

HAZARD AND RISK

CHAPTER TWENTY-THREE

23 Hazard and risk

This chapter provides an assessment of environmental hazards and risks that could arise during construction and operation of the project, and management strategies to address these hazards and risks.

23.1 Secretary’s environmental assessment requirements

The Secretary’s environmental assessment requirements relating to hazard and risk, and where these requirements are addressed in this Environmental Impact Statement, are outlined in Table 23-1.

Table 23-1 Secretary’s environmental assessment requirements – hazard and risk

Ref.	Secretary’s environmental assessment requirements	Where addressed
10. Socio-economic, Land Use and Property		
10.3	Assess the likely risks of the project to public safety, paying particular attention to subsidence risks, bushfire risks and the handling and use of dangerous goods.	<p>Public safety risks are addressed in Chapter 19 (Social impacts and community infrastructure).</p> <p>Traffic related public safety risks during construction are addressed in Chapter 8 (Construction traffic and transport).</p> <p>Traffic related public safety risks during operation are addressed in Chapter 9 (Operation traffic and transport).</p> <p>Subsidence and settlement risks are addressed in Chapter 17 (Groundwater and geology).</p> <p>Bushfire risks are addressed in Sections 23.3.2 and 23.4.2.</p> <p>Handling and use of dangerous goods are addressed in Sections 23.3.1 and 23.4.1.</p>

23.2 Assessment methodology

A desktop assessment was carried out to identify environmental hazards and risks that could arise during construction and operation of the project, as well as management measures to address such issues.

The assessment focused on those hazards and risks with the potential to adversely affect the quality of the surrounding environment, land uses and communities, with consideration of the following relevant guidelines:

- *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning 2011)
- *International Standard (ISO / IEC 31010) Risk Management – Risk Assessment Technique*
- *Australian Code for the Transport of Dangerous Goods by Road and Rail (7th edition)* (National Transport Commission, 2007)
- *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover, 2005)
- Bushfire prone land mapping developed and published by the relevant local councils.

Other work, health and safety hazards are not specifically considered in this Environmental Impact Statement. These issues would be addressed by the construction contractor and operator in accordance with relevant guidelines and legislative requirements.

23.3 Potential impacts – construction

Potential hazards and risks during construction would be associated with:

- The on-site storage, use and transport of dangerous goods and hazardous substances
- The rupture of, or interference with, underground utilities
- Risk of damage to existing building basements and ground support structures due to ground movement and geotechnical uncertainty
- Bushfire risks.

These hazards and risks are described further in the following sections.

23.3.1 On-site storage, use and transport of dangerous goods and hazardous substances

An indicative list of the types of potentially hazardous materials anticipated to be used, stored and transported during construction of the project is provided in Table 23-2, along with the relevant storage and transport thresholds established under Applying SEPP 33.

The thresholds in Applying SEPP 33 represent the maximum quantities of hazardous materials that can be stored or transported without causing a significant off-site risk.

Typically, low volumes of potentially hazardous materials would be stored on site, with the exception of the Chatswood and Marrickville dive sites where larger volumes of materials would be required to support tunnel construction. The volume required to be stored on site would largely depend on the anticipated rates of consumption, with deliveries of dangerous goods coordinated to match consumption rates. This could be about one delivery per day if needed to meet storage thresholds based on the proximity of sensitive receivers, provided that this is within transport thresholds.

Construction site planning would ensure hazardous materials are stored appropriately and at an appropriate distance from sensitive receivers, in accordance with the thresholds established under Applying SEPP 33. Should the minimum buffers be unable to be maintained, either due to space constraints, the close proximity of sensitive receivers, or a requirement to store volumes of hazardous materials in excess of storage thresholds, a risk management strategy would be developed on a case-by-case basis.

Environmental hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the construction environmental management documentation. These measures would include the storage and management of all hazardous substances in accordance with the *Work Health and Safety Act 2011*, the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and Applying SEPP 33 (Department of Planning, 2011).

Table 23-2 Indicative list of hazardous materials potentially required during construction and applicable storage / transport thresholds

Material	Australian Dangerous Good Code Class	Storage locations	Storage method	Applying SEPP 33 thresholds		
				Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Diesel	C1 ¹ ; 3 PG III ²	All sites	20 litre drums / carry cans	Greater than 5 tonnes, if stored with other Class 3 flammable liquids	5 metres	Not applicable if not transported with Class 3 dangerous goods
Petrol	C1 ¹ ; 3 PG III ²	All sites	20 litre drums	Greater than 5 tonnes, if stored with other Class 3 flammable liquids	5 metres	Not applicable if not transported with Class 3 dangerous goods
Lubricating and hydraulic oils and greases	C2	All sites	20 litre drums	N/A	N/A	Not applicable, if not transported with Class 3 dangerous goods
Explosives	1.1	No on-site storage	Delivery of explosives would be timed to avoid the need for on-site storage	N/A	N/A	Subject to consultation with the Department of Planning and Environment
Industrial grade oxygen	2.2	All sites	Cylinders (up to 55 kilograms) in rack	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Medical grade oxygen / breathing gas	2.2	Barangaroo Station and Blues Point	Cylinders (up to 55 kilograms) in rack	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Acetylene	2.1	All sites	Cylinders (up to 55 kilograms) in rack	Greater than 0.1 tonnes (100kg)	15 metres	2 tonnes; 30 times per week
Cement	N/A	All sites	Bags / pallets (in container)	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds

Material	Australian Dangerous Good Code Class	Storage locations	Storage method	Applying SEPP 33 thresholds		
				Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Premix concrete	N/A	All sites	Bags / pallets (in container)	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Concrete curing compounds	N/A	All sites	20 litre drums	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Concrete retardant	3 PG III	All sites	205 litre drums	Greater than 5 tonnes	5 metres	10 tonnes; 60 times per week
Shotcrete accelerator	3 PG II	All sites	1,000 litre intermediate bulk containers	Greater than 5 tonnes	5 metres	3 tonnes; 45 times per week
Epoxy glue	3 PG III	All sites	Small containers	Greater than 5 tonnes	5 metres	10 tonnes; 60 times per week
Coagulants	N/A	All sites	1,000 litre intermediate bulk containers	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Acids	8 PG II	All sites	1,000 litre intermediate bulk containers	Greater than 25 tonnes	N/A	2 tonnes; 30 times per week
Bases	8 PG II	All sites	1,000 litre intermediate bulk containers	Greater than 25 tonnes	N/A	2 tonnes; 30 times per week
Disinfectant	8 PG III	All sites	500 litre intermediate bulk containers	Greater than 50 tonnes	N/A	2 tonnes; 30 times per week
Anti-scalent	N/A	All sites	100 litre drums	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Membrane preservative	8 PG III	All sites	10 litre drums	Greater than 50 tonnes	N/A	2 tonnes; 30 times per week
Foam additives / surfactant	N/A	Barangaroo Station	Drums	N/A	N/A	Not applicable

Material	Australian Dangerous Good Code Class	Storage locations	Storage method	Applying SEPP 33 thresholds		
				Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Flocculent	N/A	Barangaroo Station	Drums	N/A	N/A	Not applicable
De-bonding agents	N/A	All sites	Drums / containers	N/A	N/A	Not applicable
Contaminated waste	Dependent on nature of material	All sites	Bunded areas or removed directly from site	Dependent on nature of material	Dependent on nature of material	Dependent on nature of material
Paint	N/A	Station sites	20 litre drums	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds

1 Classified as C1 if not stored with other Class 3 flammable liquids.

2 Classified as 3PGIII if stored with other Class 3 flammable liquids.

23.3.2 Rupture of, or interference with, underground utilities

As outlined in Chapter 7 (Project description – construction), a number of utilities would need to be adjusted, relocated and / or protected to enable construction of the project. Damage, rupture and / or failure to shut down or isolate underground utilities during this work has the potential to result in the following environmental hazards and risks:

- Release of untreated sewage and / or gas from a sewer main
- Release of natural gas from a gas main
- Release of large electrical currents through the ground surface from an underground electricity cable (known as earth potential rise).

The risk associated with these hazards would be minimised by carrying out utility checks (such as dial before you dig searches and non-destructive digging), consulting with the relevant utility providers and, if required, relocating and / or protecting utilities in and around the project prior to construction. Consultation with utility providers would commence during detailed design and continue during construction to mitigate the risk of unplanned and unexpected disturbance of utilities.

23.3.3 Bushfire risks

The project would be located in a highly developed urban environment that generally lacks substantial areas of vegetation. A review of bushfire prone land mapping developed and published by the relevant local councils indicated that none of the proposed construction sites would be located on or in proximity to bushfire prone land. Therefore, bushfire risks are considered to be negligible.

23.3.4 Risk of damage to existing building basements and ground support structures due to ground movement and geological uncertainty

Ground movement (or settlement) refers to a localised lowering of the ground level due construction activities. It can affect nearby buildings and other structures. Building basements and ground support structures present potential risks in terms of direct impact and indirect ground movement impacts.

An assessment of potential ground movement associated with the project is provided in Chapter 17 (Groundwater and geology). In summary, the project is considered to have a negligible ground movement risk, with superficial damage to buildings unlikely to occur. Although, small areas at station sites and dive sites may require future building strain and structural assessment. The use of survey data would improve the understanding of risks associated with basements and ground support structures and inform the design process.

The uncertainty about ground conditions also presents risks for the construction process. For example, if rock is found to be harder or softer than assumed during the design process, this could lead to tunnelling difficulties, prompt a redesign and affect stability. This uncertainty would be addressed through further geotechnical investigation to improve understanding of ground conditions and through the development of an appropriate construction methodology.

The potential for ground settlement, and management or protection measures to address this issue, are discussed in Chapter 17 (Groundwater and geology). Chapter 10 (Construction noise and vibration) considers vibration impacts and the potential for structural damage, and includes measures to address vibration impacts.

23.4 Potential impacts – operation

Potential hazards and risks during operation would be associated with:

- The on-site storage, use and transport of dangerous goods and hazardous substances
- Bushfire risks.

These hazards and risks are described further in the following sections.

23.4.1 On-site storage, use and transport of dangerous goods and hazardous substances

The main hazards and risks likely to be encountered during the operation of the project would be the storage, use and transport of chemicals, fuels and materials. In particular, the proposed tunnel water treatment plant at the southern services facility would require the storage, use and transport of several chemicals, including sodium hydroxide, polyaluminium chloride and a polymer.

An indicative list of the types of potentially hazardous materials anticipated to be used, stored and transported during operation of the project is provided in Table 23-3, along with the relevant storage and transport thresholds established under *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Applying SEPP 33) (Department of Planning, 2011).

The Applying SEPP 33 thresholds represent the maximum quantities of hazardous materials that could be stored or transported without causing a significant off-site risk.

Environmental hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the operational environmental management system. These measures would include the storage and management of all hazardous substances in accordance with the *Work Health and Safety Act 2011*, the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and *Applying SEPP 33* (Department of Planning, 2011).

Table 23-3 Indicative list of hazardous materials potentially required during operation and applicable storage / transport thresholds

Material	Australian Dangerous Good Code Class	Storage locations	Storage method	Applying SEPP 33 thresholds		
				Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Sodium hydroxide	8 PG II	Southern services facility	To be confirmed during detailed design however storage would be under the SEPP 33 thresholds	Greater than 25 tonnes	N/A	2 tonnes; 30 times per week
Polyaluminium chloride	N/A			N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Polymer	N/A			N/A	N/A	Not subject to Applying SEPP 33 transport thresholds

23.4.2 Bushfire risks

The project would be located in a highly developed urban environment that generally lacks substantial areas of vegetation. A review of bushfire prone land mapping developed and published by the relevant local councils indicated that none of the aboveground aspects of the project would be located on or in proximity to bushfire prone land. Therefore, bushfire risks are considered to be negligible.

23.5 Mitigation measures

The mitigation measures that would be implemented to address potential hazards and risks are listed in Table 23-4.

Table 23-4 Mitigation measures – hazard and risk – construction

Ref	Mitigation measure	Applicable location(s) ¹
HR1	All hazardous substances that may be required for construction and operation would be stored and managed in accordance with the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005) and <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011).	All
HR2	Dial before you dig searches and non-destructive digging would be carried out to identify the presence of underground utilities.	All
HR3	A hazardous material survey would be completed for those buildings and structures suspected of containing hazardous materials (particularly asbestos) prior to their demolition. If asbestos is encountered, it would be handled and managed in accordance with relevant legislation, codes of practice and Australian standards.	CDS, CN, VC, MP, PS, CS, WS, MDS
HR4	The method for delivery of explosives would developed prior to the commencement of blasting in consultation with the Department of Planning and Environment and be timed to avoid the need for on-site storage.	CN, VC, BN, MP, PS, WS

¹ STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site; Metro rail tunnels: Metro rail tunnels not related to other sites (eg TBM works).

Table 23-5 Mitigation measures – hazard and risk – operation

Ref	Mitigation measure	Applicable location(s) ¹
HR5	All hazardous substances that may be required for operation would be stored and managed in accordance with the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005) and <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011).	All

¹ STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site; Metro rail tunnels: Metro rail tunnels not related to other sites (eg TBM works); PSR: Power supply routes.