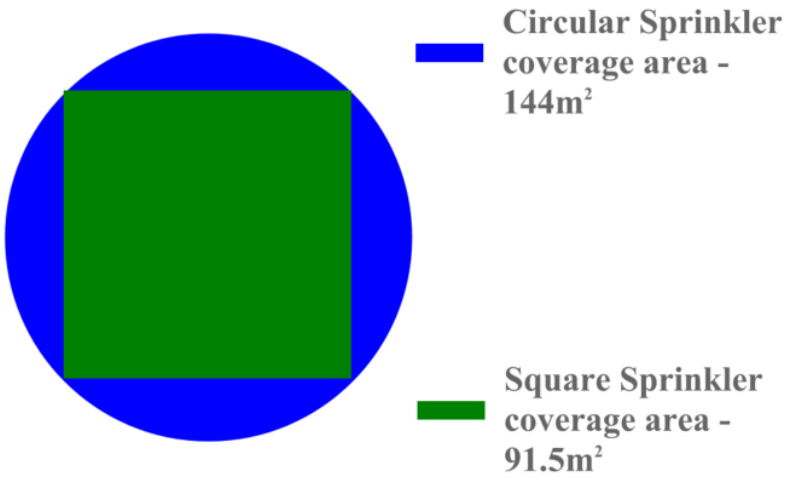


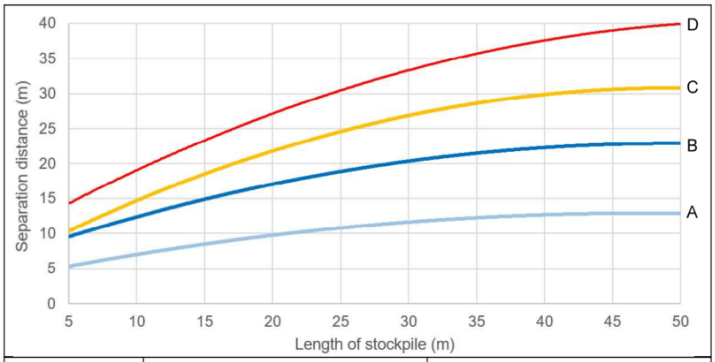
Figure 22: Simplified sprinkler coverage diagram

To further offset any uncertainties, a safety factor or 1.5 will be applied. Therefore, a reliable sprinkler coverage area of 60m^2 is assumed. Thus, in the unlikely event of a fire (noting there are preventative measures in place), the ESFR sprinkler system within the building is expected to be capable in controlling a fire seat of up to 60m^2, which is greater than the size of each TDF or granule storage group. Such that fire will not spread out of the storage pile of fire origin if not extinguish it entirely.

Spatial separation of 6m will also be provided to both minimise the risk of fire spread but to allow space for machinery (such as forklifts) to intervene during early stages of a deep seated fire.

It is noted that the NSW Fire Safety in Waste Facilities Guidelines [2] provides guidance for spatial separation between external stockpiles. Abstract shown below:

8.4.3 Minimum separation should be maintained between external stockpiles, depending on storage method and fire risk of materials, as given in Table 3 (see also Figure 5).



Length of stockpile (m)	Ordinary fire risk (i.e. ≤ 1000°C)		High fire risk (i.e. >1000°C)	
	Loose pile (A)	Baled (B)	Loose pile (C)	Baled (D)
5	5 m	9 m	10 m	14 m
10	7 m	13 m	15 m	19 m
15	9 m	15 m	18 m	24 m
20	10 m	17 m	23 m	27 m
30	11 m	20 m	26 m	34 m
50	13 m	23 m	31 m	40 m

Table 3 Minimum separation distances between external stockpiles

Figure 23: Abstract from NSW Fire Safety in Waste Facilities Guidelines – Clause 8.4.3

It is noted that Clause 7.2.6 of the same guideline defines rubber products as a high fire risk with a burn temperature of >1,000ºC, however, this considers a non-sprinkler-controlled fire. In the subject building, the presence of sprinklers are expected to reduce this temperature below 1,000ºC. As such, in this case, the hazard can be considered more akin to Type A hazard in table above. i.e. Loose pile storage, ordinary fire risk.

For a stockpile length of 7m in the subject building, interpolating from the graph yields a recommended spatial separation of approximately 5.8m, which will be rounded up to 6m. This is in line with the spatial separation provided in the subject building.

An indicative arrangement of the storage piles are shown in below.

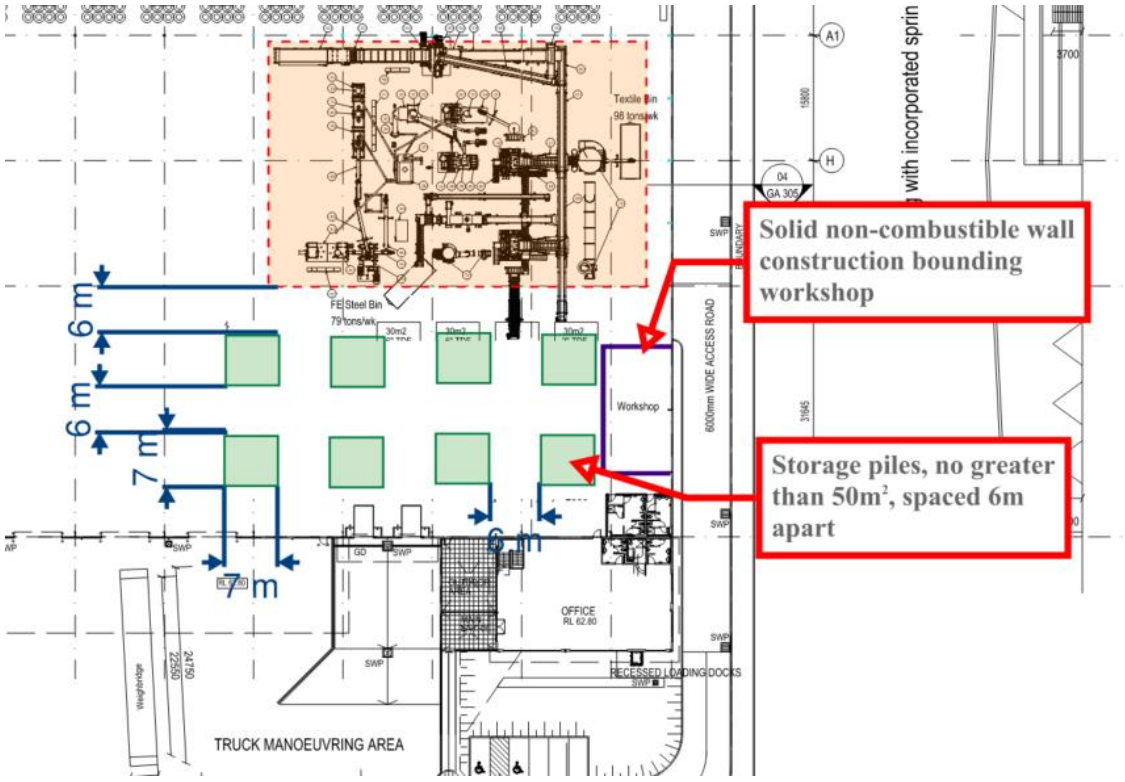


Figure 24: Indicative storage arrangement

With the measures above in place, it is expected that the risk of fire spread due to the tyre derived fuel storage (TDF) in piles or WIP stock (granules) in bags are managed.

Based on the restrictions above, it has been advised by Tyrecycle that up to estimated 150 and 100 Tonnes of TDF storage and WIP stock (in granules) in bulk bags, respectively, will be possible. Note that this value may change but must be stored as per the restrictions noted.

7.4.4 Other Fire Hazards within Site

Lead Acid Battery Storage

The subject Tyrecycle Erskine Park warehouse currently also features storage of lead acid battery. The location of this storage is shown in the figure below:

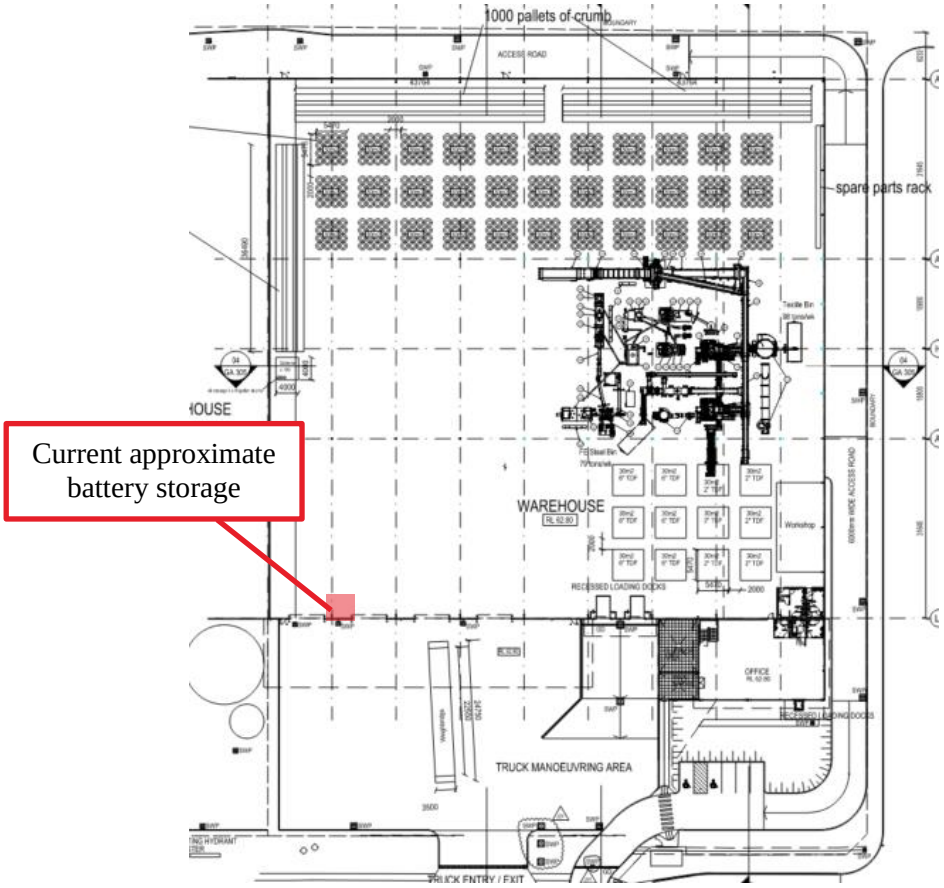


Figure 25: Current Site Layout – Location of lead battery storage

Up to 150 lead acid batteries may be stored within this cupboard, and as such it is recognised that this may pose a fire risk within the facility.

Thus, in order to mitigate the risk of fire as low as reasonably practicable, in addition to the full list of requirements outlined in Section 9, the following key requirements to address this fire hazard is outlined below:

- The lead batteries are to be stored at least 6m away from any tyre or tyre product storage areas.
- An additional fire extinguisher appropriate to addressing lead battery fires are to be provided adjacent to the battery storage cupboard. This is to be provided as per AS2444-2001.
  - Specifically, this is to by powder type extinguishers (BE or ABE) as per Table B1 of AS 2444 for an E class Fire.

In the event of a battery fire, it is expected to be controlled by the sprinkler system within the building if not by manual intervention using available extinguishers.

Should the battery fire not be controlled, it is expected to be largely isolated to the immediate area and unlikely to spread to other areas of the building due to its spatial separation to storage areas.

With the measures above in place, it is expected that the risk of fire spread due to the lead battery storage is considered to be managed.

Primary Plant Area

The subject Tyrecycle Erskine Park warehouse features a large tyre processing plant within the facility. This plant is shown in the figure below:

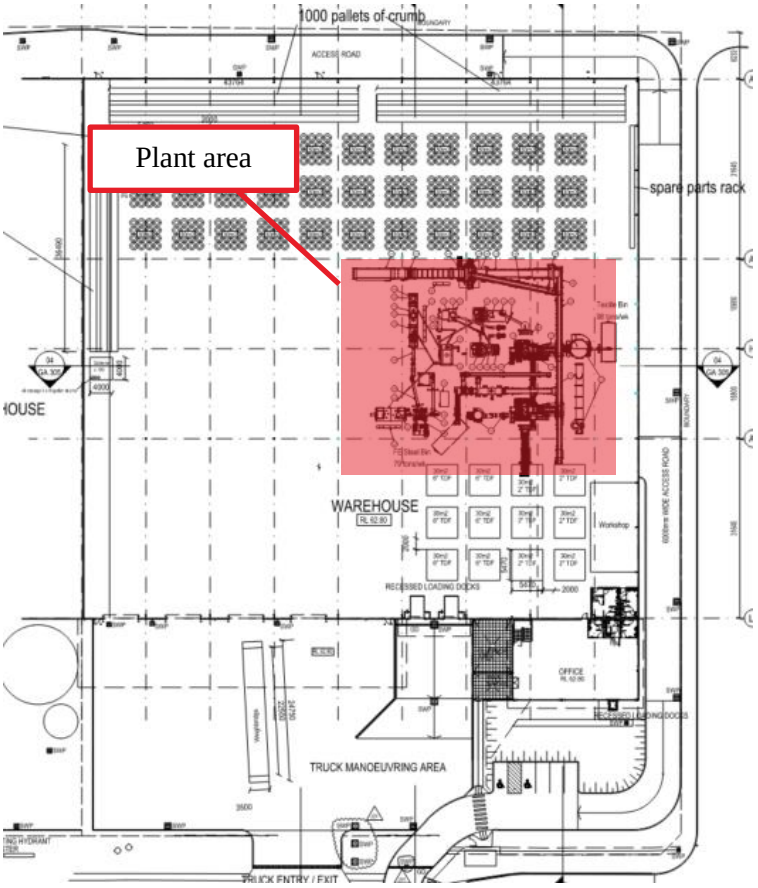


Figure 26: Current Site Layout – Location of processing plant

The primary function of the plant area is to process the tyres into shreds and crumbs. Aside from the processed material itself, the plant largely comprises of non-combustible construction. It is recognised however, whilst not a major source of fuel load itself, it does present a risk of ignition due to the inherent mechanical and electrical components.

Thus, in order to mitigate the risk of fire as low as reasonably practicable, in addition to the full list of requirements outlined in Section 9, the following key requirements to address this fire hazard is outlined below:

- Thermal cameras will be provided and aimed at the plant facility to monitor any unusual increase in temperature.
- Staff will be present within the facility at all times whilst the machinery is operational.
- The plant is to be located at least 6m from any combustible storage.

In the event of a fire, it is expected that they will quickly be noticed by staff present on site. A combination of early staff intervention and sprinklers within the building is expected to largely control the fire.

With the measures above in place, it is expected that the risk of fire spread due to the plant area is considered to be managed.

Workshop Area

The subject Tyrecycle Erskine Park warehouse features a workshop within the facility. This workshop is shown in the figure below:

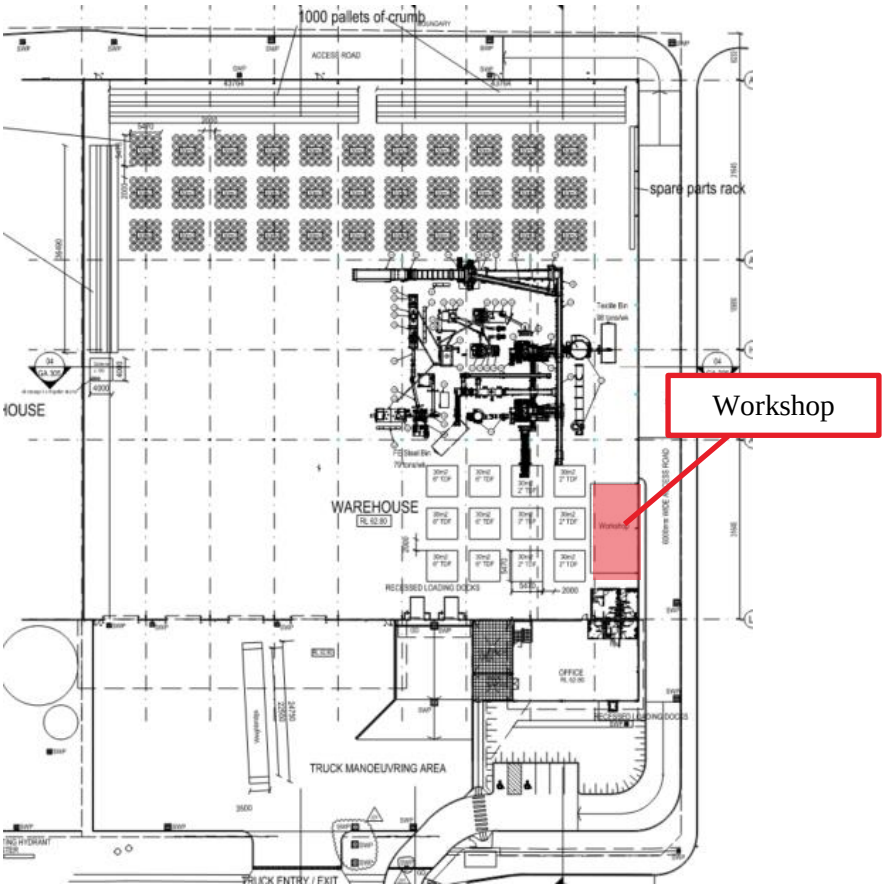


Figure 27: Current Site Layout – Location of workshop

Figure 28: Small package Flammable Liquids Cabinet – Location workshop

The primary function of the workshop is used for general repair and maintenance work. The workshop primarily comprise of tools and equipment and no major storage of goods. Nevertheless, it is recognised that this may be a source of fire ignition which may affect the adjacent TDF/granule storage.

Thus, in order to mitigate the risk of fire as low as reasonably practicable, in addition to the full list of requirements outlined in Section 9, the following key requirements to address this fire hazard is outlined below:

- The external wall of the workshop is to be bound by fully non-combustible and enclosed walls (i.e. no meshing permitted). In addition, the workshop may not be used for storage of goods other than minor tools.
- A 250 L Flammable Goods cabinet (compliant with AS 1940: *The storage and handling of flammable and combustible liquids*) is provided for the storage of a minor quantity of flammable liquids. See Figure 27..
- No ignition sources is permitted within 3m of this cabinet. Any flammable liquid containers taken from this cupboard is to be returned as soon as possible, this is to be managed by Tyrecycle management.
- An additional fire extinguisher appropriate to addressing flammable liquids stored within the workshop are to be provided adjacent to the flammable liquid cupboard. This is to be provided as per AS2444-2001.
  - Specifically, this is to by powder type extinguishers with a rating of at least 2A 60B(E) and a capacity of 9kg as recommended under AS1940 Clause 11.4.2.

Inherently, the workshop will only be used when there is staff present within. The provision of a portable fire extinguisher will allow any staff to undertake early fire suppression in the event of a small fire.

Furthermore, the provision of a non-combustible wall bounding the workshop will also minimise any ignition sources such as sparks that may be produced from the workshop. Due to the general lack of large amount of combustibles, it is unlikely a fire will be able to grow to a size

With the measures above in place, it is expected that the risk of fire spread due to the workshop area is considered to be managed.

Other minor stockpiles

It is noted in some instances, minor stockpiles of various combustible goods such as

- Loose tyres
- Metal shreds with a mixture of rubber within
- Loose rubber products (e.g. tyres, shreds or other rubber products)
- And other similar forms of combustible storage

These stockpiles, whilst generally minor can act as a conduit for facilitating fire spread between various rubber storage piles within the facility and needs to be managed appropriately.

Thus, in order to mitigate the risk of fire as low as reasonably practicable, in addition to the full list of requirements outlined in Section 9, the following key requirements to address this fire hazard is outlined below:

- Temporary storage (less than 1 hour) on the ground that is not containerised should be in long thin rows rather than square or round piles (subjected to the available free floor space). This is the preferred configuration of the piles for firefighting purposes as it allows for the rapid creation of fuel fire breaks in the piles either side of the burning area, therefore resulting in a more manageable fire size.
- For longer term storage (more than 1 hour), all storage is to be in accordance with NSW Tyre Storage guidelines [1] and to be treated as rubber products (including piles of metal shred with rubber products). Specifically (amongst other requirements under the guidelines):
  - Tyres are generally to be stacked in a constrained manner and is not to be loosely stacked or thread-on-thread. i.e.
    - Bundled Tyres

  - Pallet Systems
  - Horizontal Systems
  - Portable systems
- Each stacks are to be no greater than 3.7m in height.
- Each stack is to be no greater than 30m^2 in area.
- A minimum clearance of 2m should be provided between combustible groups.

With the measures above in place, it is expected that the storage of loose combustible materials are broadly in line with the recommendations under the NSW Tyre Storage guidelines [1].

7.5 Threat Barrier Diagrams

As indicated, the overall risk of a major tyre fire at the subject Erskine Park site is a combination of the likelihood of a fire developing and the consequences.

A threat barrier diagram has been developed for the tyre related fire scenarios at Tyrecycle.

A Threat-Barrier Diagram (TBD) is an effective way of organising and communicating hazard management processes and structures. They are designed to provide a clear visual representation of the development of a threat or hazard to a consequence, and the mechanisms by which that development can be either prevented or mitigated. They are also commonly referred to as Bowties.

The main elements of a TBD are:

- Threats: scenarios that may lead to a loss of control (LOC);
- Loss of Control (LOC): the moment when control is lost after the threat materialises and a negative consequence may occur;
- Consequences: potential results of an LOC; and
- Barriers: precautions and controls which may prevent threat scenarios leading to LOC and those that reduce the magnitude of the consequences.

Barriers are almost never one hundred percent effective as there will almost always be at least one failure mode for any control. A highly resilient system will incorporate multiple independent controls for the same threat scenario.

In general, barriers should aim to prevent a LOC occurring before attempting to prevent consequences of a LOC that has already occurred. That is, barriers should not be placed after the LOC at the expense of controls which would act before the LOC.

On the left of the diagram are all the sources of ignition and the preventative measures to ensure ignition does not occur. On the right of the diagram are the impacts or consequences of fire and the measures in place to minimize those impacts or consequences.

The TBD for the Tyrecycle Erskine Park site is presented in Appendix A.1. TDB's have been developed for the following fire scenario's:

- Fire in the MPR
- Fire in the Superchopper
- Tyre fire during truck delivery
- Fire in main tyre pile
- Fire in TDF pile
- Fire in crumb storage racks, and

- Workshop fire.

8. Fire Risk Reduction

8.1 Fire Prevention Strategy

The fire risk management strategy has now been developed further as a result of this fire risk assessment, consultation with Tyrecycle operational managers, is based on the following:

- Tyres are difficult to ignite and burn slowly initially. They usually burn as a result of initial burning of other combustible materials, including cellulosic materials and flammable liquids. The history of fires nationally and internationally is that they have often involved arson.
- Due to their donut shape, fires are able to burn on the internal tyre lining, and this largely prevents extinguishing agents to get to these burning surfaces. As a result, use of water or foam extinguishing agents, except in the very first 5-10 minutes of a tyre fire, are not effective in extinguishing fires but rather should be retained to cool non-burning tyres or other nearby combustible exposure surfaces.
- Chopping and grinding of tyres produces a low density and porous material that air may percolate. The total surface area of tyre shred/crumb may be larger compared with the volume occupied. The combination of permeability to airflow and a high exposed surface area means that a combustible material such as rubber is potentially susceptible to spontaneous combustion

8.1.1 Existing Fire Protection Measures

The key elements of the fire management strategy, based on the fire risk assessment, are:

- Have in place site surveillance with a full range of fire prevention measures
- Manage a tidy site to separate potential ignition sources from piles of tyres
- Have administrative controls in place such as Permit to Work, maintenance schedules and periodic thermal scans of electrical and rotating equipment to control potential ignition sources.
- Training for workers on how to recognise the initial stage of fire and symptoms of the onset of spontaneous combustion of tyre shred and how to respond before an out-of-control fire develops
  - Staff who have basic procedures to identify and separate burning tyres from other tyres using portable equipment and excavators or front-end loaders.
- Have procedures and equipment on site to separate initial slow burning tyres from other unburnt tyres in piles of tyres
- Provide quick notification, good access and water supply for effective fire brigade operations
- Manage any run-off of fire-fighting water or other contaminants
- Manage the impacts of any large-scale fire events in close consultation with EPA and FRNSW
- Tyres keep in limited size piles with trafficable access paths in between
- The largest tyre pile generally constrained by the concrete barriers of the pre-processed tyre stockpile (although this is noted to be insufficient due to the height of the piles and to be replaced by a fire-rated tyre pen)
- Portable extinguishers and fire hose reel coverage for subject building, including the pre-processed tyre stockpile and on all vehicles (portable fire extinguishers only). Fire extinguisher checks are completed daily during pre-start activities.
- Fire hydrant coverage to the west and east end of the site (i.e. factory and office, and surrounding areas including the pre-processed tyre stockpile). Fire hydrant checks are done every 1-2 weeks
- Available perimeter access for brigade appliance and entry from three sides of the site.
- The building is also provided with an ESFR automatic fire suppression system meeting AS2118.1-1999 throughout.

- It is understood that the ESFR sprinkler system is capable of providing a sprinkler coverage area of 144m^2; and
- Able to operate continuously for up to 90 minutes.

It is noted however, as the intention is to increase the storage capacity within the site, the existing fire protection measures noted above alone will not be sufficient. Additional fire safety measures outlined in Section 9 are to be implemented.

The existing risk management control measures at the Tyrecycle site at Erskine Park have been identified through consultation with Tyrecycle staff and by review of existing Tyrecycle policies, plans and procedures for the site.

The existing control measures; preventative controls including management procedures and mitigation measures at Tyrecycle, Erskine Park, are strongly focussed on fire prevention and a rapid response to potential or small tyre fires to keep fire risks at very low levels. Tyrecycle already have a considerable range of fire prevention measures on site, as well as a range of fire protection/ mitigation measures in terms of equipment and management procedures for dealing with the unlikely event of ignition of tyres.

Tyrecycle are committed to site and operational improvements at Erskine Park to reduce further the likelihood and the consequences of fire involving the outdoor tyre storage piles.

8.2 Fire-Fighting Approach

The first approach has to be for staff to take quick action to remove a smouldering or a burning tyre or tyres from the tyre pile.

If the fire has started to spread with flaming combustion to multiple tyres then heavier excavator or other equipment may need to be used to separate out the burning tyres from the non-burning ones, while using hose streams to keep non-burning tyres in the pile cool.

If the fire progresses past that point, the consequences of a large fire involving one of the indoor tyre storage piles could potentially impact on site personnel, the attending fire brigade personnel, the Erskine Park plant operations and the local environment. Such fires can burn for hours or days depending on a range of factors.

A major fire at Erskine Park would clearly impact significantly on plant operations and have the potential to impact on the environment through run-off of TDF and other contaminated fire-fighting water, air pollution, and ground seepage.

Fire brigades have their own standard operating procedures to protect and minimize risks to fire fighters.

8.3 Water Containment

It is expected that the Tyrecycle facility be provided with facilities which makes all efforts to contain all fire water within the premises (amongst other requirements) under the current EPA license:

The existing water containment measures are:

- Storm water drains available to the sunken loading dock with an isolator shut off valve.
- Four of six roller doors to the building are provided with an internal slope to drain water into the loading dock area.
- Additional bunding (drive-over fire retardant bunding) will be provided at the roller doors to direct flow to the recessed area beneath the loading area

9. Required Fire Safety Measures

To ensure that the risk of a fire at Tyrecycle is reduced so far as reasonably practicable, a management program is in place to monitor the controls that are in place to mitigate and reduce the risks of fire.

The process that has been followed is to identify the fire hazards and potential causes of fire onsite

- To develop controls that prevent a fire starting;
- To develop controls that reduce the opportunity of a fire developing once initiated;
- To develop controls that mitigate the consequences of a fire; and
- To have management systems in place to monitor, review and maintain the controls.

This section summarise the hazards and controls and depicts them in bowties so that the integrated control strategy can be visualised. The management processes in place for each control are described, followed by the processes in place for management oversight.

Through this Risk Assessment recommendations have been made for additional controls or changes to additional controls. These are also identified and discussed.

All requirements listed below are to be adopted and implemented by the Tyrecyle facility.

For each of the control measures (barriers) depicted in the TBD in A.1, a summary of the management of that control is provided.

9.1.1 Site Security

The following elements make up the site security arrangements at Tyrecycle:

- Storage site is an enclosed secured warehouse.
- Doors and sliding doors providing access to the building is expected to be locked and secured during after-hour times.
- It has been advised that there will be at least a staff member (security or workers) on site at any given time during a 24 hour period.
- Existing CCTV coverage is generally provided throughout the site, both internally and externally to cover key access areas. There are a total of 25 cameras with currently three being thermal cameras. Refer figures below
- Note that additional thermal cameras to be installed, refer Section 9.1.6

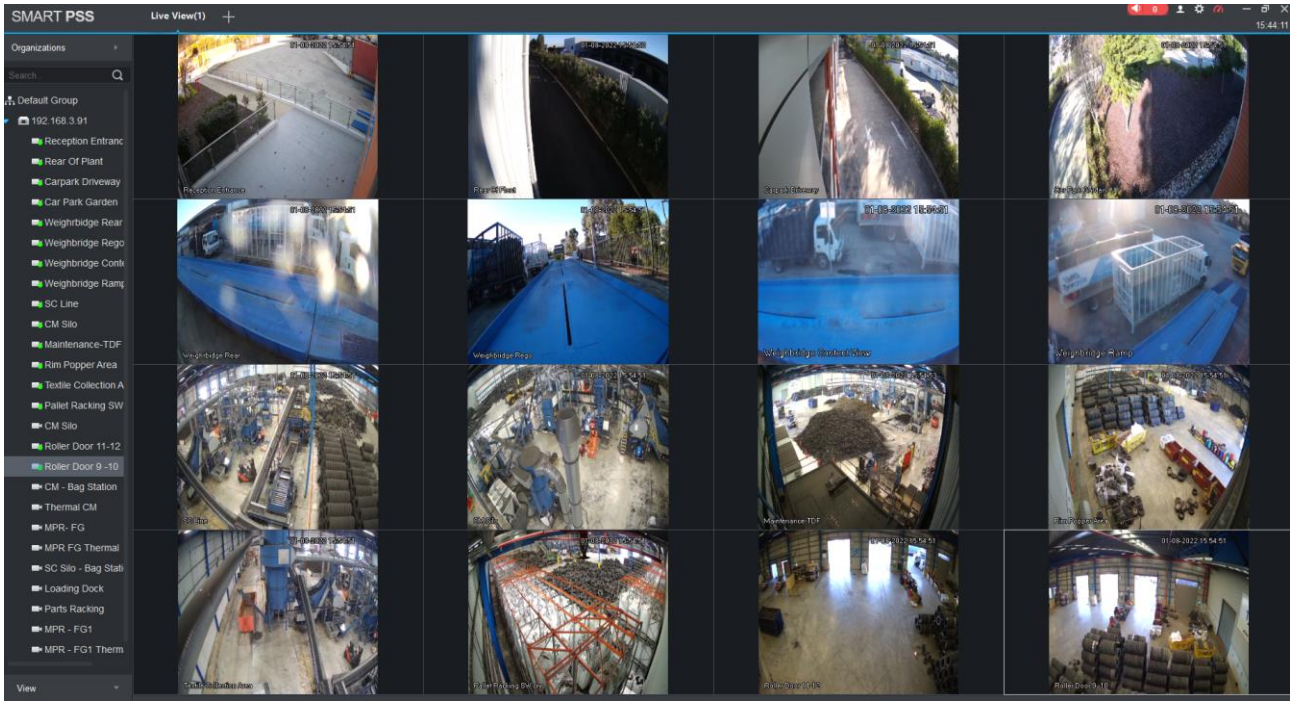


Figure 29: CCTV Coverage of Tyrecyle Site

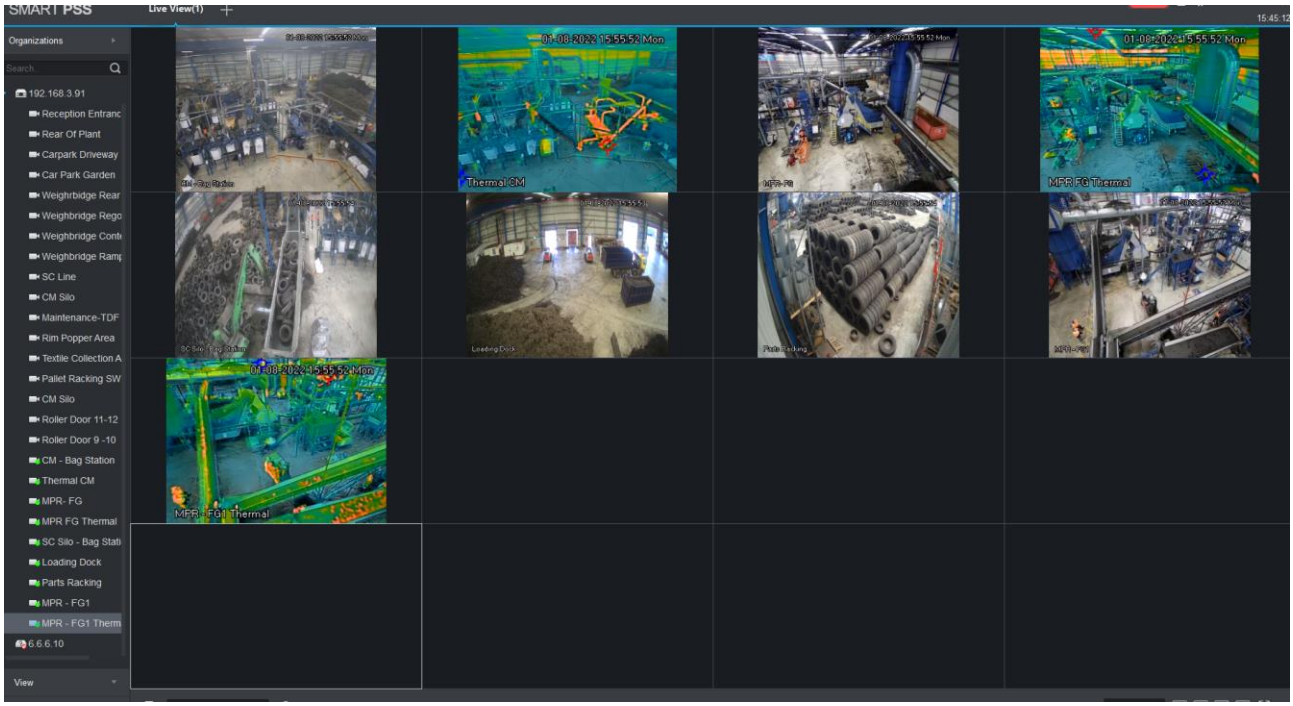


Figure 30: CCTV Coverage of Tyrecycle Site

9.1.2 Stock Control

The stocking levels on site are maintained to control the maximum fuel load onsite. The proposed capacity is based on available storage space to meet the storage constraints outlined in this report and this is tracked through the weighbridge checks of tyres coming onto site and tyre recycled products leaving the site. Periodically, inventory audits are completed to verify stock levels.

Tyre piles are managed visually to maintain separation distances and inventories in each pile to ensure they do not exceed the area sizes or height.

9.1.3 Ignition Source Control

Ignition sources are controlled on site, with controls on the use of naked flames and spark producing activities through the Hot work permit system – refer to document R613 Reference Sheet & Permit – Hot Works V2.0.pdf

9.1.4 Contamination Control

The tyre shred and crumb piles are monitored to ensure that no organic material contamination is present that could provide more readily ignitable material from heat accumulation in the piles. Tyres are checked before being fed to the crumbing conveyor.

9.1.5 Thermal Scans – Electrical systems

Thermal scans of all major electrical systems are recommended to be undertaken annually to ensure that thermal hot spots in circuits through poor connections and other deterioration are detected before they lead to potential ignition sources.

Note that frequency of tests may need to be reviewed depending on results.

9.1.6 Thermal Cameras

Thermal cameras are to be provided to manage and observe any unusual heat signatures within the building. Specifically, they are to be provided to cover the following areas:

- Unloading areas where tyres are offloaded from incoming trucks
- Tyre crumb storage racks
- TDF Storage piles
- Main tyre stockpile (storage pens)
- Plant area (currently in place)

Thermal cameras are to be configured such that an auto call out to plant manager will occur at 50°C.

9.1.7 Permit to Work – Hot Works

The permit to work system controls maintenance activities on site and ensures any hot work is completed with additional controls to avoid ignition of a fire. Hot work permit system – refer to document R613 Reference Sheet & Permit – Hot Works V2.0.pdf.

9.1.8 Maintenance Schedule

Tyrecycle is understood to run maintenance planning schedule through the MEX system. This provides a planned schedule of maintenance on equipment on site as well as initiating checks on the fire equipment systems on site. It also provides a detailed list of spare parts for the equipment.

Check lists are also used to assess equipment before use including:

- Truck and trailer pre-operational checklist;
- Mobile plant checklist;
- Pre-startup checks for the shredding and crumbing plants.

9.1.9 Emergency Response Plan

Tyrecycle maintains an Emergency Management Plan (ERP) referred to as ‘Tyrecycle Emergency Response Procedure’ (current version 3.1) that has defined procedures for the following events to respond to the following emergency scenarios:

- Medical emergencies;
- Fire and/or smoke;
- Bomb threat;

- Personal threat;
- Internal emergencies i.e. power failure and floods;
- External emergencies i.e. wildfire or an incident at a neighbouring property; and
- Evacuations.

In addition to the existing plan, the following are to be included:

- Tyrecycle to develop their respective procedure in their emergency management plan considering other appropriate approach to perform full extinguishment of the burning tyres.
- ERP to also include staff training and procedures to utilise machinery (e.g. forklifts) to separate the fire-involved material (if safe to do so) from various storage piles within the facility.
- Staff training to also be provided to enable staff to effectively undertake early fire suppression using tools such as portable fire extinguishers or hose reels.

9.1.10 Fire Suppression Systems

The building is also provided with an ESFR automatic fire suppression system meeting AS2118.1-1999 throughout. Refer Appendix D.

- The ESFR sprinkler system must be capable of providing a sprinkler coverage area of 144m^2 with 12 sprinkler heads operating simultaneously; and
- Able to operate continuously for up to 90 minutes.

Note that in-rack sprinklers (if necessary under the relevant standards) may be required to be installed. This is to be checked with a fire services engineer to determine the level of protection appropriate to the storage.

9.1.11 Fire Protection / Early Manual Fire Intervention Measures

9.1.11.1 Available Machinery

Machinery such as forklifts are to be provided within the facility and to be operation at any time to facilitate early fire intervention in the event a deep seated fire occurs and cannot be accessed by conventional means.

Whilst the subject Tyrecycle facility is operational, at least one staff members must be trained and present to operate such machinery.

9.1.11.2 Fire extinguishers and hose reels

Throughout the Tyrecycle Erskine Park site, fire extinguishers and hose reels (achieving full coverage of the site) are to be located (if not already) for ready access for trained personnel to utilise at the first signs of a hotspot or small fire to apply extinguishing media.

The following key requirements are to be noted:

- Depending on the revised arrangement of the storage locations, additional fire hose reels may need to be provided to ensure full coverage within the building is provided.
- In addition to fire extinguishers required to be provided under E1.6, additional fire extinguishers are to be provided to the following as follows:
  - An additional fire extinguisher appropriate to addressing lead battery fires are to be provided adjacent to the battery storage cupboard. This is to be provided as per AS2444-2001.
    - Specifically, this is to by powder type extinguishers (BE or ABE) as per Table B1 of AS 2444 for an E class Fire.
  - An additional fire extinguisher appropriate to addressing flammable liquids stored within the workshop are to be provided adjacent to the flammable liquid cupboard. This is to be provided as per AS2444-2001.

- Specifically, this is to by powder type extinguishers with a rating of at least 2A 60B(E) and a capacity of 9kg as recommended under AS1940 Clause 11.4.2.

9.1.12 Fire Protection Measures for Main Warehouse Floor

9.1.12.1 Primary Tyre Stockpile(s)

The primary stockpiles of tyres are to be arranged within storage pens. These include randomly stacked tyres for processing and tread-on-tread truck tyres for external delivery.

Specifically, the pens are to meet the following criteria:

- The total tyre storage stockpile area of each pen are to be no greater than 60m^2
- The total storage stockpile height of each pen are to be no greater than 3.7m
- The storage pen are to be bound by construction achieving an FRL of 120 minutes on three sides.
- The construction is to extend 1m above the stockpile height and at least 2m beyond the outermost stockpile edge.
  - This is dependent on the preferred nominated stockpile limits.
- Construction and management of the pens is to be in accordance with Clause 8.2 of FRNSW Fire Safety Guideline – Fire Safety in Waste Facilities

An indicative stockpile pen is shown below:

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 (see Figure 3).

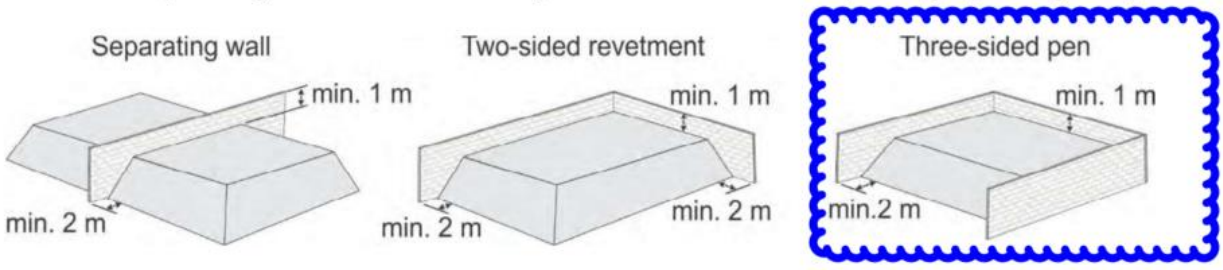


Figure 3 Example separating masonry wall, revetment or pen

Figure 31: Based on FRNSW Fire Safety Guideline – Fire Safety in Waste Facilities

An indicative arrangement of the primary tyre stockpile pens are outlined in Figure 14.

9.1.12.2 Tyre Crumb Storage Racks

As the fuel load density of the tyre crumb storage racks are extremely high, the racking (and associated storage) is to installed such that it complies with the restrictions/ limitations of the ESFR system. If the existing ESFR Sprinkler system is insufficient to accommodate the desired storage capacity, upgrades to the existing system may be required. This may included the provision of in-rack sprinklers if required under the relevant AS2118.1-1999 standard.

In addition, each row of racks is to have a minimum of 6m unobstructed access on each accessible side.

An indicative arrangement of this storage is outlined in Figure 17.

9.1.12.3 Tyre Derived Fuel (TDF) and WIP Stock (Granules) Storage Pile(s)

A significant control measure to limit the maximum size of a fire at the Tyrecycle Erskine Park site is to limit the size of combustible material and to ensure there is sufficient separation between fuel load to prevent ignition of other piles or buildings within the facility.

Specifically in the cases of the TDF storage piles or Granule bags, they are to be arranged in groups with a combined area of no greater than 50m^2 to be arranged in 7m x 7m piles with a height no greater than 3.7m. Subsequently, each of these ‘groups’ are to be located greater than 6m from each other.

Allocated areas (i.e. 7m x 7m bays with 6m separation) are to be clearly marked on the ground.

An assessment on the tyre pile sizes and the separation distances has been discussed in section 7.4.4 of this report. An indicative arrangement of this storage is outlined in Figure 24.

9.1.13 Egress Provisions

It is noted that in consideration of storage location for various piles, they must be arranged such that impact to egress is not hindered. Specifically:

- Travel distances to exits are not to be increased
  - Note that existing Performance Solutions applicable to the base building has permitted limited extension of travel distances. Refer Section 2.2. Specifically:
    - Exit travel distances within the warehouse of more than 40m (approximately 65m) to an exit
    - Travel distances between alternative exits of more than 60m (approximately 130m).
  - Otherwise travel distances are to comply with BCA DTS Provisions D1.4 and D1.5.
- Minimum exit width clearance of 1m is to be maintained for paths of travel in accordance with BCA DTS D1.6.
- No storage racks may be permitted above paths of egress.
- All exit signage is to be updated to reflect the revised arrangement of storage areas within the building. i.e. the new arrangement of storage areas is expected to have impacted the existing travel paths.

Other potential impacts on fire services equipment (e.g. fire hydrants, fire hose reels, portable fire extinguishers etc…) as well as possible impact to brigade intervention are to be reviewed and coordinated by a fire services engineer.

9.1.14 Fire brigade facilities

Fire hydrants connected to a ring main are provided at the site for the FRNSW to connect hoses to supply larger quantities of water to a fire. A fire hydrant extension is understood to be provided to serve the warehouse in accordance with AS2419.1-2005 and BCA Clause E1.3.

It is recognised however that the subject facility is a sprinkler-protected building. As such, it is expected that any fires will be suppressed or controlled such that it will not evolve into a large fire.

In the unlikely event that the fire is not successfully suppressed or controlled, it is understood that the brigade is unlikely to utilise fire hydrants and will instead focus on limiting further fire spread to adjoining buildings as well as search and rescue.

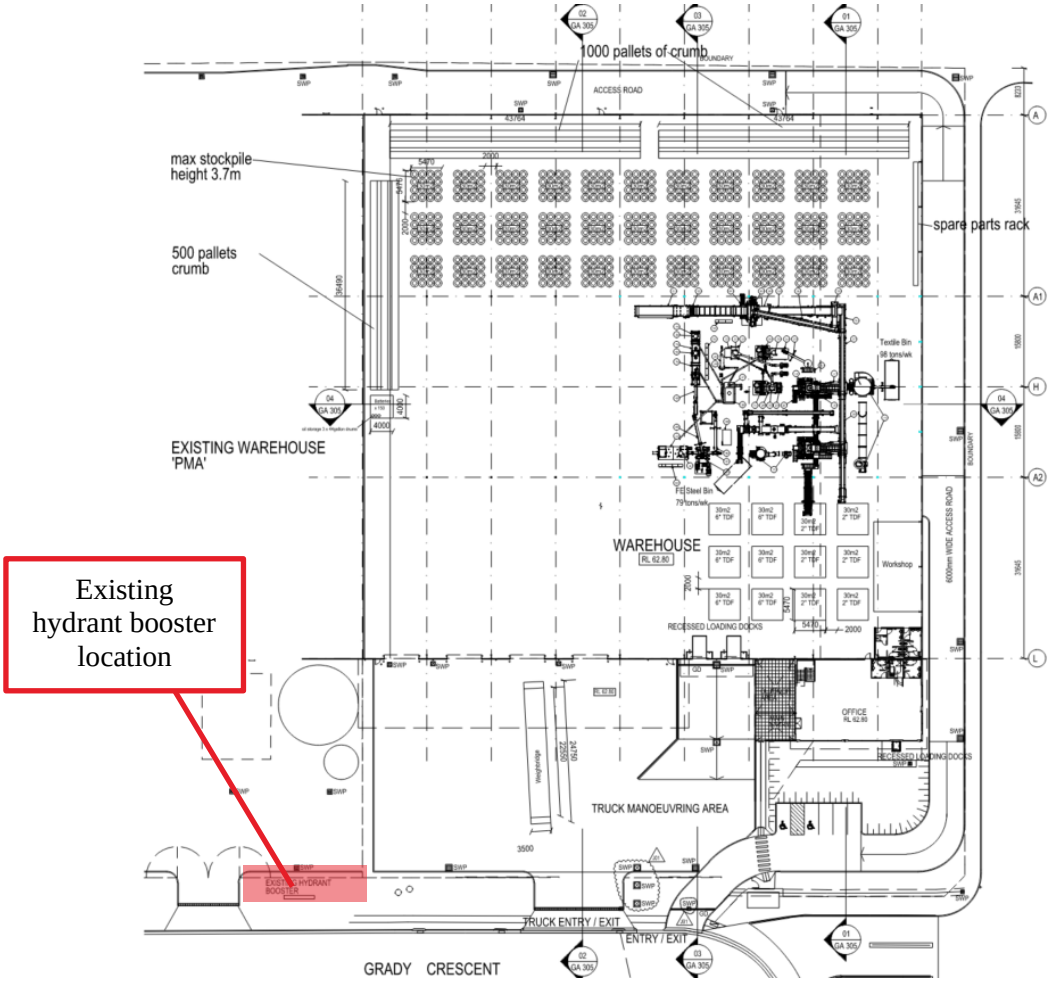


Figure 32: Location of Hydrant Booster

9.1.15 Other General and Construction requirements

Existing loadbearing columns within the building are to be retrospectively fire-rated to achieve an FRL of 120 minutes where within 2m of a storage pile. This is to be provided from the floor up to the underside of the ceiling.

The external wall of the workshop is to be bound by fully non-combustible imperforate and enclosed walls (i.e. no meshing permitted). In addition, the workshop may not be used for storage of goods other than minor tools.

- Unless otherwise varied by requirements within this report, the building is to adhere to the requirements of any existing applicable FERs.
- It is expected that the Tyrecycle facility be provided with facilities which makes all efforts to contain all fire water within the premises (amongst other requirements) as required under the current EPA license. Specifically:
  - Storm water drains available to the sunken loading dock with an isolator shut off valve.
  - Four of six roller doors to the building are provided with an internal slope to drain water into the loading dock area.
  - Additional bunding (drive-over fire retardant bunding) will be provided at the roller doors to direct flow to the recessed area beneath the loading area
- Tyrecycle is to stop receiving any incoming truckloads when they exceed the storage limits.

  - It is noted that there may be logistical challenges for short term changes, however Tyrecycle is responsible in anticipating a build-up of storage and plan accordingly ahead of time as far as practicable.
  - It is recommended that Tyrecycle make arrangements to allocate some 'backup' storage areas (such as one storage pit) to act as a buffer for any unexpected increase in storage requirements.
- The only exception is that a flame-proof cabinet for the storage of flammable liquid is permitted within the workshop.
- A revised Emergency Evacuation Diagram and Emergency Response Procedure is to be produced to reflect the requirements/changed required within this report.
  - It is noted that the current existing Emergency Evacuation Diagram is incomplete and only shows half of the subject facility.
- No ignition sources is permitted within 3m of this cabinet. Any flammable liquid containers taken from this cupboard is to be returned as soon as possible, this is to be managed by Tyrecycle management.
- Temporary storage (less than 1 hour) on the ground that is not containerised should be in long thin rows rather than square or round piles (subjected to the available free floor space). This is the preferred configuration of the piles for firefighting purposes as it allows for the rapid creation of fuel fire breaks in the piles either side of the burning area, therefore resulting in a more manageable fire size.
- Tyre shreds shall be free of fragments of wood, wood chips and other fibrous organic matter
- Tyre shreds shall have less than 1% (by weight) of metal fragments that are not at least partially encased in rubber
- All exit doors located on the west side of the building (i.e. behind the tyre shred racks) are to be provided with vision panels.
- For longer term storage (more than 1 hour), all storage is to be in accordance with NSW Tyre Storage guidelines [1] and to be treated as rubber products (including piles of metal shred with rubber products). Specifically (amongst other requirements under the guidelines):
  - Tyres are generally to be stacked in a constrained manner and is not to be loosely stacked or thread-on-thread. i.e.
    - Bundled Tyres
    - Pallet Systems
    - Horizontal Systems
    - Portable systems
  - Each stacks are to be no greater than 3.7m in height.
  - Each stack is to be no greater than $30m^2$ in area.
  - A minimum clearance of 2m should be provided between combustible groups.

Note that any other storage in any other location not designated within this report or arranged per above is not permitted. An indicative markup of the key tyre (and associated products) storage location is provided in figure below.

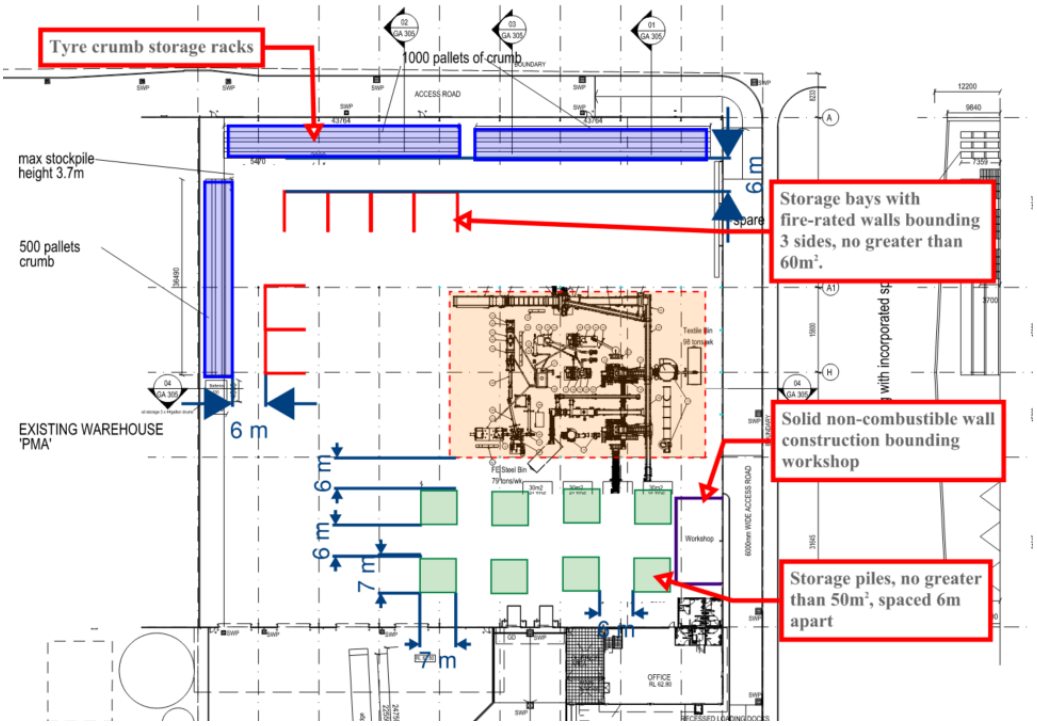


Figure 33: Indicative key rubber storage arrangement (subject to variation within restrictions)

10. Conclusion

Aside from the existing fire prevention and fire protection measures on site, additional fire risk reduction measures are recommended to further minimize the risk of fire at the facility as summarised in Section 9.

Amongst other requirements outlined in Section 9, the following key requirements are to be noted:

Primary Pre-processed Tyre Stockpile

- The total tyre storage stockpile area of each pen are to be no greater than 60m^2
- The total storage stockpile height of each pen are to be no greater than 3.7m
- The storage pen are to be bound by construction achieving an FRL of 120 minutes on three sides.
- The construction is to extend 1m above the stockpile height and at least 2m beyond the outermost stockpile edge.
  - This is dependent on the preferred nominated stockpile limits.
- Construction and management of the pens is to be in accordance with Clause 8.2 of FRNSW Fire Safety Guideline – Fire Safety in Waste Facilities

Tyre crumb storage racking

- an ESFR sprinkler system per AS2118.1-1999 is provided to serve the building throughout. It is recognised that this system is considered to be an enhanced system over a typical AS2118.1 sprinkler system used in general warehouses. The racking (and associated storage) is installed so that it complies with the restrictions/ limitations of the ESFR system.
- thermal cameras will be (if not already) used to provide constant monitoring of the racking areas and will notify staff members in the event that a 'hot spot' is identified.
- The racking is to be provided with a minimum 6m of unobstructed access on the accessible side to facilitate the use of machinery with ease. This will also provide spatial separation from the pre-processed tyre stockpiles mentioned above.

Tyre Derived Fuel Storage (TDF) or WIP Stock (Granules)

- TDF pile or granule bags to be grouped such that each 'group' does not have an area of over 50m^2 to be arranged in 7m x 7m piles with a height no greater than 3.7m.
- Groups of TDF piles or granule bags are to be spatially separated from each other by a minimum distance of 6m.
- However, the TDF or granule storage need not be located more than 2.5m of the loadbearing columns provided that the loadbearing columns are provided with an FRL of 120 minutes.
- If the TDF or granule storage is located within 6m of the workshop, the external wall of the workshop is to be bound by fully non-combustible and enclosed walls (i.e. no meshing permitted). In addition, the workshop may not be used for storage of goods other than minor tools.

Based on the evaluation above, with the existing fire safety (prevention and protection) measures on site and the recommendations noted in the abovementioned sections, the fire risk in relation to fire hazards within the facility is expected to be reduced to as low as reasonably practicable.

The maximum storage capacity will be conditional on the requirements and restrictions outlined within this report being met. i.e. the amount of tyre (and associated components) stored may be increased up to the amount where the restrictions can no longer be met, it is expected this is ultimately determined by available floor space within the facility. An indicative markup of the key tyre (and associated products) storage location is provided in Figure 33.

11. References

11.1 Project Documentation

This report is based on the documentation listed below:

Item	Provided by	Date/Revision
Relevant Drawings		
Architectural Drawings 21 Grady Crescent, Erskine Park Project No. TCGRCR-110221-R0 Sheet 1 *Floor Plans*	Ogtec	21/02/21
Relevant Email Correspondences		
Subject: RE: Tyrecycle Erskine Park - Proposed Measures *Subject facility operation information & estimated tyre storage capacity*	Lathen Loibl - Tyrecycle	Tue 2/08/2022 3:33 PM
Subject: RE: Tyrecycle Erskine Park - Proposed Measures *Staff schedule information*	Lathen Loibl - Tyrecycle	Fri 8/07/2022 9:11 AM
Subject: RE: Tyrecycle Erskine Park - Proposed Measures *Subject facility general operation information*	Lathen Loibl - Tyrecycle	Tue 12/07/2022 2:57 PM
Subject: FW: Tyrecycle Erskine Park - Pallet Racking *Info regarding sprinkler operation*	Lathen Loibl - Tyrecycle	Tue 10/05/2022 8:54 AM
Relevant Standards		
AS1940	Standards Australia	2017
AS2118.1	Standards Australia	1999
AS2419.1	Standards Australia	2005
AS2444	Standards Australia	2001
Other Relevant Documentation		
Best Practice Guidelines for Tyre Storage and Fire and Emergency Preparedness	Tyre Stewardship Australia	March 2019
Fire Safety Guideline Fire Safety in Waste Facilities	Fire and Rescue NSW	27/02/2019
Fire Safety Guideline Guideline for Bulk Storage of Tyres	Fire and Rescue NSW	05/12/2014
Tyrecycle Emergency Response Procedure	Tyrecycle	April 2021 V3.1
Fire Engineering Report (Base Build) Report No. 2320004-RPT02-1	Exova WarringtonFire	30/10/2013 Issue 1

11.2 Information References

[1] FRNSW, Guideline for bulk storage of rubber tyres - Version 03, Sydney, 2014.

[2] FRNSW, Fire Safety Guideline - Fire Safety in Waste Facilities, 2020.

[3] "P2RIC," [Online]. Available: http://infohouse.p2ric.org/ref/11/10504/html/intro/tire.htm.

[4] E. &. R. Russ, The Composition of a Tyre – Typical components, The waste & resources action programme, 2006.

[5] Tyre Stewardship Australia, Tyre Product Stewardship Scheme Guidelines, 2012.

[6] Cal Recycle, [Online]. Available: http://www.calrecycle.ca.gov/tires/enforcement/inspections/NumberTires.htm .

[7] Health and Safety Executive UK, "Spontaneous heating of piled tyre shred and rubber crumb - Briefing note," [Online]. Available: https://www.hse.gov.uk/rubber/spontaneous.htm. [Accessed 2022].

[8] EPA Victoria, Management and storage of combustible recyclable and waste materials - guideline - Publication 1667.3, 2021.

[9] Home Office/ The Scottish Office, Fire safety for tyre sites, 1995.

[10] Office of the State Fire Marshal, Rings of Fire Revisited Tire Fire Prevention and Suppression, State of California, Undated.

[11] FEMA, Scrap and shredded tire fires, USFA-TR-093, 1998.

[12] Society of Fire Protection Engineers, SFPE Handbook of Fire Protection Engineering, Fourth Edition, Quincy, Massachusetts: NFPA, 2008.

[13] Integrated Waste Management Board, Assessment of markets for fiber and steel produced from recycling waste tires, California, 2004.

Appendix A

Calculations

A.1 Tyre Ignition Calculations

Time to ignition was estimated using literature values for CHF and TRP based on:

$$\sqrt{\frac{1}{t_{ig}}} = \frac{(\dot{q}''_e - \mathrm{CHF})}{\mathrm{TRP}}$$

t_{ig} Time to ignition [s]

CHF Critical Heat Flux, from experimental data source:
SFPE Handbook Table 3-4.2, values as outlined in assumptions

TRP Thermal Response Parameter, from experimental data source:
SFPE Handbook Table 3-4.2, values as outlined in assumptions

q_e" Incident heat flux [kW/m²] as calculated in the following section

The critical heat flux (CHF) is the minimum heat flux at or below which a material cannot generate the combustible mixture. The thermal response parameter (TRP) is the resistance of a material to generate a combustible mixture. The higher the CHF and TRP values, the longer it takes for the material to heat up, ignite, and initiate a fire, and thus the lower the fire propagation rate. [12]

A primary component in tyres is synthetic rubber which is usually styrene butadiene rubber (SBR), [13] states 60% of a tyre is synthetic.

As such the properties of SBR are the basis of the consequence analysis.

SFPE Handbook Table 3-4.2 [12]provides Critical Heat Flux (CHF) and Thermal Response Parameters (TRP) for both the synthetic material: Styrene-Butadiene Rubber (SBR), as well as SBR Conveyor Belts. The composite nature of conveyor belts is similar to tyres (i.e. contains steel, fabric, fillers etc.).

Therefore, where fire hazard properties are available to SBR conveyor belts these will be used in preference over ‘pure’ SBR properties.

Using the CHF and TRP parameters the required received heat flux has been calculated to cause ignition at 5 minutes and 10 minutes.

Time to ignition	SFPE Handbook 4th ed						
$\sqrt{\frac{1}{t_{ig}}} = \frac{(\dot{q}''_e - \mathrm{CHF})}{\mathrm{TRP}}$							
t_{ig}	Time to ignition [s]						
CHF	Critical Heat Flux, from experimental data source: SFPE Handbook Table 3-4.2, values as outlined in assumptions						
TRP	Thermal Response Parameter, from experimental data source: SFPE Handbook Table 3-4.2, values as outlined in assumptions						
q_e"	Incident heat flux [kW/m²]						
Reference							
SFPE Handbook 4th ed							

Table 3 -4.2	SBR Conveyor belts		SBR (material only)	
CHF	10 - 15	kW/m²	10 - 15	kW/m²
TRP	336 - 429	kW.s$^{1/2}$/m²	198	kW.s$^{1/2}$/m²

	SBR Conveyor belts					SBR (ordinary polymer)	
t_{ig} 5 min	300	300	300	300		300	300
t_{ig} 10 min	600	600	600	600		600	600
CHF	10	10	15	15		10	15
TRP	336	429	336	429		198	198
q_e" 5 min	**29.4**	**34.8**	**34.4**	**39.8**		**21.4**	**26.4**
q_e" 10 min	**23.7**	**27.5**	**28.7**	**32.5**		**18.1**	**23.1**

Worst case parameters

Figure 34: Calculated incident heat flux required to have an SBR material ignited in 5 and 10 mins

The ignition times assume the heat flux is received from time zero to the ignition time of interest (5 minutes of 10 minutes). i.e., 29.4 kW/m² is the incident heat flux for the whole time. In a real fire event, the received heat flux would gradually increase as the remote fire event grows, the heat flux will also vary with time, with the flame front likely move across the tyre pile and the fire progresses through the combustion phases.

Using the worst case parameters for SBR conveyors, the ignition time has been calculated for various incident heat fluxes.

	Received/ Incident Heat Flux [kW/m²]							
Worst case parameter	**11**	**12**	**15**	**20**	**25**	**30**	**35**	**40**
CHF	10	10	10	10	10	10	10	10
TRP	336	336	336	336	336	336	336	336
Time to ignition [s]	112896	28224	4516	1129	502	282	181	125
[min]	1882	470	75	19	8	5	3	2
[hrs]	31.4	7.8	1.3					

Figure 35: Calculated ignition time based on a range of received/incident heat flux

Based on the figure above, tyres could be exposed to an incident heat flux of 10 kW/m² for over a day (31 hours) before ignition. It can also be exposed to an incident heat flux of 20 kW/m² for 19 minutes before ignition.

Appendix B

Fire Incidents

B.1 Major Fire Incidents

Table 5:Australian and International major tyre fire events:

Fire location	Pile size	Fire duration	Ignition Source	Sources of info
Brisbane, QLD, AUS 19/03/2021	-	-	Suspicious	ABC Media release
Perth, WA, AUS 04/12/2020	-	12 hours	Unknown	9NEWS Media release
Brisbane, QLD, AUS 2/4/2016	-	2 days	-	QFRS Media release
Tottenham, VIC, AUS 13/02/2016	10 m x 25 m x 2 m	6 hrs	-	EPA Vic website MFB Media Release
Broadmeadows, VIC, AUS. 16/01/2016	100 m x 30 m x 4 m	23 hours	Electrical fault in nearby Machinery	MFB news releases Jan 11 2016
Moyston Jan 2015	30,000 tyres	-	Bush Fire	EPA Victoria news report
Numurkah, VIC, AUS, 2/05/2013	50 m x 50 m area	4 hrs	Suspicious	CFA news and media website
Villawood, NSW, AUS 01/01/2013	50 m x 30 m factory	1.5 days	Grass fire	Fire & Rescue News: May 2013
Longford, TAS, AUS 15-17/02/2012	~12,000 tyres 65 m x 55 m	2.5 days	-	EPA Tas report
Essex, UK March 2015	50 m x 20 m x 2 m	2 days	-	Essex County Fire & Rescue Incident report, March 2015
North Yorkshire, UK January 2014	15,000 tonnes of tyres	2 weeks	Suspicious	BBC news report, January 2014
Fforestfach Swansea, Wales 2011	5,000 tons of shredded tyres	3 weeks	-	BBC news report, July 2011
Lockport, New York, USA Jan 27, 2012		22 hrs	Live industrial power line fell on the tyres and short circuited	Lockport Journal Report Jan 29 2012
Tulsa, Oklahoma, USA July 2013	'several stories tall'	24 hrs	Lightning strike	News 9 Report July 2013
Devon Meadows, VIC 1999	30,000 tyres	Several hours	-	Aap news report 1999
Washington, USA February 1997	1.7 million tyres 50 ft high piles with no separation	14 days	Arson	US Fire Administration/Technical Report Series

Fire location	Pile size	Fire duration	Ignition Source	Sources of info
Arizona, USA August 1997	26 piles each 150 ft x 60 ft x 35 ft	7 days	Suspicious	Special Report: Scrap and Shredded Tire Fires December 1998
Maryland, USA March 1997	4,800 whole tyres (plus 800 tyre planters)	12hrs	Tyres stored too close to combustibles	
New York, April 1995	7 piles 30 feet high (2 million tyres)	9 days		

Appendix C

Tyrecycle Documents

C.1 Tyrecycle Incident Record

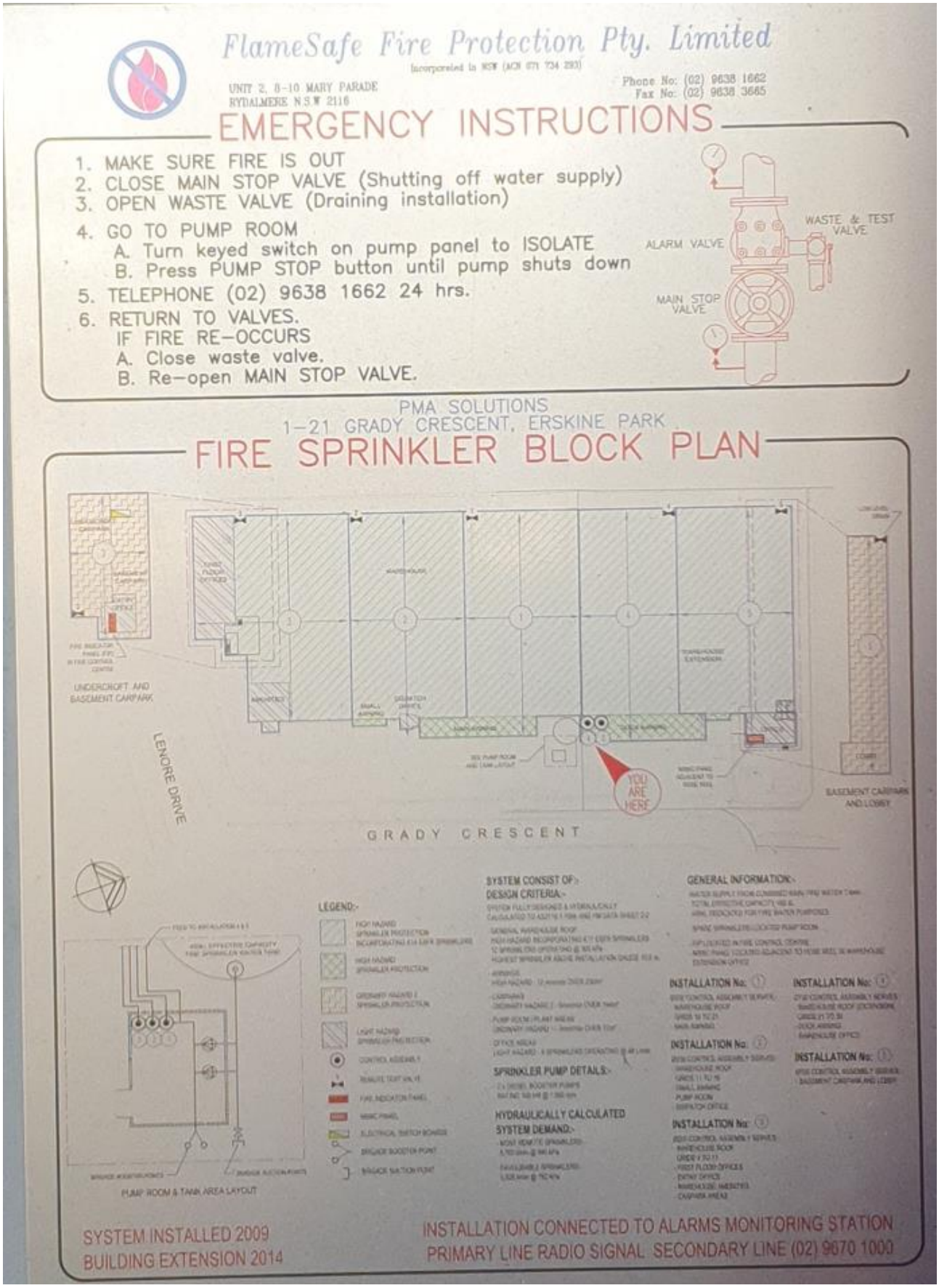
Incidents From: 01/03/2021 *To:* 08/08/2022
Business Unit: All
Department: All
Location/Project: All
Area: All
Outcome: All
Injury Type: All
Injured Person: All
Company Equipment/Property: All
Investigation Status: All
Entered By: All

Business Unit	ID	Internal Reference ID	Description
Erskine Park	4759	02/08/22	Senior Supervisor was conducting routine plant walkthrough, when he had noticed a small flame coming from MPR - Spark Detection automatically activated, extinguishing small fire.
Erskine Park	4745	28/07/22	@ approx. 6:30pm An afternoon shift operator , manning the steel bin noticed flames coming from the Rasper work platform.
Erskine Park	4616	26/05/22	All In One Recycling Driver - Benny Hunjan was reversing truck into whole tyre stockpile to deliver tyres when he has collected the main hydrant along the column and the protective barriers.
Erskine Park	4620	25/05/22	Operator approached State Operations Manager to report that he is feeling a pulling pain on his left, back thigh before he left after completing his shift. Following day when he reported back to work, he was accompanied to the company doctor for consultation. No bruising observed by attending physician, but he was scheduled for a scan (27/5) since the employee has a history of the same symptoms on the same part of the his body. He also consulted our company doctor way back January of this year. He is currently on light duty until final assessment will be done on 30/5 to include the result of the scan. Further update will be given.
Erskine Park	4535	22/04/22	Maintenance employee was changing the spike in the cracker mill silo when he jerked his knee.
Erskine Park	4514	14/04/22	Contractor labourer was swapping bins out when he felt a small twinge in left arm
Erskine Park	4418	09/03/22	Driver went to lift the tailgate not realising how close it was to the door. As it rose up, it damaged the front door leaving a hole in it.
Erskine Park	4361	08/02/22	Employee was reversing comapny vechicle when he struck the concrete barrier, causing minimal damage to the front guard of the car
Erskine Park	4357	02/02/22	ACFS Front Mover hit the Side rail of the weight bridge on his way in to be weighted. Rego: BF63RC
Erskine Park	4358	11/01/22	Operator was reversing the Front end loader when he clipped the brace of the Rack. Base on the Operator's statement it was a miscalculation on his part.
Erskine Park	4306	16/12/21	Employee was picking up a tyre when right foot slip a bit and suddenly felt severe pain on the back of his left thigh. Ice pack was applied on the affected body part. Employee brought to the company Doctor for further assessment. Employee good to work following day on duties he can tolerate.
Erskine Park	4277	13/12/21	Operator was sweeping floor in Parts racking area when he felt faint. He has then walked out of the plant, via the rear fire exit door. After this, he has then passed out for an unknow period.
Erskine Park	4279	08/10/21	Maintenance Supervisor has tested Positive to Covid 19
Erskine Park	4144	06/10/21	Swift container truck entered EP site - Driver was instructed to go over weighbridge for weights. Driver has reversed to line up ramps, he has then tried to go up the ramp on an angle, causing the prime mover to drive off the bridge itself.
Erskine Park	4136	09/02/22	Operator was driving forklift with an empty bulk bag attached when he struck one of the center columns

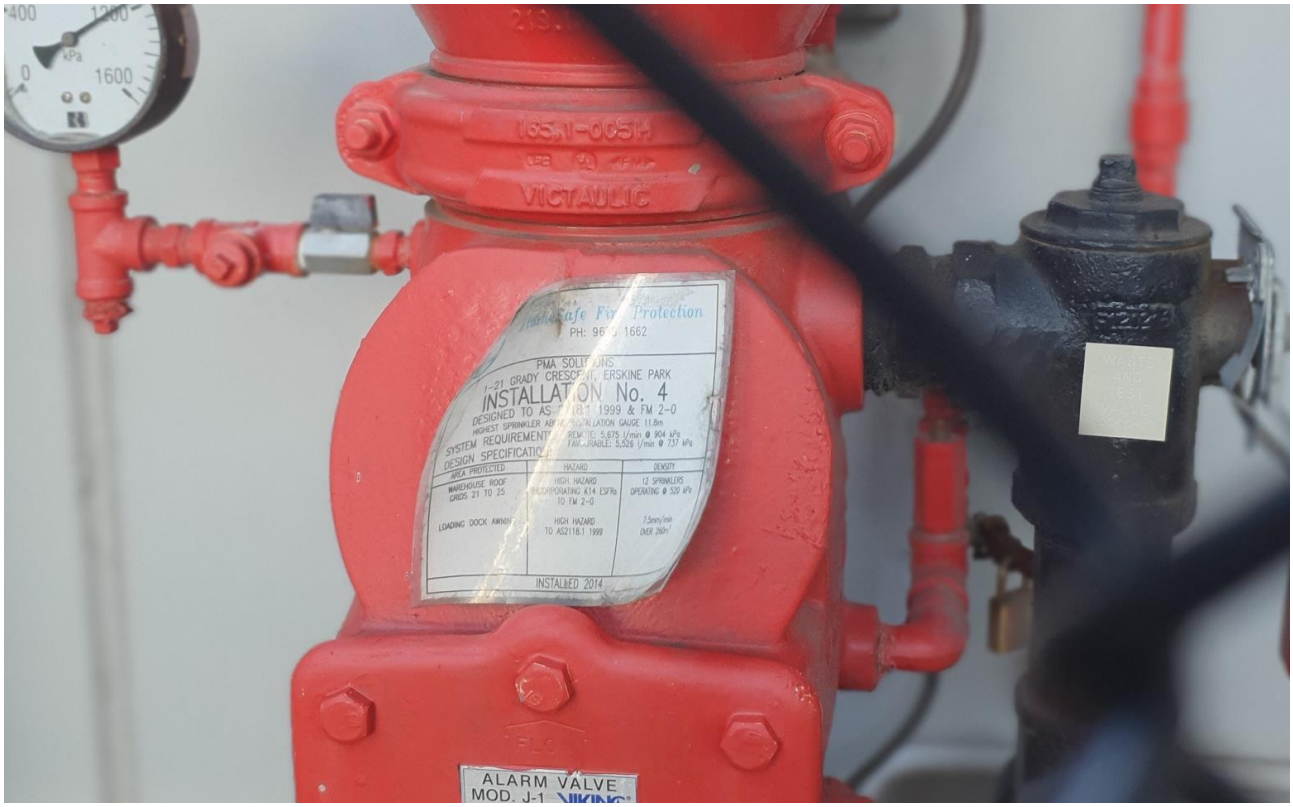
Appendix D

Additional Services Information

D.1 Site Photo of Fire Sprinkler Block Plans



D.2 Site Photo of Sprinkler Valve



Appendix E

Threat Barrier Diagrams

E.1 Bowtie Diagrams

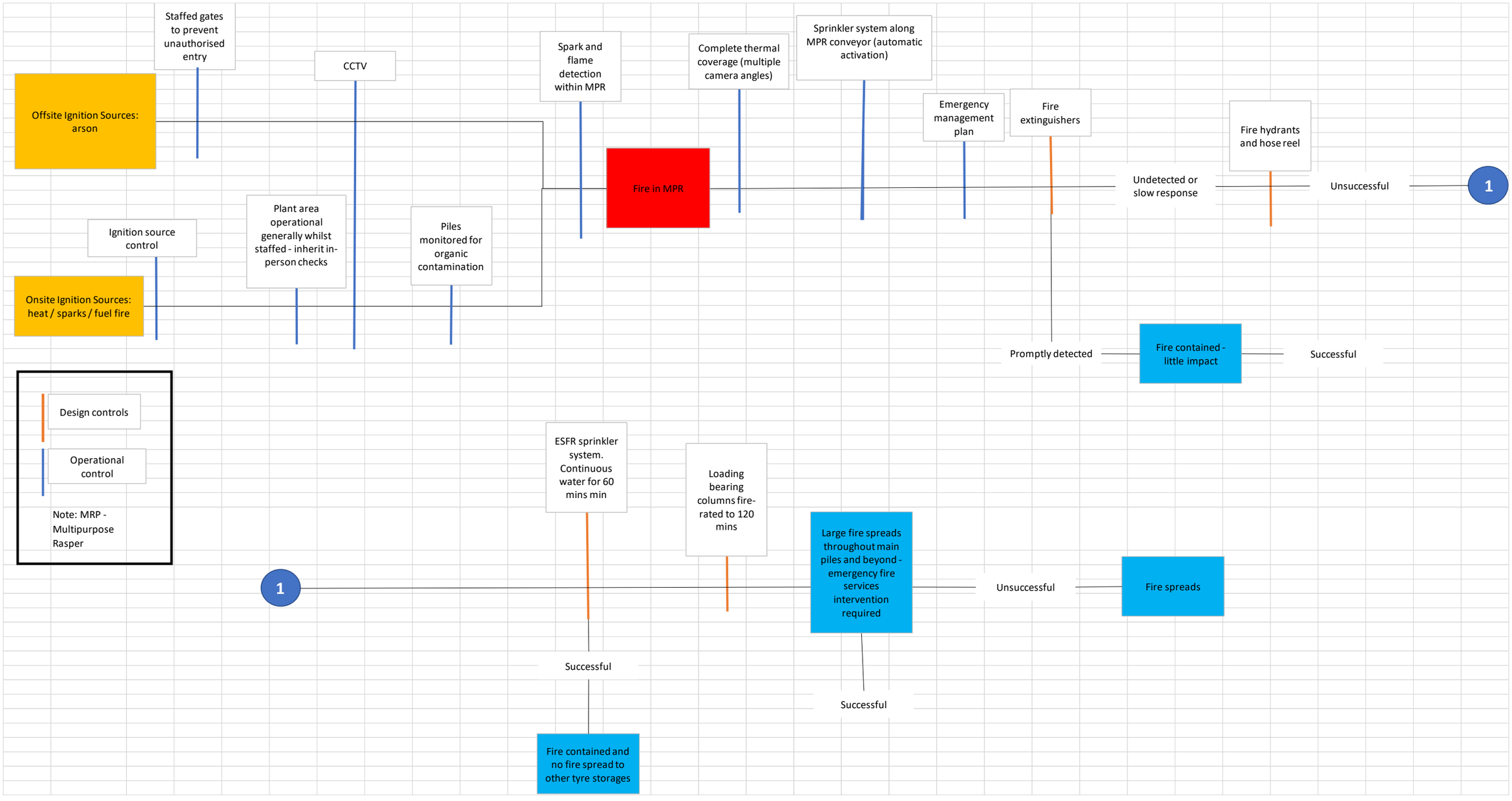


Figure 36: Bowtie Diagram – Fire in MPR

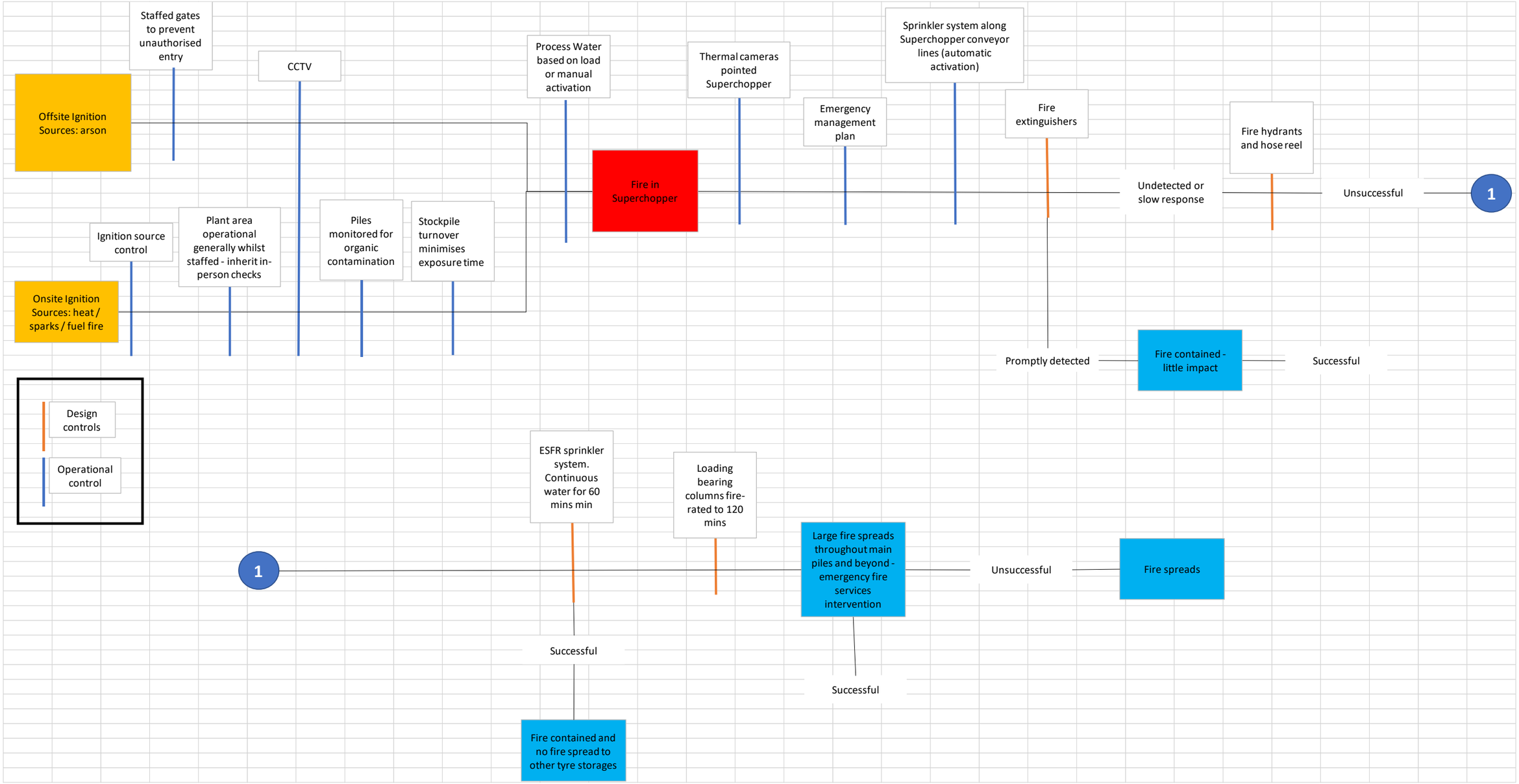


Figure 37: Bowtie Diagram – Fire in Superchopper

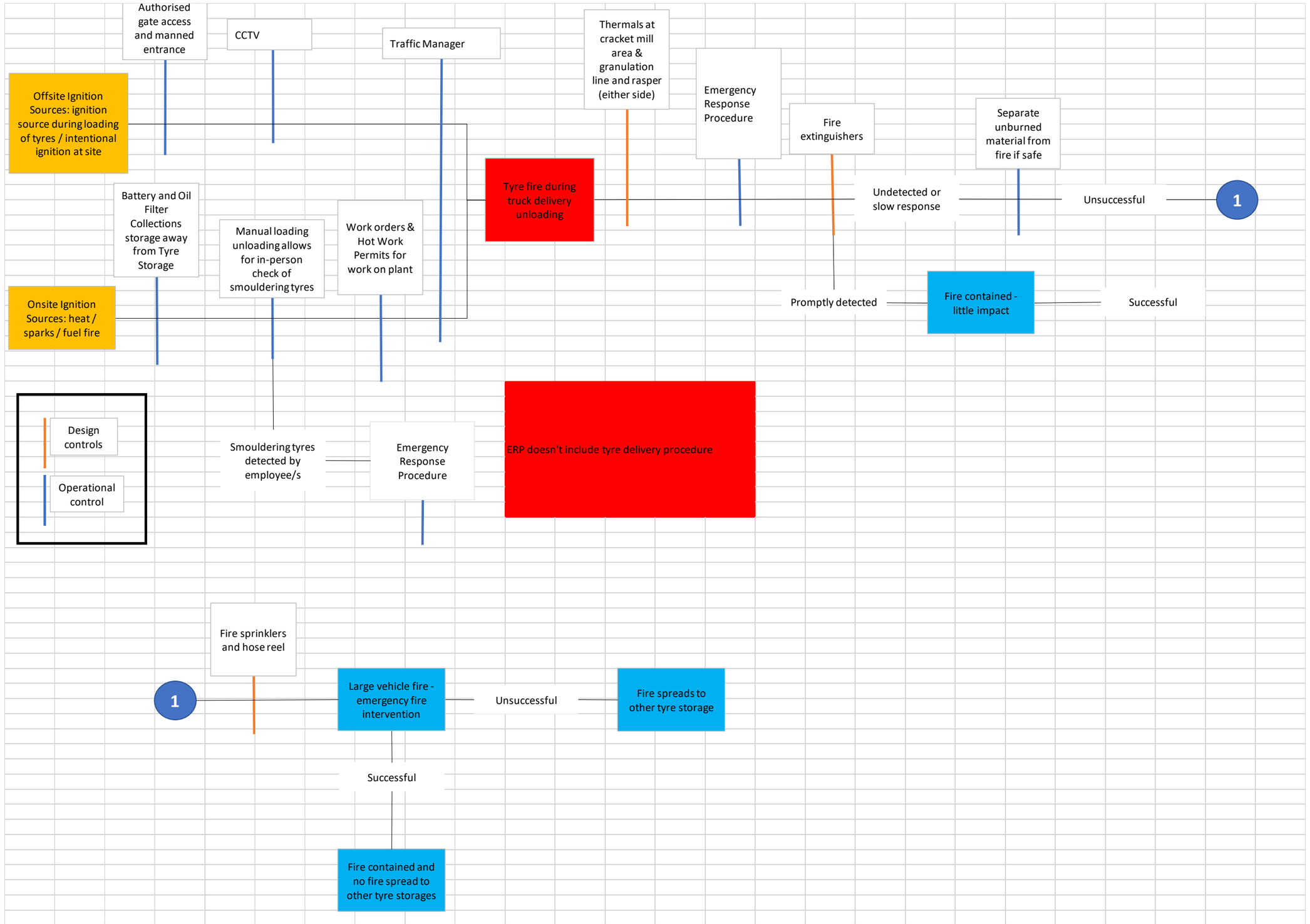


Figure 38: Bowtie Diagram – Tyre fire during Truck Delivery

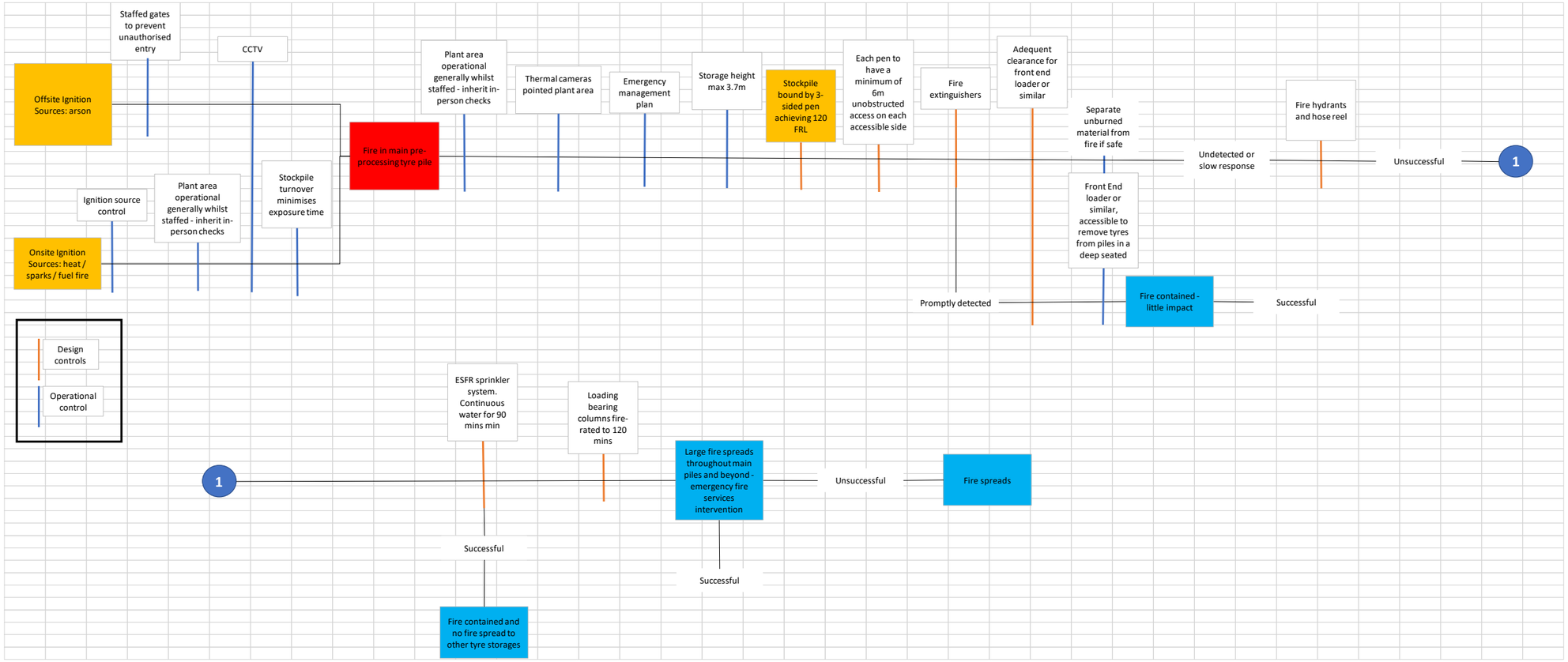


Figure 39: Bowtie Diagram – Fire in main tyre stockpile

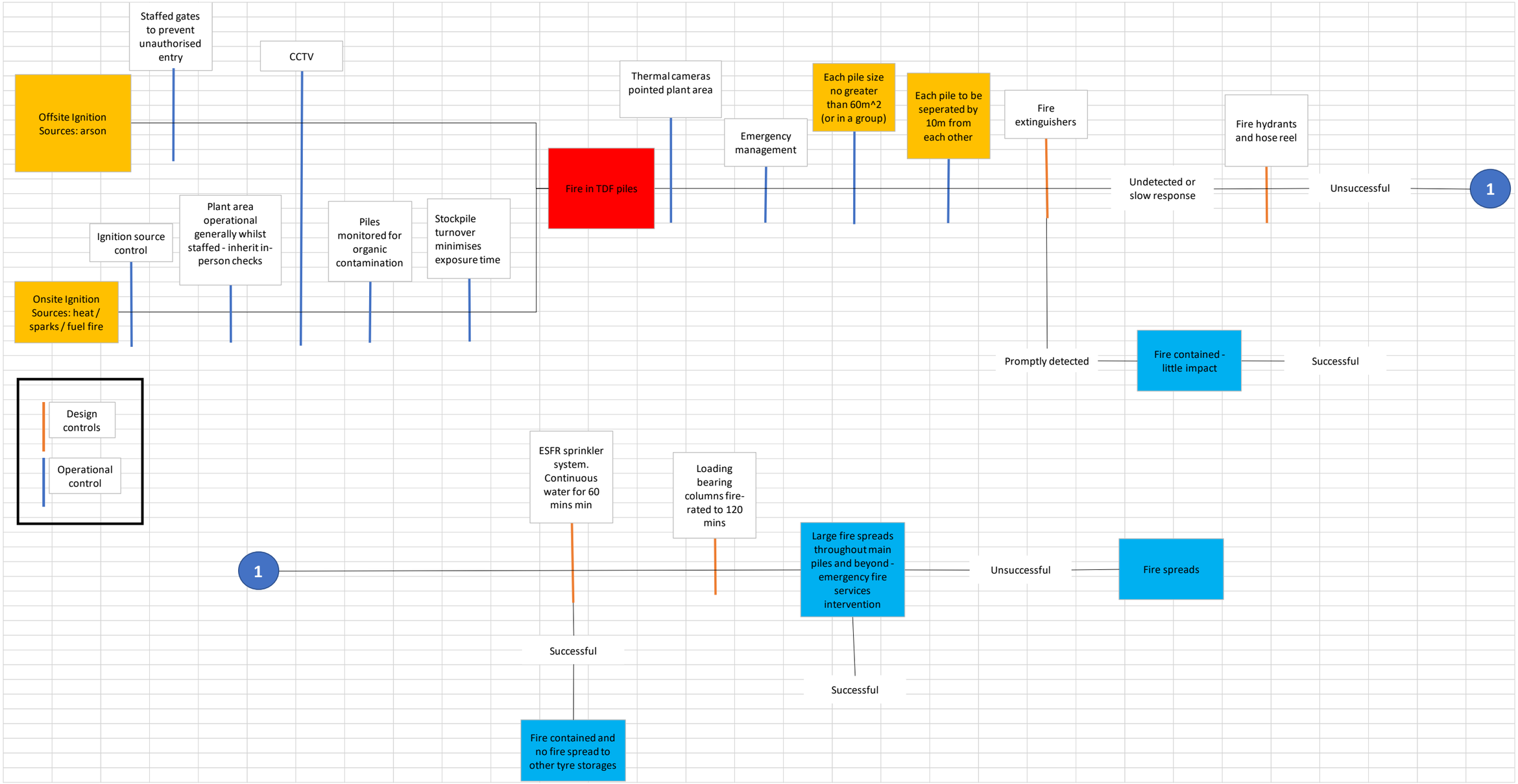


Figure 40: Bowtie Diagram – Tyre fire in TDF Piles

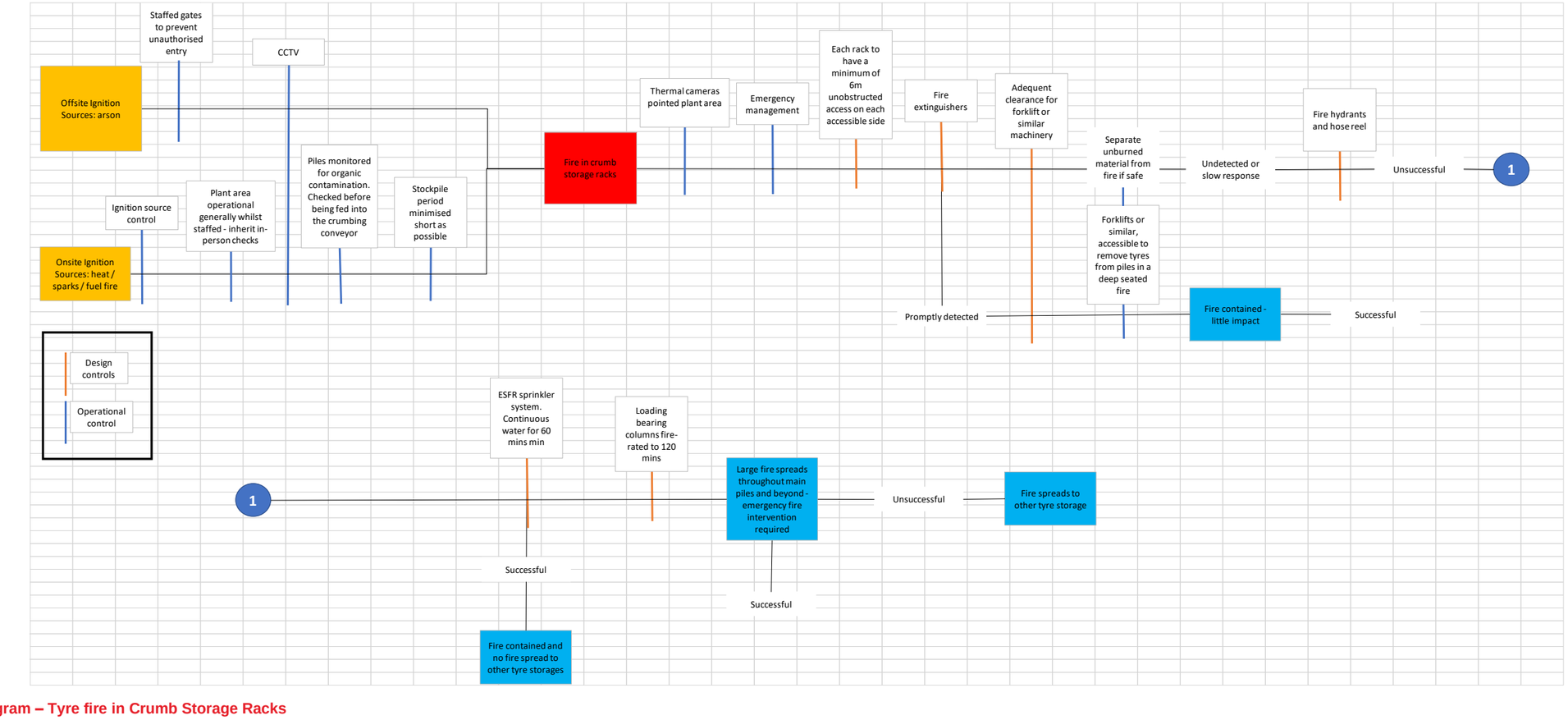


Figure 41: Bowtie Diagram – Tyre fire in Crumb Storage Racks

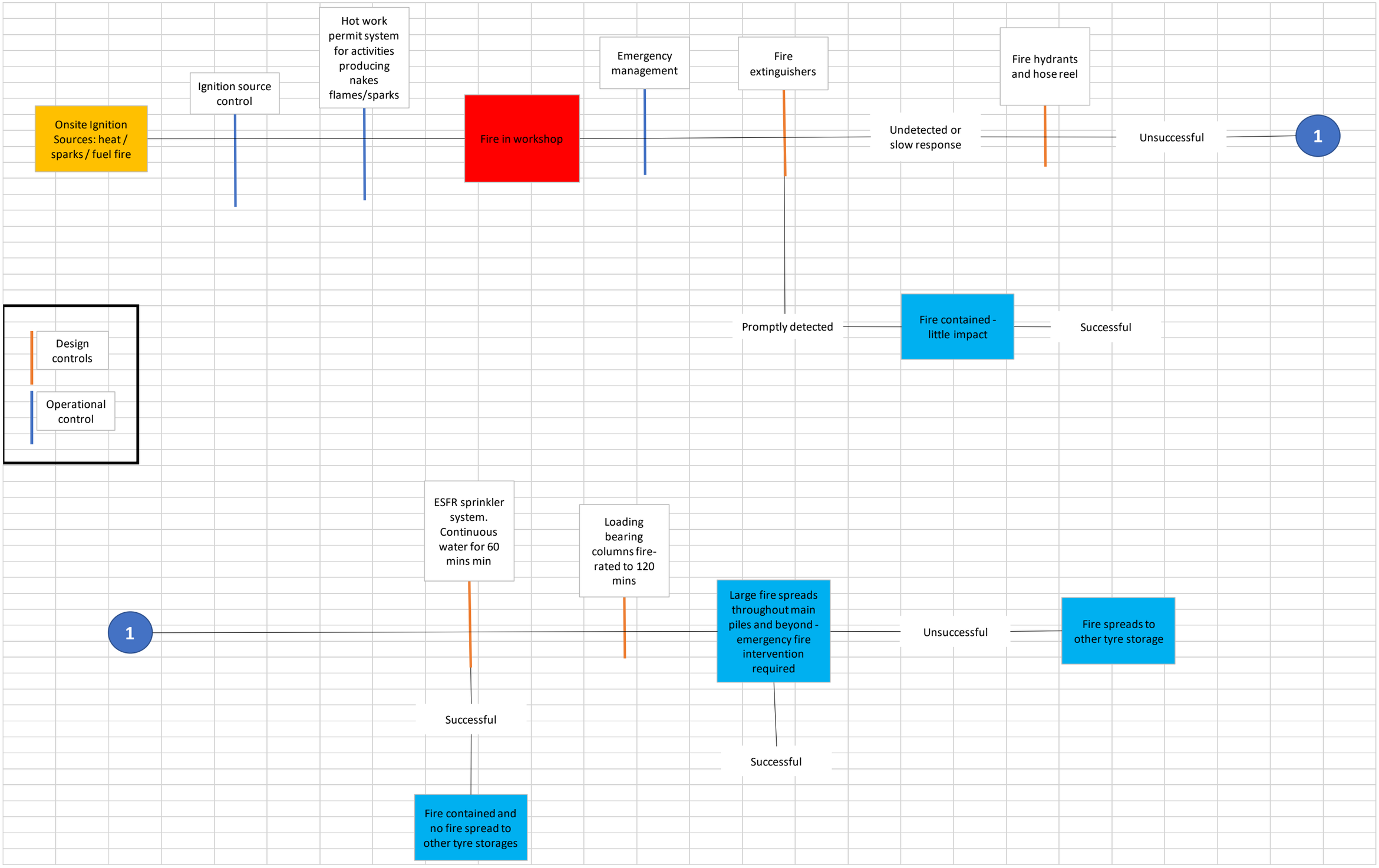


Figure 42: Bowtie Diagram – Workshop Fire

Appendix F

EPA Licence

F.1 Current Tyrecycle EPA Licence 21464

Environment Protection Licence

Licence - 21464

Licence Details	
Number:	21464
Anniversary Date:	19-May

Licensee

TYRECYCLE PTY LTD

1-21 GRADY CRESCENT

ERSKINE PARK NSW 2759

Premises

TYRECYCLE

1-21 GRADY CRESCENT

ERSKINE PARK NSW 2759

Scheduled Activity

Resource recovery

Waste processing (non-thermal treatment)

Waste storage

Fee Based Activity	Scale
Non-thermal treatment of waste tyres	Any annual processing capacity
Recovery of waste tyres	Any waste tyres recovered
Waste storage - waste tyres	> Any tyres stored

Contact Us

NSW EPA

4 Parramatta Square

12 Darcy Street

PARRAMATTA NSW 2150

Phone: 131 555

Email: info@epa.nsw.gov.au

Locked Bag 5022

PARRAMATTA NSW 2124

Environment Protection Licence

Licence - 21464

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Environment Protection Licence

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Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

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The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

TYRECYCLE PTY LTD
1-21 GRADY CRESCENT
ERSKINE PARK NSW 2759

subject to the conditions which follow.

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1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Waste processing (non-thermal treatment)	Non-thermal treatment of waste tyres	Any annual processing capacity
Resource recovery	Recovery of waste tyres	Any waste tyres recovered
Waste storage	Waste storage - waste tyres	> tyres stored

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
TYRECYCLE
1-21 GRADY CRESCENT
ERSKINE PARK
NSW 2759
PART LOT 4 DP 1253870

A2.2 The premises location is shown on the map below.

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Note: Premises boundary is within the red border of the aerial map in Condition A2.2

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

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EPA identification no.	Type of monitoring point	Location description
1	Noise monitoring	22 Regulus Street, Erskine Park NSW 2759
2	Noise monitoring	28 Shaulua Crescent, Erskine Park
3	Noise monitoring	116 Weaver Street, Erskine Park

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Waste

L2.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
J120	Waste oil/hydrocarbons mixtures/emulsions in water	As defined in Schedule 1 of the POEO Act as in force from time to time	Waste storage	A maximum of 60 tonnes of waste lead acid batteries and/or waste oil is permitted to be stored at the premises at any time.
NA	Waste tyres	As defined in Schedule 1 of the POEO Act as in force from time to time	Waste processing (non-thermal treatment) Waste storage	A maximum of 29,000 tonnes to be received at the premises in a 12 month period.
D220	Lead acid batteries	As defined in Schedule 1 of the POEO Act as in force from time to time	Waste storage	A maximum of 60 tonnes of waste lead acid batteries and/or waste oil is permitted to be

	stored at the premises at any time.

L2.2 The authorised amount of waste permitted on the Premises cannot exceed 970 tonnes at any one time.

L2.3 A maximum of 29,000 tonnes of waste tyres is permitted to be received at the premises in a 12 month period.

L2.4 A maximum of 60 tonnes of waste lead acid batteries and/or waste oil is permitted to be stored at the premises at any time.

L2.5 All waste processing and waste storage activities must be undertaken within the enclosed building at the Premises, as outlined in Condition A2.2. No waste is to be stored and/or processed in the outside areas of the Premises.

L3 Noise limits

L3.1 Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 1,2,3

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	Day-LAeq (15 minute)	Yearly	42
Evening	Evening-LAeq (15 minute)	Yearly	42
Evening	Night-LAeq (15 minute)	Yearly	42
Night	LAFmax	Yearly	56

L3.2 For the purpose of condition L3.1:
a) Day means the period from 7 am to 6 pm Monday to Saturday and the period from 8 am to 6 pm Sunday and public holidays.
b) Evening means the period from 6 pm to 10 pm
c) Night means the period from 10 pm to 7 am Monday to Saturday and the period from 10 pm to 8 am Sunday and public holidays

L3.3 Noise-enhancing meteorological conditions
a) Unless referred to in condition L3.3 (b), the noise limits that apply are the noise limits in condition L3.1 plus 5 dB.
b) The noise limits set out in condition L3.1 apply under the following meteorological conditions:

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Assessment period	Meteorological Conditions
Day	Stability Categories A, B, C and D with wind speeds up to and including 3 m/s at 10 m above ground level
Evening	Stability Categories A, B, C and D with wind speeds up to and including 3 m/s at 10 m above ground level
Night	Stability Categories A, B, C and D with wind speeds up to and including 3 m/s at 10 m above ground level; or Stability category E and F with wind speeds up to and including 2 m/s at 10 m above ground level

L3.4 For the purposes of condition L3.3:
a) the meteorological conditions are to be determined from meteorological data obtained from the meteorological weather station identified as Bureau of Meteorology AWS at Horsley Park
b) Stability category shall be determined using the following method from Fact Sheet of the Noise Policy for Industry (NSW, EPA, 2017) - Use of sigma-theta data (section D1.4)

L3.5 To assess compliance:
a) with the LAeq (15 minute) or the LAFmax noise limits in condition L3.1 and L3.3, the noise measurement equipment must be located:

(i) approximately on the property boundary, where any residence is situated 30 metres or less from the property boundary closest to premises; or where applicable,
(ii) in an area within 30 metres of a residence façade, but not closer than 3 metres where any residence on the property is situated more than 30 metres from the property boundary closest to the premises; or , where applicable,
(iii) in an area within 50 metres of the boundary of a National Park or Nature Reserve,
(iv) at any other location identified in condition L3.1

b) with the LAeq (15 minute) or the LAFmax noise limits in condition L3.1 and L3.3, the noise measurement equipment must be located:

(i) at the reasonably most affected point at a location where there is no residence at the location; or,
(ii) at the reasonably most affected point within an area at a location prescribed by condition L3.5 (a).

L3.6 A non-compliance of conditions L3.1 and L3.3 will still occur where noise generated from the premises is measured in excess of the noise limit at a point other than the reasonably most affected point at the locations referred to in condition L3.5 (a) or L3.5 (b).

Note: For conditions L3.5 and L3.6: the reasonably most affected point is a point at a location or within an area at a location experiencing or expected to experience the highest sound pressure level from the premises.

L3.7 For the purpose of determining the noise generated from the premises, the modifying factor corrections in Table C1 in Fact Sheet C of the Noise Policy for Industry (NSW EPA, 2017) may be applied, if appropriate, to the noise measurements by the noise monitoring equipment.

L3.8 Noise measurements must not be undertaken where rain or wind speed at microphone level will affect the acquisition of valid measurements.

Note: Additions to Definition of Terms of the Licence

• Noise Policy for Industry - the document entitled *"Noise Policy for Industry"* published by the NSW Environment Protection Authority in October 2017.

- Noise - 'sound pressure levels' for the purposes of conditions L3.1 to L3.8:

1. LAeq (15 minute) - the value of the A-weighted sound pressure level of a continuous steady sound that, over a 15 minute time interval, has the same mean square sound pressure level as a sound under consideration with a level that varies with time (Australian Standard AS 1055:2018 Acoustics: description and measurement of environmental noise).
2. LAFmax - the maximum sound pressure level of an event measured with a sound level meter satisfying Australian Standard AS IEC 61672.1-2013 Electroacoustics - Sound level meters - Part 1: Specifications set to 'A' frequency weighting and fast time weighting.

L4 Hours of operation

L4.1 All construction works at the premises must be conducted between 7 am and 6 pm Monday to Friday and between 8 am and 1 pm Saturdays and at no time on Sundays and Public Holidays.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 All operations and activities occurring at the premises must be carried out in a manner that prevents and minimises the emission of air pollutants from the premises.

O3.2 The premises must be maintained in a manner that prevents and minimises the emission of air pollutants.

O3.3 Trucks entering and leaving the premises that are carrying loads must have their loads covered at all times, except during loading and unloading.

O4 Idling

O4.1 Idling of trucks must be minimised where possible.

O4.2 Vehicle and plant engines must be switched off when not in use.

O5 Emergency response

O5.1 The licensee must prepare, maintain and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises. The licensee must keep the incident response plan on the premises at all times. The incident response plant must document systems and procedures to deal with all types of incidents (e.g spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment. The licensee must develop their PIRMP in accordance with the requirements of Part 5.7A of the *Protection of the Environment Operations Act 1997* and the Protection of the Environment Operations (General) Regulation 2009.

O6 Processes and management

O6.1 Any waste for processing, storage or resource recovery at the premises must be assessed and classified in accordance with the EPA Waste Classification Guidelines as in force from time to time.

O6.2 There must be no burning or incineration of waste at the premises.

O6.3 Tyre processing must not involve heat (thermal) or chemical processing.

O6.4 All processing, including shredding and granulating, and stockpiling of tyres must occur within the enclosed building.

O7 Waste management

O7.1 All Waste tyres stockpiled at the premises must be stored in accordance with the current version of the NSW Fire & Rescue *NSW Fire safety guideline: Fire management in waste facilities 2020* and NSW Fire & Rescue *Guidelines for Bulk Storage of Rubber Tyres 2014*.

O7.2 All Waste tyres (including whole tyres, shredded or crumbed tyred and tyre pieces) must be contained within the tyre and tyre crumb piles in the enclosed facility.

O7.3 The maximum height of any processed or unprocessed waste tyres stored at the Premises cannot exceed 3.7 metres in height above ground level.

O7.4 Waste oil must be stored in a covered and bunded area and regularly removed to a waste oil recycle operation.

O7.5 All vehicles that enter or leave the Premises for the purpose relating to the operation of the Premises must be weighed at the Premises' weighbridge on entering and leaving the Premises.

O8 Other operating conditions

O8.1 The licensee must ensure that no material, including rubber pieces, sediment or oil, is tracked from the premises.

O8.2 All plant and equipment must be maintained in accordance with manufacturer requirements to minimise malfunction that could result in abnormal air quality emissions.

O8.3 All stormwater systems and stormwater treatment devices (including drainage systems, sumps and traps) must be regularly maintained.

Noise

O8.4 Noise management and mitigation measures detailed in the planning application's noise assessment (*Statement of Environmental Effects*, prepared for Tyrecycle Pty Ltd, dated 16 September 2020, Element Environment Pty Ltd) must be implemented at the premises. These measures must include the following:
a. Keep roller doors closed where possible,
b. truck engines to be switched off when not in use for extended periods; and
c. complaints should be logged and investigated.

Tyre management

O8.5 All tyre processing activities must occur within an enclosed building, in accordance with Condition A2.2.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

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M2 Weather monitoring

M2.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

POINT 1,2,3

Parameter	Sampling method	Units of measure	Averaging period	Frequency
Temperature at 2 metres	AM-4	Celsius	1 hour	Continuous
Wind Direction at 10 metres	AM-2 & AM-4	Degrees	15 minutes	Continuous
Wind Speed	AM-2 & AM-4	metres per second	15 minutes	Continuous
Sigma Theta	AM-2 & AM-4	Degrees	15 minutes	Continuous
Rainfall	AM-4	millimetres	15 minutes	Continuous
Relative humidity	AM-4	percent humidity	1 hour	Continuous

M3 Recording of pollution complaints

M3.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M3.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M3.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M3.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M4 Telephone complaints line

M4.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M4.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M4.3 The preceding two conditions do not apply until 3 months after the date of the issue of this licence.

M5 Other monitoring and recording conditions

M5.1 Attended noise monitoring must be undertaken in accordance with condition L3.5 and must:

1. occur annually in a reporting period;
2. occur at each location in condition L3.1;
3. occur during each day, evening and night period as defined in the Noise Policy for Industry for a minimum of:

- 1.5 hours during the day;
- 30 minutes during the evening; and
- 1 hour during the night.

4. occur for three consecutive operating days,

M5.2 A log book or similar record containing evidence of total material tonnage received and stored per annum, is to be kept at the premises and is to be made available for the EPA, upon request.

M6 Noise monitoring

M6.1 To assess compliance with the noise limits specified within this licence, the licensee must undertake operator attended noise monitoring at each specified noise monitoring point in accordance with the table below.

POINT 1,2,3

Assessment period	Minimum frequency in a reporting period	Minimum duration within assessment period	Minimum number of assessment period
Day	Yearly	1.5 hours	3 consecutive operation days

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening

material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

Noise monitoring report

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the annual monitoring. The assessment must be prepared by a competent person and include:

1. an assessment of compliance with noise limits presented in condition L3.1 and L3.3; and
2. an outline of any management actions taken within the monitoring period to address any exceedences of the limits in condition L3.1 and L3.3.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

8 Special Conditions

E1 Financial Assurance

E1.1 A financial assurance in the form of an unconditional and irrevocable and on demand guarantee from a bank, building society or credit union operating in Australia as "Authorised Deposit-taking Institutions" under the *Banking Act* 1959 of the Commonwealth of Australia and supervised by the Australian Prudential Regulatory Authority (APRA) must be provided to the EPA prior to the issuing of the licence.

E1.2 The financial assurance must be favour of the NSW Environment Protection Authority (EPA) in the amount of $100,000. The financial assurance is required to secure or guarantee funding for works or program required by or under this licence. The financial assurance must contain a term that provides that any monies claimed can be paid to the EPA, or at the written direction of the EPA, to any other person. The licensee must provide to the EPA, along with the original counterpart guarantees, confirmation in writing that the financial institution providing the guarantees is subject to supervision by APRA.

E1.3 The financial assurance must be maintained during the operation of the facility and thereafter until such time as the EPA is satisfied the premises is environmentally secure.

E1.4 The EPA may require an increase in the amount of the financial assurance at any time as a result of reassessment of the total likely costs and expenses of rehabilitation of the premises.

E1.5 The EPA may claim on a financial assurance under s303 of the POEO Act if the licensee fails to carry out any work or program required to comply with the conditions of this licence.

E2 Environmental obligations of licensee

E2.1 While the licensee's premises is being used for the purpose to which the licence relates, the licensee must:

1. Clean up any spill, leak or other discharge of any waste(s) or other material(s) as soon as practicable after it becomes known to the licensee or to one of the licensee's employees or agents.
2. In the event(s) that any liquid and non-liquid waste(s) is unlawfully deposited on the premises, such waste(s) must be removed and lawfully disposed of as soon as practicable in accordance with any

direction given by the EPA.
3. Provide all monitoring data as required by the conditions of this licence or as directed by the EPA.

E2.2 In the event of an earthquake, storm, fire, flood or any other event where it is reasonable to suspect that a pollution incident has occurred, is occurring or is likely to occur, the licensee must:

1. Make all efforts to contain all fire water on the premises,
2. Make all efforts to control air pollution from the premises,
3. Make all efforts to contain any discharge, spill or run-off from the premises,
4. Make all efforts to prevent flood water entering the premises,
5. Remediate and rehabilitate any exposed areas of soil and/or waste,
6. Lawfully dispose of all liquid and solid waste(s) stored on the premises that is not already securely disposed of,
7. At the request of the EPA, monitor groundwater beneath the premises and its potential to migrate from the premises,
8. At the request of the EPA, monitor surface water leaving the premises, and
9. Ensure the premises is secure.

E2.3 After the licensee's premises cease to be used for the purpose(s) to which the licence relates or in the event that the licensee ceases to carry out the activity that is the subject of this licence, that licensee must:

1. Remove and lawfully dispose of all liquid and non-liquid waste stored on the licensee's premises, and
2. Rehabilitate the premises, including conducting an assessment of the site and if required remediation of any site contamination.

E3 Air Quality Management Plan

E3.1 An air quality management plan must be developed and implemented prior to the commencement of any dust generating activities associated with the premises.

The air quality management plan must include as a minimum:

1. Risk assessment
2. Proactive and reactive mitigation measures of all significant, and potentially significant, emissions sources
3. Key performance indicators(s)
4. Monitoring method(s)
5. Location, frequency and duration of monitoring
6. Record keeping
7. Response mechanisms and contingency measures
8. Responsibilities and
9. Compliance monitoring

Environment Protection Licence

E4 Post Commissioning Monitoring

E4.1 Within the first six months of operations and during a period of maximum operations, the proponent must undertake a monitoring program to confirm the air emission performance of the discharge points servicing the two cyclone filters. The monitoring required by this condition is contained in Table 1 below. The monitoring must be undertaken at a suitable location selected in accordance with TM-1 contained in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

Pollutant	Unit of Measure	Sampling Frequency	Sampling Method
Solid Particles (total)	Milligrams per cubic metre	Special Frequency 1	TM-15
Volumetric flow rate	Cubic metres per second	Special Frequency 1	TM-2
Velocity	Metres per second	Special Frequency 1	TM-2

Note: Note: Special Frequency 1 means one round of monitoring for the associated pollutant.

For each of the pollutants and parameters outlined in Table 1, the sampling methods are those contained in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

E4.2 Within six weeks of completion of the monitoring program, the licensee must provide the EPA with a report that includes:

1. The analytical results of monitoring undertaken for each discharge point
2. A comparison of the emission rates determined from monitoring with the emissions rates contained in the Air Quality Impact Assessment (AQIA) prepared by Todorski Air Sciences (September 2020)
3. Where a comparison in condition E2.2(2) shows emission rates from monitoring results are greater than the emission rates contained in AQIA, the report must identify mitigation measures to achieve emission performance commensurate with the AQIA.

The EPA may utilise the information contained in the report submitted to revise or include additional conditions in this EPL.

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Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

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TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste

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Environment Protection Authority

(By Delegation)

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End Notes