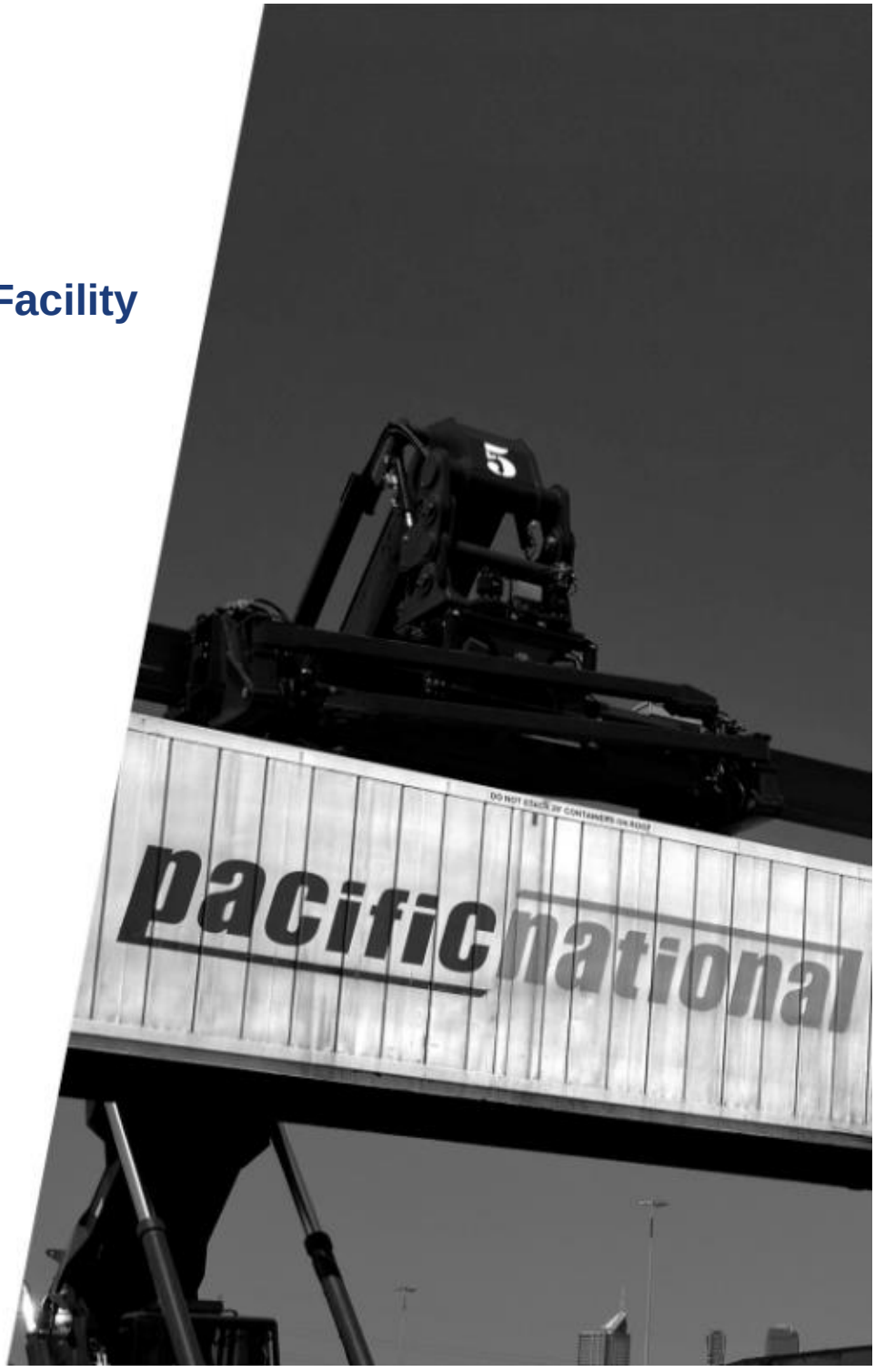
Major Hazard Facility Safety Case

Date: August 2022



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1. Executive Summary

This Safety Case for Adelaide Freight Terminal (AFT) has been developed to meet Pacific National's (PN) obligations under Chapter 9 (Major Hazard Facilities) of the Commonwealth Work Health and Safety Regulations 2011 ("the MHF regulations") [1].

The Safety Case provides an overview of the AFT and the operations undertaken within the facility. Certain operations associated with the handling of bulk quantities of dangerous goods involve hazards which, if not adequately controlled, could result in a Major Incident (MI). The current philosophy and management arrangements applied to ensure the continued safe handling of dangerous goods at the facility are outlined.

The potential MIs and possible consequences have been thoroughly assessed via a formal risk assessment conducted in 2010 with assistance from R4Risk, which was subsequently reviewed and updated in 2014 by PN. During the 2017-18 financial year a further review was conducted of the risk assessment. This review used a combined approach, taking into account the dynamic movement of the Schedule 15 Chemicals (also known as dangerous goods) over the network and through the four PN Major Hazard Facilities (MHF) located at Melbourne, Adelaide, Sydney and Perth.

The purpose of the review of the major hazard risk assessment (risk assessment) for the MHF was to account for the following:

- improvements implemented to the process of identifying Schedule 15 Chemicals at the MHFs which have been issued with an MHF licence
- potential changes in the hazards and risks at the MHF since the risk assessment was completed in 2010
- review of the critical controls, monitoring programs and identifying potential improvements to risk control measures
- regulatory changes (implementation of the new Commonwealth regulations for the Adelaide Freight Terminal and Melbourne Freight Terminal, which were issued with a MHF licence under the superseded Commonwealth OHS regulations).

The Safety Case contains a description of the methodology used for the risk assessment process, including the:

- hazard identification process
- risk assessment process, including the criteria to be used to evaluate each risk
- approach to determine control measure adequacy, and to demonstrate that the risks have been reduced used to "so far as is reasonably practicable" (SFAIRP)
- risk review process in 2014.

Section 8 of the Safety Case describes the 12 potential MIs that have been identified for AFT that were identified during the 2010 risk assessment and confirmed through the subsequent 2014 and 2017 risk assessments. Control measures have been implemented for each MI to minimise the likelihood of the MI occurring and to limit the consequences should one occur. The risk assessment determined that the risks of potential MIs occurring were well controlled and tolerable. Further practicable improvements to risk reduction have been identified and are listed in the Risk Reduction Recommendations, contained in Appendix A.

The ongoing performance of the control measures is supported through the monitoring and auditing processes incorporated into the MHF safety management system (SMS) implemented across all four MHFs. A comprehensive SMS provides the 'backbone' by which all aspects of safety are managed. An overview of the PN SMS is provided in Section 12.

The Safety Case has been developed in consultation with employees. Section 13 provides an overview of the consultation processes followed during the development of the Safety Case.

Section 14 of the Safety Case provides a summary of the Emergency Management Plan that has been developed for the facility with the complete plan attached to the Safety Case in Appendix E.

1.1 Scope of the Safety Case

The Safety Case encompasses all activities and operations within the boundaries of AFT which have the potential to cause a MI. Further details on AFT and its operations are provided in Section 5.

For the purposes of the Safety Case, PN defines a MI as follows:

A sudden occurrence (event) involving a release of Schedule 15 Chemicals causing serious danger or harm to:

a) a person(s) (on-site or off-site); or

b) property; or

c) the environment.

Serious danger or harm is defined according to the consequence scale of the PN consequence matrix contained in the Risk Management Standard:

Severity Level		2 - Major	1 - Critical
Impact Categories	Health & Safety	An incident resulting in a single fatality. Serious injury resulting in irreversible impairment or disablement >30% of body to one or more persons.	An incident resulting in multiple fatalities. Serious injury resulting in irreversible impairment or disablement >30% of body to more than 10 persons.
	Environment	Major impact (<1 year) to land, biodiversity, ecosystem services, water resources or air.	Serious or extensive impact (<5 years) to land, biodiversity, ecosystem services, water resources or air.
	Finance & Governance	EBITDA pa – $20M to $70M NPV $70M to $250M Fraud $100K to $1M Credit rating downgrade	EBITDA pa > $70M NPV > $250M Fraud > $1M Significant Debt Covenant breach
	Legal & Compliance	Serious breach of Legislation resulting in litigation fines (range $1M to $10M) or delay in service delivery. Significant prosecution, fines or penalties.	Very serious breach of legislation (e.g. Competition and Consumer Act 2010, Rail Safety Act). Breach resulting in major fines/damages of >$10M and/or criminal conviction of Management and/or Directors.
	Reputation & Community	Substantiated news item, national news profile with embarrassment. Impact on stakeholder confidence in management. On-going multiple community complaints about same operational issue, threats of community coalition establishment and engagement with local media and local, state and federal government representatives.	Substantiated widespread news item with significant reputation damage and third party actions, including threat or investigation or legal action, that impacts on ability to achieve strategic objectives. Significant impact on stakeholder confidence in management. Community protest about operational issue, community coalition formed and/or ongoing government and media campaign.

2. Safety Case Certification

OPERATOR STATEMENT

In accordance with regulation 561 (5) of the Commonwealth Work Health and Safety Regulations 2011, I declare that:

1. I am (cross out whichever does not apply):
    a. The operator of the MHF
    b. Senior executive officer of the operator of the MHF who resides in the jurisdiction in which the MHF is located; and
2. The information provided in the safety case under regulations 561 (1) and (2) of the WHS Regulations is accurate and up to date; and
3. As a consequence of conducting the safety assessment, I have/the operator has* a detailed understanding of all aspects of risk to health and safety associated with major incidents that may occur; and
4. The control measures I am/the operator is* to implement:
    a. Will eliminate the risk of a major incident occurring so far as is reasonably practicable; and
    b. If it is not reasonably practicable to eliminate the risk of a major incident occurring – will minimize the risk so far as is reasonably practicable; and
    c. In the event of a major incident occurring – will minimize its magnitude and the severity of its health and safety consequences so far as is reasonably practicable; and
5. All persons to be involved in the implementation of the safety management system have the knowledge and skills necessary to enable them to carry out their role safely and competently.

Paul Scurrah

Chief Executive Officer

Pacific National

3. Contact Information

The Pacific National contacts for the Safety Case are as follows:

Primary Contact:

Josh Kirkham
Superintendent Freight Terminal
Adelaide Freight Terminal
Pedder Crescent
Regency Park 5010 SA
Phone: 08 8348 3104
Email: Josh_kirkham@pacificnational.com.au

Facility Contact:

Vincent Ortuso
Manager Operations, SA
Adelaide Freight Terminal
Pedder Crescent
Regency Park 5010 SA
Phone: 08 8348 3104
Email: Vincent_ortuso@pacificnational.com.au

The Manager Operations is responsible for ensuring the requirements of this Safety Case are in place at the Adelaide Freight Terminal.

4. Definitions

4.1 Acronyms

Acronym	Meaning
AQR	Aggregate quantity ratio
BLEVE	Boiling liquid expanding vapour explosion
CCC	Cumulative critical control
COP	Critical operating parameter
DG	Dangerous goods
HAZID	Hazard identification
HCDG	High consequence dangerous good
HIRAC	Hazard Identification, Risk Assessment and Control
ITV	Internal transfer vehicle
LFL	Lower flammability limit
LOC	Loss of containment
MHF	Major hazard facility
MI	Major incident
MICC	Major incident critical control
AFT	Adelaide Freight Terminal
PIN	Personal identification number
PN	Pacific National
RRF	Risk reduction factor
Schedule 15	Schedule 15 of the Commonwealth Work Health and Safety Regulations 2011
SCO	Safety Case Outline
SDS	Safety Data Sheet
SFAIRP	“so far as is reasonably practicable”
SHED	Safety, Health and Environment Database
SIL	Safety integrity level
SMS	Safety Management System
TMS	Train Management System
WHSE	Work, Health, Safety and Environment

4.2 Glossary

Acronym	Meaning
Major hazard facility	means a facility at which scheduled chemicals are present or likely to be present in a quantity that exceeds their threshold quantity and has been determined by the regulator to be a MHF
Major incident	an occurrence at a major hazard facility that: ▪ results from an uncontrolled event at the major hazard facility involving, or potentially involving, scheduled chemicals ▪ exposes a person to a serious risk to health or safety emanating from an immediate or imminent exposure to the occurrence.
Major incident critical control	means: ▪ a control measure that is designed to eliminate or mitigate against a major incident occurring ▪ a control measure that is designed to migrated against the severity of a major incident
Major incident hazard	means a hazard which could cause or contribute to causing a major incident
Piggyback loading	Means the process of loading a road tanker trailer directly onto a rail wagon using a prime mover, which is subsequently detached from the trailer prior to rail transport.
Safety assessment	is a comprehensive and systematic investigation and analysis of all aspects of risks to health and safety associated with major incidents that may potentially occur in the course of operation of the major hazard facility, including: ▪ the nature of each major incident and major incident hazard ▪ the likelihood of each major incident hazard causing a major incident in the event of a major incident occurring, ▪ the potential magnitude and the severity of a major incident should it occur and its potential health and safety consequences ▪ the range of control measures considered ▪ the control measures the operator decides to implement.
Scheduled 15 Chemicals	means hazardous chemicals that have been determined to pose a high risk to people, plant and property which are specified in Schedule 15 of the WHS Regulations

5. Facility Description – Adelaide Freight Terminal

5.1 Corporate Overview

Pacific National is Australia's largest private rail freight business. Operating in all mainland states and the Northern Territory, PN is a transport leader, delivering investment, innovation and growth in rail to provide the competitive answer for transport customers.

PNs intermodal division, trading as Pacific National Services Pty Ltd (ABN 48 052 134 362) operates freight terminals in each major capital city, four of these freight terminals Melbourne, Adelaide, Perth and Sydney are licenced MHFs.

5.2 Adelaide Freight Terminal Location

The AFT is a licenced Major Hazard Facility, licence number 2014-019 located at Pedder Crescent in Regency Park, SA. The AFT is bounded by Naweena Road and Gallipoli Drive to the west, Grant Junction Road to the North, the mainline rail easement is directly to the east of the terminal and further east is Churchill Road, with Regency Road to the south of the terminal. Regency Park is bordered by the suburbs of Angel Park, Woodville Gardens, Kilkenny, Dudley Park, Prospect, Kilburn, and Wingfield.

A location map showing the boundaries (in purple) of the AFT is presented below in Figure 1.

Figure 1: AFT location map showing approximate facility boundaries

5.3 Description of Operations

5.3.1 Overview

The AFT's main operations involve movements of containerised freight to and from inter-state rail services. Up to 1500 trucks per week may cycle through the AFT as freight is delivered or dispatched. Some of the freight includes bulk and packaged containers of dangerous goods (DGs), which include the movement of Schedule 15 chemicals. The entire movement of DGs comprise less than 1% of the total container movements through the terminal.

The transit holding times of DGs at the facility are closely monitored to minimise the quantities held at the facility (and therefore the associated exposure). To minimise the handling of DGs at the facility, where possible, containers are moved directly from train wagons onto trucks or vice-versa. DG containers may be held on the ground (i.e. "grounded") for short periods (usually less than 12 hours) whilst awaiting pickup by a train or the customer. Customers are notified when containers are on hand for more than 24 hours to arrange prompt pick up. Electronically generated inventories are produced daily to assist with the management of containers. Containers are moved to/from trains and around the terminal using purpose-built mobile equipment.

5.4 Facility Details

The AFT is open for business 24 hours per day except for the period between 0500 to 0600 Tuesday,0300 to 0700 Sunday and 1700 to 2200 Sunday. During a 24-hour period, the terminal can have up to 86 personnel on site, not including truck drivers.

The terminal layout comprises 11 rail tracks which are used for train loading and unloading. These tracks are accessible to road transport via bitumen roads.

5.4.1 Freight Arrival by Rail

Incoming trains are routed to the AFT control via a series of network protocols. Trains enter the terminal, after authorisation is granted by the AFT Shift Supervisor and proceed into the yard under the control of the train driver, and on occasions shunt pilot and shunters. Due to the length of the train, multiple movements are required to break up the train into sections that are then shunted into the tracks within the terminal for freight unloading.

As the train enters the terminal, a roll-by inspection is conducted by terminal operators (who are qualified train inspectors) to identify obvious train integrity or freight issues (e.g. leaking product). After arrival, a full train inspection is conducted, both above and below each wagon, to identify any loading integrity issues and any wagon defects, for subsequent inspection and if required, maintenance before the rolling stock or freight is permitted to leave the terminal.

Typically, trains will be on track for an average period of 12 hours during which time the loading and unloading of containers takes place.

5.4.2 Freight Dispatch by Rail

Train dispatch operations are essentially the reverse of the arrival process. A train inspection is conducted prior to the train being cleared to leave the terminal to ensure loading and wagons are compliant with PN and network standards and verify there are no wagon or load integrity issues. A roll-by inspection is also conducted as the train leaves the terminal as a final confirmation of train and load integrity.

5.4.3 Freight Delivery and Dispatch by Road

Truck drivers are subject to AFT safety inductions, which covers the safe working rules for the terminal. Trucks delivering or collecting containers enter the terminal through the main terminal gate, controlled by an electronic PIN gate access system. Trucks are allocated a 'trip number' by the PN 'FreightWeb' freight booking system, which is associated with the train journey. Unless the truck is booked and arrives within the acceptable time tolerance associated with the freight delivery, the gate access system will not allow the truck entry into the terminal.

On entering the terminal, the truck is directed by the gate access system to the specific delivery or pick-up bay. Trucks must follow terminal traffic rules and are not permitted to move anywhere else on site. While driving on site, trucks are required to regularly cross internal tracks, which are controlled by AFT shunters during propelling rail movements to prevent the interaction between vehicles and rollingstock.

5.4.4 Yard Operations

Yard operations cover the following key activities:

- movement of freight to and from rail wagons
- movements of freight to and from trucks
- piggyback loading of freight containers to and from rail wagons
- internal freight movements to and from holding areas
- internal shunting of rail wagons.

The mobile equipment used for moving freight around the terminal includes reach stackers and 'Internal Transfer Vehicles' (ITVs). Mobile equipment and yard operations are isolated from rail movements by setting physical 'derailers' on the internal tracks. These will force a train or wagon to derail in preference to causing collisions between trains and mobile equipment or other wagons on the loading / unloading tracks. Photos 1 and 2 below display examples of the load lifting equipment. Photo 3 shows an example of piggyback loading activities.

Photo 1: Reach Stacker top lift from container stack

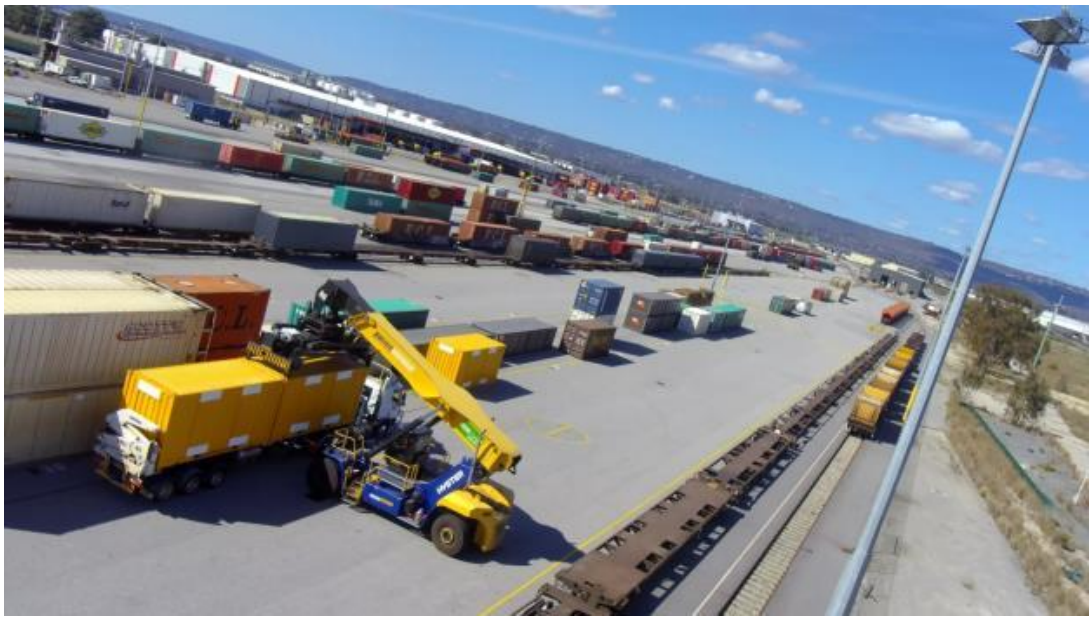

Photo 2: Reach Stacker loading container onto truck

Photo 3: Photo of piggyback loading operation involving a tanker of petrol

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5.5 Freight Operations involving Schedule 15 Chemicals

The nature of PNs rail operations means that Schedule 15 Chemicals may be present anywhere on the loading tracks within AFT or the adjacent container bays. DGs are loaded on trains and separated in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (the ADG), therefore the location of Schedule 15 Chemicals is dependent upon the number, class and quantity of dangerous goods booked onto a particular train service.

Where possible, DG's are loaded directly from truck to wagon or wagon to truck to minimise container handling. Where containers are grounded for operational requirements, they are either unloaded from wagon into a bay location in the immediate vicinity of the wagon from where they were unloaded or from a truck into a bay location where they will be later loaded onto a wagon, which is dependent upon the bay location the truck has been allocated in TMS.

DGs are not transit stored in a dedicated location within the freight terminal. This decision has been made for several reasons.

(i) As indicated previously, where possible DGs are loaded directly onto wagon or onto trucks in order to minimise container handling and therefore minimise the risk of a major incident occurring as a result of a container handling incident.

(ii) Where containers cannot be loaded directly onto trucks or wagons, grounding them in a dedicated location would require load lifting equipment travelling significant distances to ground the container and then later load the train or truck on arrival, thereby increasing the risk of a container handling incident occurring.

(iii) Finally, by having DG containers spread throughout the terminal, separated at a minimum in accordance with the ADG, this maximises separation between the containers. Therefore, in the event of an incident occurring this minimises the risk of an interaction between incompatible DGs.

A site plan showing the terminal loading roads and container storage areas is shown in Figures 2 and 3 below. As stated previously, Schedule 15 Chemicals may be present in the vicinity of any of these loading roads and container storage bays, and their location will vary from day to day depending on the number of DGs consigned on the freight services that leave and arrive at the facility. Therefore, a major incident involving Schedule 15 Chemicals may occur in any of these locations.

Section 6 contains a more detailed breakdown of the Schedule 15 Chemicals that are handled at the facility.

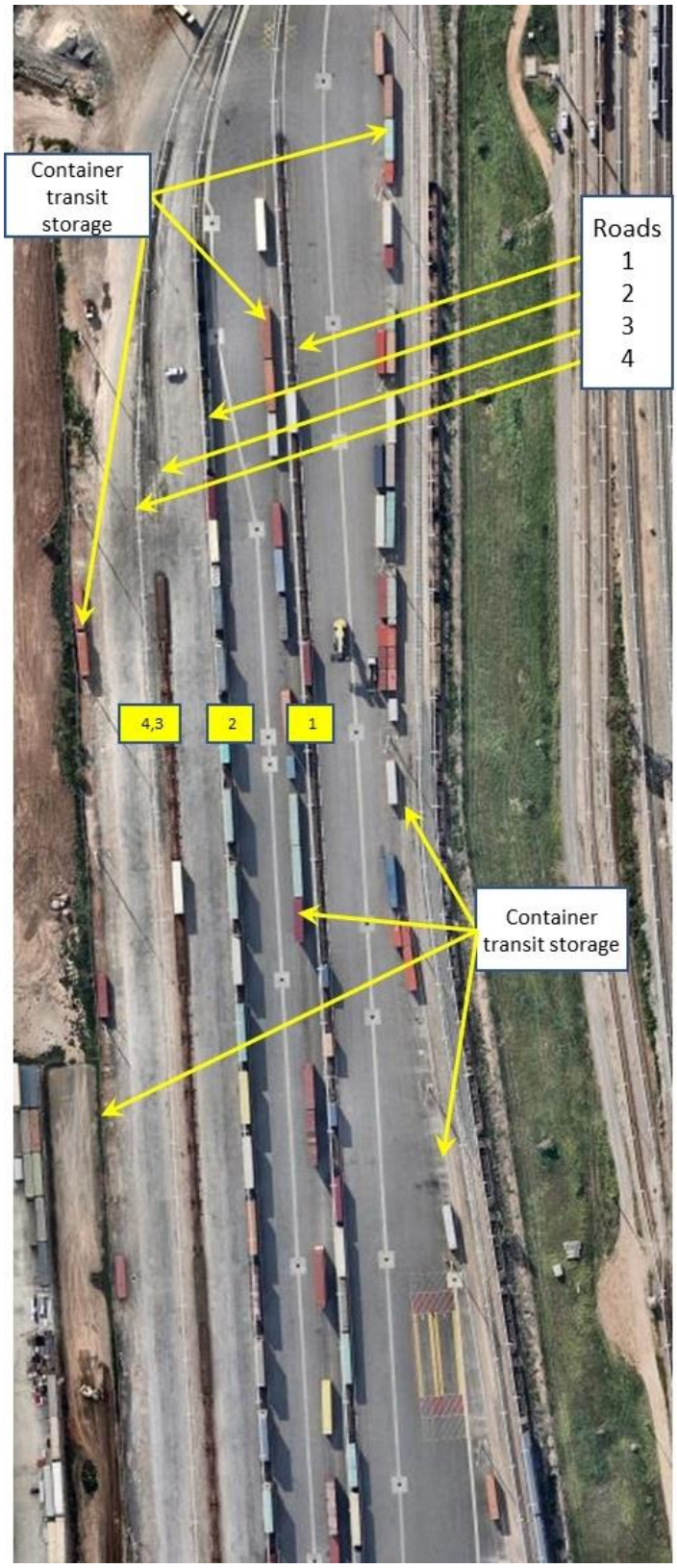


Figure 2: Site diagram showing container storage locations and loading roads at the AFT (north end of terminal)

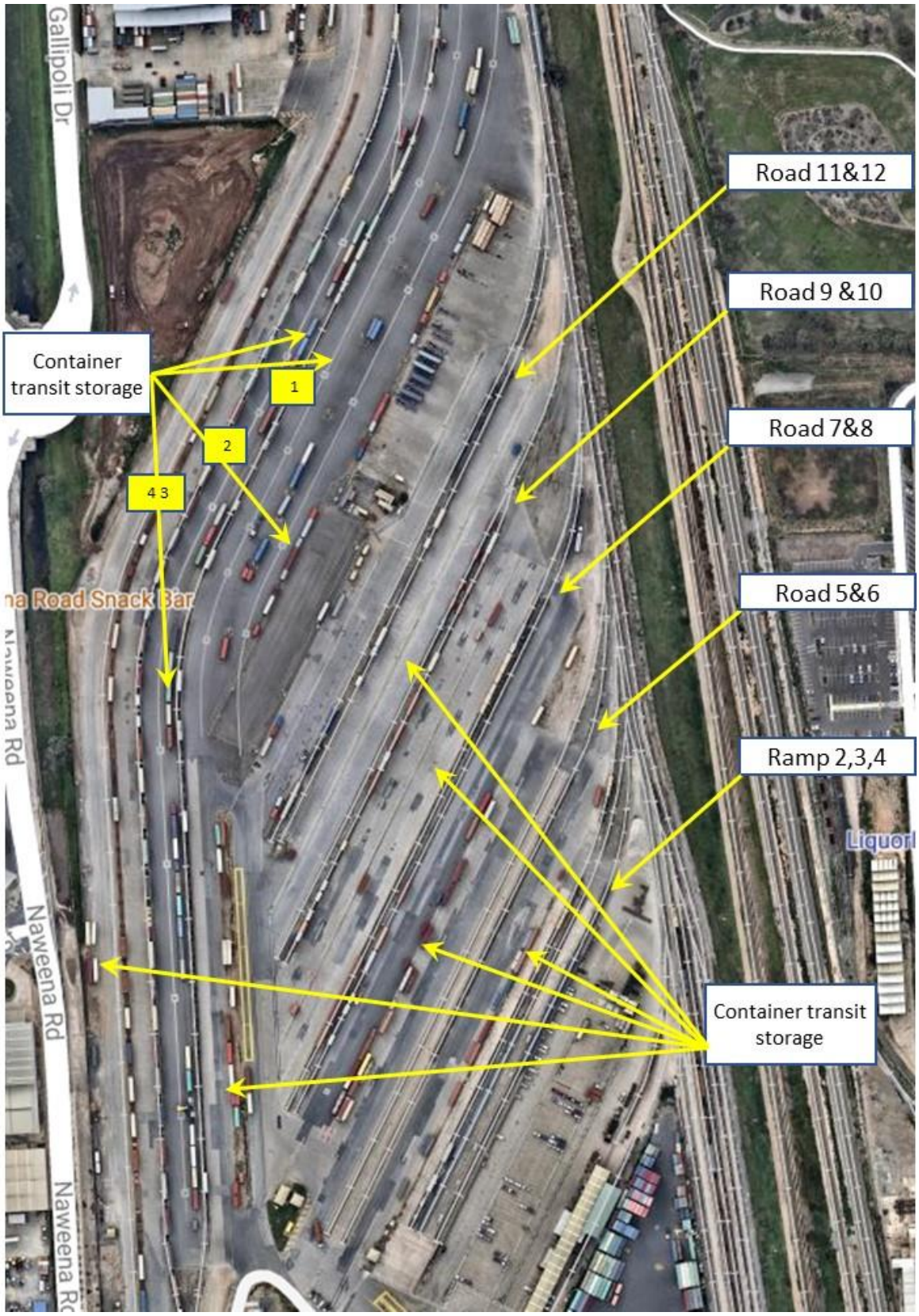


Figure 3: Site diagram showing container storage locations and loading roads at the AFT (south end of terminal)

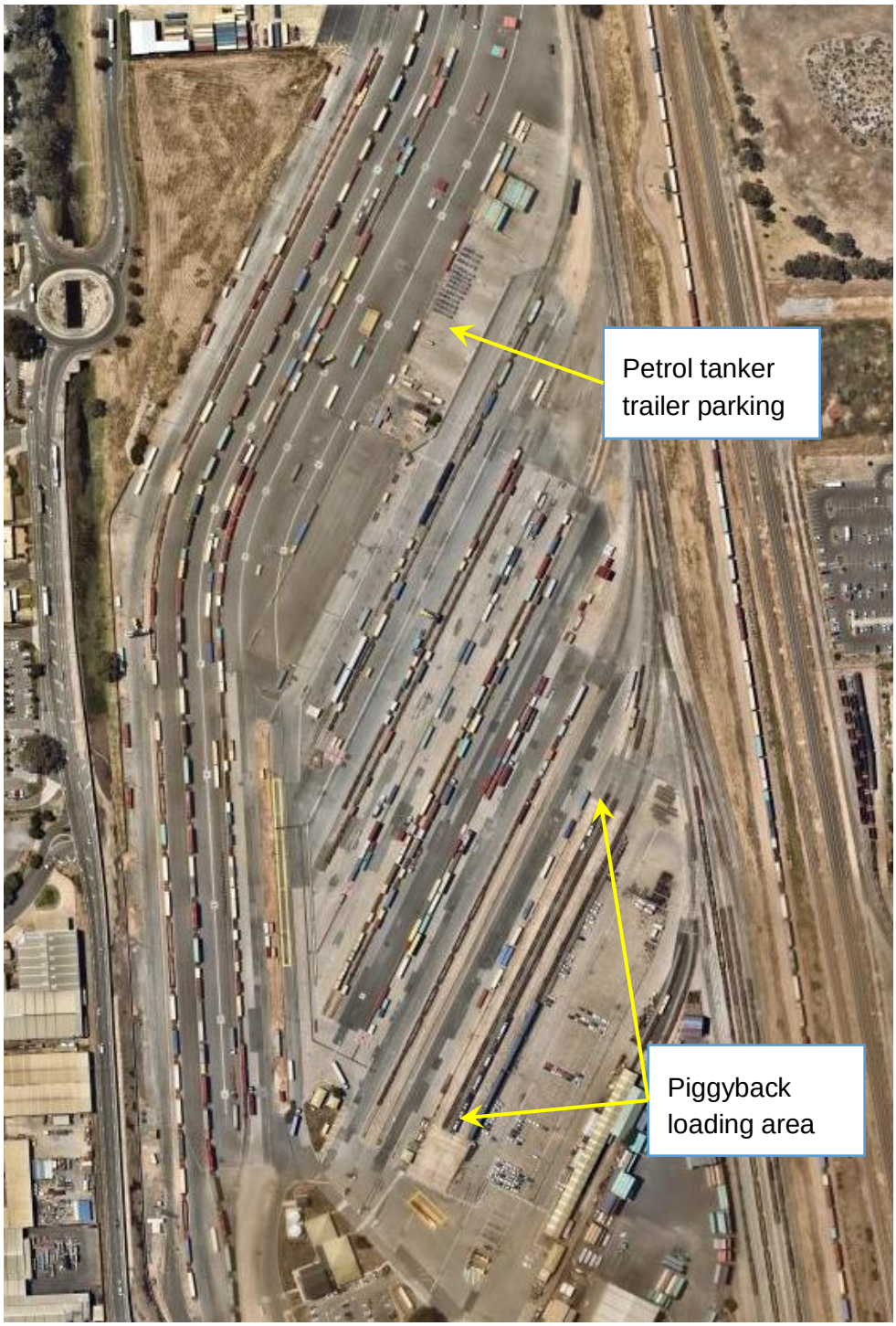


Figure 4: Site diagram showing transit storage areas for petroleum tankers

5.6 Locality Details

5.6.1 Surrounding land use

AFT is located within the municipality of Regency Park; land immediately to the west, north and south of the facility is zoned industrial. To the east of the facility land there is a mixture of zoning areas; to the direct east of the facility is land zoned for both industrial and miscellaneous uses, the latter predominantly associated with major retail business including Costco, Aldi, the Churchill Centre and Bunnings. To the north-east the land is zoned for residential purposes, with the closest premises approximately 100 metres from the terminal boundary. The major industries / companies surrounding the facility are:

- **TOLL Intermodal** to the south of the AFT operate a domestic freight forwarding / logistical cross dock operation involved in the unpacking and loading of multi-modal containers and vehicles. Minor quantities of Liquefied Petroleum Gas (LPG) are stored on site for forklift operations. No underground petroleum storage systems are present at this facility.
- **Shell Regency Park Truck Stop** operate a bulk fuel storage facility located to the south of the AFT. Manifest quantities of class 3 flammable liquids, combustible liquids and liquefied petroleum gas (LPG) are stored at this facility. This business is a logistics and supply company involved in the transportation of diesel fuel locally by semi-trailer and rigid vehicles. Operations at the facility are conducted five days a week or at call.
- **Northline** operates a freight forwarding depot involved in the loading / unloading of containers, storage of products awaiting transport and 3PL (third party logistics) storage for a range of customers. DGs of class 8 are handled in packaged quantities. An LPG cylinder is stored on site for mobile handling equipment operations. No underground storage for petroleum systems are present at this facility.
- **Railroad Transport** operates a storage and warehousing facility, including the unpacking and loading of intermodal freight for subsequent distribution. Diesel in bulk is stored at the facility.
- **Advanced Plastic Recycling** is a manufacturer of wood plastic composite products**.** No DGs are held at this facility.
- **Coopers Brewery** to the south-west of the AFT operates a brewing facility. It consists of a 4.4-megawatt gas-powered co-generation power plant, 2 packaging lines and an 18,000m^2 warehouse. Manifest quantities of LPG and Sodium Hydroxide are held in above ground storage tanks.

None of the above facilities are classified as Major Hazard Facilities and there are no other Major Hazard Facilities located in the vicinity of the AFT.

In addition, the following establishments are located in the immediate vicinity of the AFT:

- to the north-east of terminal is the Kilburn Railway Station, part of the Adelaide Metro system
- to the south-east is the TAFE SA Regency Campus
- Regency Park Golf Course to the east.

There are also several smaller industrial and manufacturing operations located in the immediate vicinity of the AFT. Figure 5 below shows the location of the above facilities in relation to the AFT.

The council planning map presented in Figure 6, shows the AFT and the nearby planning zones which provides a good indication of the nature of neighbouring land uses, including the nearest residential premises.

Figure 5: Map of AFT showing neighbouring facilities

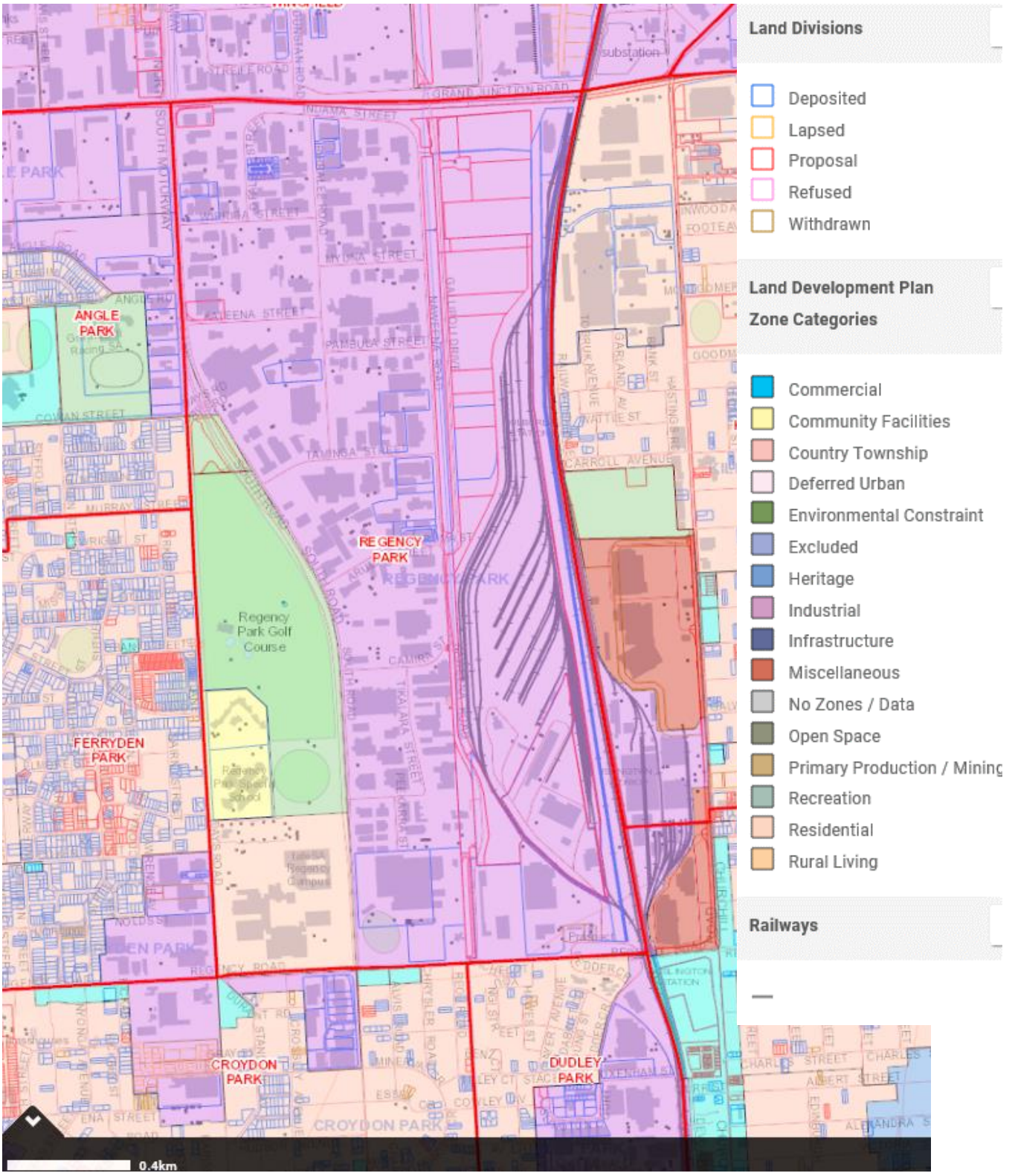


Figure 6: Map of AFT showing locality planning information (from Location SA Map Viewer)

5.6.2 Topographical Detail

The topography of the AFT on the Adelaide plain is relatively flat. Most of the yard is between 6 metres and 8 metres elevation above sea level, with the Regency Road overpass at the south-eastern corner rising to 16 metres. There are no water courses running through the terminal, but there is a small drain west of Gallipoli Drive running in a northerly direction to the Port River estuary.

Approximately two kilometres north is the Port River estuary and salt pans. The surrounding topography is urban. A suitable surface length for gas dispersion would be one for regular large obstacle coverage such as suburbs or forest. The topographical layout of the area is presented in Figure 7 below.

5.6.3 Meteorological Data

Meteorological data, shown in Table 1 below, was sourced from the Adelaide Regional Office to obtain the three weather classes that were used in the dispersal calculations when undertaking the consequence modelling. This data has been used to form the decision-making processes with respect to emergency management, including:

(i) determining the most appropriate locations to establish emergency evacuation points, that is in locations that are most likely to be upwind from any incident involving DGs, including Schedule 15 chemicals. However, the final determination for directing people to evacuation points will be made based on wind conditions at the time of the incident.

(ii) developing the emergency response procedures for the different types of emergencies that were identified during the development of the Emergency Management Plan, which is provided in Appendix E.

Meteorological data that was used in the consequence modelling for the various scenarios involving the release of flammable and toxic gases and flammable liquids.

Weather Stability	Parameter	Adelaide	Melbourne	Perth	Sydney
D-Medium	Windspeed (m/s)	4.0	4.1	4.3	3.9
	Temperature (°C)	18.1	15.5	18.6	18.0
D-Low	Windspeed (m/s)	1.4	1.4	1.5	1.0
	Temperature (°C)	15.8	15.1	15.5	15.0
F	Windspeed (m/s)	1.0	1.2	1.1	1.0
	Temperature (°C)	13.3	13.5	12.5	13.3

Table 1: Meteorological details including AFT data

Figure 7: AFT Topographical detail (sourced from Location SA Viewer)

5.7 Organisational Charts

PNs corporate organisation chart is presented in Figure 8 below. The responsibility for the development of the Safety Case belongs to Paul Scurrah, Managing Director and Chief Executive Officer

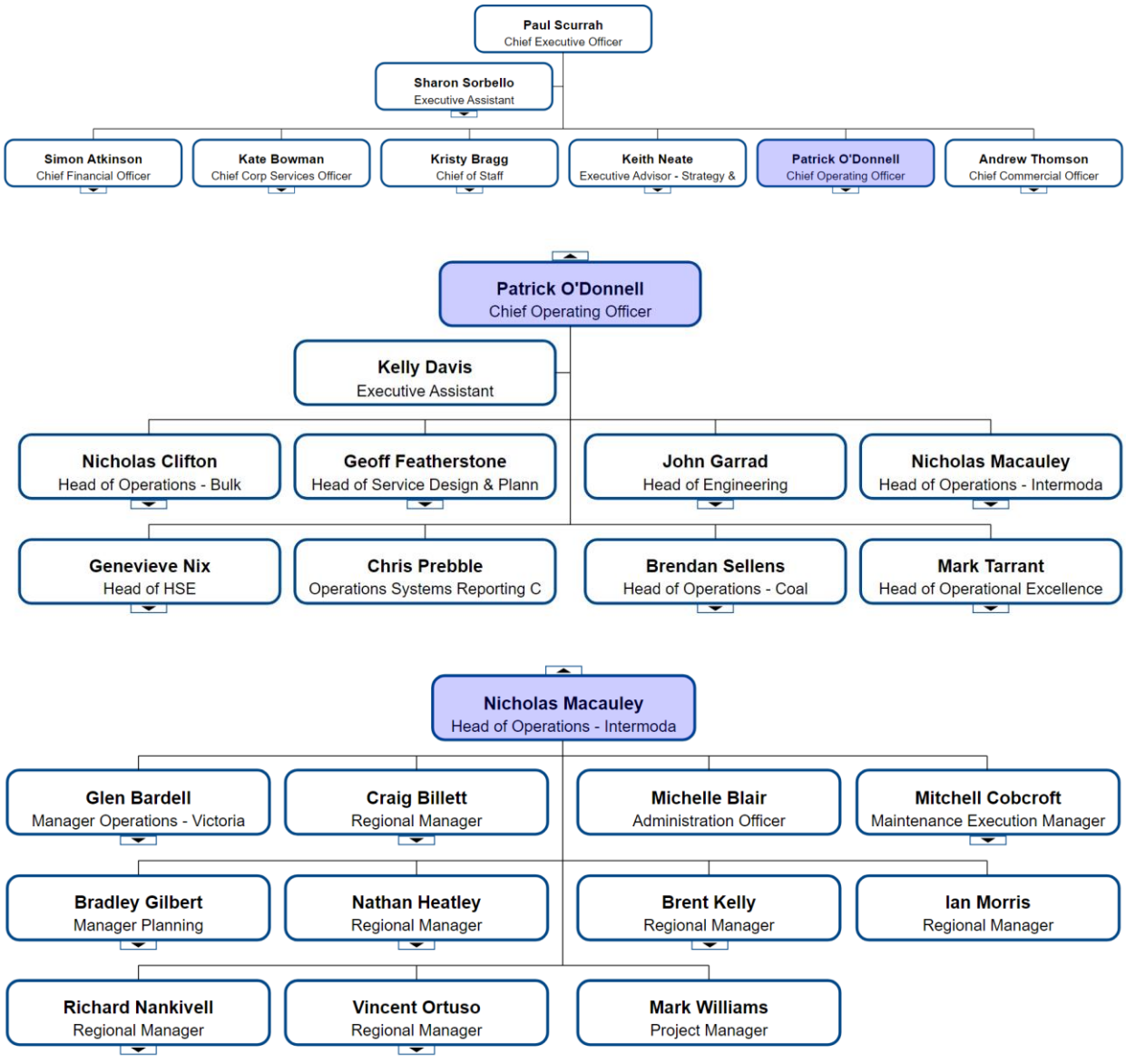


Figure 8: Pacific National Freight Organisational Chart

The AFT is under the responsibility of the Manager Operations, SA/NT (Vince Ortuso). The AFT organisation chart is presented in Figure 9 below and includes the HSE support structure.

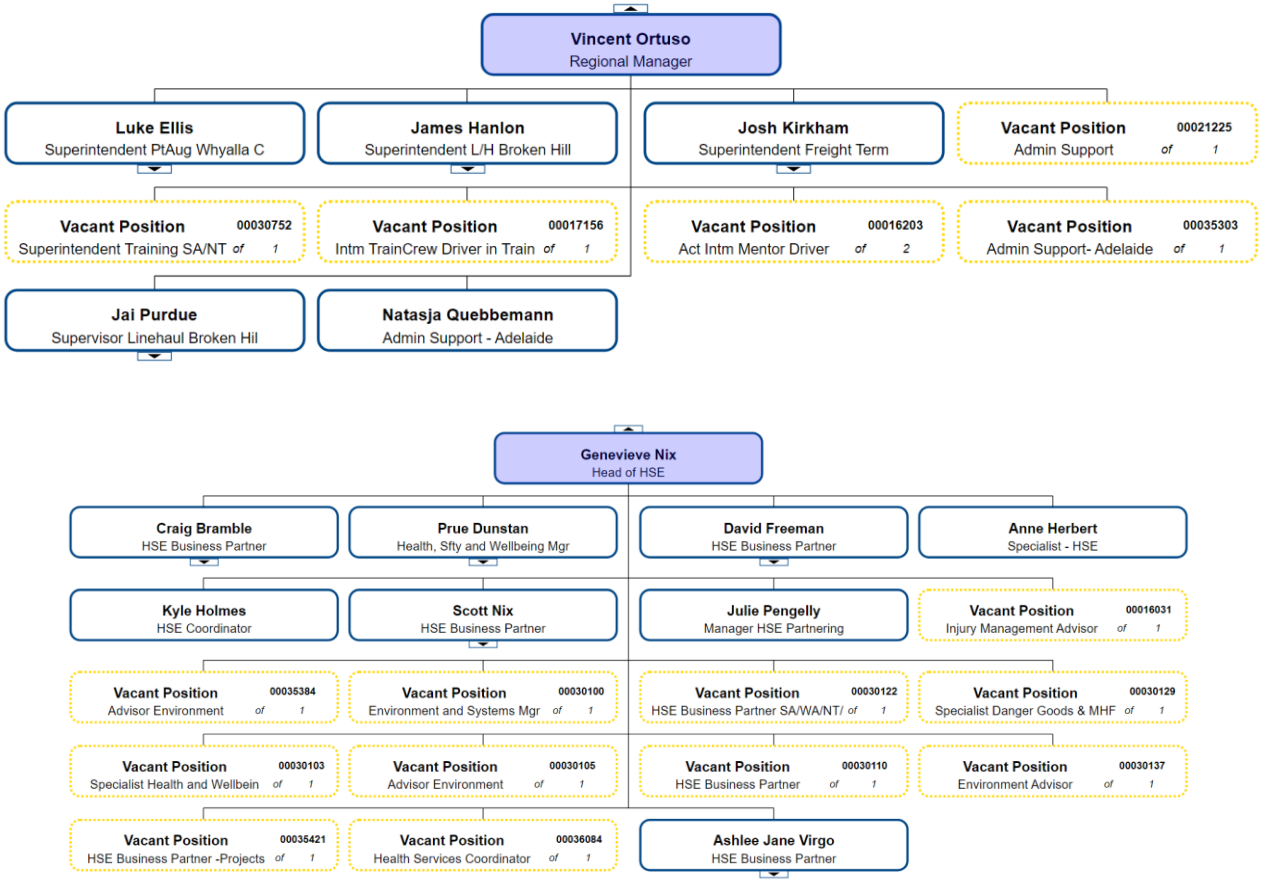


Figure 9: AFT Organisation Chart and HSE Support Structure

5.8 Community Advice

As an operator of a MHF, the following information has been provided to the local community and the local authority:

a) The name and location of the facility

b) The name, position and contact details of a contact person from whom information can be obtained

c) A general description of the MHF's operations

d) How the local community will be informed of an occurrence of an MI

e) The actions, as specified in the "Pacific National Letter to Neighbours", that the members of the local community should take if a major incident occurs

f) A summary of the AFT safety case.

The sample letter to the local community was previously sent to the Port Adelaide Enfield Council, residents and businesses in the potential ERPG3 Zone *(the zone where the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects)*.

Where a change to the operations of AFT impacts on the advice to the community, the letter will be revised and reissued.

Sample letters to the local community and businesses are provided in Appendix F.

A copy of the Emergency Management Plan was provided to the South Australian Metropolitan Fire Service (SAMFS), Special Operations Department in accordance with Regulation 347, 361 and 557 of the Work Health and Safety Regulations 2012. A copy of the report provided by SAMFS in relation to the plan is contained in Appendix F.

6. Schedule 15 Chemicals Handled

AFT handles a range of Schedule 15 Chemicals that present different hazards. Due to the nature of operations at AFT and the overall Freight business, the quantities of DGs present at the facility vary greatly. Seasonal demand and a competitive marketplace results in significant variation to the Aggregate Quantity Ratio (AQR) for the combined Schedule 15 Chemicals on a daily basis.

To support the review of the Safety Case, PN captured data from PN's Train Management System (TMS) for the period from 1/7/2020 to 30/6/2021. This updated data set provides a representative sample of the DGs that were transiting through the AFT (both outbound and inbound DGs). The data was analysed to provide the overall potential freight movement of the Schedule 15 Chemicals. This was used to determine a 'baseline' for the average quantities of Schedule 15 Chemicals at any point in time at AFT.

Table 2 below also includes the peak quantity that was present at the AFT during the analysis period. DGs are handled at the MHFs in the following configurations:

- bulk containerised dangerous goods
- bulk iso-containers
- containerised packaged dangerous goods
- road tankers loaded onto 'piggyback wagons'
- intermediate bulk containers
- multi-element gas containers.

The quantities of DGs at the AFT are closely managed to minimise the holding time of DGs and therefore the amount of DGs that will be present at any given time.

Additionally, it cannot be assumed that the Schedule 15 Chemicals listed in Table 2 will be present on any given day, as consignment of products is dependent on customer demands and train schedules. Schedule 15 Chemicals may only be consigned for limited periods during a year, therefore average and peak quantity volumes should be taken as a 'worst case scenario'.

Item	Hazardous chemical	UN Number	DG Class	Total Annual Throughput (t)	Peak Daily Quantity (t)	MHF Threshold Quantity (t)	MHF 10% of Threshold	2% Exclusion Rule Applies	Peak Daily Exceeds Threshold	Ratio Peak Daily / Threshold Quant.
2	ACETYLENE	1001	2.1	69.1	5.247	50	5	No	Yes	0.10494
7	AMMONIA, ANHYDROUS, LIQUEFIED or AMMONIA SOLUTIONS, relative density less than 0.880 at 15 degrees C in water, with more than 50% ammonia	3318	2.3	96.3	9.648	200	20	No	No	0.04824
15	CHLORINE	1017	2.3	186.9	78	25	2.5	No	Yes	3.12
18	ETHYLENE DIBROMIDE	1605	6.1	0.0	0.001	50	5	Yes		
19	ETHYLENE OXIDE	1040	2.3	0.0	0.001	50	5	Yes		
23	HYDROFLUORIC ACID SOLUTION (greater than 50%)	1790	6.1	0.0	0.001	50	5	Yes		
24	HYDROGEN	1049	2.1	25.2	1.872	50	5	No	No	0.03744
26	HYDROGEN CYANIDE	1051	6.1	0.0	0.001	20	2	Yes		
29	LP GASES	1075	2.1	40.9	10.017	200	20	No	No	0.050085
30	METHANE or NATURAL GAS	1971	2.1	3.7	0.5	200	20	Yes		
31	METHYL BROMIDE	1062	2.3	20.3	2.52	200	20	Yes		
33	OXIDES OF NITROGEN, including nitrous oxide, nitrogen dioxide and nitrogen trioxide	1067	2.2	69.1	2.467	50	5	No	No	0.04934
34	OXYGEN	1072	2.2	487.6	23.567	2000	200	Yes		
38	SODIUM CHLORATE, solid	1495	5.1	2164.3	322	200	20	No	Yes	1.61
40	SULFUR DIOXIDE, LIQUEFIED	1079	2.3	1.0	0.317	200	20	Yes		
	Aggregate Ratio									**5.020045**

Table 2: AFT Total Annual Throughput of Schedule 15 Chemicals

Physical and chemical properties and hazards of any Schedule 15 DGs handled through AFT may be retrieved through the ChemAlert system which is available via the PN intranet. Due to the very large range of dangerous goods that may be potentially handled through AFT, Safety Data Sheet (SDS) documentation has not been provided with this Safety Case; this information can be provided by PN upon request.

7. Dangerous Goods Safety Management at Pacific National MHFs

This section provides an overview of the current "philosophy" for managing risks associated with the transport of dangerous goods at PN MHFs. The Safety Case process is consistent with this philosophy and the Safety Case outcomes are integrated into the risk management process as part of the continuous improvement processes in place at PN. The main factors comprising the philosophy (as it applies to the management of hazards involving dangerous goods) are:

- an understanding of the nature of the hazards and potential MIs
- positive safety culture
- safety systems
- operational controls and practices.

7.1 Nature of hazards and potential MIs

Upon review of the basic operations of the MHFs (refer Section **Error! Reference source not found.**), the primary activities, which could involve the potential for a release of Schedule 15 Chemicals, can be summarised as follows:

- train unloading/loading via mobile equipment to/from container stacks
- truck unloading/loading via mobile equipment to/from container stacks
- holding of containers awaiting loading to train or truck
- transportation on site via trucks and rail wagons.

The major hazards associated with these operations are:

- damage to containers and potential loss of containment caused by dropping of a container during a lift, or impact of a container on a solid object during lifting
- damage to containers and potential loss of containment caused by a vehicle incident on site
- a "spontaneous" leak occurring from a container during storage or handling on site
- escalation events involving dangerous goods containers exposed to external fires.

The above terminal activities and hazards are of primary concern for personnel (occupational) safety reasons. As such, various engineered systems and standard procedures are implemented to minimise the likelihood of containers being dropped or impacted due to normal container handling practices. It is important to note that individual container handling practices do not differ between DG and non-DG containers (i.e. the same suite of preventative controls are in place irrespective of whether a container is holding DG or not). This helps to ensure that the systems and procedures that prevent containers from being dropped or impacted are consistent, thereby reducing the likelihood of a release of DGs.

Section 8 describes in detail the specific major hazards (relating to release of Schedule 15 DGs) that were identified through the risk assessment process.

7.2 Positive Safety Culture

Pacific National uses its best endeavours to create a positive safety culture. This is characterised by communication founded on mutual trust, shared perceptions of the importance of safety, and building confidence in the efficacy of preventive measures.

Key elements of the positive safety culture to which PN is committed include:

- **Keeping people informed***:* PN aims to ensure that its managers and workers are kept well informed in relation to safety matters within the organisation. This includes collecting, analysing and disseminating relevant information derived from the workforce, safety occurrences, near misses and regular pro-active checks of the organisation's safety activities.
- **Maintaining vigilance***:* PN encourages its management and workers to be constantly on the lookout for the unexpected. The aim is to recognise, and act on, problems and issues as they emerge well before they can escalate to more serious events.
- **Promoting a just culture environment***:* PN aims to promote a 'just culture' which acknowledges human error and the need to manage it by supporting systems and practices that promote learning from past errors or mistakes. PN encourages uncensored reporting of near miss occurrences and worker participation in safety issues. A 'just culture' is transparent and establishes clear accountability for actions. It is neither 'blame free' (awarding total immunity for actions) nor 'punitive' (enacting a disciplinary response regardless of whether acts were unintentional or deliberate).
- **Promoting organisational flexibility:** PN needs to adapt effectively to meet changing demands. This relies on being prepared for and practiced in handling changing circumstances, with people competent to lead and carry out tasks. Flexibility is achieved through training and operational preparedness to enable local teams to respond dynamically to unforeseen events such as MIs, operate effectively and autonomously when required and without the need to adhere to unnecessary inflexible rules.
- **Encouraging willingness to learn***:* PN is willing and eager to learn from its workers, its own experiences and from external information. The key is that PN and its members use the information to improve safety and act on the lessons derived.

7.3 Safety Management Systems

The PN SMS is a comprehensive system covering all aspects of safety management within PNs train and terminal operations. An overview of the structure of the HSEMS, which includes a more detailed description of those elements critical to the management of major hazards is provided in Section 12.

7.4 Operational Controls and Practices

The PN SMS includes specific standards and procedures covering the various requirements and operational practices related to DG management. Key operational controls specifically applying to the safe handling of DG are outlined below.

7.4.1 General Requirements for Dangerous Goods

The PN *Dangerous Goods Procedure* covers the general requirements for handling dangerous goods across PN operations. The requirements applicable to terminals include:

- acceptance and dispatch processes for terminals
- identification, monitoring and management of all dangerous goods within a terminal
- scheduling deliveries and customer pick-ups to minimise the quantities on site at the terminals
- segregation of incompatible DGs
- incident management and emergency response.

7.4.2 High Consequence Dangerous Goods (HCDGs)

HCDGs or security sensitive substances are chemicals that have been declared by statutory bodies as being of security concern because they have the potential for misuse to cause mass casualties and/or mass destruction. Currently the term applies to formulations of ammonium nitrate >45% concentration and calcium ammonium nitrate.

The handling of these materials is subject to various regulatory controls within Australia, depending on the state or territory. A licence or authority to transport HCDGs is required throughout Australia. The PN SMS has requirements in the *Management of High Consequence Dangerous Goods Procedure* covering the handling of HCDGs, which includes:

- processes to verify authority to transport HCDGs by freight forwarders and truck drivers
- risk assessment and control
- development of security management plans
- identification, monitoring and management of all HCDG products while in the control of PN
- verification of the condition of the containers and seals
- incident management and emergency response
- system auditing.

7.4.3 Dangerous Goods Identification and Monitoring

The PN *Dangerous Goods Procedure* describes the requirements for ensuring that DGs are correctly identified within PN terminals and on trains.

All DGs entering terminals must be correctly placarded and PN must be provided with the required documentation / information prior to terminal entry being permitted. This information is entered into PNs computer system FreightWeb and tracked through the Transport Management System (TMS) and the Container Handling System (CHS).

A copy of the TMS "train consist report" must be carried on all trains. This report includes a list of all DGs on the train, including quantity, class, packing group, package type and the position of the DGs on the train.

7.4.4 Managing Scheduling of Dangerous Goods in Terminals

The PN procedure INT-PRO-SAF *Managing the Scheduling of Dangerous Goods Whilst in Terminals* outlines the requirements for managing the scheduling of DGs to minimise the quantities of DGs held, and thus reduce the exposure to the hazards associated with their presence.

Section 13 of the PN InfoPak (a document which describes the terms and conditions under which customer consignments can travel on PN train services) issued to all PN Freight customers states:

- collect Dangerous Goods on the day of arrival at the point of destination;
- comply with the Australian Dangerous GoodsCode (including making all required declarations);
- give Pacific National a full and accurate written inventory of the Dangerous Goods, including an emergency procedures guide;
- Containers loaded with placardable Dangerous Goods will only be accepted into a Terminal on a pre-booked basis on the day of intended travel on an intermodal service.
- Terminals are not licensed Dangerous Goods storage depots. Pacific National will not store Dangerous Goods other than for the period of time necessary to receive containers in readiness for out-railing and to facilitate delivery of containers from in-railed services.
- PN terminals are not licensed DG storage depots. For this reason, PN will not hold DGs other than for the period of time necessary to receive containers for out-railing and to facilitate delivery of containers from in-railed services.

The intent of these requirements is to minimise the time that DGs are held at a terminal. In general, DGs are held on site for a period of 12 hours prior to train departure and the customer

is required to collect DG containers within 12 hours of the freight becoming available after train arrival. DG's are not stored at the Adelaide Freight Terminal.

PN Customer Service Centres are responsible for notifying and reminding customers that they have dangerous goods in the yard that require pick up and following up with the customer if the consignment has not been picked up on the day of arrival.

This process ensures dangerous goods are not transit stored at terminals for extended periods of time, thereby minimising dangerous goods quantities held on the site.

7.4.5 Segregation

Local procedures prescribe the methods and rules used to ensure that correct DG segregation rules are applied when grounding containers at the terminal. These procedures are aligned with the dangerous segregation rules contained within the Australian Code for the Transport of Dangerous Goods by Road and Rail (edition 7.7).

Computerised load planning is used to determine the correct location of outbound container placements on wagons for dispatch by rail, thereby ensuring that correct segregation is applied on the trains. This is followed by a pre-departure check of the actual consist against the load plan to verify the location of containers and sequencing of wagons is accurately recorded in the train consist report.

8. Hazard Identification (Potential Major Incidents)

8.1 Overview

This section contains a summary of the hazard identification and risk assessment process undertaken at AFT as part of the Safety Case development. For full details of this process, please refer to the Risk Assessment Report contained in Appendix G.

The risk assessment approach utilised for the management of major hazards at PN MHFs follows the overall approach outlined in the PN Risk Management Standard. The processes contained in this Standard are designed specifically for safety risk management, and contain the following key steps:

- identifying hazards
- assessing risks arising from those hazards through consideration of their consequences and likelihood
- eliminating those risks where practicable
- identifying risk management controls where risks cannot be eliminated
- demonstrating that the residual risk has been managed to SFAIRP.

This process is illustrated in Figure 10 below and follows the criteria contained within ISO 31000 Risk Management.

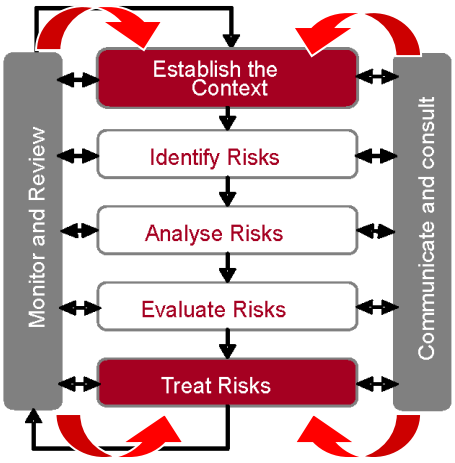
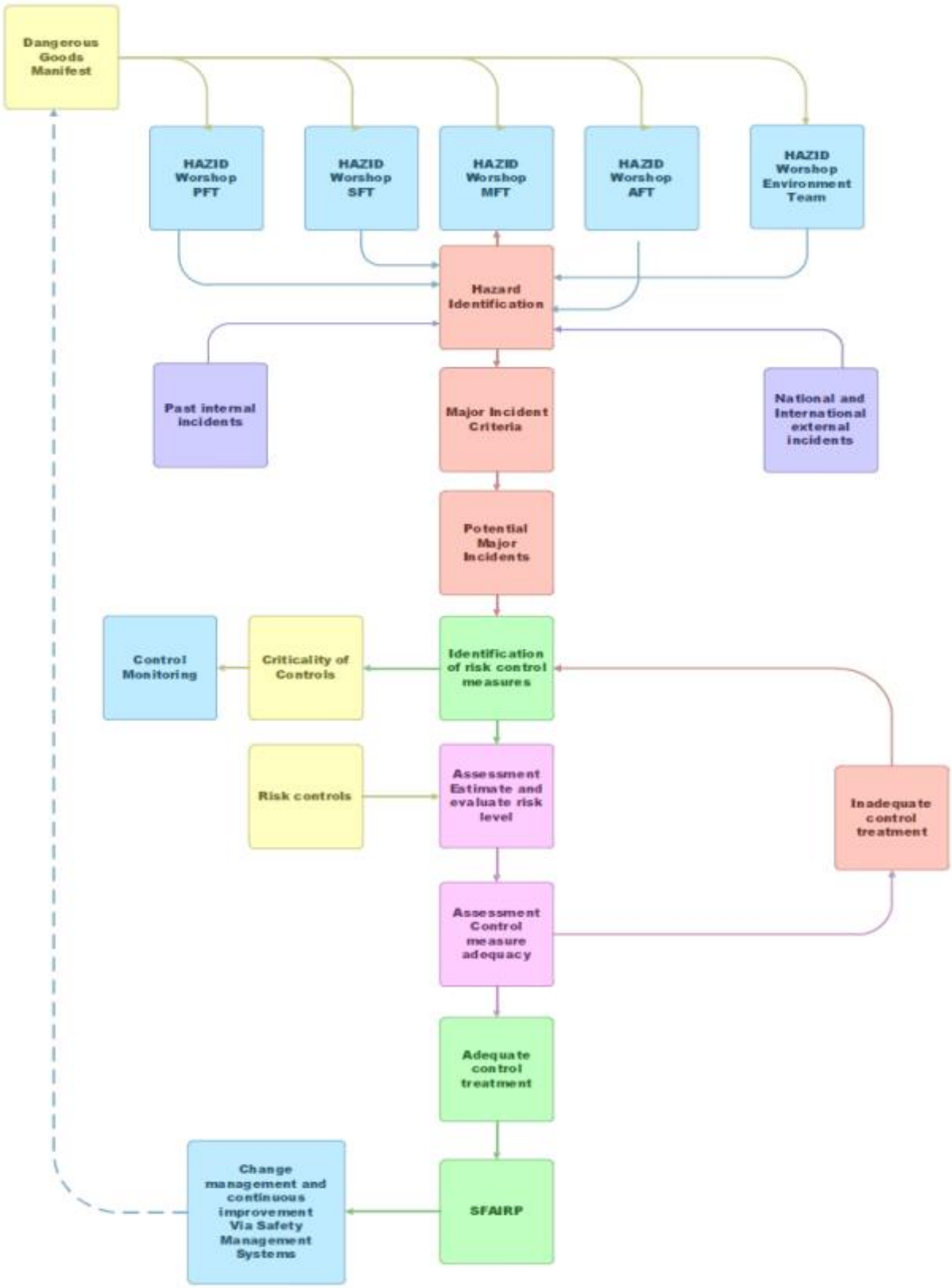


Figure 10: Risk management process

The major steps in the process in the context of the management of major hazards are described in this section (Hazard Identification) and Sections 9 (Risk Assessment) and 0 (Control Measures and Adequacy). Figure 11 below provides a diagrammatic overview of the overall hazard identification and risk assessment methodology that was applied at the AFT and the other MHFs during the major hazard risk assessment workshops.


Dangerous Goods Manifest
HAZID Worshop PFT
HAZID Worshop SFT
HAZID Worshop MFT
HAZID Worshop AFT
HAZID Worshop Environment Team
Hazard Identification
Past internal incidents
Major Incident Criteria
National and International external incidents
Potential Major Incidents
Control Monitoring
Criticality of Controls
Identification of risk control measures
Risk controls
Assessment Estimate and evaluate risk level
Inadequate control treatment
Assessment Control measure adequacy
Adequate control treatment
Change management and continuous improvement Via Safety Management Systems
SFAIRP

Figure

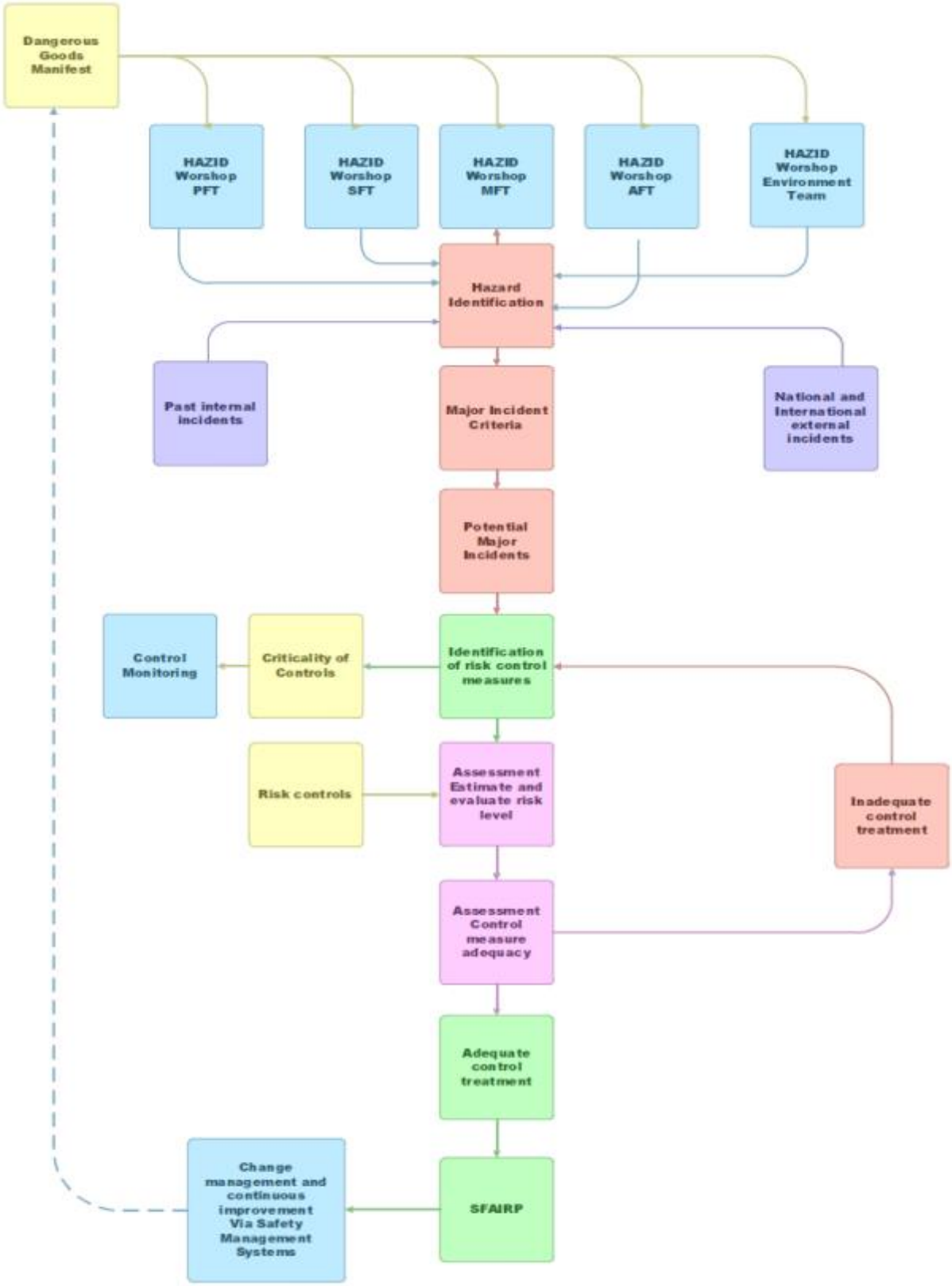


Figure 11: Risk assessment process

8.2 HAZID Methodology

The purpose of the HAZID was to identify potential MIs at AFT and the contributing causes (MI hazards). A potential MI was defined as an event which occurs upon "loss of containment" (LOC) of a hazard which may subsequently lead to a release of Schedule 15 Chemicals. In identifying potential MIs, aspects for consideration included:

- the nature and scale of DGs handled at AFT
- the types of activities conducted at AFT that involve DGs
- activities conducted in the vicinity of Schedule 15 Chemicals that may lead to a MI
- consideration of individual events and analysis of common minor occurrences which could combine to cause a MI
- previous risk assessments, reviews and risk management workshops
- previous audits and inspections
- interfaces with other organisation's railway operations
- historical events at PN sites
- historical events at other railway sites conducting similar operations.

The methodology comprised of a structured examination of the operations at the AFT. The operations were divided into logical 'nodes' for the study. The selected nodes were as follows:

- freight delivery / dispatch by rail
- freight delivery / dispatch by road
- yard operations.

A set of deviations / guidewords were developed prior to the workshop to prompt discussion amongst the participants. Once a credible deviation from the normal operational condition was identified that could result in a MI, causes for this deviation were determined. The consequences of the deviation / cause were also identified, and a judgment was made as to whether the credible worst-case consequences met the criteria for a MI. Further action or investigation was then initiated where information on the hazards and causes required further definition.

From the above risk review, the general categories of initiating events which could lead to a loss of containment of DGs may be categorised as follows:

- collision of container with other equipment (e.g. rolling stock, load lifting equipment and road trucks)
- yard derailment
- metallurgical failure of container/vessel
- dropped container

- safety valve failure
- impact from external source
- natural disaster
- terrorist attack
- fire, including escalation events (fires, explosions) resulting from exposure of dangerous goods containers to fire.

An initial HAZID and risk assessment workshop was conducted at the AFT on 17 November 2010 involving a representative cross-section of employees and other specialists to provide the appropriate level of input and expertise. This workshop was followed up with a risk assessment conducted in 2014 and again in November 2017 to ensure that the original risk assessment results remained relevant and current.

A subsequent series of workshops was held in late 2019 to examine the terminal operations involving the loading of road tankers containing petroleum onto flat wagons. Using the same methodology as described above, the group investigated the MI hazards that could potentially lead to a LOC of petroleum and subsequent MIs, associated with the loading of road tankers onto rail wagons, known as piggyback loading.

8.3 Major Incident Hazards

The outcomes of the workshops conducted at the AFT was a listing of potential MI hazards for the AFT and the basis for their classification as a MI (i.e. what the consequences of the event could be). Where specific incidents were rejected as being MIs (e.g. the credible worst-case consequences did not exceed the required threshold), the basis for these decisions was recorded.

For the purposes of the Safety Case, the major hazards involve releases of loss of containment (LOC) of Schedule 15 Chemicals. For the LOC to meet the severity criteria to be classed as a MI, the LOC would need to involve a significant quantity of material. Very small releases (e.g. leaking flanges or minor quantity spills etc.) were excluded on this basis.

For example, a review of the past incidents from 2007 to 2017 for all PN Freight terminals was undertaken as part of the preparation for the hazard identification. No incidents that would be classified as MIs occurred during that period.

During the review period referred to above, a few minor spills involving DGs were reported across the Intermodal terminals. In particular, a leak of liquid occurred from a container of solid sodium cyanide, the liquid was later found to be condensate and did not contain any sodium cyanide. This incident was not considered to have the potential to escalate to a MI.

The potential MI hazards involving LOC of Schedule 15 Chemicals, associated with the main activities at AFT, may be broadly categorised as follows:

- damage to containers (and LOC) due to an unsecured release of a container during a lift
- damage to containers (and LOC) caused by impacts during lifting, train operations, mobile equipment operations etc.
- damage to containers (and LOC) caused by mobile equipment, truck or vehicle collisions
- random spontaneous leaks of containers during handling or storage on-site
- damage to containers due to external events such as catastrophic failure of the transport vessel, sabotage, external motor vehicle incidents, natural events etc
- LOC of petrol from road tankers associated with piggyback loading

The summary of the potential MI hazards identified through the HAZID process is presented in Table 3 below along with their casual factors and are considered as credible events leading to LOC of Scheduled 15 Chemicals, and potentially a MI.

Major Incident Hazard	Causes
Runaway rollingstock	1. Rollaway of stabled wagons 2. Rollaway of stabled train 3. Rollaway of train or wagons during operations due to driver incapacity
Yard Derailment	4. Damaged or defective wagon components 5. Track protection device is not removed 6. Points, derailers or track infrastructure - mechanical failure 7. Foreign objects on track 8. Points - Network interface - incorrectly set
Rollingstock collision with vehicles, trains or other equipment	9. Propelling movement striking mobile plant 10. Propelling movement striking other rollingstock on road 11. Movement striking other rollingstock/ truck carrying DGs fouling the track
Truck collision (carrying Schedule 15 DG)	12. Collision of truck with fixed equipment 13. Collision of truck with mobile plant 14. Collision of truck with rollingstock
Container dropped (during lifting operations)	15. Mobile lifting equipment attempts to load un-isolated train 16. Train shunting begins while loading 17. Failure of twistlock engagement 18. Mechanical failure of rail mounted gantry crane 19. Mechanical failure of mobile load lifting equipment 20. Failure of leg lift

Major Incident Hazard	Causes
Container dropped (during transport on site)	21. Sudden braking/change of direction (mobile plant) 22. Sudden braking/change of direction (truck) 23. Sudden braking/change of direction (ITV)
External impacts to container	24. Collision of mobile equipment resulting in an item which falls onto container 25. Stability of load-lifting equipment affected by extreme weather 26. High wind toppling stacked containers 27. Toppling of a general container onto a DG container in the immediate vicinity
Container integrity failure	28. Container Failure
Container impacted by mobile plant, trucks or vehicles	29. Container impacted by Internal Transfer Vehicle (ITV) 30. Container impacted by truck 31. Container impacted by light vehicle 32. Container impacted by mobile plant - operator error 33. Container impacted by mobile plant - falling over 34. Container impacted by mobile plant reversing
External fire	35. Arcing of overhead high voltage power lines 36. Release of flammable materials
Sabotage	37. Terrorism 38. Vandalism 39. Trespassers 40. Theft
External events	41. Plane crash 42. Structural impact
Piggyback loading	43. Failure of loading hitch 44. Loading failure 45. Release of flammable materials 46. Tanker integrity failure 47. Trailer / prime mover fire 48. Over pressurisation of tanker 49. Separation of trailer from prime mover

Table 3: Summary of potential Major Incident Hazards and causal factors

8.4 Major Incident Outcomes

The DG classes that are of most concern from a major hazard perspective handled in significant volumes are flammable gases (Class 2.1), toxic gases (Class 2.3), flammable liquids (Class 3) and oxidising substances (Class 5.1). Escalation events may result if DG containers are exposed to external fires (e.g. as a result of a release of flammable material and their subsequent ignition).

With the current conditions present at AFT, incidents involving other DGs handled such as lower hazard reactive materials, flammable solids or corrosive materials are generally considered to result in localised consequences, even in the case of a major release. It would be very unlikely for a release of these materials to result in an incident serious enough to be classified as a MI.

Therefore, it is recognised that specific outcomes involving different types of DGs may result in different consequences (smaller/larger magnitude). Due to the very large range of DGs that may be handled at AFT, the possible consequences of their release were classified into generic outcome groups, being:

- fires caused by ignited releases of flammable liquids or gases, or escalation events including explosions involving DGs exposed to external fires
- toxic gas releases that impact on nearby people
- spills / releases causing significant environmental impacts.

8.4.1 Consequence Assessment for high-risk incidents

For the purposes of the risk assessment, escalation of fires involving DGs was covered under the MI outcome “Fires”. In the risk assessment, the consequence assessment for the “Fire” outcome has been very conservatively assessed as CRITICAL on the consequence scale of the risk matrix in order to capture the worst credible consequences for all possible fire-related outcomes from the identified MIs, which have been summarised in the subsections below.

8.4.2 Ammonium Nitrate Emulsion (ANE) fire and explosions

The Australian Explosives Industry and Safety Group (AEISG) 2 Code notes in Appendix A (of the Code):

“*This Code recognises that due to their very low sensitivity, the only credible way for ANEs to explode by accident is through prolonged and intense fire engulfment*”

For such a scenario to occur within the AFT it requires:

a) A major release of flammable material, and

b) Ignition of the release, and

c) The spill/fire must be in the immediate vicinity of an ANE container.

The risk assessment has identified the control measures that are relevant for the escalation scenario and these are displayed on the bowtie diagrams (Appendix C). These are the control measures that prevent releases of DGs ('left hand side' preventative controls), ignition controls ('Fire' outcome) and control measures to prevent escalation of fires (segregation rules, emergency response).

For the specific case of ANE explosion, the magnitude of the consequences could be greatly increased (large explosion versus localised fire). This is recognised in the AFT Emergency Management Plan with specific response plans developed for fires involving ANE.

8.4.3 Flammable gas fires and explosions

The planned or unplanned release of flammable gas transported in ISO tanks has the potential to result in a MI should ignition of the vapour cloud occur.

Specific consequence modelling, available in Appendix H, has been performed for LOC incidents involving ISO tanks of ethylene, one of the more frequent flammable gases transported by PN in large quantities. The consequence modelling was arranged in response to an incident at Berrimah Freight Terminal in Darwin (a non-PN owned facility) where several ISO-tanks of ethylene over pressurised, which required manual venting to enable them to be safely transported off site. The manual venting resulted in the entire freight terminal being evacuated.

The modelling identified that jet fires and flash fires are a credible though unlikely outcome in the event that a vapour cloud arising from either a planned or unplanned release of ethylene is ignited, the latter which has the potential for offsite impact.

The risk assessment has identified the control measures that are relevant for the escalation scenario and these are displayed on the bowtie diagrams (Appendix C). These are the control measures that prevent releases of DGs ('left hand side' preventative controls), ignition controls ('Fire' outcome) and control measures to prevent escalation of fires (segregation rules, emergency response).

In addition, should a planned venting of ethylene be required due to over pressurisation of the ISO tank, specific safe work procedures will need to be implemented in order to prevent the ignition of the resultant vapour cloud and protect persons from exposure to any radiant heat should ignition of the cloud occur.

8.4.4 Flammable gas cylinders and boiling liquid expanding vapour explosion (BLEVE)

The explosion (BLEVE) of a flammable gas cylinder is an escalation event/outcome from one of the identified MIs. It is credible that in the event of a jet fire from a small gas cylinder, the fire could impact on adjacent cylinders, resulting in gas release (via the pressure relief valve). In a worst-case scenario involving many cylinders and a large escalating fire, explosions (such a BLEVE) could occur.

The risk assessment has identified the control measures that are relevant for the escalation scenario and these are displayed on the bowtie diagrams (Appendix C). These are the control measures that prevent releases of DGs ('left hand side' preventative controls), ignition controls ('Fire' outcome) and control measures to prevent escalation of fires (segregation rules, emergency response).

For the specific case of fires involving stored flammable gas cylinders, the magnitude of the consequences could be increased (large fire with the potential for multiple small explosions versus a small jet fire). This is recognised in the AFT Emergency Management Plan with specific response plans developed for fires.

Specific consequence modelling has been performed for fires involving flammable gas cylinders, this is provided in Appendix H. The consequence modelling includes single small jet fire as well as fireball (representing instantaneous ignited release such as would occur in a BLEVE scenario).

Whilst the magnitude of an escalating event involving many gas cylinders would be larger than a single cylinder fire, the assessed consequence level would remain in the CRITICAL category (with a lower likelihood). Therefore, the escalation scenario would not affect the assessed risk for the MI fire outcome.

8.4.5 Containerised Flammable Liquids Fire and BLEVE

A fire involving a flammable liquids container (e.g. Propylene Oxide) is an escalation event/outcome from one of the identified MIs. In a worst-case scenario involving an iso-container and a large escalating fire, explosions (such a BLEVE) could occur.

The risk assessment has identified the control measures that are relevant for the escalation scenario and these are displayed on the bowtie diagrams (Appendix C). These are the control measures that prevent releases of DGs ('left hand side' preventative controls), ignition controls ('Fire' outcome) and control measures to prevent escalation of fires (segregation rules, emergency response).

Specific consequence modelling has been performed for fires involving flammable liquids in iso-containers. This is provided in Appendix H

8.4.6 Road tanker flammable liquid fires

The AFT facilitates the loading of road tankers containing petroleum (UN 1203) onto flat wagons which are transported to Alice Springs on One Rail Australia (ORA) trains. On average two road tankers holding approximately 35,000 litres each of petrol are loaded onto wagons three days per week. While awaiting loading onto the flat wagons, road tanker trailers are transit stored for several hours at the north end of the AFT yard.

Due to the unique loading arrangements, which involves the road tankers being driven onto the flat wagons by prime movers prior to being secured to the wagons through a hitch arrangement a separate risk assessment was undertaken at the AFT to identify the MI hazards and corresponding controls required to either prevent or mitigate against a MI.

Consequence modelling was undertaken which examined a range of potential MI arising from a LOC of petroleum. The modelling concluded that flash fires and early and late pool fires were the most credible outcomes should a LOC event be exposed to an ignition source. Jet fires were not considered to be credible as the droplet size associated with a release were considered to be too big to sustain a jet fire. A fireball event was also discounted due to the open layout of the terminal.

The risk assessment has identified the control measures that are relevant to prevent the MI Hazards that would lead to a LOC of petrol which are represented on the left-hand side of the BowTie diagram. While the controls to prevent an escalation of the LOC are represented on the right-hand side of the BowTie diagram. The focus of these controls is the elimination of ignition sources and the containment of spilt product until it can be cleaned up.

A copy of the BowTie analysis is attached to Appendix C and a copy of the consequence modelling is attached to Appendix H.

9. Risk Assessment

The risk assessment process for AFT consisted of two phases:

- risk assessment conducted in 2010; and
- risk assessment reviews conducted in 2014 and 2017.

AFT was originally classified by Comcare as a MHF in 2010 under the superseded Commonwealth Occupational Health and Safety (Safety Standards) Regulations [3]. PN conducted a complete risk assessment during 2010 [4] to satisfy the requirements of the superseded regulations. Following the introduction of the Commonwealth WHS legislation in 2011 Comcare subsequently determined that AFT would retain its classification as a MHF. As such, a review of the previous risk assessment from 2010 was conducted in 2014 and again in 2017 to ensure:

- any changes in the hazards and risks at AFT since the previous risk assessment had been captured
- improvements implemented at AFT had been identified
- the revised PN risk assessment matrix was used to quantify the level of risk associated with each of the identified MIs (refer Section 9.2.1)
- regulatory changes (i.e. implementation of the new Commonwealth Regulations) had been incorporated in the risk assessment process.

9.1 Risk Assessment Methodology

The steps in conducting the risk assessment in 2010 were as follows:

1. Select a cause of a MI as identified in the HAZID.
2. Discuss the scenario with the risk assessment team to confirm that the cause was credible, and that the possible consequences satisfied the MI criteria.
3. Review the control measures which prevent the cause leading to a LOC event e.g. container impacted, container dropped etc.
4. Make a team-based qualitative judgement on the likelihood of the LOC event occurring (i.e. all preventative control measures fail). Background data including incident history and near-miss events were used, where available, to assess the LOC likelihood.
5. Identify the potential outcomes and associated consequences, should the LOC event involve dangerous goods (including cumulative effects).
6. Identify the mitigating control measures that further reduce the likelihood of the LOC event resulting in the MI outcome or reduce the severity of the consequences.
7. Assess the likelihood and consequence (risk) of each of the final outcomes.

8. Evaluate the risk for each MI outcome using tolerability criteria.

9. Identify further improvements to reduce the risk, where practicable.

10. The likelihood and consequences of the MI outcomes were estimated qualitatively using the 2010 PN risk matrix, contained within the PN Risk Management Standard.

11. The risk assessment process applied for AFT is presented graphically in the flow chart in Figure 11 previously.

9.2 Risk Assessment Review Methodology

9.2.1 Risk Assessment Workshop 2014

The risk assessment review workshop conducted in 2014 involved the following activities:

- hazards at the AFT that could be a source of MIs were reviewed and validated
- the existing 'preventative control measures' that prevent a hazard from leading to a MI, and the 'mitigating control measures' that reduce the severity of the consequences, were reviewed and validated
- the risk level was assessed using the revised PN risk matrix which was released in June 2013 (shown in Tables 4 - 6 below)
- additional or alternative control measures were identified, where practicable, to further reduce the risk
- the 'critical' control measures were reviewed and validated. Where practicable, further improvements to the control measures were identified, to improve their effectiveness.

9.2.2 Risk Assessment Workshop 2017

In November 2017 two risk assessment review workshops were conducted at the AFT to review the existing risk assessment and identify further improvements to the risk assessment and existing risk control measures. The workshop was facilitated by the Dangerous Goods and MHF Specialist and covered the following areas:

- control and risk
- potential exposure (MHF)
- potential exposure versus residual risk
- control effectiveness and critical control effectiveness
- critical control monitoring

The outcome of the workshop was the identification of potential risk control measures that could potentially be applied to further reduce the risk of a MI occurring. These recommendations will be reviewed by a working group in order to determine their practicality. Appendix A – Risk Reduction Recommendations, summarises the recommendations arising from the 2017 risk assessment review workshops.

	Safety & Health	Property Loss & Security	Environment
CRITICAL (Critical impact, likely to permanently impair PNs business and employees)	Employee/Contractor An event that results in one or more fatalities Third Party/General Public An event that results in one or more fatalities due to PN error or failure	An event resulting in extensive material damage and/or business interruption Serious threat to long term viability of the business Assets at unacceptable risk	Definite risk of fines, prosecution Remediation requiring more than 12 months to recover Uncontrolled toxic release off site with significant detrimental effect Major action required by emergency services
MAJOR (Significant event, major disruption to or lasting impact on PNs business and employees	Employee/Contractor An event resulting in significant irreversible impairment or disablement Third Party/General Public An event resulting in multiple fatalities due to third party error	An event resulting in major material damage, business interruption and/or degradation of service Impact on multiple areas of the business Assets at major risk	Potential breach of regulations, licence, PN policy or other public commitment Loss of production capability Off-site release with limited detrimental effects Remediation requiring less than 12 months Multiple Emergency Units response
MODERATE (Material disruption to, or temporary impact on PNs business and employees)	Employee/Contractors An event resulting in minor temporary ongoing disability or impairment Third Party/General Public An event resulting in a fatality to a member of general public due to third party error (e.g. Level Crossing)	An event causing moderate material damage, business disruption and/or degradation of production, impact to multiple areas of the business. Assets at risk	"Breach of environment procedures, noticeable impact Remediation in less than 1 month On site release contained with outside assistance Limited Emergency Services response
MINOR (Minimal disruption to, or temporary impact on PNs business and employees)	Employees/Contractors An event resulting in an injury requiring medical treatment but no on-going impairment or disablement Third Party/General Public An event resulting from apparent suicide	An event causing minor damage, business disruption, and/or degradation of service, limited to a single area of the business. Assets at minor risk	Minor breach of environment procedures, minimal environmental impact Minor unnecessary resource use or generation of waste Major on-site release immediately contained No Emergency Services Response
INSIGNIFICANT (Minor event, no impact on PNs business and employees)	Employee/Contractors Injury requiring no treatment or requiring only first aid.	An event causing no measurable operational impact to the business.	Minimal Environmental impact Recovery without intervention

Table 4: Risk matrix consequence table

	Likelihood
Almost Certain	Is expected to occur in most circumstances, can expect more than 1 event every year Guidelines: > 95% probability of eventuating
Likely	Will probably occur in most circumstances, can expect 1 event every year Guideline: 65 % probability of eventuating
Possible	Might occur at some time, can expect 1 event every 5 years Guideline: 50% probability of eventuating
Unlikely	Could occur at some time, can expect one event every 5 to 20 years Guideline: 35% probability of eventuating
Rare	May occur in exceptional circumstances, can expect one event every 20 to 50 years Guideline: < 5% probability of eventuating

Table 5: Risk matrix likelihood table

	Consequences				
	5 Insignificant	**4** Minor	**3** Moderate	**2** Major	**1** Critical
1 Almost Certain	**Low 15**	**Medium 10**	**High 6**	**Very High 3**	**Very High 1**
2 Likely	**Low 19**	**Medium 14**	**High 9**	**High 5**	**Very High 2**
3 Possible	**Very Low 22**	**Low 18**	**Medium 13**	**High 8**	**High 4**
4 Unlikely	**Very Low 24**	**Very Low 21**	**Low 17**	**Medium 12**	**High 7**
5 Rare	**Very Low 25**	**Very Low 23**	**Very Low 20**	**Low 16**	**Medium 11**

Table 6: Risk matrix – risk evaluation table

9.3 Risk Criteria

Using PNs risk evaluation process (as described previously), the risk level associated with an event was categorised as:

- very high
- high
- medium
- low; or
- very low.

The tolerability of the risk is dependent on the "*so far as is reasonably practical*" SFAIRP philosophy. SFAIRP is a framework for making decisions about tolerability of risk. According to this framework, there is a level of risk which is intolerable and cannot be justified. There is also a level at which risk is so low that it is negligible and can generally be accepted. Between these limits there is a region where risk is only tolerated if all reasonably practicable measures have been adopted to reduce the risk.

Decisions on what is considered SFAIRP are typically based on good practice and balancing the costs and benefits of accepting the risk, compared to the implementation of further risk reduction measures. When the assessed risk is close to the intolerable level, the expectation is that the risk will be reduced, unless the cost of reducing the risk is grossly disproportionate to the benefits gained. Where risks are close to the negligible level, then action is commonly only taken to reduce risk further where the benefits exceed the cost of risk reduction. The process for acceptance of risk is guided by the governance and internal control arrangements summarised in the Risk Action Table, contained within the PN Risk Management Standard (see **Error! Reference source not found.**below). In determining what is SFAIRP, regard is given to the following five factors:

- the likelihood of the hazard concerned eventuating
- the degree of harm that would result if the hazard eventuated
- what was known or ought reasonably to be known, about the hazard and any ways of eliminating or reducing its risk
- the availability and suitability of ways to eliminate the hazard or reduce its risk
- the cost of eliminating the hazard or reducing its risk.

Risk Rating	Residual Risk Action Required
Very High	**Escalation:** Risk reported to the Executive Team and ARC or HSEC upon identification **Ownership**: Risk owned by Business Unit GMs **Monitoring:** Risk, critical controls and treatment plans monitored monthly by the Executive Team and half yearly by the ARC or HSEC **ARC /HSEC Reporting**: Detailed treatment plan status updates reported to the ARC or HSEC half yearly
High	**Escalation:** Risk reported to the Executive Team upon identification **Ownership**: Risk owned by Business Unit GMs **Monitoring**: Risk, critical controls and treatment plans monitored half yearly by the Executive Team and the ARC or HSEC **ARC /HSEC Reporting**: Treatment plan status updates reported to the ARC or HSEC half yearly
Medium	**Escalation**: Risk reported to Business Unit GMs at identification **Ownership**: Risk owned by Business Unit GM's direct report **Monitoring**: Risk, critical controls and treatment plans monitored half yearly by the Business Unit GMs **ARC / HSEC Reporting:** not required
Low	**Escalation:** not required **Ownership:** Risk owned by Managers **Monitoring:** Risk and critical control effectiveness monitored half yearly by the GM's direct report **ARC / HSEC Reporting:** not required
Very Low	**Escalation:** not required **Ownership:** Risk owned by Manager's direct report **Monitoring:** Risk and critical control effectiveness monitored as required by Managers **ARC / HSEC Reporting**: not required

Table 7: Risk Action Table

9.4 Summary of the Risk Assessment

The summary of the risk assessment results is presented in Table 8 below. For all MIs other than MI-5 (container dropped during load lifting operations) and MI-11 (sabotage), the risk of a release of DGs is 'very low'. The 'medium' risk level for fire and toxic exposure outcomes are determined primarily due to the potentially serious consequences. The likelihood in most cases is at the lower limit of the likelihood scale on the risk matrix. The complete risk assessment report is contained in Appendix G. MI bowtie diagrams which summarise the MIs, causes, controls and outcomes are contained in Appendix C.

Appendix A contains the list of risk reduction recommendations that the risk assessment team considered reasonable to action. In several cases, these recommendations require further investigation or review in order to fully determine the practicability to implement. These recommendations, once assessed and determined to be practicable, will be carried forward to close-out through the HSE Management Plan in place for AFT.

Potential Major Incident	Outcome Risk Ranking (MI)			
	Release	Fire	Toxic	Explosion
MI#1-Runaway rolling Uncontrolled movement of train/wagon impacting other equipment, train, wagon etc resulting in loss of containment of Schedule 15 DGs	Very Low (20)	Low (16)	Medium (11)	-
MI#2-Yard derailment Derailment of rolling stock resulting in impact and damage to containers resulting in loss of containment of Schedule 15 DGS	Very Low (20)	Low (16)	Medium (11)	-
MI#3-Rollingstock collision Rollingstock collision with vehicles, trains or other equipment resulting in impact to DG containers resulting in loss of containment of Schedule 15 DGs	Very Low (20)	Low (16)	Medium (11)	-
MI#4-Truck collision (carrying Schedule 15 DGs) Truck collision with vehicles, trains or other equipment resulting in impact to a dg container resulting in loss of containment of the Schedule 15 DGs	Very Low (20)	Low (16)	Medium (11)	-
MI#5-Container dropped (During Lifting operations) Lifting failure resulting in a DG container being dropped and impacted resulting in loss of containment of Schedule 15 DGs	Low (17)	Low (16)	Medium (11)	-

Potential Major Incident	Outcome Risk Ranking (MI)			
	Release	Fire	Toxic	Explosion
MI#6-Container dropped (during transport on site) Container dropped during transport by truck resulting in loss of containment of Schedule 15 DGs	Very Low (20)	Low (16)	Medium (11)	-
MI#7-External impacts to container External impacts to container (dropped objects etc) resulting in loss of containment of Schedule 15 DGs	Very Low (20)	Low (16)	Medium (11)	-
MI#8-Container impacted by mobile plant, trucks or vehicles DG container struck by vehicle including (mobile plant terminal and contractor vehicles and trucks) resulting in loss of containment of Schedule 15 DGs	Very Low (20)	Low (16)	Medium (11)	-
MI#9-Container integrity failure Container integrity failure resulting in loss of containment of Schedule 15 dangerous goods	Very Low (20)	-	-	-
MI#10-External fire External fire impacting container integrity (bush fire, grass fire, building fire etc.) resulting in loss of containment of Schedule 15 dangerous goods (explosion / toxic gas release due to fire escalation)	Very Low (20)	Low (16)	Medium (11)	Medium 11)
MI#11-Sabotage Sabotage causing direct or indirect container damage resulting in loss of containment of Schedule 15 DGs (including vandalism and terrorism)	Low (17)	Medium (12)	Medium (11)	-
MI#12-External events Impact from external events resulting in loss of containment of Schedule 15 DGs (plane crash, external MI etc)	Very Low (20)	Low (16)	Medium (11)	Medium (11)
MI#13 Piggyback loading Loss of containment of petroleum when undertaking piggyback loading operations.	Medium (11)	Low (16)	Low (16)	Very low (20)

Table 8: Summary of risk assessment outcomes

9.5 Summary of the 2014 Risk Assessment Recommendations

The 2014 risk assessment resulted in several recommendations being suggested as a means to further reduce the risk of a MI occurring. These have been progressively assessed and where found to be practicable have been implemented into the AFT operations. A number of recommendations were raised during the 2014 risk assessment workshop; each of these were reviewed and below is a summary of the resulting actions and final outcomes.

No.	Recommendation	Action taken	Status
1	**Determine the required separation distance between the substation/transformer and DG containers. Implement an exclusion zone**	A review of *transit storage* in AS 1940 *The storage and handling of flammable and combustible liquids* identified a minimum three metre exclusion zone requirement for packaged stores of flammable liquids from potential ignition sources. All substations at the AFT are separated by a minimum three metres from flammable and combustible liquids using bollards as a separation barrier. No further action required.	Completed
2	**Develop DG segregation rules to apply where DG containers are grounded or stored. Incorporate into policies and procedures**	Divisional Intermodal procedure Segregation and storage of hazardous chemical containers has been introduced. A segregation card has also been deployed to assist with determining separation distances. These rules are consistent with the segregation requirements contained within the Australian Code for the Transport of Dangerous Goods by Road and Rail (version 7.5).	Completed
3	**Ensure the emergency response procedures include the appropriate steps to safely manage the recovery of DG containers that may have sustained damage because of an incident**	AFT procedure *FRT-PLA-SAF AFT Emergency Management Plan* contains guidelines on managing spill / rupture events that are above the terminals capability to manage. Recovery of DG containers that	Completed

No.	Recommendation	Action taken	Status
		have been damaged due to an incident will be guided by external advice which is currently sourced from: • customers • emergency services • PNs spill response provider - ISS First Response.	
4	**Review / update emergency response procedures / dangerous goods spill response procedures to provide clear directions for the critical steps to be undertaken for the case of a leaking DG container to ensure that Pacific National employees are not put at risk during the emergency response activities. Consider immediate spill containment / internal resource requirements, external or customer technical support etc.**	Direction provided to terminal staff in what do in the event of a significant DG leak is contained within the *FRT-PLA-SAF AFT Emergency Management Plan.* A hard copy of this document is located in the AFT Emergency Information Container at the entrance to the terminal and can also be accessed from the PN document management system (SafetyNet). The AFT Emergency Management Plan provides direction on steps to take in the case of a leaking DG container. Site familiarisation training has provided information to employees on the practical and functional use of the spill response container. Spill Response Container stocks are audited post door activation and flashing strobe warning light using *INT-FOR-SAF Spill Response Container Audit – Reorder Form*.	
5	**Review policies/procedures for stacking of DG containers**	Divisional Intermodal procedure Segregation and storage of hazardous chemical containers has been introduced.	Completed
6	**Implement improvements in near miss reporting to ensure that all mobile equipment collisions are recorded**	Near miss reporting is a Leading indicator and reported on in PN Safety Dashboards (monthly)	Completed
7	**Consider consolidation of various incident recording databases**	The Safety Health and Environment Database (the SHED) was released in November 2014 and is used to	Completed

No.	Recommendation	Action taken	Status
		record all incidents, near misses and hazards reported.	
8	**Ensure consistency of information pertaining to the transport of DG described in the Terms and Conditions and the Conditions of Carriage sections of the customer information pack (InfoPak)**	The PN Intermodal "InfoPak was revised and updated with the Terms and Conditions and Conditions of Carriage sections of the document consolidated to provide clarity and consistency of information pertaining to the transport of DGs on Pacific National trains.	Completed
9	**Review the process for the auditing of customer tanks to ensure it meets PN requirements**	Terminal Load Compliance Inspection Safety Form has been implemented at the SFT and forms part of the critical control monitoring program.	Completed
10	**Review the handover/verification process for the receipt of DGs at the terminal**	A process has been introduced to check DG containers for compliance with ADG Code (version 7.7) on arrival at the Terminal.	Completed
11	**Consider the implementation of a line of work process to notify the receiving terminal of arriving DGs and early notification of customers to pick-up DG containers soon after they arrive (minimising the holding time for DGs at the Terminal)**	Pacific National uses FreightWeb which is a real-time application to assist customers in monitoring the location of their goods. This allows for the real-time monitoring of the location and pending arrival of the DGs. Customers can log into Freightweb at any time to determine the location of their freight and when it will be arriving at the pick-up terminal. In addition, Pacific National distributes daily an automated notification to customers advising them of daily freight arrivals and when their freight will be available for collection. This applies to all freight types, not just dangerous goods	Completed

No.	Recommendation	Action taken	Status
12	**Incorporate external auditing of the maintenance providers systems for maintenance on critical safety systems on mobile equipment and ITVs to verify adequacy of safety critical maintenance**	PN engaged maintenance providers for the forklifts and gantry cranes in 2016. As part of the tender reviews process PN reviewed the proposed maintenance schedule against OEM requirements to confirm that the equipment would be maintained appropriately. PN has introduced scheduled auditing of the maintenance providers in June 2018.	Completed
13, 17	**Review the controls associated with leg-lifting of containers to identify any further means to reduce the risks associated with this activity. Consider the use of modified trans-flats for chlorine, cameras etc.**	PN in May 2014 conducted a Risk Assessment regarding loss of containment of chlorine for the entire loading process with Orica and K&S Freighters (chlorine road transporter). The assessment identified that no fatalities from the handling of chlorine in Australia in the past 35 years. There are two medium risk events with regard to the legs failing to engage on the container. The causes are the driver unable to see the pockets and sensors being inadvertently triggered. The controls to reduce these risk events were to install cameras on the forklift legs to enable the operator to check engagement of the legs in the rear container pockets. In addition, the new forklifts are fitted with engine fire suppression systems to mitigate against a mobile equipment fire should one occur. Routine fleet inspection of the forklifts occurs daily and in accordance with routine scheduled maintainer service by Adapt-a-lift to ensure serviceability of the equipment.	Completed

No.	Recommendation	Action taken	Status
14	**Confirm that emergency procedures include the use of the TMS system to identify /locate dangerous goods**	*FRT-PLA-SAF AFT Emergency Management Plan* includes the use of the TMS system to identify and locate dangerous goods within AFT.	Completed
15	**Provide an intermodal standard for truck driver induction process. In particular review the refresher training requirements, traffic management, computer based one-stop training, site specific requirements etc.**	The AFT Truck driver induction has been reviewed and induction cards issued with expiry dates.	Completed
16	**Review the intermodal procedure for traffic management plans to ensure the controls to reduce the truck collision risk are fully implemented**	The AFT Traffic Management Plan has been reviewed	Completed
18	**Investigate the possibility of alternative transiflats to eliminate leg-lifting of chlorine drums.**	In May 2014 PN undertook a combined risk assessment of controls associated with leg lifting and a review of the entire loading process in respect to loss of containment of DG product with Orica and K&S Freighters. The risk assessment identified "top-lift" container bases with retractable arms do not have enough anchor points for the number of chains required to adequately secure the chlorine drums to the base. Therefore, it was determined that the transport of chlorine drums with leg-lift transi-flats was the only viable option for this product type.	Completed
19	**Implement speed limiting of internal vehicles if trial in MFT proves to be successful**	In 2014 a GPS trial on speed limiting internal vehicles was conducted at the MFT. The trial revealed that the 'Geo-fence' (a virtual geographic boundary, defined by GPS) trialled was not accurate enough to distinguish when an internal vehicle operated by a PN employee was in the terminal or on a public road. The likelihood of incident was therefore increased as the internal vehicle	No further action required

No.	Recommendation	Action taken	Status
		would be travelling at a speed significantly less than stipulated on a public road e.g. travelling 20 kph in an 80 kph zone as the 'Geo-fence' would have controlled the vehicle on the public road as well as within the terminal. Therefore, it was determined impractical to introduce this initiative into the terminal operations. Plant involved in container handling at the AFT are speed limited. ITV's are limited to a maximum of 20kph; reach stackers are restricted to a max speed of 15km per hour when operated unladen, their speed is further reduced depending on the load capacity of the machine. When undertaking leg lift operations, the speed of a reach stacker is slowed to 10kph and when operated in a 'cab-forward' position, 5kph.	
20	**Consider installing a variable message board for advising truck drivers of shunting operations in progress.**	Variable Message Boards (VMB) have been used as a short-term control when AFT has undergone significant change. However, having a permanently installed VMB was considered impractical and had the potential to add to terminal congestion. Visual control measures, for example, line markings and appropriate signage has been installed at designated rail crossings at all MHFs and these controls are communicated to all employees, truck drivers and contractors during inductions.	Completed
21	**Confirm the required separation distance that should be enforced beyond the derailers**	20 m separation distances from derailers to where wagons are placed. White lines have been marked on the appropriate locations and distance from the derailers to ensure adherence to the distance.	Completed

No.	Recommendation	Action taken	Status
22	**Reinforce/communicate the policy on leg lifts at all intermodal terminals**	"No Light No Lift" Policy reinforced/ communicated via Mobile Equipment Operations Training Package (section 5 Handling Containers). No Light No lift Policy acknowledged by all Terminal Operators. LSN 11/11 Disseminated 10/11/2011. LSN 03/14 Disseminated 12/09/2014	Completed
21	**Implement improvements to controls on mobile equipment reversing (e.g. Cameras/ reversing sensors)**	Lease contract acquisition requirements for new terminal mobile equipment entails fixed position cameras for machine reversing and offside bottom lift leg application. Reverse cameras have been fitted to existing forklifts.	Completed
22	**Consider implementing a PN National intermodal standard for the control of track maintenance activities**	The Assets, Infrastructure and Services business unit within PN is responsible for track maintenance activities.	Completed
23	**Implement improvements to controls on mobile equipment reversing (e.g. cameras or reversing sensors)**	All terminal mobile reach stackers are equipped with audible reverse alarm and in cab reversing camera activated upon machine reverse gear selection. The warning and alarm functionality are covered in the training that is provided to reach stacker operators and documented in the reach stacker training material.	Completed
24	**Implement exclusion zone, bollards etc around electrical power boards located 1B3. Alternatively consider removing these boards.**	Yellow bollards 1800mm high are positioned in a square diagonal formation around electrical power boards, light towers and fire hydrants within the terminal.	Completed

10. Consequence Modelling

Following the risk assessment in 2010 PN engaged R4Risk to conduct consequence modelling. The modelled scenarios, which were developed based on the MI outcomes identified during the AFT risk assessment, are:

- Scenario 1: Class 2.1 flammable gas fire (10 kg cylinders in a shipping container)
- Scenario 2: Class 2.3 toxic gas release (920 kg chlorine drum / 450 L ammonia cylinder)
- Scenario 3: Class 3 flammable liquids fire (20 L drums within a shipping container)
- Scenario 4: Class 3 flammable liquid fire (20,000 L iso-container)
- Scenario 5: Class 4 flammable solids fires (12 kg cartons in a shipping container)
- Scenario 6: Class 2.2 non-toxic, non-flammable gas with subsidiary risk of 5.1 oxidising agent.

In January 2016, PN engaged Arriscar Pty Limited (Arriscar) to estimate the physical effects of ammonium nitrate emulsion (ANE) explosions and chlorine gas releases. The outcomes of this modelling process conducted by Arriscar are summarised in Sections 10 1 and 10.2 below.

Following this modelling process, a review by the risk assessment team at the AFT was conducted in April 2017 to further understand the magnitude and severity of a number of MI scenarios that could occur at AFT. The review looked at potential exposures arising from a LOC incident, the impact of this type of incident from the perspective of the AFT and the greater community, taking into consideration of the land use in the vicinity of the AFT.

In 2019, PN engaged Arriscar to undertake further consequence modelling focussing on the handling of ethylene (UN Number 1962) and petrol (UN Number 1203). As per previous consequence modelling, the focus of this process was on potential LOC events and the resultant onsite and offsite impacts.

10.1 ANE explosion overpressure

The peak quantity of ANE present at AFT was calculated at 45 tonnes, which corresponds to approximately two isotainers. Arriscar also examined the risk reduction obtained if the inventory could be separated to prevent sympathetic detonation.

Table 9 below presents the numerical results while Figure 12 below is a graphical representation, showing the extent of 21 kPa overpressure (0.21 bar) from an explosion of 26t ANE, nominally equivalent to one container.

ANE (Tonnes)	NEQ (kg)	Explosion Overpressure (kPa)		
		7	14	21
26	20800	490	286	215
45	32000	589	343	258

Table 9 Distance (m) to Overpressure for AFT ANE storage

Figure 12: Explosion overpressure contours for 45tonne ANE, AFT

The findings from the Arriscar consequence modelling determined that an explosion of 45 tonnes of ANE will encroach a residential area to the north east of the AFT boarding Railway Terrace and Carroll Street.

The modelling process identified that risk reduction for the AFT could include separating the peak inventory of ANE into two 26t inventories, separated by at least 50 metres. Separating the peak inventory in such a manner reduces the extent to which the 7 kPa overpressure contour impacts residential areas.

The majority of ANE transported through AFT is on through trains travelling from west to east or east to west (depending upon customer requirements). In these circumstances the ANE remains on the trains while awaiting the loading and unloading of inbound and outbound freight.

Where ANE is unloaded at AFT, the terminal investigated the feasibility of this recommendation and determined that in most circumstances this would involve double handling of the ANE containers. The current terminal practice for the handling of these containers is to load them directly from rolling stock onto the truck, to minimise their handling. To introduce the recommendation of separating the containers would involve lifting the container off the rolling stock with load lifting equipment, moving it to another location and storing it on the ground and then lifting the container onto the truck when it arrives in the terminal. Whereas keeping the container on the rollingstock until the truck arrives for collection means the container is picked up only once and loaded directly onto the truck when it is then removed from the terminal. This process minimises the risk of a container handling incident occurring.

Typically, containers of ANE are collected within 12 hours of their arrival by train into the terminal. Where it is required for containers of ANE to on remain on site for an extended period of time, they will be separated from other ANE containers by at least 50 metres, this process is documented in FRT-PRO-SAF Management of High Consequence Dangerous Goods.

10.2 Toxic gas dispersion (chlorine)

The average quantity of chlorine that arrives at the AFT is 54 tonnes, though peak quantities of up to 175 tonnes have been observed

Table 10, and Figures 13 and 14 below show the extent of the toxic load equivalent to AEGL-3 concentrations for rupture cases and 10mm diameter holes. These figures show the potential chlorine releases to impact residential and commercial properties north of the terminal. The further north chlorine cylinders are located, the greater the potential to impact residential properties.

The release duration and hence exposure times for chlorine release from 725 kg containers is less than one hour. This potentially enables a “shelter in place” strategy to be effective in mitigating the consequences of the release.

Weather Class	D-High	D-Low	F
Rupture Case	537	446	684
10 mm Diameter Hole	307	405	735

Table 10: Extent of AEGL-3 toxic load

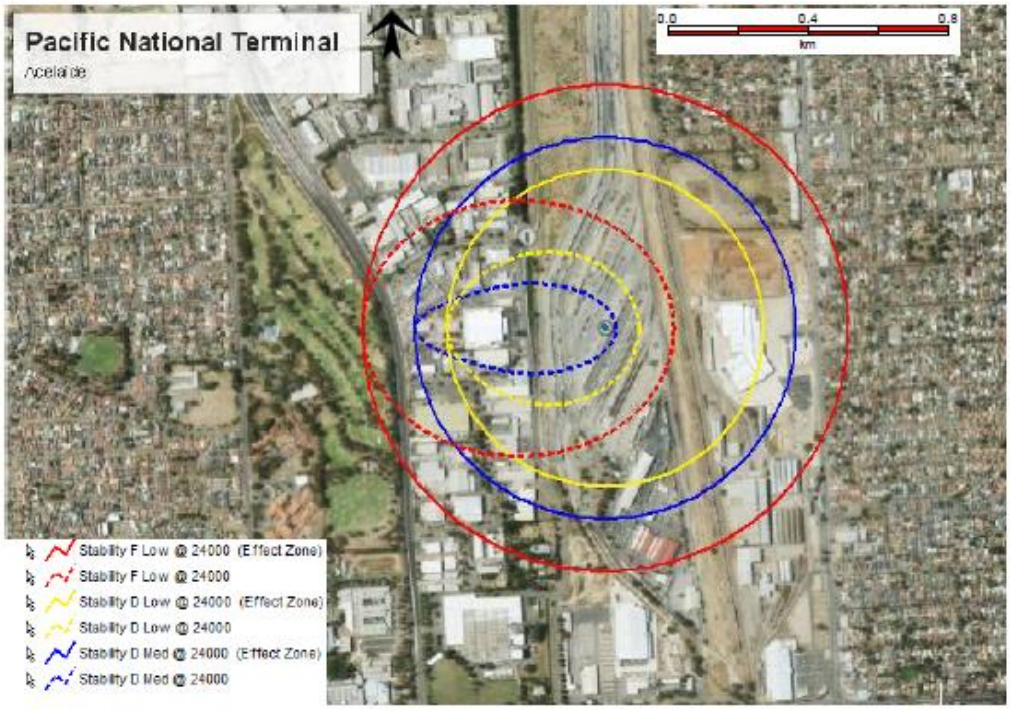


Figure 13: Extent of AEGL-3 toxic load catastrophic rupture

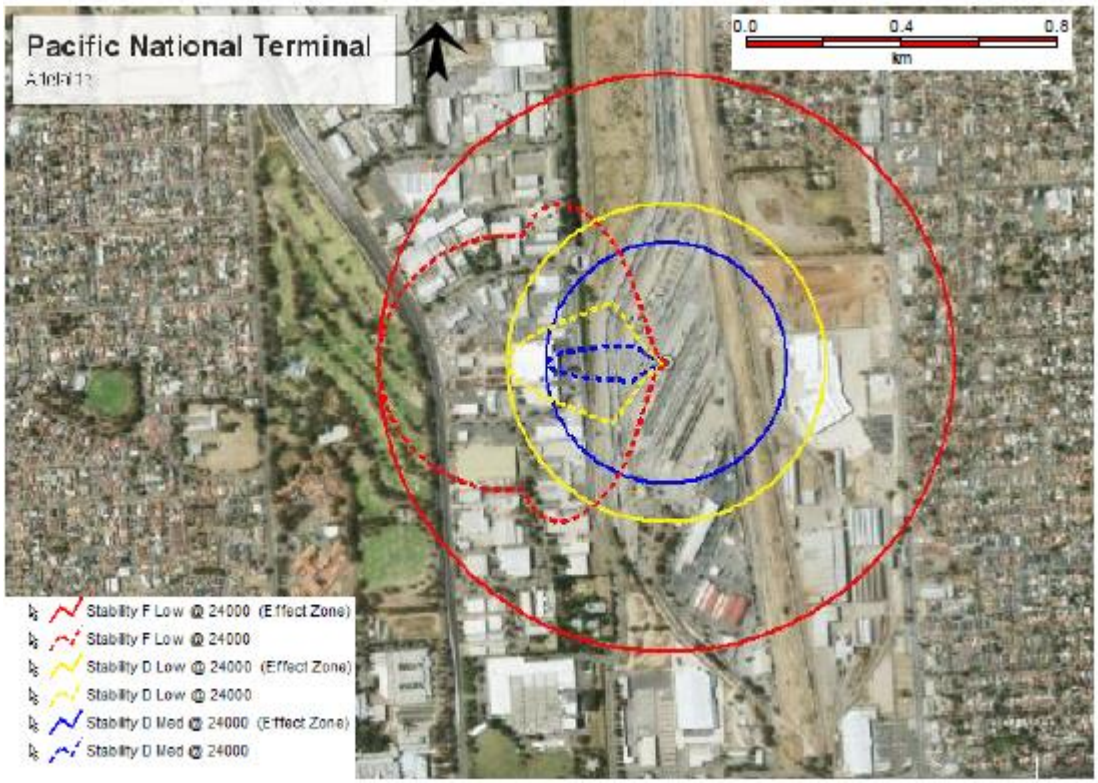


Figure 14: AEGL-3 toxic load, 10mm diameter hole

PN examined the movement, loading and unloading of chlorine through the AFT. Similar to the ANE, the majority of chlorine freight consignments transported through the AFT is on through trains travelling east-west. In these circumstances the position of the chlorine containers is dependent upon their position on the train which is influenced by a number of factors, including length of train, other DGs present on the train / management of segregation, enroute attaches and detaches of rolling stock. Therefore, it would not be practical to relocate the position of the chlorine in the AFT while it is rail transit.

Where chlorine consignment is unloaded at the AFT, where possible the containers are unloaded directly from rolling stock onto the truck. Where containers have to be unloaded to the ground their position in the terminal is dependent upon their position on the train when it arrives. The terminal examined the practicality of moving chlorine containers to the southern end of terminal and determined this activity increased the risk of a container handling incident occurring as this would require the load lifting equipment (using leg lift attachments) to travel extended distances through the terminal, where the preferred risk mitigation strategy is to minimise container handling and travel.

The Arriscar Pty Limited Consequence Modelling Report for Intermodal Terminals for Pacific National January 2016 is attached in Appendix H.

10.3 Flammable gas fire

Bulk ISO-tanks of ethylene regularly transit through the AFT when consigned for delivery to the Berrimah (Darwin) Freight Terminal. Peak quantity of ethylene was determined to be 22 tonnes, being a single ISO-tank.

The consequence modelling considered both planned releases such as manual venting of over pressurised tanks and unplanned releases such as that associated with a breach of containment. The consequence modelling concluded that the injury and fatality risk for the pressure relief of ethylene ISO tanks is limited to the area immediately around the ISO tank, with the risk being further reduced if the venting is directed upwards.

Where an unplanned release occurs, there is the potential for off-site impacts, however the report concluded that such as incident with offsite impacts has a very low risk of occurrence; with a frequency of 30 in a million years. The report further concluded, that due to the open layout of the freight yard, explosions are unlikely.

Emergency response procedures are scheduled to be developed to enable the site to manage any situation involving the planned or unplanned release of bulk quantities of ethylene.

Figures 15 and 16 below shows the maximum ½ lower flammability limit (LFL) extent for the planned venting of an ethylene ISO-tank and 50mm horizontal liquid release, which is the worst-case scenario for LOC of ethylene.

A copy of the technical report prepared by Arriscar in September 2019 is included in the Appendix H.

Figure 15: Maximum 1/2 LFL extent for horizontal safety valve relief

Figure 16: Maximum 1/2 LFL extent for 50mm horizontal liquid release

10.4 Petrol Tanker flammable liquid fire

Peak quantities of petrol (UN 1203) have been calculated to be approximately 70,000 consisting of two multi-compartment road tankers which are loaded onto flat wagons at the car loading platforms located at the south end of the AFT. Prior to loading a single road tanker will be temporarily stored at the north end of the terminal (refer to Photo 4).

Consequence modelling was undertaken which examined a range of potential MI arising from a LOC of petroleum.

The modelling concluded that the loading and transit storage of petroleum did not pose an offsite risk. However, in the event of a fire there existed the potential for persons to be exposed to radiant heat from the fire. Subsequent to this finding, arrangements were made to relocate the area where tankers were transit stored to prevent persons in occupied buildings from being exposed to high levels of radiant heat, which has been captured in the BowTie analysis. Furthermore, petrol tankers will not be loaded onto wagons within 40 metres of the office where Prixcar employees are located.

Figures 17 and 18 below shows respectively the fire radiation intensity at the car ramp and the transit storage area for a 35kL late pool fire.

A copy of the consequence modelling conducted by Arriscar in September 2019 is attached to Appendix H.

Figure 17: 10-minute release of 35kL late pool fire radiation intensity at car ramp

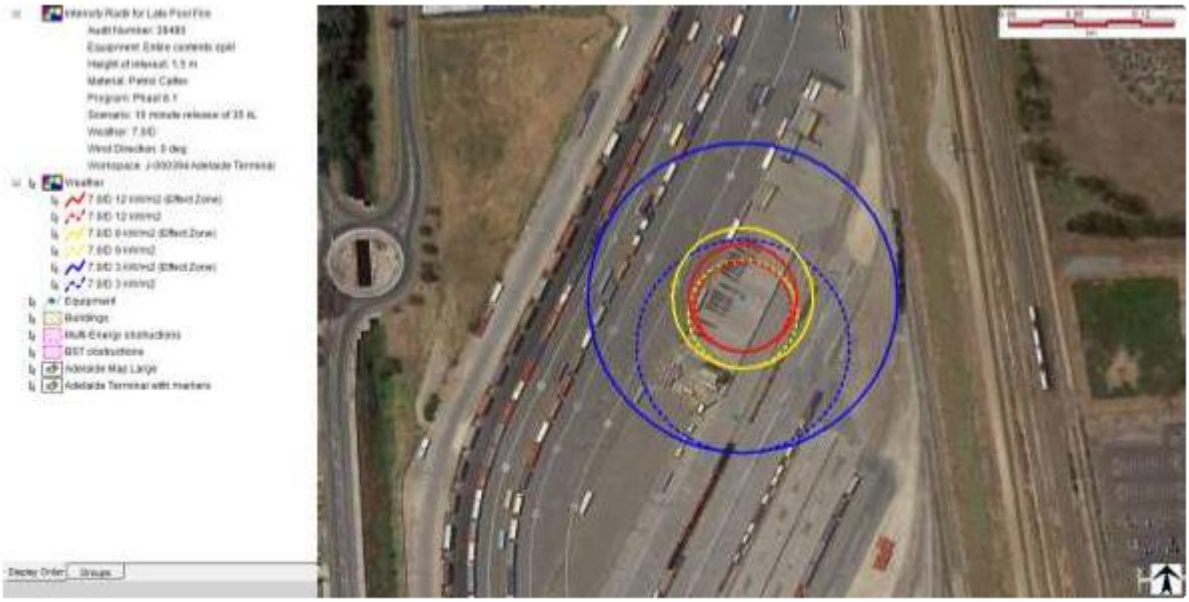


Figure 18: 10-minute release of 35kL late pool fire radiation intensity at transit storage area

11. Control Measures and Adequacy

11.1 Identifying Control Measures

When considering a single MI, many existing controls were identified as contributing to the management of risk associated with that event. However, the actual contribution of each control to the management of the risk may vary widely. For all controls identified as managing the risk associated with a MI, a screening process was applied to identify those controls that have the greatest influence in managing the risk associated with that event. It is these controls (i.e. "major hazard controls") that require subsequent focus to ensure that the risk from MIs remains at a tolerable level.

In total, five different control measure types were identified:

- Major Incident Critical Control (MICC) - directly impacts event, significant increase to MI risk if the control measure was disabled and therefore are required to have the highest level of effectiveness
- Cumulative Critical Control (CCC) - Those control measures which, if disabled, would produce an increased in the risk of more than one MI scenario
- Critical Control - No direct impact to a MI, however significant impact to non-MI events
- Important control – Non-critical, non-fatal risk
- Base control – Non- critical, administrative control

For the purposes of the Safety Case only MICCs and CCCs were included in the assessment and the subsequent reporting process as these were identified as either directly or indirectly contributing to the prevention of or mitigation against a MI.

11.2 Review of Control Measures

The major hazard control measures for each MI were further reviewed and the critical control measures (MICC and CCC) for each MI were identified. These critical control measures are those control measures that apply to more than one MI and which, if disabled, would produce a significant increase in the risk of a MI across a range of scenarios.

In determining the selection criteria for MICC and CCC, the following aspects were considered:

- the severity of the consequences of the event
- the contribution of the event to the overall risk profile of the site
- the applicability of the control measure to the event
- the effectiveness of the control measure in preventing / mitigating the event
- the nature of the control measure (e.g. engineering-based or system-based)
- whether the control measure protected against a range of different events.

11.3 Control Measure Hierarchy

In determining what additional control measures may be appropriate, consideration was given to the hierarchy of hazard controls (extracted from the PN HSE *Risk Management Procedure*). This is shown schematically in Figure 19 below.

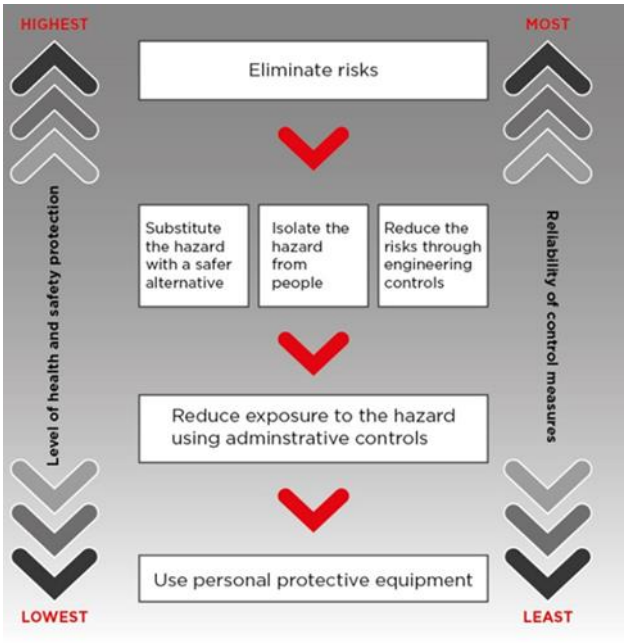


Figure 19: Hierarchy of hazard controls

11.4 Control Measure Adequacy

The effectiveness of the MICC and CCC measures were assessed as part of the risk assessment review workshop. Factors that were considered as part of this assessment included the following:

Applicability: The control measure must be applicable to the event. If it functions as designed, it should prevent the event or significantly mitigate its consequences.

Implemented: The control measure must be fully implemented, i.e. the control measure must be in place.

Independence: There should be sufficient independence of the critical control measures nominated for a single event. There should be no single failure that can disable two or more critical controls.

Reliability: The control measure should be sufficiently reliable, i.e. it should have a low probability of failure on demand.

Monitored and audited: The control measure should be monitored so that its performance may be established. Systems that manage the performance of the control measure should be audited to ensure that the control remains functional and effective.

The effectiveness of critical control measures in preventing a specific scenario (cause) was measured using a qualitative rating approach. Comprehensive details of the control adequacy assessment approach are provided within the Risk Assessment Report contained in Appendix G.

The overall adequacy of the critical control measures (as a group) for each MI was then assessed based on the following:

- ***The control measures should be proportionate to the inherent risk.*** The total extent of control applied to each hazard needs to be proportionate to the inherent level of risk. This determines the amount of time and effort expected to reduce the risk to SFAIRP. The greater the risk, the greater the effort expected.
- ***The number of control measures that have been selected.*** A number of different and independent control measures are considered more appropriate than reliance upon just a few controls. A mixture of different types of control measures (e.g. engineering, administrative, and procedural controls) is preferred to reliance upon a single type of control measure.
- ***The hierarchy and effectiveness of control measures selected.*** Control measures that eliminate or prevent MIs (preventative control measures) are preferred over control measures that reduce or mitigate the impacts of the MI (mitigative control measures). To be considered effective, the control measures must also not be disabled in the event of the MI (i.e. they must remain viable).
- ***Considering the full range of operating circumstances.*** Risk control measures must be effective in all operating conditions, including abnormal events.

11.5 Risk Assessment Outcomes - Control Measures

The MICC's were identified for each scenario. The focus was to ensure that preventative control measures were in place to address each cause. A limited number of MICCs were available to reduce the severity of the consequences, should a loss of containment of DGs occur. The mitigating control measures commonly apply to each loss of containment scenario.

Critical control measures that are primarily applied to manage the risk for each scenario were nominated by the AFT risk assessment team. The effectiveness each critical control measure was assessed by the team according to the process described in Section 11.4 above. A summary list of the critical control measures, and effectiveness assessment, is presented with the risk assessment report contained in Appendix G.

11.6 Control Measure Performance Indicators and Standards

Monitoring the performance of controls is a key part of the overall risk management process. Effective and functional control measures assist to ensure the actual risk of a hazardous event remains at, or below, the estimated risk level. This is achieved by ensuring that the ongoing performance of the identified controls remains at, or exceeds, the performance level that was assumed when estimating the risk of the event. The performance of a control may be demonstrated by the application of performance indicators and standards, these are defined as:

Performance Indicator: Any quantitative or qualitative information used to measure the performance of any functional aspect of a control measure.

Performance Standard: A benchmark, target or reference level of performance set for a control measure as measured by the performance indicator, or for an aspect of the SMS, against which performance may be tracked.

Alternatively, a performance indicator may be described as an objective measure that shows the current and past performance of the control measure, whereas a performance standard represents the required level of performance to ensure that the risk is managed to a tolerable level.

The critical controls that manage the risk associated with major hazards are grouped according to the SMS element that the control performance is managed by, together with the performance indicator and performance standard. The performance of that aspect of the SMS is then monitored. This enables the performance of the control measures contained within the SMS element to be tracked and verified. Where the performance of the control measure is found to be not reaching the desired performance standard, action is will then be taken to address the issue.

Critical Operating Parameters (COPs) relevant to the bowtie outcomes and resultant critical control measures are listed in Appendix B Major Hazard Control Key Matrix.

A summary of the critical controls, and the relevant performance indicators and performance standards is provided in Appendix I Critical Control Monitoring Plan (CCMP).

The CCMP identifies:

- A description of each control and its level of criticality (MICC or CCC)
- The control type (preventative or mitigative)
- The reference documentation that applies to that control
- The specific monitoring requirement and tool to be used to determine compliance to the control and its overall effectiveness
- The frequency of monitoring each of controls
- Identification of the person responsible for the monitoring of the control.

A matrix is also contained in the CCMP which defines the terminology used within the plan and the underlying assumptions that have been used to form the decisions for required monitoring levels.

Responsibility for implementing this Safety Case and ensuring the CCMP is undertaken is the Manager Operations SA.

11.7 Demonstration of SFAIRP

To demonstrate that the risks associated with the MIs have been reduced to be SFAIRP, the reasons for not adopting further risk control measures must be documented. This must show that the cost of implementation of further risk controls is grossly disproportionate with the risk reduction gained or that implementation of the risk control may introduce other risks and hence not result in a net reduction of risk.

The risk assessment workshop process conducted in April 2017 has assisted to demonstrate that the risks associated with the MIs has been reduced to be SFAIRP as follows:

- all but two MIs were assessed as a very low risk for the release of DGs. For those two MIs where the risk of release of DGs was assessed as 'low', the control measures were further reviewed to ensure they were adequate and that all practicable risk reduction measures were implemented
- reviews of incidents, past studies, and other documentation has provided knowledge about hazards at AFT
- the professional judgement of personnel at the HAZID and risk assessment workshops provided knowledge of ways to control the hazards
- the assessment of effectiveness and adequacy of the control measures considered the suitability and availability of additional control measures
- the risk reduction possible through implementing additional or alternative control measures was balanced against cost by informed workshop team judgement. Where more detailed cost-benefit analysis is justified, recommendations have been developed to address the necessary follow-up work. These are contained in Appendix A - Risk Reduction Recommendation Summary.

To ensure that the risks remain SFAIRP, existing and new control measures are monitored and managed through the application of performance monitoring processes (refer Section 11.6 above).

11.8 Additional Control Measures / Control Measure Improvements

Where practical, improvements were identified through the review of control measure effectiveness. In total, 36 recommendations for improvement were made from the risk assessment review process, which are presented in Appendix A – Risk Reduction Recommendation Summary.

11.9 Links to the Safety Management System

The ongoing effectiveness of the control measures that limit the risk associated with major hazards is managed through PN safety management system. For the ongoing management of the major hazard risks at AFT, it is important that the SMS is effective in managing these controls.

The links between the control measures that manage major hazards and the SMS were identified and recorded. The adequacy with which the SMS manages these control measures is then assessed through monitoring and audits of the SMS.

The Risk Assessment Report (Appendix G) shows the linkages between the critical control measures and the SMS elements that manage the performance of these controls.

12. Safety Management System (SMS)

12.1 Overview of the HSE Management System

The PN HSE management system is designed to provide for a consistent approach to HSE management across PN and support the integration of HSE management processes and responsibilities with other business responsibilities. It is based on the premise that effective HSE management relies on a systematic approach with appropriate governance, structures and clearly defined accountabilities.

Pacific National's (PN's) Health, Safety and Environment (HSE) Management System has been developed to be consistent with the Management System designed around AS/NZS standards.

It is designed on the principles of continuous improvement and adopts the methodology of Plan-Do-Check-Act, as outlined in the figure below:

Figure 16 – Pacific National Plan-Do-Check-Act

12.2 PN HSE Management System Framework

The PN HSE management system outlines how HSE management is structured and functions and is underpinned by PN's "PNA" (Pacific National Approach). Our PNA defines five strategic priorities that will ensure we are focused on what is important and aligned as a team and include Safety; People and Leadership; Customers; Community; and Financial success. It is based on a decentralised philosophy where the senior Leadership Team set the strategy and governance framework, and operating business units execute the strategy, systems and processes in line with that framework.

Business Units and sites execute the necessary HSE management activities to ensure HSE risks are managed. Business Units and sites have the discretion to establish specific procedures where company-wide directives do not cover issues specific to that operation. Relevant HSE documentation is available on The Junction - SafetyNet.

Strategies cascade throughout the company to guide continuous improvement in HSE performance. Auditing and review programs are put in place to ensure that systems and practices meet the requirements set out in PN HSE documents.

The components of the framework undergo scheduled reviews to ensure that they reflect any significant legislative changes as well as the current PN context and expectations of stakeholders.

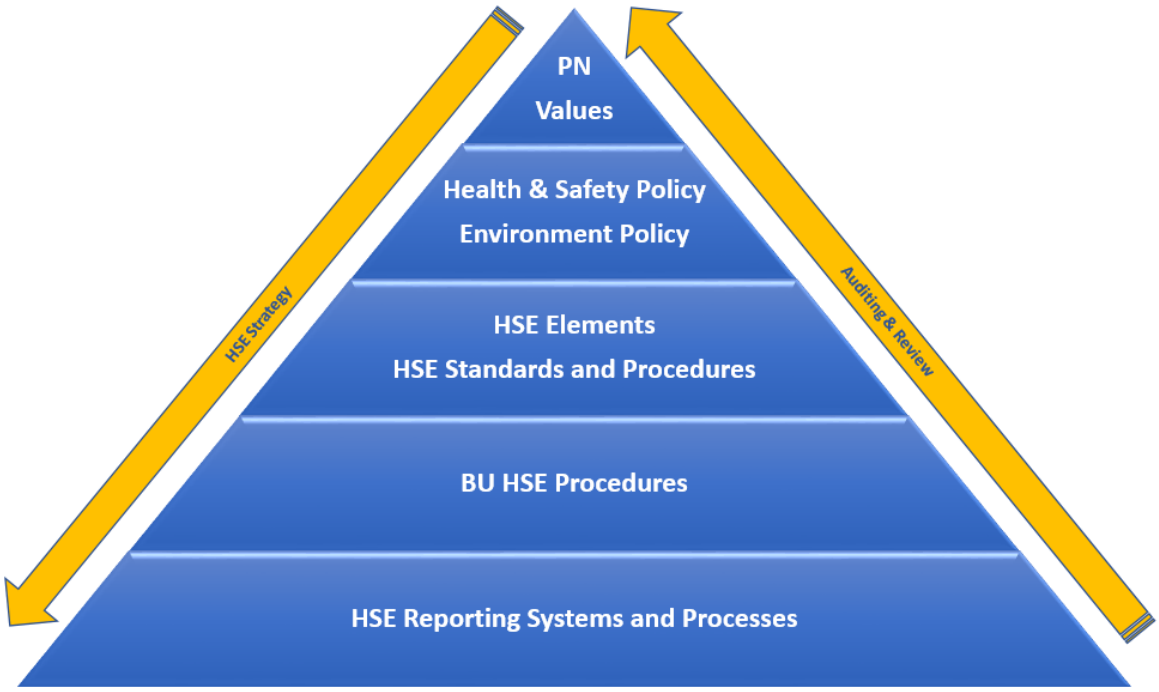
Pacific National's 15 HSE Elements are:

#	Pacific National's 15 HSE Elements of the SMS	Supporting SMS documents	**Schedule 17 (4.2)** *cross reference identifying the specific provision being complied with*
1.	**Leadership, Accountabilities & Responsibilities**	PN-POL-SAF HSE Policy PN-STD-SAF Responsibilities and Accountabilities	**Schedule 17 (1)** *Safety Policy and safety objectives* **Schedule 17 (2)** *Organisation and personnel*
2.	**Legal & other Business Requirements**	PN-STD-SAF Document and Records Management PN-STD-SAF Legal and Other Requirements PN-STD-SAF Rail Accreditation Management	
3.	**Planning, Goals & Targets**	HSE Strategy 2019- 2023	**Schedule 17 (1)** *Safety Policy and safety objectives* **Schedule 17 (7)** *Performance monitoring*

4.	**Communication & Consultation**	PN-PRO-SAF Communicating HSE Information Procedure PN-STD-SAF Community Engagement and Complaints Management PN-STD-SAF Safety Issue Resolution PN-STD-SAF WHS Consultation	**Division 3 of Part 9.5** *Consultation and Workers' Safety role* **574** *Safety role for workers* **575** *Operator of MHF must consult with workers*
5.	**Risk & Change Management**	PN-STD-SAF Change Management PN-PRO-SAF HSE Risk Management Procedure PN-PRO-SAF Critical Risk Management Framework (HSE)	**Division 3 of Part 9.3** *Management of risk* **569** *Review of risk management* **Schedule 17 (5)** *Management of change* **Division 3 of Part 9.4 (564; 566; 569)** *Identification of major incidents; Control of risk; Review of risk management*
6.	**Training & Competence**	PN-STD-SAF Certification of Workers Management PN-STD-SAF Learning and Development	**574** *Safety role for workers* **Division 3 of Part 9.6** *Duties of Workers at Licensed Major Hazard Facilities*
7.	**Health, Well-Being, Hygiene & Rehabilitation**	PN-STD-SAF Drug and Alcohol Management PN-STD-SAF Trauma Management PN-STD-SAF Fatigue Risk Management PN-STD-SAF First Aid Management PN-STD-SAF Rehabilitation Management	
8.	**Suppliers, Contractors & Procurement**	Procurement Standard Contractor Management Standard Contractor Management Procedure	
9.	**Asset Management**	Engineering Procurement Standards (EPS)	**Schedule 17 (6)** *Principles and standards*
10.	**Operational Control**	Pacific National Procedure *Dangerous Goods*	**Schedule 17 (3)** *Operational controls*

		Pacific National Standard Shunting Pacific National Procedure Shunting Intermodal Procedure: INT-PRO-SAF Terminal Operations in Severe Weather Intermodal Procedure INT-PRO-SAF: *Moving Dangerous Goods Classes 1,6,2 and 7*	
11.	**Environment**	PN-STD-ENV Contaminated Land Management PN-PRO-ENV Spills Response PN-STD-ENV Environmental Management PN-GUI-ENV Environment Community Education and Awareness	**Schedule 17 (3)** *Operational controls*
12.	**Emergency & Security Preparedness**	PN-STD-SAF Crisis and Emergency Management PN-PLA-SAF PN Emergency Management Plan PN-STD-SAF Security Management	**Division 3 of Part 9.3 (557)** *Emergency Plan* **Division 3 of Part 9.4 (564; 567)** *Identification of major incidents; Emergency Plan* **Division 3 of Part 9.4 (571; 572; 573)** *Information for visitors; information for local community and local authorities; information for local community-major incident*
13.	**Incident Management & Investigation**	PN-STD-SAF Incident Reporting and Investigation Standard	
14.	**Performance, Measurement & Monitoring**	PN-STD-SAF HSE Reporting	**Schedule 17 (7)** *Performance monitoring* **Schedule 17 (8)** *Audit*
15.	**System Review & continuous improvement**	PN-STD-SAF Workplace Inspection and Monitoring PN-PRO-SAF Managing Corrective and Preventative Actions Procedure PN-STD-SAF Safety Management System Review	

PN's HSE Framework



12.3 Pacific National HSE Elements for the Control of Major Hazards

12.3.1 Health and Safety Policy

The PN Health and Safety Policy is set at the top level of the SMS structure. The Health and Safety Policy describes PNs overall commitment to ensuring the health, safety and welfare of employees, contractors, visitors and members of the public who interact with our operations.

12.3.2 Responsibility and Accountability

The key health and safety responsibilities of management, employees and contractors within PN are defined and documented in the PN Responsibilities and Accountabilities Standard. This Standard ensures all persons including, managers, employees and contractors clearly understand their responsibilities and accountabilities to enable them to demonstrate visible, proactive and committed leadership to effectively manage health and safety in accordance with PNs values, policies and standards.

Managers are held directly accountable for their safety performance within PN through the performance planning process. Key performance indicators (KPIs) which track safety related metrics are set for each business and site. These KPIs in conjunction with the incident reporting program assists managers in understanding incident trends and to identify, plan, control and co-ordinate key safety initiatives consistent with PNs drive for a high level of safety performance. The performance monitoring aspects are described in further detail in Section 12.4 below.

12.3.3 Hazard Identification, Risk Assessment and Control Measures

The requirement to formalise local hazard identification and risk assessments is specified in the Risk Management Standard and Risk Management Procedure. The Standard describes the requirement for the review of risk control plans, management responsibility in risk evaluation and consultation with employees regarding moderate and high risks.
The Risk Management Procedure sets the framework and criteria for conducting all risk assessment activities within PN. The Procedure provides guidance on the framework for determining which control measures should be implemented for major incidents.
The Hazard Reporting Procedure describes the requirements for hazard reporting and their subsequent management.

12.3.4 Consultation

The *WHS Consultation Standard* sets the framework for establishing effective consultation amongst PNs stakeholders in relation to matters affecting their health and safety. It describes the function of the systems in place to consult on safety and health matters with workers and their representatives. Specifically, workers are to be informed of the following:

- who their health and safety representatives are
- the consultation processes that exist within the business and at their location
- how safety information is accessed
- the systems in place to encourage and submit hazard reports and improvement suggestions.

AFT has a site Safety Specialist and WHSE committee who are responsible for promoting a positive safety culture through the safe implementation, coordination and monitoring of safety at AFT. The AFT WHSE committee is viewed as a leadership endeavour in all facets of safety to promote a positive safety culture. WHSE Committee members are required to:

- lead by example
- ensure safety messages are communicated and fully understood by all employees, contractors and visitors
- actively listen to and properly manage the safety concerns raised by others

- promote safe working practices and procedures
- adopt the highest standards in the identification and management of risks.

12.3.5 Safety Critical Information

The *Communicating WHS Information Standard* defines the process for developing, distributing and communicating safety critical information.
PN defines safety critical information as any document, standard, rule, procedure, or other form of communication that contains information affecting the safety of PNs operations and that may need to be communicated to all applicable employees.
Safety critical information may include but is not limited to the following:

- system safety notices
- new or amended policies, standards or procedures
- new or amended train operation or terminal operation procedures
- training or briefing packages
- applicable safety alerts issued by the regulators
- applicable safety alerts issued by a track network manager
- new or amended track network manager safe working rules or procedures.

12.3.6 Safe Work Practices

Operating procedures are controlled documents which are managed and reviewed according to the requirements of the *Document and Record Management Standard*. All Freight procedures are available through the PN document management system, SafetyNet.
The SMS contains various procedures for safe work practices relevant to Freight operations. These include procedures covering areas such as:

- permit to work procedures
- shunting
- controlling terminal rail movements
- train departure and arrivals
- isolation of rail tracks
- crane and mobile equipment operations
- traffic management
- container storage and handling practices.

12.3.7 Contractor Management

The *Contractor Management Standard* specifies all requirements for management of contractors at PN. The Standard addresses the following areas:

- risk assessment prior to tender or engagement
- contract document preparation
- selection of contractors
- contractor engagement
- contractor induction and training
- contractor supervision
- non-compliance management
- contractor performance evaluation.

The *Contractor Management Handbook* is provided to all contractors and sets out their safety requirements and expectations.

12.3.8 Equipment Integrity

The *Plant Management Standard* sets minimum requirements to ensure the safe and environmentally sound design, manufacture, commissioning, erection, installation, use, maintenance, transport, storage and disposal of plant. This Standard requires that plant is inspected and maintained to the extent necessary to ensure that risks associated with the use of the plant is minimised.
PN will ensure that:

- inspections, maintenance and cleaning are carried out having regard to procedures recommended by the designer and/or manufacturer or developed by a competent person
- all safety features and warning devices of plant are maintained and tested
- repair, inspection and, if necessary, testing is carried out by a competent person
- repairs to the plant are carried out so as to keep the plant within its design limits
- any additional requirements for registered plant are satisfied.

12.3.9 Change Management

The *Change Management Standard* sets the requirements for the validation of health and safety related issues associated with change, including change management methods and procedures for all life cycle stages of asset management including design, construction, operation, maintenance, modification and removal.
Any proposed change which materially affects safe operations requires the following:

- a risk assessment

- identification of suitable controls
- consultation with affected stakeholders
- provision of training and information for affected personnel.

12.3.10 Induction, Training and Competency

The *Learning and Development Standard* requires that all PN employees are acquainted with the SMS, site-specific safety related issues and using the PN intranet to access up-to-date documents.

Employee competency requirements and certifications are monitored to ensure that employee skills and certifications remain current with legislative requirements and/or PNs requirements. The requirements are defined in the Learning and Development Standard. Accredited training includes, train inspection, DG handling, and mobile equipment handling. Verification of competency is scheduled at two yearly intervals or whenever there are changes to legislation or procedures.

Intermodal Procedure INT-PRO-SAF *Freight Terminal Induction Process* outlines the induction processes for new employees, casual visitors, container truck drivers and contractors. It is designed to ensure the risks associated with interactions between terminal operations, customers, contractors and visitors are mitigated and that induction and access of personnel conforms with PN Safety and Health Standards.

12.3.11 Procurement

Procurement of contracted services, plant and equipment, including risk assessment requirements for new plant and equipment is covered under the *Procurement Policy and Procurement Management Standard.*

12.3.12 Emergency Planning and Preparedness

The *Emergency Response Standard* defines the requirements for emergency response planning and procedures for PN operations. The Standard sets out:

- the process adopted by PN to respond to emergencies
- the responsibilities of each level of PN workforce, including contractors, in respect to emergency management
- requirements for emergency preparedness including testing of safety equipment, provision of dangerous goods manifests and training to personnel.

The AFT Emergency Management Plan:

- aims to minimise the likelihood of emergencies occurring and associated impacts on people, equipment, the facility and the environment
- describes the various roles and responsibilities of staff in the event of an emergency
- establishes a framework that all resources and support services are effectively mobilised and deployed in the event of an emergency
- establishes a framework of competency and communications to ensure an appropriate and timely response to an emergency that may occur.

12.3.13 Security

The *Security Management Standard* specifies the requirements to systematically manage security-related risks and to identify security situations and manage security arrangements of employees, contactors, visitors and plant.
Specific requirements for the security of HCDGs are specified in the Procedure IPM-B1-2: *Management of High Consequence Dangerous Goods.*

12.3.14 Incident and Near-miss Reporting

The *Incident Reporting and Management Standard* and *Incident Investigation Standard* set out incident management processes, from the management of an incident, through to incident reporting, investigation and trend analysis. The primary focus of the incident management process is to develop and maintain systems designed to prevent incident recurrence.

12.4 Performance Monitoring

12.4.1 Monitoring of Safety Performance

The *WHSE Objectives, Planning and Reporting Standard* describes the process for the setting of annual performance targets, objectives and plans that are aimed at improving health and safety performance across the business. Monitoring of objectives and compliance to annual plans is the responsibility of the Executive Steering Committee which is chaired by the Chief Executive Officer.

12.4.2 Safety Key Performance Indicators

Safety KPIs have been defined based on PN incident types and are used to monitor safety performance of operational site managers. The setting and monitoring of safety KPIs in conjunction with the incident reporting program assists managers in understanding incident trends and to identify, plan, control and co-ordinate key safety initiatives consistent with PNs drive for a high level of safety performance.

The KPIs include both 'lead' and 'lag' indicators. The lagging indicators are typically actual incidents that have occurred however these are not all linked to actual injury criteria. Examples are yard derailments, collisions, and load-lifting incidents. Selected leading indicators are used to provide further information on the performance of the safety systems. Examples include near miss incidents, hazard reports and internal audit performance.

12.4.3 Site Inspections

PN has developed and documented a comprehensive site safety and health inspection process using site specific checklists. Site inspections are undertaken at pre-determined intervals in accordance with the site inspection calendar and checklists. Where an unsatisfactory condition or a hazard is identified through a site inspection it is reported to the relevant supervisor/manager and recorded in the SHED. The hazard reporting and corrective actions are implemented in accordance with the *Managing Actions Standard.*

12.5 Auditing and Review

12.5.1 Auditing

PN has implemented an extensive program of audits to ensure:

- all processes, activities, conditions, events and practices are consistent with the SMS
- PN is not exposed to undue safety and health risks as a consequence of its operations
- established inspection, testing, monitoring, review and reporting programs are being completed according to the scheduled frequency and are effective in managing and monitoring safety performance
- relevant regulatory requirements (including licences and agreements) and contract conditions are met
- operations are conducted in a manner that demonstrates due diligence in respect of environmental, work health and safety and rail safety requirements
- railway safety activities comply with planned arrangements to determine the efficiency, effectiveness and overall reliability of the SMS.

Audits are scheduled based on the status and importance of the activity and associated risks.

The *Audit Management Standard* sets out PNs strategy to regularly monitor, audit and review systems and risk controls in place to assess compliance, gauge progress and identify opportunities for improvement. Corrective actions and non-conformances identified during the audit are entered into The SHED.

12.5.2 Management Review

The *Management Review Standard* provides for the continuous improvement and management review of the SMS and for work health and safety matters. The management review process aims to enhance the SMS to achieve continuous improvement in safety performance, effective management of risk and compliance of the SMS to legislative obligations.

12.5.3 Corrective and Preventative Actions

Corrective and preventive actions and review of their adequacy and effectiveness are important elements to ensure continual improvement of the SMS; the process is described in the *Managing Actions Standard*. Corrective and preventative actions may arise from various sources, including:

- risk assessments
- hazard and incident reports
- complaints from members of the community
- audits
- inspection and testing.

Corrective and preventive actions arising out of audits are managed to completion through The SHED. Site Managers must review the effectiveness of corrective/preventive actions implemented within their area of responsibility, in consultation with the WHSE Committee, and report any findings to the relevant Business Unit President for assessment.

13. Consultation during the Safety Case Process

13.1 Overview of Consultation Processes

Consultation regarding health and safety issues is managed according to the Safety Standard PN-STD-SAF *WHS Consultation.*

13.2 Health and Safety Representatives

AFT Health and Safety Representative (HSR) attended the two HAZID / risk assessment workshops and reviewed the risk assessment reports. These workshops were conducted on the 15th and 23rd of November 2017.

Further communication with the HSRs continues to occur following the completion of the Safety Case. The HSRs will be involved during any ongoing assessment of the Safety Case.

13.3 Employees

Appropriate input was sought from employees during the site risk assessment activities by including appropriate representation of employees directly in the risk assessment workshops (technical, operational, maintenance etc.). The HSR who attended the risk assessment workshops was also a Terminal Operator.

Site WHSE committees play a key role in ensuring that employees are properly informed during the Safety Case development. Where necessary, “toolbox” meetings, flyers or other suitable means of direct communication will be used to update employees on the Safety Case activities and any changes that may occur in terms of identified MIs, risk control measures and the roles of Safety Workers. Safety critical information will be communicated to employees in accordance with PN Safety Standard: PN-STD-SAF WHS Consultation.

14. Emergency Planning and Response

The current version of the Emergency Management Plan (EMP) for the AFT has been attached in Appendix E. The EMP was developed to comply with AS 3745 and has been submitted to the Metropolitan Fire Brigade for approval.

14.1 Emergency Planning Philosophy

The AFT manages emergencies including MI's through implementation of its emergency response processes and incident specific procedures in the initial stages of an emergency to ensure that:

- the occurrence of an emergency is accurately assessed
- reliable information is provided to emergency response personnel about the location, the nature of the emergency, potential exposures, the available access to the site and the resources required to respond appropriately to the incident
- emergency services are provided with assistance on their arrival to site
- all persons present on site are accounted for and located to a position of safety
- first aid and medical treatment is administered
- the emergency is contained and controlled
- off-site impacts are minimised and neighbouring facilities and residencies are noted as required
- the emergency site is secured.

The emergency responses at AFT aim to limit the consequences of any MI through:

- ensuring all PN employees receive the required level of training and information to enable them to response appropriately in the event of an emergency occurring
- assigning specific responsibilities to various positions at the AFT to coordinate the initial response until emergency services arrive and providing a point of interface between the AFT and the lead responder
- timely and accurate notification to emergency services who will be the lead responders to any emergency that may occur at the facility and have the technical expertise and resources to respond to such incidents
- removing all persons from any immediate danger to prevent them from being exposed to any Schedule 15 chemicals, thereby minimising the risk of death, injury or ill health as a result of such exposure
- ensuring the local community is promptly notified of any incident that may have off site impact, and that they can take any necessary measures to limit any potential exposure.

14.2 Emergency Management Plan Summary

The EMP was developed in consultation with persons from the Emergency Control Organisation (ECO) who will be responsible for the initiation of the emergency response should an incident on site occur including a Major Incident. The Plan is divided into multiple sections that detail the processes and procedures by which incidents will be responded to, managed and recovered from, including:

Site and hazard details

- Describes site specific details including key contacts, locality data and neighbourhood information, organisational structure, description of operations and potential onsite and off-site impacts arising for an incident.

Risk analysis detail

- Lists the potential incidents that may occur at the site including those that may arise from the Schedule 15 Chemicals that may be present on site, how they may originate, potential protection measures for neighbouring communities and the impacts and consequences to people, property and the environment should one of these incidents occur.

Emergency response and coordination

- Describes how an emergency response will be initiated and coordinated on site, including the roles duties and responsibilities of the Emergency Management Team (EMT), who will be the key personnel to coordinate the emergency response until emergency services arrive on site.

Notification, communication, reporting and recording

- Describes the warning systems that will be used to notify those persons on site, that an emergency situation is occurring and the actions persons need to take.
- Details how the events leading, during and following the termination of the emergency will be recorded and describes how the debriefing processes will occur to assess the effectiveness of the emergency response process and procedures.

Resources on and off site

- Provides an overview of the on and off -site resources and equipment that are available to PN persons and emergency responders to assist in the emergency response and manage any events that may occur as a result of the emergency.
- Resources and equipment available include fixed firefighting, spill response and first aid equipment.

Warden Response and Evacuation Procedures

- Describes the actions of the fire wardens where an emergency situation occurs that requires either a full or partial evacuation of the AFT.

- Specific procedures have been developed for each type of credible emergency that may occur which have been identified through a risk assessment process. These procedures will guide the wardens in the appropriate actions that need to be taken for each type of scenario and are contained within the Appendices to the plan.

Appendices

- The Appendices contain detailed information that supports the implementation of any emergency response to a situation that may occur at the facility. In addition to the specific emergency response procedures, the appendices contain contact information for site personnel, off site resources and immediate neighbours, locations of firefighting equipment including the hydrant system, and a dangerous goods manifest including those Schedule 15 Chemicals likely to be present on site.

14.3 Initiation of the Emergency Management Plan

The structure of the ECO is shown in Figure 20 below. In the event of an emergency including an MI the Shift Supervisor takes on the responsibility of the Incident Controller (Chief Warden) and directing the emergency response activities until the emergency services arrive on site.

During the time the AFT is open for operation, a Terminal Supervisor is rostered on shift at all times. In total there are six teams that work across the roster, each headed by a Shift Supervisor and a number of other persons who will assume emergency support roles. Each team receives training in emergency response management including:

- Warden training
- First aid training
- Emergency response activities including evacuation drills, desk top scenarios
- PN responsibilities and accountabilities

The EMP including the roles, responsibilities and duties of the EMT are communicated to all workers through various mechanisms including:

- Site induction on commencement
- Emergency response activities such as evacuations and desk-top scenario training, delivered through work team training
- Toolbox meetings
- Visual display information located within the facility

The Emergency Management Plan contained in Appendix E contains detailed information on the roles and responsibilities of the EMT.

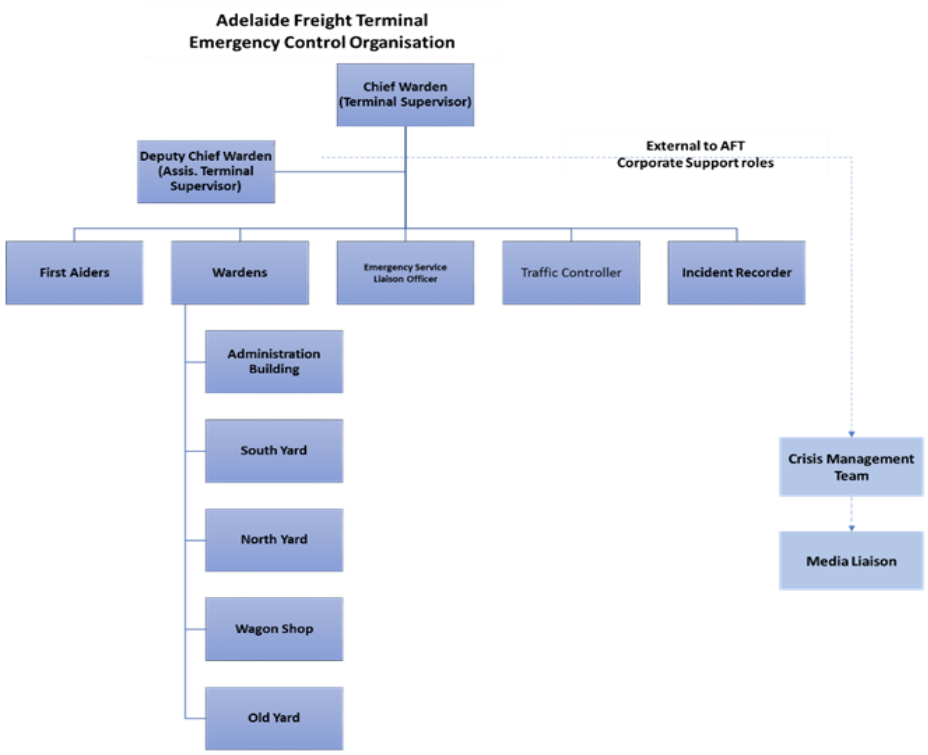


Figure 20: Emergency Management Team Structure

14.4 Testing of the Emergency Management Plan

The EMP is tested annually via an emergency drill which incorporates staff, contractors, and truck drivers. In addition to the annual drill, desk top reviews of the emergency plan are held with key staff who will be responsible for the implementation of the plan in the event of an emergency occurring on site.

The effectiveness of the Emergency Management Plan is then reviewed in consultation with management, the WHSE committee and other relevant parties.

The control measures, on which the plan is developed, are reviewed whenever:

- there is evidence that the risk assessment is no longer valid
- injury or illness results from exposure to a hazard to which the risk assessment relates
- a significant change is proposed in the place of work or in work practices or procedures to which the risk assessment relates.

14.5 Emergency Response – Debriefing

The EMP for AFT places responsibility on management to take all reasonable steps to provide a debriefing to internal and external stakeholders with information about the major incident and what steps it and external stakeholder should take to eliminate or minimise risks to health and safety.

15. Security Management

15.1 Access Control

AFT has perimeter fencing along the west boundary and majority of the east boundary. Areas of track are not fenced at the train entrance and exit points on the northern and southern boundaries to allow train and rollingstock movements/ access. CCTV monitoring throughout the terminal to monitor for unauthorised access.

15.2 Security Procedures

The full-time presence of AFT staff minimises the security risk as trespassers are quickly identified and arrangements are made to have them removed from site, i.e. by contacting local police. The terminal has installed a 'record and review' functional CCTV network throughout the terminal as well as at truck and vehicle entry and exit points.

Any potential tampering, unexplained loss, theft, spill or leak of any product including HCDG's, is reported via either terminal staff or train drivers to PN Integrated Planning Services in North Sydney, NSW using an 1800 number that is manned 24 hours per day. The police are also contacted for a security breaches relating to HCDGs.

15.3 Truck Gate Access

On arrival at the AFT in-gate when the truck driver enters both their PIN code, which is their authorisation to access the AFT, and the trip number (provided by PN) into the entry gate keypad, the boom gates will open allowing access to the terminal. In the event that access is denied, there is an intercom system which allows the driver to contact the Customer Service Centre, who will provide assistance.

Truck drivers will only receive a PIN code once a site induction has been completed.

15.4 Container Doors / Seals

All containers are checked and sighted to ensure container integrity, when loaded onto wagons by trained PN staff. Container security is checked for door seals, door security, product integrity and container condition. Where HCDGs are transported, seal numbers are checked on container arrival against the seal numbers supplied by the customer. Any abnormalities are reported through the Incident Reporting and Management Standard.

16. Incident History

No incidents classified as a MI have occurred at AFT in the past five years.

17. Document History

Revision	Date Issued	Reviewed by	Approved by	Revision type
1	12-Jul-2011	P. Martin	V. Ortuso	New issue
2	11-Oct-2018	L. Williams	V Ortuso	Update of plan for MHF licence renewal
3	21-02-2020	L. Williams	V Ortuso	Update of plan to include piggyback loading and ethylene consequence modelling
3.1	14-05-2020	L. Williams	V Ortuso	Update to include the regular transport of Sodium Chlorate
4.0	15/04/2022	J. Hooper	V Ortuso	Update to plan including contacts; org charts; Operator Statement; PN HSEMS and framework; Reflective of PN's Value and PNA; updated schedule 15.

18. Distribution

Name	Position	Organisation	Date
Registered on Document Management System - SafetyNet			11-Oct-2018
Bill Elder	Assistant Director Authorisations	Comcare	21-Feb-2020
Bill Elder	Assistant Director Authorisations	Comcare	May 2022

19. References

1 Work Health and Safety Regulations 2011 – Chapter 9 – Major Hazard Facilities, Commonwealth of Australia.

2 Australian Explosives Industry Safety Group 2017 – Code of Practice Storage and Handling of UN3375.

3 Work Health and Safety (Safety Standards) Regulations 1994 – Part 9 – Major Hazard Facilities, Commonwealth of Australia.

4 R4Risk, “Pacific National, AFT Risk assessment”, R4Risk Ref: 129-20, Release 1, 06 October 2014

5 Pacific National Risk Assessment Report Date: Feb, 2018