26 Sustainability and climate change – Stage 1

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This chapter describes the overall approach to sustainability for Stage 1, as well as an assessment of the potential impact of climate change and the greenhouse gas emissions that would be generated during Stage 1 construction.

26.1 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements relating to sustainability and climate change for Stage 1, and where these requirements are addressed in this Environmental Impact Statement, are outlined in Table 26-1.

Table 26-1: Secretary's Environmental Assessment Requirements – Sustainability and climate change Stage 1

Reference	Secretary's Environmental Assessment Requirements	Where addressed
12. Sustainability		
12.1	The sustainability of the Proposal in accordance with (as relevant) Green Star or the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability Rating Tool (or equivalent) and commit to an appropriate target rating.	This chapter Chapter 8
13. Other issues		
13.1	Air quality, greenhouse gas and energy, climate change adaptation, waste management and resource use, hazard and risk assessments should be undertaken in accordance with the commitments in Section 9 of the Scoping Report.	Chapter 23 This chapter Chapter 24 Chapter 25 Refer to Table 2 of Appendix A for Scoping Report requirements

26.2 Overview

Chapter 8 (Concept environmental assessment), Section 8.20 outlines initiatives and targets for the Sydney Metro West Concept that have been developed to align with relevant government resource efficiency policies. These initiatives and targets would also apply to Stage 1. These initiatives would be further refined as part of the design process, committed to in an update to the Sydney Metro West Sustainability Plan and included in the contract documents for Stage 1 works.

Sydney Metro West (including Stage 1) would also achieve an equivalent or improved level of sustainability performance compared to previous metro projects. This would include achieving a minimum Infrastructure Sustainability Council of Australia (ISCA) IS rating of 75 – Version 1.2 (or equivalent) and a 5-Star Green Star rating.

This chapter assesses the following elements of sustainability for Stage 1:

- Climate change risk and adaptation
- Greenhouse gas and energy.

Chapter 17 (Social impacts – Stage 1) considers the social sustainability elements.

26.3 Climate change risk and adaptation

26.3.1 Climate change risk assessment methodology

The climate change risk assessment and adaptation planning process methodology for Stage 1 is based on the Australian Standard AS 5334-2013 Climate change adaptation for settlements and infrastructure – A risk based approach. This standard follows the International Standard ISO 31000, Risk Management – Principles and guidelines.

The main steps in the process are:

- Establishing the climate change context of Stage 1
- Carrying out a climate change risk assessment
- Treating key climate risks.

The climate change risk assessment was carried out using the Transport for NSW risk framework. The severity or consequence of risks was assessed with reference to the following:

- Health and safety impact
- Environmental impact
- Customer experience and operational reliability impact
- Government, stakeholder and community trust
- Regulatory impact
- Managerial and organisational impact
- Impact on the benefit realisation
- Financial impact.

Risk likelihood was assessed cumulatively over the applicable asset life, rather than the chance of occurrence of the hazard-consequence combination in any given year.

Climate change risks were assessed by considering the implications of climate change projection scenarios, allowing for a business-as-usual risk control for natural hazards that would still apply in the absence of any consideration of climate change.

A climate change workshop was undertaken as part of the definition design process. Participants considered climate change projections for the region and the potential impact these would have on a range of aspects related to Stage 1.

26.3.2 Climate change risks

To effectively manage potential climate change risks, each stage in the design and delivery of Stage 1 would consider the most up to date climate change projections and design guidelines and would be subject to ongoing review and response by designers and constructors. Refer to Section 26.5 for mitigation measures to manage climate change risks for Stage 1.

Climate change projections relevant to Sydney Metro West (including Stage 1) are detailed in Chapter 8 (Concept environmental assessment), Section 8.20, and include:

- Potential increases in absolute maximum temperature
- Potential increases in average temperatures and the frequency of heatwaves
- Potentially lower annual average rainfall, increased rainfall intensity during storm events and resultant surface water flooding
- Potential sea level rise in the order of 0.19 metres by 2030 and 0.88 metres by 2090
- Potential increased carbon dioxide concentrations in the atmosphere, together with increased temperature and periods of heavy rainfall could lead to increases in the carbonation of concrete.

As a consequence of these projections (especially increased temperatures and reduced annual rainfall) there could be potential increases in the number of days where the Forest Fire Danger Index will be greater than 50 (severe).

Climate change is anticipated to have potential direct and indirect impacts on Stage 1. The climate change risk assessment process for Stage 1 identified the following potential risks after the implementation of climate change adaption measures (residual risks):

- Six medium (tolerable) risks
- Three low (acceptable) risks. For these risks, no risk treatment is proposed at this stage – although some of the risks would be followed up during detailed design.

No extreme (unacceptable) risks or high (undesirable) risks were identified.

Table 26-2 outlines the 'medium' risks for Stage 1 and the proposed risk treatments (in addition to 'business as usual' measures).

Table 26-2: Climate change risks identified as 'medium'

Potential risk	Pre-treatment risk rating	Risk treatment	Post-treatment risk rating
Stabling and maintenance facility and other infrastructure located in low-lying areas may be at increased risk of flooding causing damage and disruption to services.	High	• Consider sea level rise and increased rainfall projections in flood modelling to determine any additional impact from climate change on local flood behaviour.	Medium
Potential increases in the number of flood events impacting on the tunnel drainage systems.	Medium	• Consider sea level rise and rainfall projections in design of tunnel portals and tunnel drainage systems • Space proof for additional drainage system capacity	Medium
Potential indirect flooding risks to local and regional communities.	Medium	• Risks to be re-evaluated following detailed survey	Medium
Potential changes to groundwater levels impacting on the integrity of embankments and cuttings, potentially leading to their collapse. Collapse could lead to damage or burying of rail lines. Embankments and cuttings are limited to the tunnel portal and dive structure and the stabling and maintenance facility.	Medium	• Ensure design takes into account climate change projections, research into embankments and cuttings used in regions where landslides and mass movement is likely.	Medium
Potential inundation of rail infrastructure near marine water including wave and tide damage.	Medium	• Consider sea level rise projections in flood protection design.	Medium
Potential increased carbonation of concrete resulting in such structures not lasting their required lifespan. Potential requirement for additional maintenance to deal with carbonation of concrete and exposure of concrete reinforcement.	Medium	• Consider revising the exposure classification for concrete structures to provide additional protection against concrete carbonation and chloride ion attack.	Medium

26.4 Greenhouse gas and energy

26.4.1 Greenhouse gas assessment methodology

Greenhouse gas emissions are reported as tonnes of carbon dioxide equivalent (tCO2-e) and categorised into three different scopes (either scope 1, 2 or 3) in accordance with the Greenhouse Gas Protocol (World Resources Institute, 2014), Intergovernmental Panel on Climate Change and Australian Government greenhouse gas accounting/classification systems.

The three emission categories (known as 'scopes') help differentiate between direct emissions from sources that are owned or controlled by a project, and upstream indirect emissions that are a consequence of project activities, but which occur at sources owned or controlled by another entity. The three greenhouse gas scopes are:

- Scope 1 emissions, also referred to direct emissions
- Scope 2 emissions, also referred to as indirect emissions
- Scope 3 emissions, includes all indirect emissions (not included in scope 2) due to upstream or downstream activities.

The objectives of the greenhouse gas assessment were to:

- Identify the likely sources of greenhouse gas emissions associated with construction of Stage 1
- Quantify the greenhouse gas emissions associated with each greenhouse gas source
- Identify opportunities (mitigation measures) to reduce greenhouse gas emissions.

Transport for NSW's online Carbon Estimate and Reporting Tool was used for the greenhouse gas emissions assessment. The tool was developed to provide consistency in greenhouse gas emissions assessment and reporting for the construction stage of Transport for NSW projects.

The greenhouse gas assessment is a preliminary estimate based on current design information and construction methods.

26.4.2 Estimated greenhouse gas emissions

Greenhouse gas emissions were estimated for the range of construction emission sources (noting that Stage 1 does not include metro operation). The estimated scope 1, 2 and 3 emissions are summarised in Table 26-3.

In 2016/17, NSW's annual greenhouse gas emissions were about 131.5 million tCO_2-e (Department of Planning, Industry and Environment, 2019d), with the transport industry sector accounting for about 21 per cent of the total at 28 million tCO_2-e.

Construction of Stage 1 would equate to about 1.4 per cent of the transport industry's 2016/17 annual greenhouse gas emissions and about 0.3 per cent of total NSW emissions. While these percentage contributions are small within the NSW and national contexts, the management and mitigation measures outlined in Section 26.5 would further minimise and offset greenhouse emissions during construction.

Table 26-3: Estimated greenhouse gas emissions – Stage 1

Resource	Source	Greenhouse gas emissions (tCO_2e)$_1$
Scope 1	Fuel consumption	38,165
	Vegetation clearing	56
Scope 2	Electricity consumption	111,685
Scope 3	Fuel consumption	1,957
	Electricity consumption	12,410
	Construction materials	217,104
	Haulage	7,290
TOTAL		**388,667**

Note 1: tCO_2e = tonnes of CO_2 equivalent.

26.5 Management and mitigation measures

26.5.1 Approach to management and mitigation

Stage 1 would be constructed in accordance with the Sydney Metro West Sustainability Plan (discussed in Section 8.20). Contractors for Sydney Metro would be required to develop an environmental and sustainability management system which would be linked to the Sydney Metro sustainability system.

The relationship between key documents within the Sydney Metro and contractor environment and sustainability management systems is shown in Figure 26-1. Notably:

- The Contractor's Construction Environment Management Plan and sub plans would capture the construction environmental management requirements emerging from the Environmental Impact Statement and the Sydney Metro West Sustainability Plan
- The Contractor's Sustainability Management Plan would capture governance and design requirements, social sustainability initiatives required by the Sydney Metro West Sustainability Plan and contract requirements. This plan would vary in scope across different delivery packages
- Progress against sustainability objectives and targets would be tracked through regular sustainability reporting over the delivery period.

Sub-contractors engaged by the contractor would be required to work under the contractor's environmental and sustainability management system.

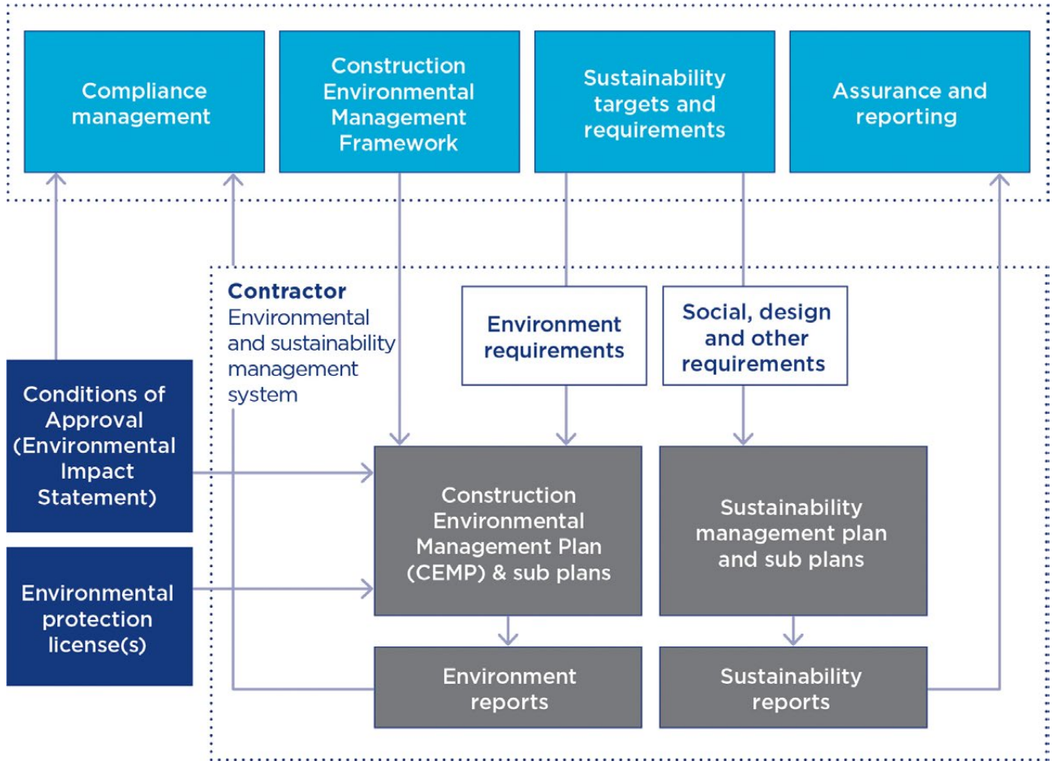

Figure 26-1: Environmental and sustainability management system

The Construction Environmental Management Framework provides the basis for the development and implementation of a design and/or construction sustainability management plan. The framework provides minimum requirements for the plan which includes carbon and energy management, and waste management and recycling.

The Contractor's Sustainability Management Plan would also incorporate the specific mitigation measures listed in Table 26-4 as relevant to the scope of works.

26.5.2 Mitigation measures

The mitigation measures that would be implemented to address sustainability and climate change for Stage 1 are listed in Table 26-4.

Table 26-4: Mitigation measures - Sustainability and climate change Stage 1

Reference	Impact/issue	Mitigation measure	Applicable location(s)[1]
SCC1	Sustainability implementation	Sustainability initiatives would be incorporated into the detailed design and construction to support the achievement of the Sydney Metro West sustainability objectives.	All
SCC2	Sustainability implementation	Best practice level of performance would be achieved using market leading sustainability rating tools during design and construction.	All
SCC3	Climate change risks	Climate change risk treatments would be confirmed and incorporated into the detailed design.	All
SCC4	Greenhouse gas emissions	An iterative process of greenhouse gas assessments and design refinements would be carried out during detailed design and construction to identify opportunities to minimise greenhouse gas emissions. Performance would be measured in terms of a percentage reduction in greenhouse gas emissions from a baseline inventory calculated at the detailed design stage.	All
SCC5	Greenhouse gas emissions	25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction would be offset.	All

Note 1: WMS: Westmead metro station; PMS: Parramatta metro station; CSMF: Clyde stabling and maintenance facility; SSF: Silverwater services facility; SOPMS: Sydney Olympic Park metro station; NSMS: North Strathfield metro station; BNS: Burwood North Station; FDS: Five Dock Station; TBS: The Bays Station; Metro rail tunnels: Metro rail tunnels not related to other sites (e.g. tunnel boring machine works); PSR: Power supply routes.

26.5.3 Interactions between mitigation measures

Mitigation measures in other chapters that are relevant to sustainability and management of potential climate change risk impacts include:

- Chapter 21 (Hydrology and flooding – Stage 1), specifically measures which address detailed construction planning to consider flood risk at construction sites.

Together, these measures would minimise the potential sustainability and climate change impacts of Stage 1.

There are no mitigation measures identified in the assessment of other environmental aspects that are likely to affect the assessment of sustainability and climate change.

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