ARUP

Health Infrastructure NSW

Shoalhaven Hospital

Preliminary Hazard Analysis

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Executive Summary

The *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) is used in New South Wales to regulate the planning approval process for developments in hazardous and offensive industries, and potentially hazardous and potentially offensive industries.

This report followed the *Applying SEPP 33* guidance document to define the thresholds for storage quantities of dangerous goods at Shoalhaven Hospital.

This assessment concluded that the liquid oxygen storage tanks (15 kL main tank and a 3 kL backup tank) exceeded the screening threshold. Therefore, preliminary hazard analysis (PHA) was conducted to determine the risk to off-site and on-site populations.

The conclusion of this PHA determined that either the separation distances to the site boundary from the tanks must be increased or a protective enclosure must be installed, in accordance with AS 1894-1997 *The storage and handling of non-flammable cryogenic and refrigerated liquids*. Details of these requirements are presented in Section 5 of this report.

1. Introduction

Shoalhaven Hospital is located on Scenic Drive in Nowra, NSW as shown in Figure 1.

Figure 1: Satellite view of Shoalhaven Hospital

Shoalhaven Hospital is undergoing a redevelopment program, which will see a significant expansion of the hospital's capacity. As a result of the storage and use of dangerous goods in the hospital's ordinary operations, the development application is required to be assessed against the Resilience and Hazards SEPP as "potentially hazardous industry". This report documents the criteria for that assessment and the subsequent PHA after it was deemed this development is "potentially hazardous". The PHA must be prepared in accordance with the *Applying SEPP 33* guideline, the Hazardous Industry Planning Advisory Paper No. 6 'Hazard Analysis' (HIPAP No. 4) (DPE, 2011) [3] and Multi-Level Risk Assessment (DPE, 2011) [4].

The current bed count at Shoalhaven Hospital is 240. The redevelopment will create an additional 183 spaces, a 76.25% increase. The quantities in the dangerous goods manifest provided in Appendix A reflect the current operations at Shoalhaven Hospital. Therefore, in order to best reflect the increased capacity at the hospital, all current storage quantities have been doubled for the assessment.

Additionally, details of the new oxygen tanks, comprising a 15 kL liquid oxygen storage tank and a 3 kL liquid oxygen back-up tank, have been incorporated into the assessment.

2. Resilience and Hazards SEPP

The New South Wales' *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) commenced on 1 March 2022 [1]. The Resilience and Hazards SEPP consolidates the following SEPPs, which were withdrawn on the same day:

1. SEPP (Coastal Management) 2018 (Coastal Management SEPP)
2. SEPP 33 – Hazards and Offensive Development (SEPP 33)
3. SEPP 55 – Remediation of Land (SEPP 55)

SEPP 33 was previously used as the basis for assessing whether a development fell under the policy's definition of "potentially hazardous industry" or "potentially offensive industry".

The consolidation of the three previous SEPPs into the new Resilience and Hazards SEPP is part of the NSW Government's SEPP consolidation project, which is aimed at reducing the complexity of the NSW planning system; 45 previous SEPPs have been consolidated into 11 new SEPPs.

No policy changes have been made in the Resilience and Hazards SEPP; all changes are administrative. The same screening process used to assess whether a development is "potentially hazardous" or "potentially offensive" is applicable. Similarly, the Hazardous and Offensive Development Application Guidelines *Applying SEPP 33* (2011) [2] remains relevant. *Applying SEPP 33* outlines the screening process used to assess whether the Resilience and Hazards SEPP applies (in the context of potentially hazardous or potentially offensive industry).

Any references to SEPP 33, particularly in extracts from *Applying SEPP 33*, should be taken as references to the Resilience and Hazards SEPP.

3. Resilience and Hazards SEPP Screening Process

Applying SEPP 33 describes the process to be followed when assessing whether a development application is to be considered potentially hazardous. Figure 1 of *Applying SEPP 33* (The SEPP 33 Process) is reproduced below in Figure 2.

Figure 1: The SEPP 33 Process

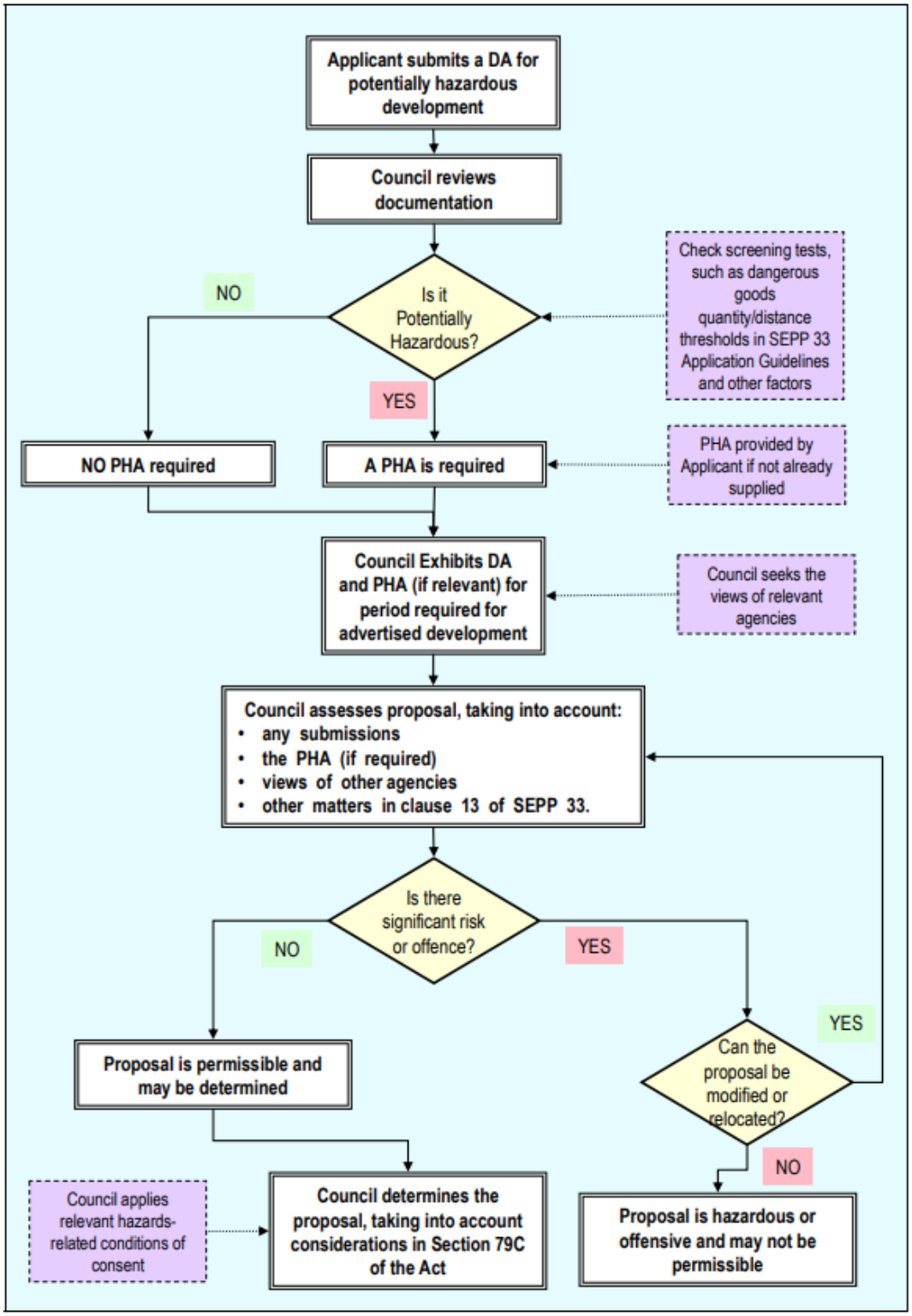

Figure 2: The Resilience and Hazards SEPP Process (extract from *Applying SEPP 33* [2])

The screening method used to determine whether a development is potentially hazardous varies based on the class of dangerous good being assessed. Table 1 lists the table and figure references in *Applying SEPP 33* for the respective screening methods for each class of dangerous good.

Table 1: Screening Method References in *Applying SEPP 33* [2]

Class	Description	Method to Assess Quantity (*Applying SEPP 33* references)	Method to Assess Transportation (*Applying SEPP 33* references)
1.1	Explosives – substances and articles which have a mass explosion hazard	Figure 5 (if > 100 kg)	Table 2
1.2	Explosives – substances and articles which have a projection hazard but not a mass explosion hazard	Table 3	Table 2
1.3	Explosives – substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both but not a mass explosion hazard	Table 3	Table 2
2.1	Flammable gases - pressurised (excluding LPG)	Figure 6 (if > 100 kg)	Table 2
2.1	Flammable gases - liquefied (pressure) (excluding LPG)	Figure 7 (if > 500 kg)	Table 2
2.1	Flammable gases - LPG (above and below ground)	Table 3	Table 2
2.3	Toxic gases	Table 3	Table 2
3PGI	Flammable liquids	Figure 8 (if > 2 tonne)	Table 2
3PGII	Flammable liquids	Figure 9 (if > 5 tonne)	Table 2
3PGIII	Flammable liquids	Figure 9 (if > 5 tonne)	Table 2
4	Flammable solids	Table 3	Table 2
5	Oxidisers, organic peroxides	Table 3	Table 2
6	Toxic substances	Table 3	Table 2
7	Radioactive material	Table 3	Table 2
8	Corrosive substances	Table 3	Table 2

Classes 1.4, 1.5, 1.6, 2.2 and 9 are excluded from the risk screening as they are considered to not be potentially hazardous with respect to off-site risk [2]. Combustible liquids such as diesel are not considered dangerous goods and are also excluded.

3.1 PHA Process

Applying SEPP 33 outlines that the NSW Department of Planning and Environment's *Multi-level Risk Assessment* [4] guideline is relevant and should be referred to when preparing PHAs. This guideline outlines three levels of analysis built around consequence-based screening and rapid risk classification. *Multi-level Risk Assessment* describes the three approaches as follows:

- *Level 1 is an essentially qualitative approach based on comprehensive hazard identification to demonstrate that the activity does not pose a significant risk.*
- *Level 2 supplements the qualitative analysis by sufficiently quantifying the main risk contributors to show that risk criteria will not be exceeded.*
- *Level 3 is a full quantitative analysis.*

A qualitative assessment (level 1) may suffice provided all or most of the following conditions are met:

- *Screening and risk classification and prioritisation indicate there are no major off-site consequences and societal risk is negligible;*
- *The necessary technical and management safeguards are well understood and readily implemented; and*
- *There are no sensitive surrounding land uses*

This reports uses the level 1 qualitative analysis. Justification for this assessment is outlined in Section 5.

4. Screening Results

A manifest of dangerous goods stored and used at Shoalhaven Hospital was provided; the manifest is attached in Appendix A. Table 2 presents the results of the screening assessment. The column on the right, labelled "minimum quantity per load" is extracted from Table 2 in *Applying SEPP 33*. *Applying SEPP 33* states that "if quantities are below this level, the potential risk is unlikely to be significant unless the number of traffic movements is high".

The manifest provided uses the Global Harmonized System (GHS) to categorise the dangerous goods stored and handled at Shoalhaven Hospital. The quantities are presented in aggregate within each GHS category. Conversely, *Applying SEPP 33* uses the Australian Dangerous Goods Code (ADGC) categorisation system. While there is considerable overlap between the two systems, there are some nuances. Therefore, the most conservative threshold from the ADGC has been selected.

Table 2: Screening Results

Class	Quantity *(kg or L)*	Scaled Quantity *(kg or L)*	Quantity threshold *(kg or L)*	Threshold exceeded?	Minimum quantity per load (tonne)
2.1 (ex LPG)	11.73	23.46	100[1]	No	5
2.1 (LPG)	181.53[2]	363.06	10 000	No	5
2.2/5.1	18 000	—[3]	5000	Yes	5
3	502.63	1005.26	2000	No	1
4.1	18.44	36.88	5000	No	2
5.1	0.96	1.92	5000	Yes[4]	5
5.2	22.8	45.60	10 000	No	5
6.1	3.15	6.30	500	No	3
8	759.99	1519.98	5000	No	5

[1] The 0.1 tonne (100 kg) threshold for class 2.1 materials (excluding LPG) is the lowest value given in Figure 6 in *Applying SEPP 33*. Although higher thresholds can be achieved by demonstrating sufficient separation distances, a quantity below 0.1 tonnes removes the need to consider separation distance at all.

[2] The quantity of LPG given is derived from the listed quantity of aerosols (355.95 L). An analysis of common aerosol products performed by Arup found that the overwhelming majority of aerosol propellants were the components of LPG (propane, isopropane, butane), at an average of 51% (w/w). Conservatively if all aerosols listed are flammable, the resultant quantity of propellant is 181.53 L.

[3] The 18 000 L value for class 2.2/5.1 (i.e., liquid oxygen) is the actual capacity of the new tanks and therefore does not need to be scaled.

[4] The total quantity of class 5.1 materials includes the liquid oxygen (class 2.2/5.1) hence exceeding the threshold.

The quantity of class 5.1 materials (oxidising substances) **exceeds the threshold**. Therefore, **a PHA is required**.

The results of the PHA are presented in Section 5.

5. Risk Classification and Prioritisation

The quantity of liquid oxygen stored exceeds the screening threshold in *Applying SEPP 33*. Therefore, as outlined in Appendix 5 of *Applying SEPP 33*, the Multi-Level Risk Assessment guidance material is used to determine the type of analysis.

Page 12 of this guidance material outlines that a qualitative analysis can be considered sufficient only if there are no harmful consequences extending significantly beyond the site boundary. Compliance with AS 1894-1997 *The storage and handling of non-flammable cryogenic and refrigerated liquids*, is sufficient to ensure there are no harmful consequences beyond the site boundary.

Oxygen is an oxidising gas so there is the potential for offsite risk in relation to the combustion of other materials.

To complete the classification process, the following matters were reviewed to assess the potential impacts off-site:

- Likelihood of tank failure;
- Consequences of tank failure;
- Off-site populations and;
- Risk of fatality.

5.1 Likelihood of Oxygen VIE Tank Failure

The UK HSE *Failure Rate and Event Data for use in Risk Assessments* [5] gives a catastrophic[1] tank failure rate of 2.2 x 10^{-5} per year (or 22 per million person years) for single walled Liquid Oxygen (LOX) Refrigerated Vessels. For major leaks[2], the rate is 1 x 10^{-4} per year (or 100 per million person years) and for minor failure 8 x 10^{-5} per year (or 80 per million person years).

These failure rates are considered acceptable risks as set out by HIPAP No. 4, as they are low relative to other known and tolerated risks.

5.2 Consequence of Tank Failure

Liquid oxygen will form a pool of liquid vaporising oxygen within the secondary containment bunding around the vessel. This cloud will produce a cool layer of oxygen moving in the downwind direction. The consequence from this release is the potential for producing an oxygen enriched atmosphere (above 23% oxygen concentration in air). This could potentially increase the combustability of combustible materials such as used boxes or cartons, wastepaper, firewood, tyres, or the like, and fuel existing fires. However, as the tanks are located outside, the oxygen will dilute into the atmosphere very quickly, resulting in minimal risk to any off-site populations.

Further reduction in risk to off-site populations is discussed in the following sections.

[1] Catastrophic failure: Sudden and total failure from which recovery is impossible.

[2] Major leak: Leak hole sizes between 25-50 mm for pressure vessels

5.3 Off-Site Populations

The hospital is surrounded on two sides by the Shoalhaven River (immediately beyond the river is the Nowra Golf Course) and residential areas to the East and South. The liquid oxygen tanks are directly opposite the residential area on Shoalhaven Road, approximately 20 m away.

5.4 Off-Site Risk of Fatality

Oxygen is non-toxic and non-combustible. However, it is a strong oxidiser, so it can increase the ability for other materials such as diesel to burn. Additionally, contact with liquid oxygen can cause frostbite on exposed skin and eye damage.

Figure 3 illustrates the oxygen tank locations and separation distances.

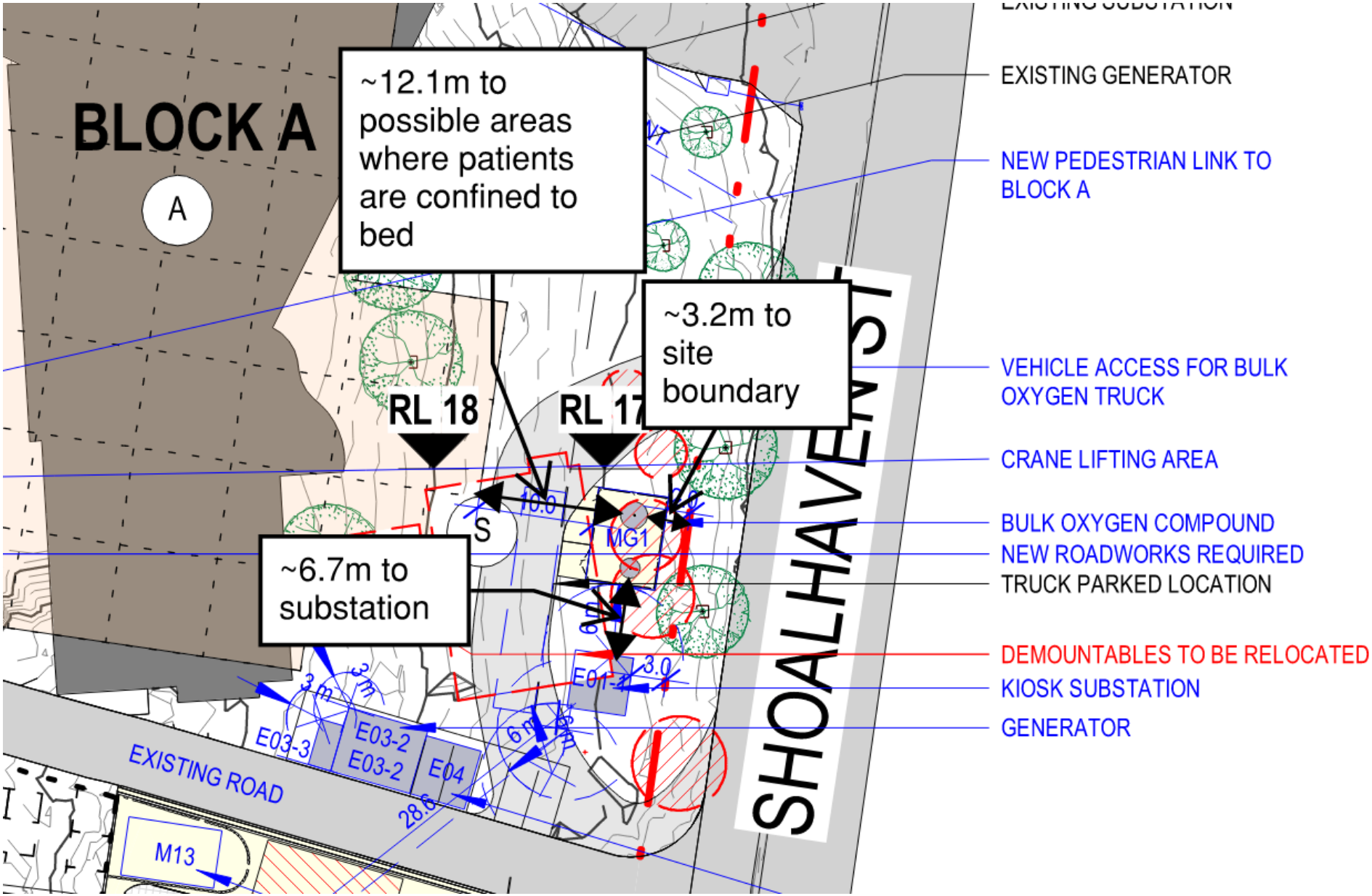

Figure 3: Site plan of oxygen tanks and separation distances

Note: it is assumed that all building and structure exteriors are non-combustible.

AS 1894 Table 4.1 specifies the minimum separation distances for liquid oxygen, relating to off-site risks.

Table 3: Off-site risk separation distances (Source: Table 4.1 AS1894)

Items from which separation is required	Minimum distance	Achieved?
Property boundary **Street, road boundary or car park, other than authorised vehicles**[3] **Areas where open flames, smoking or sources of ignition are permitted**[4] **Fixed installations of gases in cylinders**[5] **Other dangerous goods stores of other classes or subsidiary risks**	4 m	No, the distance to the property boundary is approximately 3.2 m. The separation distances to on-site locations are addressed in the next section

Note: Combustible materials refers to such things as used boxes or cartons, wastepaper, firewood, tyres, or the like, but not to materials in structures such as timber in a fence or building walls. This separation is measured horizontally. The vertical separation distance required to the specific locations is 7.2 m. The vertical separation is measured over the top of the protective enclosure. A roof having an FRL of 240/240/240 is necessary when the vertical separation distance cannot be achieved otherwise. However, this separation distance may be halved if the combustible material is slow burning e.g., coal or heavy timber.

To achieve the required 4 m separation distance to the site boundary, either one of the following options needs to be done:

- The tanks need to be moved further away from the site boundary. Consider the separation to Block A, as in accordance with Table 4, areas of the building where patients are confined must be separated by at least 12 m; **or**
- A protective enclosure is required to be built to achieve the separation distance in the tanks' current location. Figure 4 shows the requirements for this enclosure. In accordance with Clause 1.5.26, the FRL shall be at least 240/240/240. The height of the enclosure shall be at least 1 m above the highest leak point. The separation distance of 4 m is measured from the highest leak point horizontally around the enclosure.

[3] Note, this separation distance may be measured around a screen wall. The separation distance is measured horizontally. The vertical separation distance shall be at least 1.6 m, and is measured over the top of the protective enclosure.

[4] Electrical equipment complying with the requirements of Clause 4.10 is not considered an ignition source.

[5] Separation may be achieved by the use of a non-combustible splash guard that is as high as any pipework connected to the vessel or extends at least 500 mm above the uppermost point of any cylinder, whichever is the higher. Cylinders shall be kept at least 50 mm above the ground

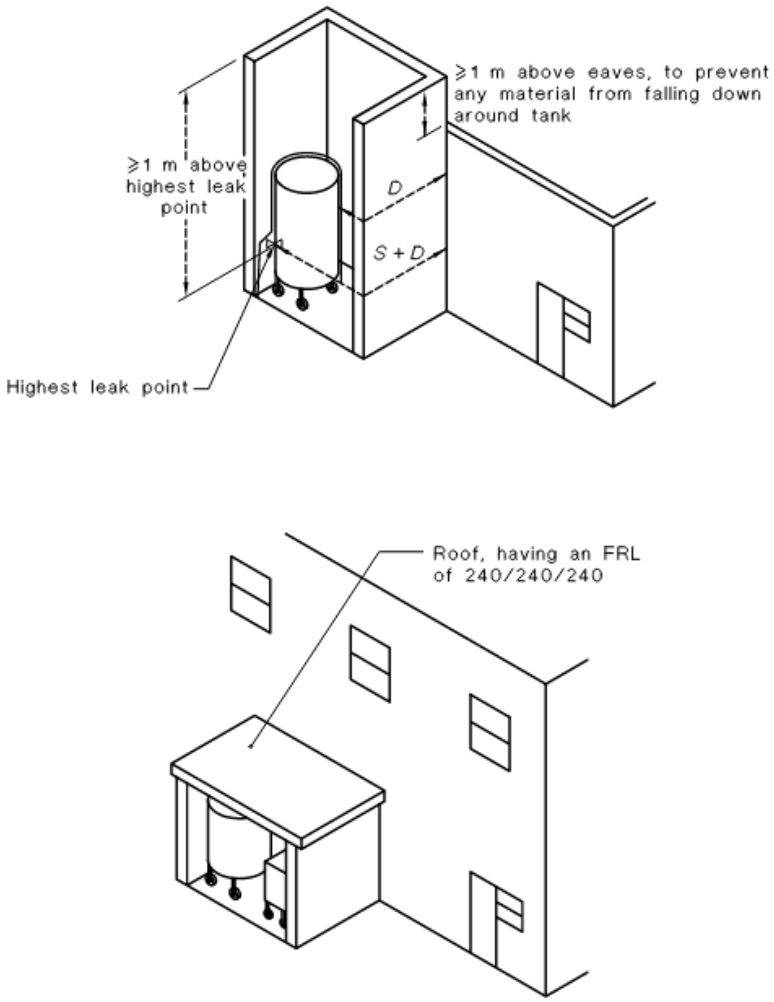

Figure 4: Measurement of separation distances using a protective enclosure (Source: Figure 4.2 AS 1894)

If the above requirement can be achieved, the individual risk of fatality for off-site populations is zero as sufficient separation distance would be achieved from off-site populations. Thus, there would be no societal risk associated with dangerous goods (liquid oxygen) that exceed the threshold quantities, as compliance with AS 1894 is deemed sufficient.

Therefore, it has been assessed that there is no serious potential for harm and a qualitative analysis is appropriate.

5.5 On-Site Risk

AS 1894 Table 4.1 specifies the minimum separation distances for liquid oxygen from protected places and sensitive receptors

Table 4: On-site risks separation distances (Source: Table 4.1 AS 1894)

Items from which separation is required	Minimum distance	Achieved?
Building or structure with non-combustible exterior, or sprinklered building of other construction	4 m	Yes, distance to all buildings (Block A) and structures (substation), is greater than 4 m
Property boundary **Street, road boundary or car park, other than authorised vehicles**[6] **Areas where open flames, smoking or sources of ignition are permitted**[7] **Fixed installations of gases in cylinders**[8] **Other dangerous goods stores of other classes or subsidiary risks**	4 m	Yes, no fixed installations of gases or other dangerous goods within the vicinity The separation distances to off-site locations are addressed in the section above
Medium or high voltage electrical equipment greater than 415 volts e.g., substation **Building or structure with combustible exterior** **Openings in walls of adjacent buildings or structures**[9]	5 m	Yes, the substation is approximately 6.7 m away from the closest oxygen tank
Areas where personnel can congregate e.g., offices[10] **Compressor or ventilator air intakes**	7 m	Yes, the closest possible area that could contain personnel is the Block A building which is 12 m away
Places of public assembly[11] **Areas of buildings where patients are confined to bed**[11] **Solid combustible material (see table note)**	12 m	Most likely. The closest building in which patients could be confined to bed is approximately 12.1 m away. Note, this measurement was taken from the closest point of the Block A

[6] Note, this separation distance may be measured around a screen wall. The separation distance is measured horizontally. The vertical separation distance shall be at least 1.6 m, and is measured over the top of the protective enclosure.

[7] Electrical equipment complying with the requirements of Clause 4.10 is not considered an ignition source.

[8] Separation may be achieved by the use of a non-combustible splash guard that is as high as any pipework connected to the vessel or extends at least 500 mm above the uppermost point of any cylinder, whichever is the higher. Cylinders shall be kept at least 50 mm above the ground

[9] This separation distance may be measured around a screen wall. This separation is measured horizontally, the vertical separation distances is 3 m. A roof having an FRL of 240/240/240 is necessary when the vertical separation distance cannot be achieved otherwise.

[10] This separation distance may be measured around a screen wall. This separation is measured horizontally, the vertical separation distances is 4.2 m. A roof having an FRL of 240/240/240 is necessary when the vertical separation distance cannot be achieved otherwise.

[11] This separation distance may be measured around a screen wall. This separation is measured horizontally, the vertical separation distances is 7.2 m. A roof having an FRL of 240/240/240 is necessary when the vertical separation distance cannot be achieved otherwise.

Items from which separation is required	Minimum distance	Achieved?
		building to the oxygen tanks. Emergency evacuation assembly points are considered public assembly points, therefore in the emergency response plan, the assembly points must be 12 m away minimum. No combustible material shall be placed within 12 m of the tanks. This includes the surrounding trees. Drawing No ASB-EW-DR-AR-1010-0 states that the existing trees around the bulk oxygen compound will be demolished.

To achieve the required separation distances, it is recommended that no combustible materials, this includes combustible vegetation (includes, but not limited dry grass, brush, weeds, green waste, dead or dying trees, litter or other flammable vegetation that creates a fire hazard), within 12 m. This separation can be achieved using the protective enclosure as outlined in Figure 4

Additionally, ensure there are no public assembly points within 12 m of the oxygen tanks, this includes emergency evacuation assembly points. This separation can be achieved using the protective enclosure as outlined in Figure 4.

5.6 Controlling the Risk

As the risk of fatality to off-site populations is insignificant, it is concluded that compliance with appropriate Australian Standards will provide adequate risk management for the facility.

6. Dangerous Goods Requirements

The requirements for storage of dangerous goods are defined in guidance materials and standards. The applicable Australian Standards for this development include:

- AS 1894-1997 *The storage and handling of non-flammable cryogenic and refrigerated liquids*
- AS 1940-2017 *The storage and handling of flammable and combustible liquids*
- AS 3780-2008 *The storage and handling of corrosive substances*
- AS/NZS 3833-2007 *The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers*

The primary management of off-site risks is by locating goods in appropriate places from the boundary and separated from other reactive or incompatible goods. The requirements for liquid oxygen storages are outlined in Section 5.

7. Recommendations

The ensure there is no risk to off-site populations, Arup makes the following recommendation:

- To achieve the required 4 m separation distance to the site boundary, either the tanks need to be moved further away or a protective enclosure must be built. See Section 5.4 for details.

To ensure there is no risk to on-site populations, Arup makes the following recommendations:

- Avoid any combustible materials, this includes combustible vegetation (includes, but not limited dry grass, brush, weeds, green waste, dead or dying trees, litter or other flammable vegetation that creates a fire hazard), within 12 m. This separation can be achieved using the protective enclosure as outlined in Figure 4.
- Ensure there are no public assembly points within 12 m of the oxygen tanks, this includes emergency evacuation assembly points. This separation can be achieved using the protective enclosure as outlined in Figure 4.

See Section 5.5 for details.

8. Conclusion

This PHA concluded that the bulk oxygen tanks exceeded the quantity thresholds in *Applying SEPP 33*. Provided that compliance with AS 1894-1997 is achieved, the tanks present no risk to off-site populations. In particular, the required 4 m separation distance to the site boundary from the oxygen tanks must be achieved.

9. References

[1] NSW Department of Planning and Environment, “Resilience and Hazards SEPP | Fact sheet - March 2022,” March 2022. [Online]. Available: https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/Policy-and-legislation/SEPP-2021/Fact-Sheet---Resilience-and-Hazards-SEPP.pdf?la=en.

[2] NSW Department of Planning, “Applying SEPP 33,” January 2011. [Online]. Available: https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/hazardous-and-offensive-development-application-guidelines-applying-sepp-33-2011-01.ashx?la=en.

[3] NSW Department of Planning, “Hazardous Industry Planning Advisory Paper No. 6 Hazard Analysis”. January 2011. [Online]. Available: https://www.planning.nsw.gov.au/-/media/Files/DPE/Other/hazardous-industry-planning-advisory-paper-no-6-hazard-analysis-2011-01.pdf?la=en

[4] NSW Department of Planning, “Assessment Guideline Multi-Level Risk Assessment”. May 2011. [Online]. Available: https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/assessment-guideline-multi-level-risk-assessment-2011-05.pdf?la=en

[5] HSE, “Failure Rate and Event Data for use within Risk Assessments”, November 2017. [Online]. Available: https://www.hse.gov.uk/landuseplanning/failure-rates.pdf

Appendix A

Dangerous Goods Manifest

ChemAlert.

Placard and Manifest Quantities

(Location Name: LOCAL HEALTH DISTRICTS/ METROPOLITAN/ ILLAWARRA SHOALHAVEN LHD/ SHOALHAVEN, Child Locations Included)

RMT Risk Management Technologies

Item	Description of hazardous chemical		Placard Quantity	Manifest Quantity	Max Quantity	Actual Quantity	Placard
1	Flammable gases	Category 1	200 L	5000 L	11.73 L	11.73 L	
2	Gases under pressure	With acute toxicity categories 1, 2, 3 or 4	50 L	500 L			
3		With skin corrosion categories 1A, 1B or 1C	50 L	500 L			
4		Aerosols (including flammable aerosols)	5000 L	10 000 L	355.95 L	355.95 L	
5		**Not specified elsewhere in this Table**	**1000 L**	**10 000 L**	1,676.85 L	**1,676.85 L**	
6	Flammable liquids	Category 1	50 L	500 L	25.00 L	25.00 L	
7		**Category 2**	**250 L**	**2500 L**	276.03 L	**272.43 L**	
8		Category 3	1000 L	10 000 L	205.20 L	205.20 L	
9		Any combination of chemicals from items 6 to 8 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 L	10 000 L		N/A	
10		Category 4	10 000 L	100 000 L	7,520.91 L	7,520.91 L	COMBUSTIBLE LIQUID
11	Self-reactive substances	Type A	5 kg or L	50 kg or L			
12		Type B	50 kg or L	500 kg or L			
13		Type C to F	250 kg or L	2500 kg or L			
14	Flammable solids	Category 1	250 kg	2500 kg			
15		Category 2	1000 kg	10 000 kg	18.44 Kg	18.44 Kg	
16		Any combination of chemicals from items 12 to 15 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	18.44 Kg or L	18.44 Kg or L	

Item	Description of hazardous chemical		Placard Quantity	Manifest Quantity	Max Quantity	Actual Quantity	Placard
17	Pyrophoric liquids and pyrophoric solids	Category 1	50 kg or L	500 kg or L			
18	Self-heating substances and mixtures	Category 1	250 kg or L	2500 kg or L			
19		Category 2	1000 kg or L	10 000 kg or L			
20		Any combination of chemicals from items 17 to 19 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L			
21	Substances which in contact with water emit flammable gas	Category 1	50 kg or L	500 kg or L			
22		Category 2	250 kg or L	2500 kg or L			
23		Category 3	1000 kg or L	10 000 kg or L			
24		Any combination of chemicals from items 21 to 23 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L			
25	Oxidising liquids and oxidising solids	Category 1	50 kg or L	500 kg or L			
26		Category 2	250 kg or L	2500 kg or L	0.96 Kg or L	0.96 Kg or L	
27		Category 3	1000 kg or L	10 000 kg or L			
28		Any combination of chemicals from items 25 to 27 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	0.96 Kg or L	0.96 Kg or L	
29	Organic peroxides	Type A	5 kg or L	50 kg or L			
30		Type B	50 kg or L	500 kg or L			
31		Type C to F	250 kg or L	2500 kg or L	22.80 Kg or L	22.80 Kg or L	
32		Any combination of chemicals from items 29 to 31 where none of the items exceeds the quantities in columns 4 or 5 on their own	250 kg or L	2500 kg or L	22.80 Kg or L	22.80 Kg or L	

Item	Description of hazardous chemical		Placard Quantity	Manifest Quantity	Max Quantity	Actual Quantity	Placard
33	Acute toxicity	Category 1	50 kg or L	500 kg or L			
34		Category 2	250 kg or L	2500 kg or L	1.70 Kg or L	1.70 Kg or L	
35		Category 3	1000 kg or L	10 000 kg or L	1.45 Kg or L	1.45 Kg or L	
36		Any combination of chemicals from items 33 to 35 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	3.15 Kg or L	3.15 Kg or L	
37	**Skin corrosion**	**Category 1A**	**50 kg or L**	**500 kg or L**	238.80 Kg or L	**238.80 Kg or L**	
38		**Category 1B**	**250 kg or L**	**2500 kg or L**	252.46 Kg or L	**252.46 Kg or L**	
39		Category 1C	1000 kg or L	10 000 kg or L	30.53 Kg or L	30.53 Kg or L	
40	Corrosive to metals	Category 1	1000 kg or L	10 000 kg or L	231.00 Kg or L	231.00 Kg or L	
41		Any combination of chemicals from items 37 to 40 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L		N/A	
42	Unstable explosives		5 kg or L	50 kg or L			
43	Unstable chemicals	Any combination of chemicals from items 11, 29 and 42 where none of the items exceeds the quantities in columns 4 or 5 on their own	5 kg or L	50 kg or L			

Notes

- Information derived from schedule 11 - Model Work Health and Safety Regulations - 4 November 2011. Revised as at 9 January 2014 (Safe Work Australia)
- The following rule must be self-calculated based on knowledge of the location and use of spill compounds, and this may affect placarding requirements:
    - If a flammable liquid of category 4 is used, handled or stored in the same spill compound as one or more flammable liquids of categories 1, 2 or 3, the total quantity of flammable liquid is determined as if the flammable liquid of category 4 had the same classification as the flammable liquid in the spill compound with the lowest flash point. For example, 1000 L of flammable liquid category 1 and 1000 L of flammable liquid category 4 is considered to contain 2000 L of flammable liquid category 1.
- Care should be taken when relying on the WHS version of the placarding report as many manufacturers have not yet evaluated their chemicals for GHS classification criteria. It is suggested to compare this report with the Dangerous Goods derived version to ensure correct placarding is achieved.
- Consideration should be made of circumstances where a product is classified as a Dangerous Good (e.g. Class 8 - Corrosive), yet does not have a requirement for the equivalent GHS Classification (e.g. H290, H314). Products in this scenario will no longer be triggered as requiring a placard.
- Quantities shown are accumulative across Stock Inventory Items in each Placarding category. The quantities per Stock Inventory Item are calculated as follows:
    - The Actual Quantity per Stock Inventory Item is calculated by
        - multiplying its Number of Containers with its Container Size, where there is no Individual Container Tracking.
        - adding the available quantities in all its active Container Items, where Individual Container Tracking is switched on.
    - The Maximum Quantity per Stock Inventory Item is calculated by
        - multiplying its Max with its Container Size, where the Max is specified.
        - multiplying its Number of Containers with its Container Size, where a Max is not specified, and no Individual Container Tracking.
        - multiplying the number of its active Container Items (including empty) with its Container Size, where a Max is not specified, and with Individual Container Tracking switched on.