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SMWSASCA-CPU-SWD-EW000-AT-RPT-620000 REV G

Place, Urban Design and Corridor Landscape Plan Surface and Civil Alignment Works





Sydney Metro - Western Sydney Airport
PO Box K659

Haymarket, NSW 1240.

P: 1800 171 386

www.sydneymetro.info

Prepared By



SYDNEY METRO - WESTERN SYDNEY AIRPORT
SURFACE AND CIVIL ALIGNMENT WORKS

CPB/UI JV,
Level 5, 60 Miller St, Street
North Sydney NSW 2060



Cox Architecture
70 George Street
Sydney NSW 2000

ASPECT Studios

Aspect Landscape
L1/78-80 George Street
Redfern NSW 2016

AHJV

Aurecon Hatch Joint Venture

Aurecon Hatch JV
Level 5, 60 Miller St, Street
North Sydney NSW 2060

Author: [REDACTED]

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Executive Summary

Executive summary

This Place, Urban Design and Corridor Landscape Plan (PUDCLP) has been prepared to address the requirements of the Sydney Metro – Western Sydney Airport project approval SSI-10051 for the Surface and Civil Alignment Works (SCAW) component of the project.

Condition E77 requires that:

A PUDCLP must be prepared to document and illustrate the permanent built works and landscape design of the CSSI and how these works are to be maintained. The PUDCLP must be:

- *prepared by a suitably qualified and experienced person(s) in consultation with the community (including the affected landowners and businesses or a representative of the businesses), Western Parklands City Authority, Western Sydney Planning Partnership and relevant council(s);*
- *reviewed by an independent and suitably qualified and experienced person nominated by the DRP;*
- *submitted to the Planning Secretary prior to the construction of permanent built surface works and/or landscaping, excluding those elements which for ecological requirements, or technical requirements, or requirements as agreed by the Planning Secretary do not allow for alternate design outcomes; and*
- *implemented during construction and operation of the CSSI.*

Note: The PUDCLP may be developed and considered in stages to facilitate design progression and construction. Any such staging and associated approval would need to facilitate a cohesive final design and not limit final design outcomes.

The Condition notes that the PUCDLP may be submitted in stages to facilitate design progression and construction of the project and that any such staging and associated approval would need to facilitate a cohesive final design and not limit final design outcomes.

This PUDCLP is for the project's enabling works, permanent built works and initial landscape elements that include:

- Viaducts, Piers and Abutments
- Earthworks including new embankments and cuttings
- Drainage
- Landscape of impacted creeks
- Temporary Works

This PUDCLP has been prepared by the CPB United Infrastructure Joint Venture. Compliance with Condition E77 and other relevant conditions noted in Section 1.6 of this plan.

Table 1 outlines the project delivery packages and notes where PUDCLPs are required:

Table 1 – Western Sydney Airport Metro Contracts

Package	Scope	Contractor	PUDCLP
Station Boxes and Tunnelling (SBT)	Tunnels and Station Box excavations	CPB Ghella JV	No
Surface and Civil Alignment Works (SCAW)	Earthworks and Viaducts	CPB United Infrastructure	Yes
Stations, Systems, Trains Operation and Maintenance (SSTOM)	Stations and Precincts, Stabling and Maintenance Facility, Trains, Rail Systems, Operations and Maintenance	TBC	Yes
Footbridge St Marys (FSM)	An aerial concourse connecting the Metro station and the northern precinct to the Sydney Trains station	TBC	Yes
Corridor Landscape Works (CLW)	Corridor Landscape Restoration Works	TBC	No

Table 2 – PUDCLP Elements

Section	Topics
Section 1	<ul style="list-style-type: none"> Introduction <ul style="list-style-type: none"> Purpose Context Scope and Status Process Qualified Personnel Compliance
Section 2	<ul style="list-style-type: none"> Collaboration and consultation
Section 3	<ul style="list-style-type: none"> Design objectives
Section 4	<ul style="list-style-type: none"> Connecting with Country
Section 5	<ul style="list-style-type: none"> Permanent built elements <ul style="list-style-type: none"> Viaduct Piers Abutment Heritage impacts
Section 6	<ul style="list-style-type: none"> Watercourse crossings/east-west movement corridors <ul style="list-style-type: none"> design of viaducts design of culverts and other crossings to provide for movement of aquatic and terrestrial fauna design of scour protection details of remnant native and riparian vegetation
Section 7	<ul style="list-style-type: none"> Landscape <ul style="list-style-type: none"> landscape including hard and soft elements use of native species from the relevant native vegetation community (or communities), water sensitive urban design initiatives measures to prevent wildlife strike risk strategies to rehabilitate, regenerate or revegetate disturbed areas
Section 8	<ul style="list-style-type: none"> Cohesive final design
Section 9	<ul style="list-style-type: none"> Sustainability initiatives
Section 10	<ul style="list-style-type: none"> Delivery <ul style="list-style-type: none"> Management and routine maintenance standards and regimes Timing and responsibilities for implementation of elements included within the PUDCLP
Appendices	<ul style="list-style-type: none"> Evidence of Collaboration and consultation Consultation feedback DRP response Qualified personnel SSTOM and CLW landscape concept

This PUDCLP presents an integrated landscape, urban and place making outcome for surface enabling elements on the project and has been developed in consultation with a series of stakeholders as identified in Section 2.

Temporary works to be undertaken during construction include:

- Haul Roads/Access Roads
- Site Compounds
- Water Crossings
- Fencing
- Temporary Swale Drainage related to haul roads
- The stabilization (Cover Crop) of the haul roads and temporary Swale drainages
- Temporary stockpiles
- Construction pads

Initial earthworks and site establishment works will be subject to separate package submissions::

- SMF - Early Works package (incl. detention basin and stockpiling)
- Site Access / Haul Road packages #1, #2 and #3
- Site security and Fencing packages - North, South and WSI

1. Introduction

1. Introduction

1.1 Purpose of the Place, Urban Design and Corridor Landscape Plan

This plan has been prepared to document the Place, Urban Design and Corridor Landscape Plan (PUDCLP) for the Surface and Civil Alignment Works (SCAW) component of the Sydney Metro – Western Sydney Airport project. The SCAW component will deliver the enabling surface works between Orchard Hills and the Western Sydney Airport Business Park Station.

As an enabling contract, many of the overall project's integrated urban and place making outcome will be delivered in later packages. The SCAW works will however establish the basis for permanent built surface works and landscaping associated with the project.

The Surface and Civil Alignment Works package consists of, permanent built works and initial landscape elements that include:

- Viaducts, Piers and Abutments
- Earthworks including new embankments and cuttings
- Drainage
- Landscape of impacted creeks
- Temporary Works

Condition E63 of the Consent identifies the overall strategic outcomes for the Project:

Design Requirements and Strategic Context

E63 The CSSI must be designed with consideration of:

- the design objectives, principles and guidelines identified in documents listed in Condition A1;*
- the principles and objectives of the draft Connecting with Country Framework;*
- relevant land use changes, masterplans and initiatives, where this information is known and/or available;*
- existing and proposed future local context and character; and*
- transport and land use integration and system functionality in the context of precincts, to the extent it is known and/or defined.*

Responses to items (a) – (e) must be reviewed by the Design Review Panel (DRP) to inform the design of permanent built works and landscape design of the CSSI. The outcome of the DRP review must be provided to the Planning Secretary prior to the submission of the Place, Urban Design and Corridor Landscape Plan (PUDCLP).

Note: *In accordance with Condition A10 and Condition A16, the requirements of this condition can be staged*

An integrated urban and place making outcome must be achieved through the consideration of existing and planned public domain and private developments adjacent to the project and effective consultation and collaboration with relevant stakeholders.

The Design Review Panel has confirmed that the SCAW design works meet the requirements of Condition E63.

As required by E77, this PUDCLP addresses a permanent built structures delivered during this enabling works stage, impacts of water crossings, temporary landscape, landscape rehabilitation.

The preparation of the PUDCLP is a requirement of Condition E77 of the Sydney Metro – Western Sydney Airport project approval SSI-10051. Condition E77 allows the PUDCLP to be submitted in stages and as identified in the project's Staging Report, staging of the project is represented on a construction stage basis. Consistent with the requirements of Condition E77, E78 and E79, this PUDCLP:

- documents and illustrates the design of permanent built works and landscape works relevant to the construction stage
- details specific design objectives, principles and standards
- identifies landscaping and building design opportunities to mitigate visual impacts

- describes the key design features, including watercourse crossings
- details strategies for rehabilitation, regeneration or revegetation
- provides evidence of consultation.

The different PUDCLPs to be prepared by each package are in accordance with the staging provision. The PUDCLPs will work together to deliver integrated urban and place making outcomes.

A review of the requirements identified in Condition E63 across relevant packages confirms the following elements must be addressed with respect to Condition E77:

Table 3 –E63 Package Considerations

Requirement	SCAW	SSTOM/ FSM
a) the design objectives, principles and guidelines identified in documents listed in Condition A1;		
b) the principles and objectives of the draft Connecting with Country Framework;		
c) relevant land use changes, masterplans and initiatives, where this information is known and/or available;		
d) existing and proposed future local context and character;		
e) transport and land use integration and system functionality in the context of precincts, to the extent it is known and/or defined.	N/A	

1.2 Project overview

Sydney Metro - Western Sydney Airport line will become the transport spine for Greater Western Sydney, connecting communities and travellers with the new Western Sydney International (Nancy-Bird Walton) Airport and the growing region.

The city-shaping project, from St Marys through to the new airport and the Western Sydney Aerotropolis, will provide a major economic stimulus for western Sydney, supporting more than 14,000 jobs during construction for the NSW and national economies. The 23 kilometre new railway will link residential areas with job hubs including the new Aerotropolis, and connect travellers from the new airport to the rest of Sydney's public transport system.

Key operational features of the project include:

- around 4.3 kilometres of twin rail tunnels (generally located side by side) between St Marys (the northern extent of the project) and Orchard Hills
- a cut-and-cover tunnel around 350 metres long (including tunnel portal), transitioning to an in-cutting rail alignment south of the M4 Western Motorway at Orchard Hills
- around 10 kilometres of rail alignment between Orchard Hills and Western Sydney International, consisting of a combination of viaduct and surface rail alignment
- around two kilometres of surface rail alignment within Western Sydney International
- around 3.3 kilometres of twin rail tunnels (including tunnel portal) in the north of the site to Western Sydney International
- around three kilometres of twin rail tunnels between Western Sydney International and the Aerotropolis Core
- six new metro stations:
 - four off-airport stations: - St Marys (providing interchange with the existing Sydney Trains suburban rail network), Orchard Hills, Luddenham and Aerotropolis Core
 - two on-airport stations:- Airport Business Park and Airport Terminal

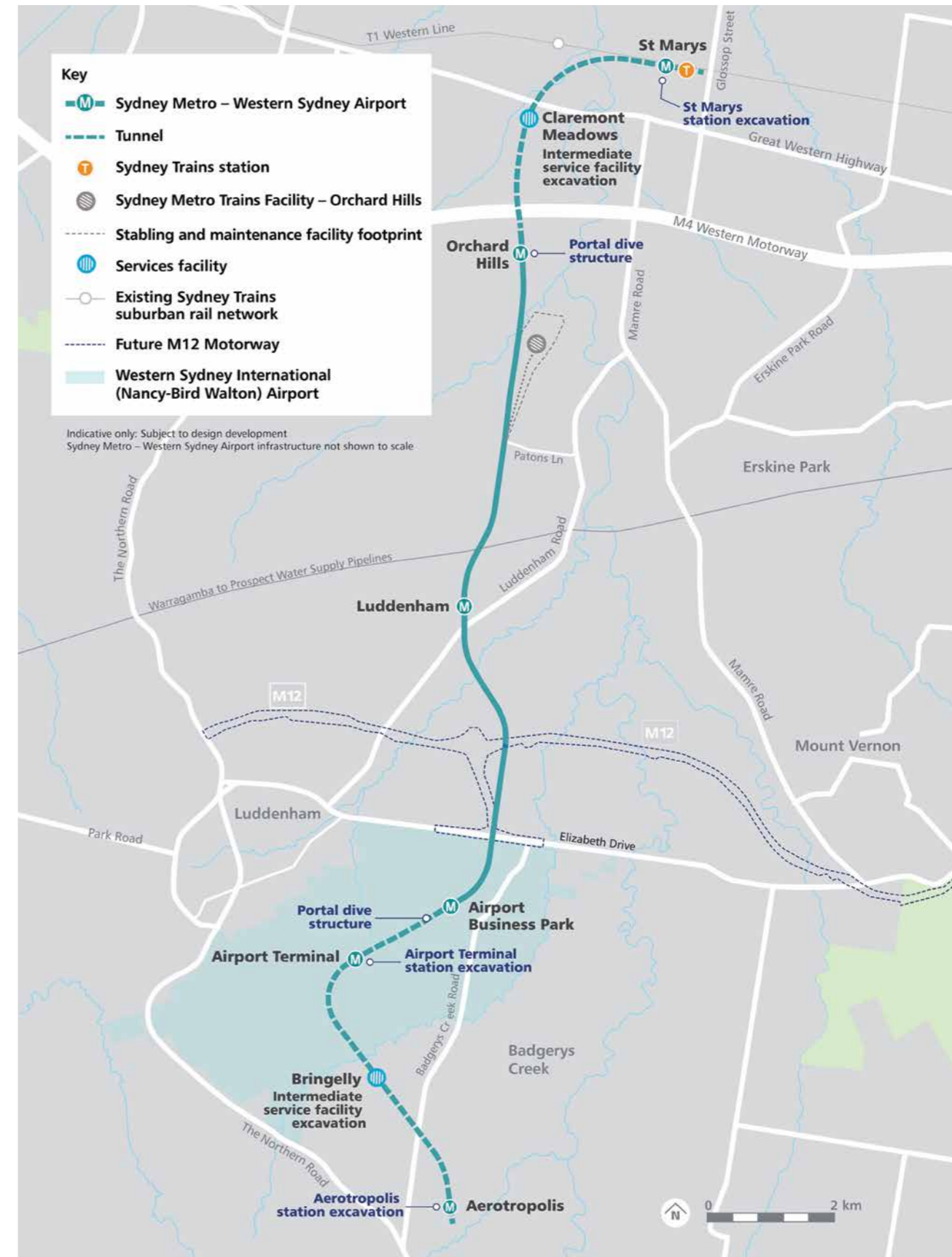


Figure 1 Overview of the project

Grade separation of the track alignment at key locations including:

- where the alignment interfaces with existing infrastructure such as the Great Western Highway, M4 Western Motorway, Lansdowne Road, Patons Lane, the Warragamba to Prospect Water Supply Pipelines, Luddenham Road, the future M12 Motorway, Elizabeth Drive, Derwent Road and Badgerys Creek Road
- crossings of Blaxland Creek, Cosgroves Creek, Badgerys Creek and other small waterways to provide flood immunity for the project
- modifications to the existing Sydney Trains station and rail infrastructure at St Marys (where required) to support interchange and customer transfer between the new metro station and the existing Sydney Trains suburban rail network
- a stabling and maintenance facility and operational control centre located to the south of Blaxland Creek and east of the proposed metro track
- new pedestrian, cycle, park-and-ride and kiss-and-ride facilities, public transport interchange infrastructure, road infrastructure and landscaping as part of the station precincts.

The project will also include:

- turnback track arrangements (turnbacks) at St Marys and Aerotropolis Core to allow trains to turn back and run in the opposite direction
- additional track stubs to the east of St Marys Station and south of Aerotropolis Core Station to allow for potential future extension of the line to the north and south respectively without impacting future metro operations
- an integrated tunnel ventilation system including services facilities at Claremont Meadows and Bringelly
- all operational systems and infrastructure such as crossovers, rail sidings, signalling, communications, overhead wiring, power supply, lighting, fencing, security and access tracks/paths
- retaining walls at required locations along the alignment
- environmental protection measures such as noise barriers (if required), on-site water detention, water quality treatment basins and other drainage works.

Off-airport project components

The off-airport components of the project will include the track alignment and associated operational systems and infrastructure north and south of Western Sydney International, four metro stations, the stabling and maintenance facility, two services facilities and a tunnel portal.

On-airport project components

The on-airport components of the project will include the track alignment and associated operational systems and infrastructure within Western Sydney International, two metro stations and a tunnel portal. The on-airport components are subject to approvals from the Commonwealth and are not dealt with in this report.

The key project features as described are indicative only and subject to design development in accordance with the process identified in Chapter 6 (Project development and alternatives) of the Environmental Impact Statement. Key operational features of the project are shown on Figure 1.

Overall, the project lies across a number of approval streams:

- NSW State Approval – SSI 10051
- Commonwealth Approval:
 - EPBC Act (Heritage and Biodiversity)
 - Airport Rail Conditions
 - Submissions Report Revised Environmental Mitigation Measures (REMMs)
 - Construction Environmental Management Framework (CEMF)
 - Environmental Performance Objectives (from the Staging Report)



Figure 2: SCAW Components

1.3 Aerotropolis Context

The transformation of Western Sydney into a new Parkland City is anchored by the new Western Sydney Airport and the surrounding growth of the Aerotropolis in line with the Aerotropolis Precinct Plan

Activity will be initially generated at the WSA with the Stage 1 terminal, a new business park and cargo hub. There is already interest in new warehousing and distribution uses on sites to the east and north of the airport.

With new development will come infrastructure upgrades.

The Northern Road has been upgraded and the new M12 from the M5 to the Airport is about to start construction. The Western Sydney Airport Metro is in construction.

Some areas south of the Warragamba pipeline have been rezoned and planning studies have commenced around Orchard Hills.

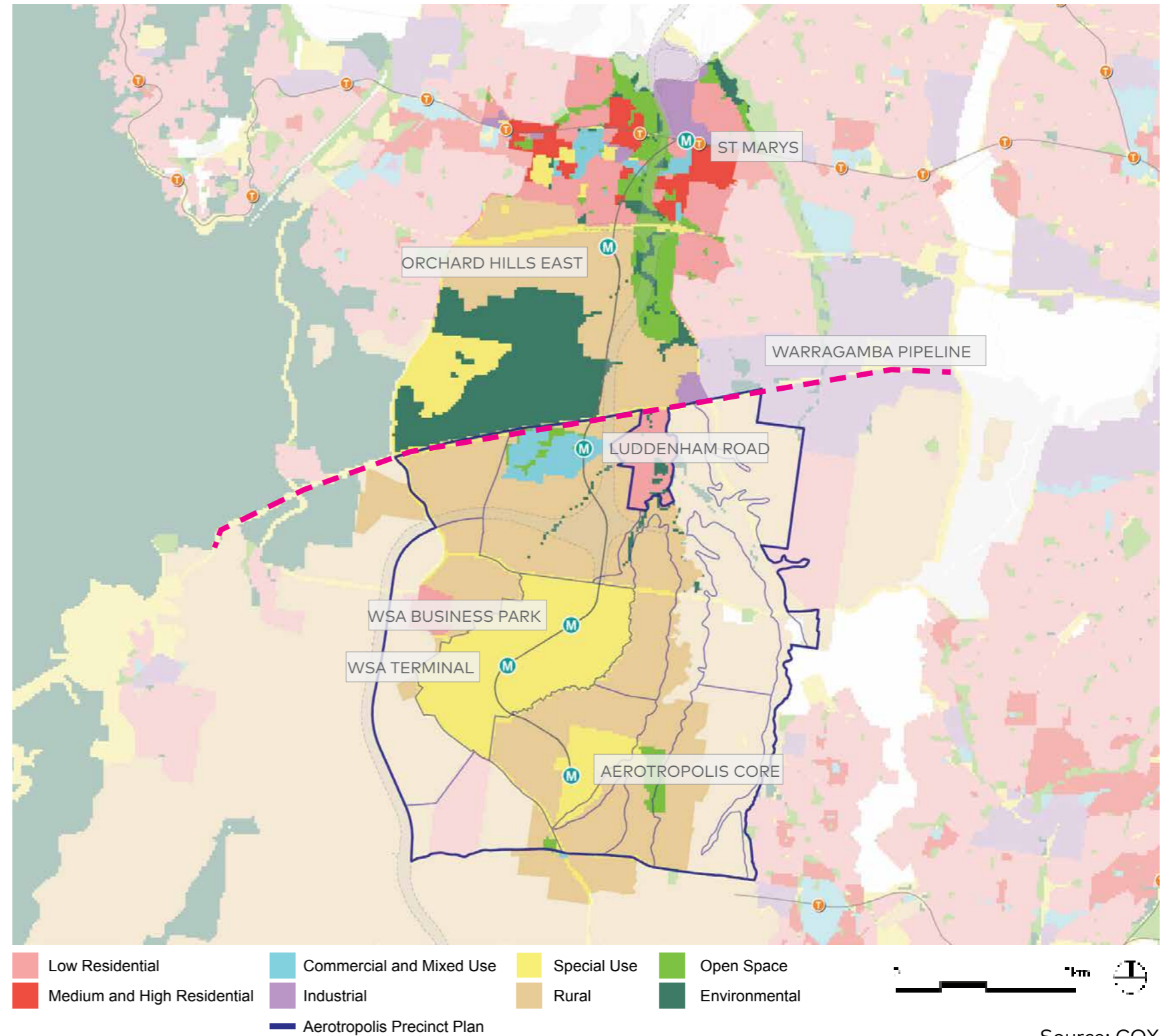


Figure 3 - Corridor Land Use Context

1.4 Scope of this Place, Urban Design and Corridor Landscape Plan

The SCAW package is limited to enabling works and their direct impact. This PUDCLP presents an integrated urban design, place making and landscaping outcome for the following project scope elements:

Permanent built elements

- Viaduct
- Piers
- Abutment
- Heritage impacts

Watercourse crossings/east-west movement corridors

- design of viaducts
- design of culverts and other crossings to provide for movement of aquatic and terrestrial fauna
- design of scour protection
- details of remnant native vegetation including riparian vegetation

Landscape

- landscape including hard and soft elements
- use of native species from the relevant native vegetation community (or communities),
- water sensitive urban design initiatives
- measures to prevent wildlife strike risk
- strategies to rehabilitate, regenerate or revegetate disturbed areas

The design and visual impact of permanent built works and landscape design that sit within the scope of the SSTOM and CLW contracts will be addressed in the SSTOM PUDCLP. This will include corridor and precinct design, stations, rail infrastructure and systems such as tunnel dive structures, overhead wiring and security fencing.

Further, in accordance with Condition E77, construction of some initial earthworks and site establishment works has commenced prior to submission of this PUDCLP to the Planning Secretary because for ecological or technical requirements, an alternate design outcome is not achievable.

Broader strategic precinct framework will be addressed in the SSTOM. Issues identified through the consultation process will be addressed as part of the development of these PUDCLPs. These issues will be listed in the relevant PUDCLP and the delivery authority for that issue(s) identified.

1.5 Status of this Place, Urban Design and Corridor Landscape Plan

The nature of the design process on a project of this scale is one that requires continuous development and refinement until the project is constructed. Notwithstanding this, the material herein provides a clear appreciation of the scale, nature and treatment of the facilities proposed and their interactions with the environment.

Where substantial changes to the design are made following the preparation of this PUDCLP, an updated PUDCLP would be prepared for submission to the Planning Secretary.

1.6 Qualified Persons

As required by Condition E77, this PUDCLP has been prepared by suitably qualified and experienced persons:

Table 4 – Qualified Persons

Name	Role	Qualifications
██████████ Cox Architecture	Urban Design Lead	B.Arch (Hons) Sydney MS Architecture and Urban Design Columbia Chartered Architect
██████████ Woods Bagot	Lead Architect	B.Arch University of South Australia
██████████ Aspect Landscape	Landscape Lead	Registered Landscape Architect, AILA Master of Arts in Urban Design with Merit, University of Westminster, London Bachelor of Landscape Architecture, Manchester Metropolitan University Bachelor of Arts in Landscape Design (Hons), Manchester Metropolitan University

CVs are included in Appendix D.

1.7 Connecting with Country

The 2020 Sydney Metro – Western Sydney Airport Definition Design included an initial Designing with Country report that outlined the historical, social, physical and policy context of the project. It drew attention to the Transport for New South Wales Reconciliation Action Plan 2019-2021 deliverables, specifically the requirement for Transport cluster agencies to:

“...make a positive difference to Aboriginal and Torres Strait Islander peoples in areas such as employment, empowerment and economic development, and to enhance and develop cultural understanding”.

The report also called out three particular actions with application to Sydney Metro projects:

- Action 1: Establish and maintain mutually beneficial relationships with Aboriginal and Torres Strait Islander stakeholders and organisations...
- Action 10: Promote respect for Aboriginal heritage and increase inclusion of Aboriginal art...
- Action 11: Embed Aboriginal and Torres Strait Islander co-design principles across Transport Cluster projects.

In 2021 Sydney Metro committed to piloting the Government Architect NSW's Draft Connecting with Country Framework on both the Western Sydney Airport and Metro West projects. The Framework seeks to embed Aboriginal values in the design and realisation of projects.

Sydney Metro has subsequently engaged directly with the Aboriginal community through a Connecting with Country working group that was established by the project in July 2021 following a public Expression of Interest process. The working group is composed of Dharug and Dharawal traditional custodians and was facilitated by GHD/Zion and Michael Mossman. A series of workshops held in the second half of the year has led to the development of a Connecting with Ngura (Country) report. Murawin has prepared the strategy for Sydney Metro West as well as providing cultural advice to this project

The report includes a summary of the Draft Connecting with Country Framework as well as an overview of Aboriginal and Dharug understandings of Country. The workshops generated themes for use in the design of the SM–WSA project. These include a line-wide theme – journey and muru/yauang (journey and pathway) - to serve as an overarching narrative for the alignment as well as station specific themes and associated colour palettes. The report describes the symbolic meaning of the gulamon/gulumon, an oval shaped carrying vessel that traditionally had a range of uses that is explained as being symbolic of everything Aboriginal people carry culturally. This symbol has been adopted to represent the journey and muru/yauang theme.

The station themes are:

- Bradfield/Aerotropolis – Badu (Water) – drawn from the Wianmatta (South Creek) which flows from Dharawal country in the south to Dharug country in the north.
- Airport Terminal Station – Guwiyang/Goyan (Fire) – selected because fire is seen as an integral part of healing, gathering and regenerating landscape and symbolic of resistance to colonisation.
- Airport Business Park – Earth – the source of material culture such as the stone used in the making tools.
- Luddenham – Air and Sky – this theme invokes the sky as father and posits this location as gathering place beneath that sky and adjacent to two creeks, Cosgroves Creek and Wianamatta.
- Orchard Hills – Plants and Wildlife – a place known to provide natural resources: grasses, seeds, medicinal plants and animals.
- St Marys – People – alluding to community and resilience in the face of colonisation, a place of safety for a range of mobs.

The Working Group identified a range of desired outcomes that include broad educational objectives, the desire to see language used across the project, employment opportunities and formal design outcomes.

Section 4 of this report articulates the specific Connecting with Country principles underpinning the SCAW design response.

1.8 Design development process

The design for the Sydney Metro - Western Sydney Airport (SM-WSA) project has developed from an initial scoping design through to the detailed design (refer Figure 4). At each stage a range of consultation and stakeholder engagement activities have occurred.

This PUDCLP draws upon the design work that occurred prior to obtaining planning approval (i.e. during the scoping, definition and reference design) for context, and then details the design work and associated consultation activities that have occurred since planning approval was obtained (i.e. during the concept and detailed design stage).

It is noted that this PUDCLP relates to the surface enabling works design subject to the project approval SSI-10051. The approval and design of any development on residual land or over station development component is subject to other planning approvals and associated design processes.

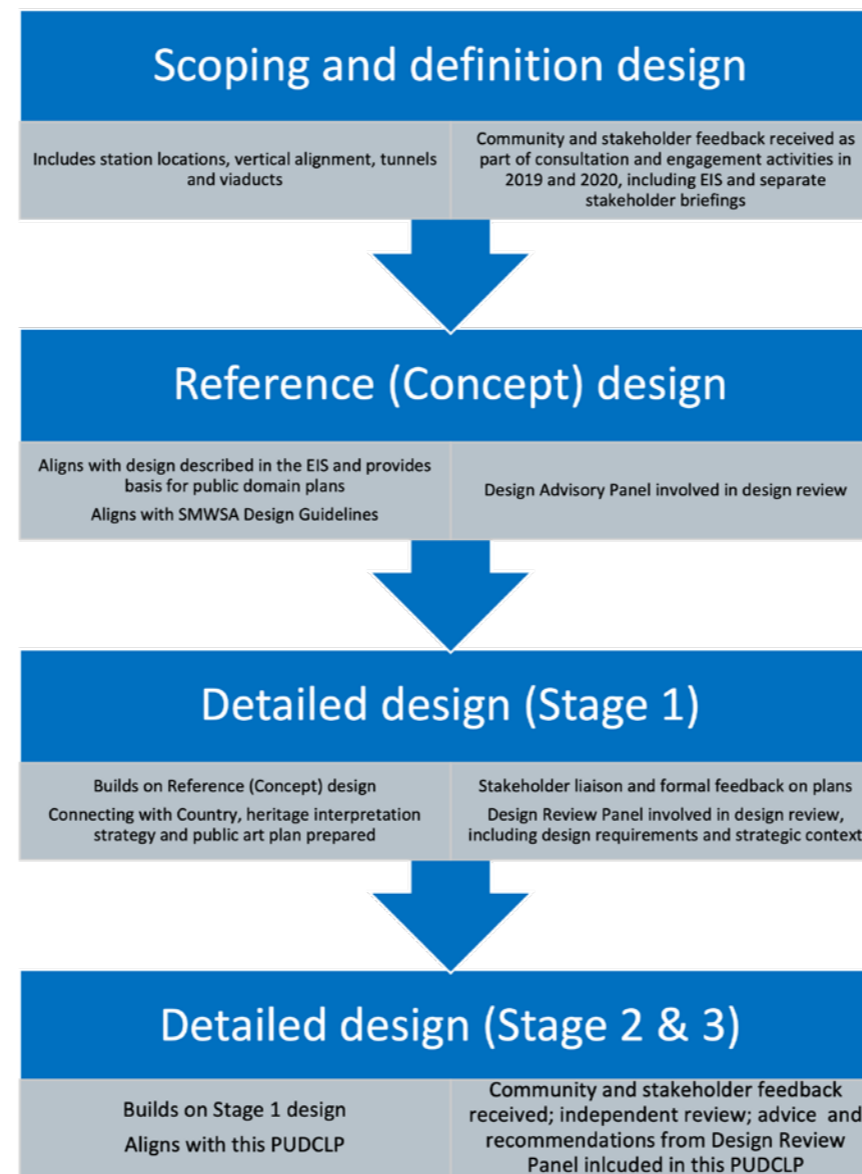


Figure 4: Sydney Metro Design Process

1.9 Compliance with CSSI Conditions of Approval

A compliance table for the project that summarises where PUDCLP conditions are being met is included as Table 5. It identifies the requirements of the relevant conditions of approval of SSI-10051 and where these have been addressed as required within this plan.

Not all Conditions of Approval are included in the PUDCLP. Separate submissions and approvals are required across a range of elements.

As required in Condition 77, the PUDCLP has been reviewed by an independent and suitably qualified and experienced person nominated by the DRP (Independent Reviewer).

Table 5 – Sydney Metro - Western Sydney Airport Conditions of Approval SCAW

No		PUDCLP	Comment
CONDITIONS OF APPROVAL SSI 10051			
A1	The Proponent must carry out the CSSI in accordance with the terms of this approval and generally in accordance with the: (a) Sydney Metro – Western Sydney Airport Environmental Impact Statement dated 21 October 2020; and (b) Sydney Metro – Western Sydney Airport Submissions Report submitted April 2021.	General	The Conditions of Approval identify the key studies and their submission requirements. The PUDCLP is one of a number of reports to be developed during design and construction of the SCAW works.
B1	The Overarching Community Communication Strategy as provided in the documents listed in Condition A1, or updated Strategy must be implemented for the duration of the work.	Section 2 – Collaboration and Consultation Appendix A - Evidence of collaboration & consultation Appendix B - Feedback from consultation	Sydney Metro is responsible for the Overarching Community Communication Strategy. The consultation process and outcomes for the SCAW project are recorded in the PUDCLP
E12	Prior to vegetation clearing, the Proponent must identify where it is practicable for the CSSI to reuse native trees and vegetation that are to be removed. If it is not possible for the CSSI to reuse removed native trees and vegetation, the Proponent must consult with the relevant council(s), NSW National Parks & Wildlife Service, Western Sydney Parklands Trust, Greater Sydney Local Land Services, Landcare groups, DPI Fisheries and any additional relevant government agencies to determine if: (a) hollows, tree trunks (greater than 25-30 centimetres in diameter and 2-3 metres in length), mulch, bush rock and root balls salvaged from native vegetation impacted by the CSSI; and (b) collected plant material, seeds and/or propagated plants from native vegetation impacted by the CSSI, could be used by others in habitat enhancement and rehabilitation work, before pursuing other disposal options.	Section 7.2.4 - Re-use of Timber	Principles for the reuse of landscape material are identified in the PUDCLP
E13	Revegetation and the provision of replacement trees must be informed by a Tree Survey undertaken during detailed design. The Tree Survey must identify the number, type and location of any trees to be removed, except for trees that are offset under Condition E4. The Tree Survey must be submitted to the Planning Secretary for information with the Place, Urban Design and Corridor Landscape Plan required under Condition E79.	Section 7.3 - Strategies to Rehabilitate, Regenerate or Revegetate Disturbed Areas	The requirement for a Tree Survey is identified in the Conditions of Approval.
E14	The Proponent must design the watercourse crossings and the east-west regional corridor (Patons Lane) crossing to achieve the following objectives: (a) design of viaducts to retain and minimise clearing/disturbance of native vegetation and maximise native plant growth under the structures, (i) maintain and/or improve riparian/terrestrial connectivity under the viaduct and bridge structures to maximise the corridor function; (ii) maximise the viaduct and bridge structures span over the riparian corridor and/or remnant native vegetation whichever is the widest; (iii) minimise the clearing/disturbance of native vegetation and native riparian vegetation; and (iv) maximise light and moisture penetration under the viaduct and bridge structures to support native plant growth;	(a) Section 6.1 - Watercourse Crossings (i) Section 6.1 - Watercourse Crossings (ii) Section 6.1 - Watercourse Crossings (iii) Section 7.3 - Strategies to Rehabilitate, Regenerate or Revegetate Disturbed Areas (iv) Section 7.2.3 - Water Sensitive Urban Design Initiatives	(a) Demonstrates benefits of the wider 40m viaduct span. (i) Identifies viaduct locations and crossing points. (ii) Demonstrates benefits of the wider 40m viaduct span. (iii) Principles for rehabilitation of impacted areas are identified. (iv) Demonstrates the use of rainwater captured from the viaduct below the structure.

No	PUDCLP	Comment	
E14	(b) design of culverts and other crossings incorporate the following into the design to provide for movement of aquatic and terrestrial fauna, (i) elevated "dry" cells to encourage terrestrial movement, and recessed "wet" cells to facilitate the movement of aquatic fauna; (ii) maximise light penetration into the culvert structures; (iii) a naturalised base along the bed of the culvert; and 'fauna furniture' (such as rocks, logs, ropes and ledges) to facilitate fauna movement to maintain connectivity and provide fauna passage;	(i) Section 6.2 - Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna (ii) Section 6.1 - Watercourse Crossings (iii) Section 6.2 - Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna	(i) Illustrates fauna crossing requirements and construction (ii) Table discusses light penetration at culverts (iii) Illustrates fauna crossing requirements and construction
	(c) design of scour protection using natural solutions such as the revegetation of banks with local native species; and	Section 6.2 - Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna Section 6.3 - Design of Scour Protection Section 6.4 - Remnant Native Vegetation and Riparian Vegetation	Outlines scour principles and riparian corridor treatments
	(d) details of remnant native vegetation including riparian vegetation.	Section 6.4 - Remnant Native Vegetation and Riparian Vegetation Section 7.2 - SCAW Planting Section 7.3 - Strategies to Rehabilitate, Regenerate or Revegetate Disturbed Areas	Outlines limits of impacts, the rehabilitation of impacted areas and planting mixes
	The Proponent must consult with DPIE EES, DPI Fisheries and engage suitably qualified experts in fauna crossing design to achieve the outcomes of this condition. Note: These design objectives must form part of the Place, Urban Design and Corridor Landscape Plan required under Condition E79.	Section 6.2 - Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna	Proposals will be reviewed with DPIE EES, DPI Fisheries
E63	The CSSI must be designed with consideration of: a) the design objectives, principles and guidelines identified in documents listed in Condition A1;	Section 1.1 - Purpose of the Place, Urban Design and Corridor Landscape Plan Section 3 - Design Objectives	Outlines key Conditions of Approval.
	b) the principles and objectives of the draft Connecting with Country Framework;	Section 4 - Connecting with Country	Connecting with Country has informed the SCAW design since the original tender phase. Consultation with Sydney Metro's Connecting with Country Working Group is on-going.
	c) relevant land use changes, masterplans and initiatives, where this information is known and/or available;	Section 5.1.1 - Context	Section 5.1 considers the existing character and new planning outcomes where known. The PUDCLP responds to high level principles and available information. There is limited relevance to SCAW with detailed planning of precincts and interfaces by SSTOM
	d) existing and proposed future local context and character; and	Section 5.1.1 - Context	Section 5.1 considers the existing character and where known, new planning outcomes. The PUDCLP responds to high level principles and available information. Detailed planning of precincts and interfaces by SSTOM
	(e) transport and land use integration and system functionality in the context of precincts, to the extent it is known and/or defined.	N/A	Detailed planning of land use and transport integration by SSTOM
	Responses to items (a) – (e) must be reviewed by the Design Review Panel (DRP) to inform the design of permanent built works and landscape design of the CSSI. The outcome of the DRP review must be provided to the Planning Secretary prior to the submission of the Place, Urban Design and Corridor Landscape Plan (PUDCLP). Note: In accordance with Condition A10 and Condition A16, the requirements of this condition can be staged.	Appendix C - DRP advice & recommendations Executive Summary	The Design Review Panel has reviewed the proposed SCAW works This PUDCLP deals only with SCAW components. There will be PUDCLPs for SSTOM and CLW works.

No	PUDCLP	Comment
E64	The CSSI must be constructed and operated with the objective of minimising light spill to surrounding properties. All lighting associated with the CSSI must be consistent with the requirements of: a) ASINZS 4282:2019 Control of the obtrusive effects of outdoor lighting, relevant Australian Standards in the series ASINZS 1158 - Lighting for Roads and Public Spaces; b) NASF Guideline E: Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports; and c) NASF Guideline C: Managing the risk of wildlife strikes in the vicinity of airports. Mitigation measures must be provided to manage residual night lighting impacts to protect properties adjoining or adjacent to the CSSI, in consultation with affected landowners.	N/A The requirements of CoA E64 are not relevant to the scope of the SCAW Project.
E65	Designs must have regard to the Movement and Place Framework relevant guidance including the Walking Space Guide: Towards Pedestrian Comfort and Safety (TfNSW, 2020) and the Cycleway Design Toolbox: Designing for Cycling and Micromobility (TfNSW, 2020).	N/A The requirements of CoA E65 are not relevant to the scope of the SCAW Project.
E75	DRP advice and recommendations, as issued by the Panel, and the Proponent's response to each recommendation must be included when submitting the final PUDCLP to the Planning Secretary for information.	Appendix C - DRP advice & recommendations The design has been reviewed by the DRP over a number of meetings from April to October 2022
E77	A PUDCLP must be prepared to document and illustrate the permanent built works and landscape design of the CSSI and how these works are to be maintained. The PUDCLP must be: (a) prepared by a suitably qualified and experienced person(s) in consultation with the community (including the affected landowners and businesses or a representative of the businesses), Western Parklands City Authority, Western Sydney Planning Partnership and relevant council(s); (b) reviewed by an independent and suitably qualified and experienced person nominated by the DRP; (c) submitted to the Planning Secretary prior to the construction of permanent built surface works and/or landscaping, excluding those elements which for ecological requirements, or technical requirements, or requirements as agreed by the Planning Secretary do not allow for alternate design outcomes; and (d) implemented during construction and operation of the CSSI.	Section 1.6 – Qualified Persons Appendix D Section 2 – Collaboration and Consultation Appendix A - Evidence of collaboration & consultation Appendix B - Feedback from consultation By DRP N/A N/A Executive Summary This PUDCLP deals only with SCAW components. A separate PUDCLP will be prepared under the SSTOM package.
E78	The PUDCLP must document how the following matters have been considered in the design and landscaping of the project: (a) the requirements of Conditions E63 to E65, and (b) advice and recommendations from the DRP.	(a) This Table (b) Appendix C - DRP advice & recommendations (a) Refer to the relevant Condition within this table to identify how these matters have been considered in the design of the Project. (b) A record of DRP issues and advice is appended.
E79	The PUDCLP must include descriptions and visualisations (as appropriate) of: (a) design of the permanent built elements of the CSSI, including stabling and maintenance and ancillary facilities, service facilities and tunnel portals;	Section 5 - Design of permanent built elements Viaduct elements and context illustrated in the report.

No		PUDCLP	Comment
E79	(b) plans for station precincts including but not limited to (i) justification of the spatial scope of each station precinct plan; (ii) provision for public art and heritage interpretation installations; (iii) placemaking opportunities, having regard to placemaking initiatives in Western Sydney Aerotropolis planning documents; (iv) interchange access plans developed in consultation with the Traffic and Transport Liaison Group; (v) active transport connections and end of trip facilities, design of pedestrian and cycle access, facilities and fixtures; (vi) design of commuter car parking elements, where relevant;	N/A	This is not relevant to the SCAW scope of works. Condition E79(b) will be addressed in SSTOM PUDCLP.
	(c) landscaping and building design opportunities to mitigate visual impacts and minimise light spill on the nearby residences;;	N/A	This is not relevant to the SCAW scope of works. Condition E79(c) will be addressed in SSTOM PUDCLP.
	(d) the design of watercourse crossings and east-west corridor movements to give to effect of Condition E14;	Section 5.1.1 – Context Section 6.1 - Watercourse Crossings Section 6.2 - Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna	Shows crossing locations and viaduct clearances.
	(e) landscaping: (i) landscape plan, hard and soft elements, for the corridor and the station precincts; (ii) use of native species from the relevant native vegetation community (or communities), where identified as appropriate; (iii) water sensitive urban design initiatives (iv) management and routine maintenance standards and regimes for design elements and landscaping work (including weed management) to ensure the success of the design; (v) measures to prevent wildlife strike risk in proximity to Western Sydney International Airport;	(i) N/A (ii) Section 7.2 - SCAW Planting (iii) Section 7.2.3 - Water Sensitive Urban Design Initiatives (iv) Section 10.4 - Management & Maintenance of Landscaping (v) Section 7.4 Wildlife Strike	(i) This is not relevant to the SCAW scope of works. SSTOM will deliver landscaping within station precincts. CLW will undertake corridor landscape (ii) Selected species based on flora surveys of corridor (iii) Outlines the design of SCAW elements. Some permanent works by SSTOM and CLW contractors (iv) Maintenance requirements until handover to SSTOM outlines (v) WSI requirements outlined
	(f) details of strategies to rehabilitate, regenerate or revegetate disturbed areas, where relevant;	Section 7.3 - Strategies to Rehabilitate, Regenerate or Revegetate Disturbed Areas	Areas impacted by SCAW construction to be rehabilitated unless required to be undertaken by by SSTOM contractor.
	(g) management and routine maintenance standards and regimes for design elements and landscaping work (including weed management) to ensure the success of the design;	Section 10.4 - Management & maintenance of landscaping	Landscape will be maintained until handover to SSTOM and CLW contractors.
	(h) operational maintenance standards; and	Section 10.2 - Operational maintenance standards	Operational requirements largely SSTOM.
	(i) the timing and responsibilities for implementation of elements included within the PUDCLP.	Section 10.1 - Timing & responsibilities	Progressive handover of elements to SSTOM contractor.

No		PUDCLP	Comment
REVISED ENVIRONMENTAL MITIGATION MEASURES			
OFF2	<p>The design of viaduct structures over the wildlife/riparian corridors at Blaxland Creek, the unnamed tributary south of Patons Lane and Cosgroves Creek would seek to:</p> <ul style="list-style-type: none"> • maximise the span over the wildlife/riparian corridor • minimise native vegetation removal within the wildlife/riparian corridors • maintain opportunities for fauna movement along the wildlife/riparian corridors and • provide opportunities to enhance fauna movement where possible 	<ul style="list-style-type: none"> • Section 6.1 - Watercourse Crossings • Section 6.2 - Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna • Section 7.2 - SCAW Planting • Section 7.3 - Strategies to Rehabilitate, Regenerate or Revegetate Disturbed Areas 	<ul style="list-style-type: none"> • Demonstrates benefits of the wider 40m viaduct span. • Outlines limits of impacts, the rehabilitation of impacted areas and planting mixes Identifies viaduct locations and crossing points. • Fauna crossing design requirements identified. • Fauna crossing design requirements identified.
ONAH2	<p>The architectural design for the project would take account local heritage context and be sympathetic to local heritage character. This would include using sympathetic building materials, colours and finishes Design should aim to minimise visual impacts by ensuring. The Design Review Panel and Heritage Working Group would be consulted in regard to the design, form and material of new built structures that may impact heritage items that significant elements are not obstructed or overshadowed Design should adhere to the Principal – Western Sydney Airport Design Guidelines</p>	Section 5.1 - Context	The DRP has been consulted on the bridge, viaduct, pier and abutment designs
HYD2	<p>Minimise works in the main creek channels (at Blaxland Creek, unnamed watercourse south of Patons Lane and Cosgroves Creek) where possible and avoid works in the channel during rainfall events</p>	Section 6.1 - Watercourse Crossings	Demonstrates benefits of the wider 40m viaduct span. Outlines limits of impacts, the rehabilitation of impacted areas and planting mixes
OWQ6	<p>At all locations where stormwater is discharged, water quality measures such as gross pollutant traps, bio-retention swales and Water Sensitive Urban Design features would be investigated and implemented where feasible and reasonable</p>	Section 7.2.3 - Water Sensitive Urban Design Initiatives	Outlines the design of SCAW elements. Some permanent works by SSTOM and CLW contractors
OLV1	<p>The landscape design for the project would include consideration of appropriate species lists to minimise opportunities to attract wildlife at levels likely to present a hazard to aviation operations. The landscape design would have regard to relevant requirements and species lists under Western Sydney Airport's Wildlife Management Plan and other relevant guidelines, including the National Airports Safeguarding Framework (Guideline C) and Recommended Practices No. 1 – Standards for Aerodrome Bird/Wildlife Control (International Birdstrike Committee 2006)</p>	Section 7.4 Wildlife Strike	WSI requirements outlined
OLV7	<p>The landscape design for the project would:</p> <ul style="list-style-type: none"> • incorporate salvaged native trees (including tree hollows and root balls), to enhance fauna habitat in suitable locations, including riparian corridors, where practicable • use native species from the relevant native vegetation communities within the local area for tree planting programs 	<ul style="list-style-type: none"> • Section 7.3 - Strategies to Rehabilitate, Regenerate or Revegetate Disturbed Areas • Section 7.2 - SCAW Planting 	<ul style="list-style-type: none"> • Principles for the reuse of landscape material are identified in the PUDCLP • (Selected species based on flora surveys of corridor

2. Collaboration and Consultation

2. Collaboration and Consultation

2.1 Consultation during preparation of this PUDCLP

Consultation was undertaken with a range of stakeholders during preparation of this PUDCLP as noted in Table 6.

A key element in the consultation process is the online Virtual Engagement Room which opened on 19 August 2022.

Providing details of the overall project, the Metro alignment and the SCAW components in particular, the Virtual Engagement Room was open for comments until 9 September 2022.

To reach the widest audience of stakeholders, agencies and community groups, invitations to view were sent from a large data base and the site was accessible via internet searches. Those attending council, agency and authority briefings were directed to the site for further information.

Responses to submissions were sent to those making submissions. Those responses were also published on the Virtual Engagement Room.

The Virtual Engagement Room will remain open after the closing of comments as required.

Those consulted are identified in Appendix A. The outcomes of the consultation process are summarised in Appendix B.

Construction Phase Communications

The Sydney Metro Overarching Community Communications Strategy (OCCS) is a guide to how the community will be consulted during construction.

A requirement is that a Community Communications Plan will be published on the SCAW project website.

Table 6 – Consultation Process and Outcomes

Consultation	Mode	Date	Action	Follow Up
Penrith Council	Presentation	2/8/22	Completed 2/8/22	Detailed response to PCC submission
Liverpool Council	Presentation	13/7/22	Completed 13/7/2022	No submission
State Emergency Services	Email		Email notification	Detailed response to SES submission
Department of Planning and Environment, Energy, Environment and Science	Presentation	15/7/22	Invited but did not attend the briefing	Follow up email. Directed to Virtual Engagement Room
Department of Primary Industries, Fisheries	Presentation	15/7/22	Invited but did not attend the briefing	Follow up email. Directed to Virtual Engagement Room CPBUI has carried out consultation with DPE EES and Fisheries
Western Parklands City Authority	Presentation	14/7/22	Invited but did not attend the briefing	Follow up email. Directed to Virtual Engagement Room
Western Sydney Planning Partnership	Presentation	15/7/22	Invited but did not attend the briefing	Follow up email. Directed to Virtual Engagement Room
NSW National Parks and Wildlife Service	Presentation	15/7/22	Invited but declined to attend briefing	Follow up email. Directed to Virtual Engagement Room
Transport for NSW	Presentation	15/7/22	Completed 15/7/22	No submission
Western Sydney Airport Co	Presentation	14/7/22	Completed 14/7/22	No submission
Department of Planning, Industry and Environment, GPEC	Presentation	15/7/22	Completed 15/7/22	No submission
Sydney Water	Presentation	15/7/22	Completed 15/7/22	No submission
Water NSW	Presentation	15/7/22	Invited but declined to attend briefing	Follow up email. Directed to Virtual Engagement Room
Greater Sydney Parklands	Presentation	15/7/22	Invited but did not attend the briefing	Follow up email. Directed to Virtual Engagement Room
Department of Planning and Environment	Presentation	15/7/22	Completed 15/7/22	No submission
Telstra	Presentation	15/7/22	Completed 15/7/22	No submission
Ausconnex	Presentation	15/7/22	Completed 15/7/22	No submission
Local Land Services	Presentation	15/7/22	Completed 15/7/22	No submission
Greater Sydney Landcare	Presentation	15/7/22	Completed 15/7/22	No submission
Connecting with Country Working Group	Presentation	5/8/22	On-going consultation	On-going consultation
Affected landowners and businesses	Virtual Engagement Room	19/8/22-9/9/22	Offered briefings – to date only Celestino has expressed interest in a briefing. Date TBA	No submission
The local community as identified and defined	Virtual Engagement Room	19/8/22-9/9/22	Hard copy and soft copy notifications sent to the local community 19 August with follow up phone calls to some known community members starting on 25 August and continuing.	No submission

2.2 Involvement of the Design Review Panel

2.2.1 Review of Response to Condition E63

In accordance with Condition E63, the CSSI must be designed with consideration of the following design requirements and strategic context:

- the design objectives, principles and guidelines identified in documents listed in Condition A1;
- the principles and objectives of the draft *Connecting with Country Framework*;
- relevant land use changes, masterplans and initiatives, where this information is known and/or available;
- existing and proposed future local context and character; and
- transport and land use integration and system functionality in the context of precincts, to the extent it is known and/or defined.

As identified in Section 1.1, as enabling works this PUDCLP addresses items:

- The design is consistent with the EIS and Submissions Report
- Connecting with Country has been incorporated into the response
- Where known, land use and master plans have been considered
- Existing conditions are considered
- Precinct transport and land use integration and system functionality will be addressed by SSTOM.

Responses to these items have been reviewed by the DRP to inform the design of permanent built works and landscape design of the CSSI. The outcomes of the DRP reviews were provided to the Planning Secretary in [insert month/year] prior to the submission of this PUDCLP and are summarised in Appendix C.

Table 7 – DRP Meetings and Issues

Meeting Date	Items
9/6/22	Viaducts Landscape Approvals
21/7/22	Viaducts Planning Materials Joints Abutment Access Concrete Process: Materials & finishes Connecting with Country - Landscape Systems Stockpile design Abutment materiality Heritage Viaduct impacts
4/8/22	Viaduct Joints Other Fences Egress
1/9/22	Viaduct Context Overall Structure Joints Parapet Concrete Abutment Design and Access Systems Soils Hydrology Fauna corridors Other Coordination with SSTOM Wildlife strikes
21/10/22	Final close out information provided: - Stockpile - Context Plan - Birdproofing - Connecting with Country - Pier locations

2.2.2 Advice and recommendations from the DRP

Design development has involved an iterative process of seeking advice and recommendations from the DRP at key design stages. The relevant requirements of Condition E63 noted in Table 3 must be addressed.

In accordance with Condition E75, the DRP advice and recommendations, as issued by the Panel, and the CPB United Infrastructure response to each recommendation is included in Appendix C.

It should be noted that the range of design elements reviewed extend beyond those required to be addressed in the PUDCLP. The Activity Tracker in Appendix C identifies all items relevant to the SCAW package discussed and reviewed with the Design Review Panel.

3. Design Objectives, Principles, Guidelines and Standards

3. Design objectives, principles, guidelines and standards

The development of the design and PUDCLP has been guided by a range of design objectives, principles and standards. The Sydney Metro - Western Sydney Airport Design Guidelines, as included in the planning approval documents for SSI-10051, provide guidelines for the design of the interface between stations and their surrounding locality, rail corridor works and station and service buildings.

The Design Guidelines identify the five project design objectives to help meet the transformational vision and world class aspirations of the project. These are supported by design principles which describe the design intent of the objectives for the stations, station precincts and the wider metro corridor.

The relevant project design objectives and supporting principles, as have been reviewed by the Design Review Panel, in order to inform the design of permanent built works and landscape design that is documented in this plan. In accordance with Condition E63, the outcome of the DRP review was submitted to the Planning Secretary in [insert month/year] and are reproduced in Appendix C.

3.1 Design objectives

3.1.1 Sydney Metro design objectives

The SCAW components form an integral part of the larger complete project. Metro's objectives have been considered as far as practicable in the enabling works design approach:

Objective 1: Ensuring an easy customer experience

Principle – Sydney Metro places the customer first. Stations are welcoming and intuitive with simple, uncluttered spaces that ensure a comfortable, enjoyable and safe experience for a diverse range of customers.

Objective 2: Being part of a fully integrated transport system

Principle – Sydney Metro is a transit-oriented project that prioritises clear and legible connections with other public and active transport modes within the wider metropolitan travel network that intersect with this new spine.

Objective 3: Being a catalyst for positive change

Principle – Sydney Metro is a landmark opportunity to regenerate and invigorate the city with new stations and associated development that engage with their precincts, raise the urban quality and enhance the overall experience of the city.

Objective 4: Being responsive to distinct contexts and communities

Principle – Sydney Metro's identity is stronger for the unique conditions of centres and communities through which it passes. This local character is to be embraced through distinctive station architecture and public domain that is well integrated with the inherited urban fabric of existing places.

Objective 5: Delivering an enduring and sustainable legacy for Sydney

Principle – Sydney Metro is a positive legacy for future generations. A high standard of design across the corridor, stations and station precincts, that sets a new benchmark, is vital to ensuring the longevity of the Metro system, its enduring contribution to civic life and an ability to adapt to a changing city over time.

3.1.2 Connecting with Country Framework objectives

Connecting with Country is a key component in the Western Sydney Airport Metro project. SCAW initiatives are outlined in Section 4.

3.2 Sydney Metro – Western Sydney Airport Urban Design principles

For the overall project, urban and public domain design must be developed with reference to the existing and potential future urban context and infrastructure.

Since the Submissions Report was lodged and project approval granted, the Sydney Metro – Western Sydney Airport Design Guidelines have been updated. The following corridor- wide urban design principles are identified in the updated Sydney Metro – Western Sydney Airport Design Guidelines to ensure that the design responds to the urban design context

Interface and activity

Activation of the urban realm of station precincts is important to ensure stations and supporting infrastructure are integrated with their existing and future urban settings and have a considered relationship to Country.

Connectivity

Walkable urban environments and integration with Country through the planned Blue-green Grid of the Western Parkland City, including the provision of safe, permeable and well-connected station precincts.

Place Making

Sydney Metro will support and contribute to vibrant, attractive urban centres with a distinct sense of place that reflect Country. Centres that provide well-connected and designed streets and spaces that will resonate with both local communities and visitors.

Culture

Opportunities to reflect and build on the rich Aboriginal and non-Aboriginal heritage of Western Sydney will strengthen design and place outcomes, and contribute to contemporary cultural expression.

Sustainability

Sydney Metro will contribute to the evolution of a new urban development paradigm in which environmentally sustainable elements, processes, designs and a consideration of Country are incorporated in the project.

Transport Network

The Transport for NSW transport modal hierarchy will guide the design of stations, interchanges and associated developments, prioritising walking and other modes of active transport.

As an enabling contract, the SCAW project does not deal with the final precinct form or urban and landscape finishes. The viaducts and abutments however will be important urban elements and significant effort has

3.3 Key Documents

A series of key documents were referenced in development of the PUDCLP.

- Sydney Metro – Western Sydney Airport Design Guidelines
- Sydney Metro – Western Sydney Airport Sustainability Plan
- Sydney Metro Corridor Landscape Strategy
- Sydney Metro Sustainability Framework
- Sydney Metro Environment and Sustainability Statement of Commitment
- Aerotropolis Development Control Plan
- Government Architects Better Placed
- Government Architects Design and Place SEPP
- Connecting with Ngura (Country)
- Sydney Metro-Western Sydney Airport Environmental Impact Statement 2016, particularly Chapter 11 Biodiversity, Chapter 20 Landscape and Visual, Appendix G Revised BDAR and Tech Papers 4-5 Non-Aboriginal heritage, Aboriginal heritage and Landscape and Visual.
- Airport Practice Note-9 Wildlife Hazard Management at Airports (Australian Airports Association 2016)
- State Environmental Planning Policy (Western Sydney Aerotropolis) 2020 Wildlife Buffer Zone Map. Department of Environment
- Western Sydney Airport Environmental Impact Statement Preliminary Bird and Bat Strike Risk Assessment September 2015
- Vegetation Management in the Corridor Guide. Environmental Management System EMS- 06- GD-0067. Sydney Trains V5.0
- Revegetation Guide. Environmental Management System EMS-06-GD-0074. Sydney Trains V4.0
- Guideline for Batter Surface Stabilisation using vegetation. Roads and Maritime 2015
- Recovering bushland on the Cumberland Plain Best practice guidelines for the management and restoration of bushland. Department of Environment and Conservation (NSW 2005)
- SMWSA corridor presentation DRP 220609 Sydney Metro

3.4 Relevant guidelines and standards

In addition to the above, the following urban design and infrastructure standards and guidelines will inform development of the detailed design:

:

- Crime Prevention through Environmental Design
- Western Sydney Street Design Guidelines
- Transport for NSW Walking Space Guide
- Aerotropolis Development Control Plan
- Government Architects Better Placed
- Government Architects Design and Place SEPP
- Connecting with Ngura (Country)
- Guidelines for watercourse crossings on waterfront land (Controlled Activities)
- Policy and Guidelines for Fish Friendly Waterway Crossings (NSW Department of Primary Industries - DPI)
- "Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings" (Fairfull and Witheridge 2003)
- NSW Fisheries (1999) Policy and Guidelines Aquatic Habitat Management and Fish Conservation. (Eds. A. Smith and D. Pollard) NSW DPI, Cronulla.
- Witheridge, G. (2002) Fish Passage requirements for Waterway Crossings - Engineering Guidelines. Catchment and Creeks Pty Ltd, Brisbane.

Transport for NSW Specifications

Transport for NSW D&C specifications are used as a basis for specifications for the SCAW landscape works. These are;

- Specification D&C R178 Vegetation - Version for WSI
- Specification D&C R179 Planting

For the WSI package, only D&C R178 Vegetation is used as there is no planting within this package.

Lighting and Security

Lighting and security elements are not part of the SCAW package.

In accordance with Condition E64, the following standards apply to lighting associated with construction and operation of the CSSI:

- *ASINZS 4282:2019 Control of the obtrusive effects of outdoor lighting, relevant Australian Standards in the series ASINZS 1158 - Lighting for Roads and Public Spaces;*
- *NASF Guideline E: Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports; and*
- *NASF Guideline C: Managing the risk of wildlife strikes in the vicinity of airports.*

Active Transport

Active Transport links are not part of the SCAW package.

Active transport links and connections that are built as part of the Sydney Metro – Western Sydney Airport project will be designed with regards to the Movement and Place Framework relevant guidance including the Walking Space Guide: Towards Pedestrian Comfort and Safety (TfNSW, 2020) and the Cycleway Design Toolbox: Designing for Cycling and Micromobility (TfNSW, 2020). Any active transport facilities will be designed, constructed and/or rectified in accordance with the Guide to Road Design Part 6A: Paths for Walking and Cycling (Austroads, 2017) and relevant Australian Standards (AS) such as AS 1428.1-2009 Design for access and mobility. The active transport links will also incorporate relevant Crime Prevention Through Environmental Design (CPTED) principles.

3.5 Land use changes, masterplans and initiatives

Resolution of land use and precinct design outcomes are not part of the SCAW package. The alignment and SCAW structures however, have been designed with regard to broader strategic planning for future precincts, and in particular to land use and environmental considerations such as those articulated in the WPCA Blueprint and Aerotropolis Precinct plans.

The alignment acknowledges the imperative to protect creek corridors in the South Creek catchment and enable their development as future open space landscape corridors. SCAW provides an elevated alignment across the primary creeks the alignment crosses but also through the future Northern Gateway/ Science Park precinct so as to ensure permeability in this future urban context.

Consideration in development of the alignment was given to:

- Draft Blueprint for Western Parkland City (on exhibition as of December 2021)
- GPEC Strategy (to be completed by DPIE in 2023)
- WPCA Masterplan for Aero Core (currently up for endorsement by WPCA Board to then be progressed via the new Masterplan Guidelines approach)
- Aerotropolis Precinct Plans (due to be finalised by Minister in early 2022).
- PCC's new structure plan in 2022 for St Marys.

3.6 Existing and proposed future local context and character

The SCAW design has considered existing conditions and, at a high level, proposed future local context and character. Local conditions are acknowledged. See Section 5.1.1 below.

The SSTOM package will consider the detail of future station precinct plans and outcomes.

4. Connecting With Country

4. Connecting with Country

4.1 Introduction

As the alignment crosses Sydney's western plains, the Western Sydney Airport Metro passes through the traditional lands of the Dharug people. The extent of proposed development for the Western Parkland City will significantly alter Country.

This part of Country on the Cumberland Plain has always been a place of movement for not only the Dharug people, but the surrounding neighbours - the Dharawal, Gundungurra and Darkinjung people.

It is our responsibility to pioneer new ways to care for Country through this process.

The SCAW project has been working with Aboriginal consultants Murawin. Murawin have considered some of the early priorities articulated by the CwC working group and considered that these points have the most direct relevance for SCAW scope. The priorities are:

- Access to Country
- Protection of habitat/wildlife
- Care of creeks that are generally never properly rehabilitated
- Provide untouched, natural areas in Parkland City
- Opportunity to reawaken landscape and respect Country as one connected thing

The focus of the work has been to develop the design with respect to the Traditional Owners and Cultural Knowledge holders.

- Mutually respectful working relationship
- Focused on centring Aboriginal perspectives
- Excellent collaboration leading to positive outcomes for Ngura and Aboriginal People.

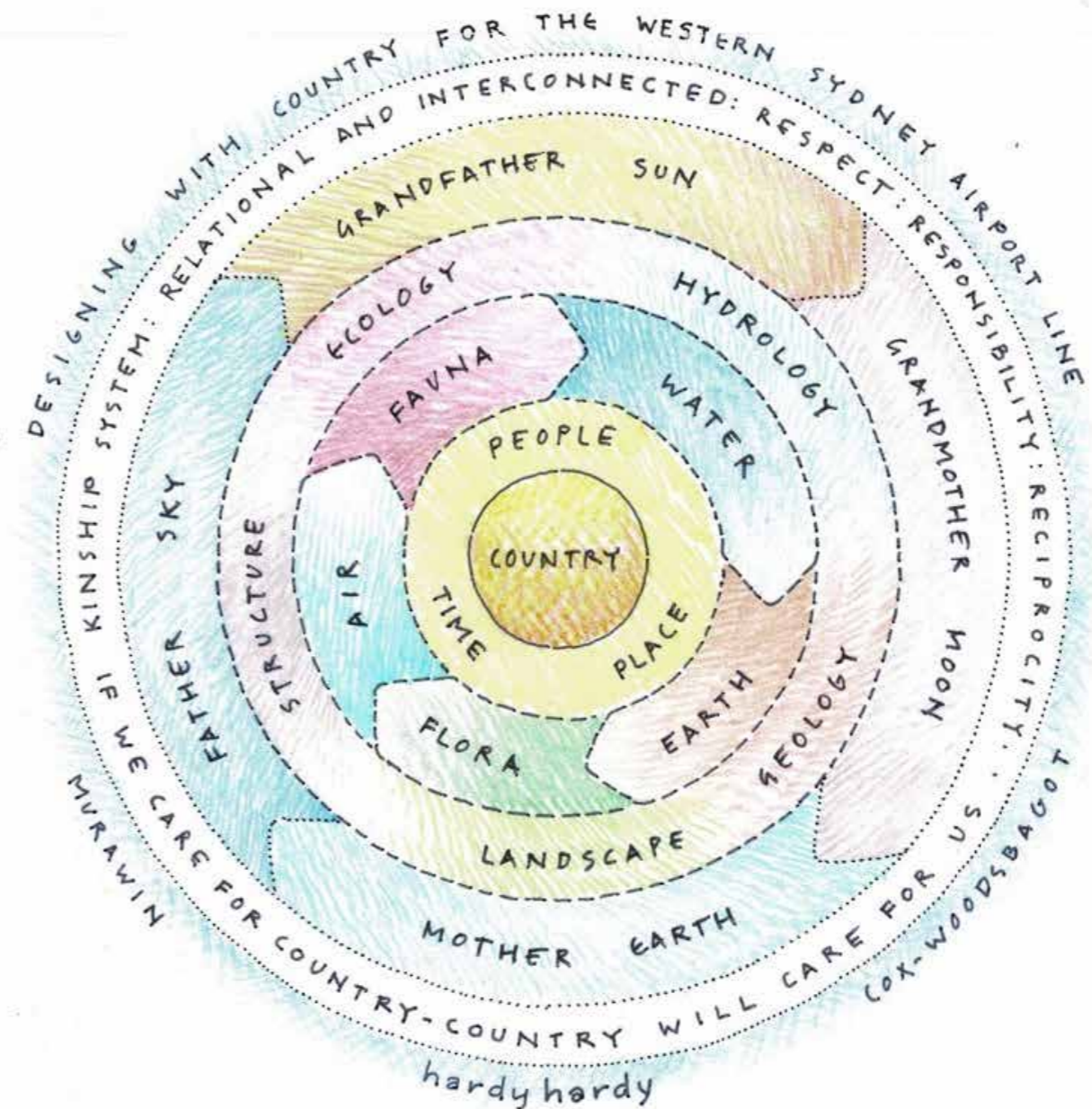


Figure 5: Connecting with Country Principles

4.2 Response

The Connecting with Country approach is manifest in the scheme as a living system through approaches to water, soil, biodiversity.

- Walk Country, listen to Country
- Build relationship and empathy with Dharug Country,
- 'Touch the earth lightly'
- Understand corridors of Dharug vegetation and biodiversity.
- Design of viaduct and landscape with the movement of landscape/water.
- Flood plains for ecology and biodiversity
- Lighting connecting with Dharug Country, light within this region unique to six Dharug Climatic seasons.
- Managing 'waste' - none of Country is considered waste.
- Circular economy and all-inclusive kinship (community)

With these principles as a framework, focus areas for the SCAW contract are:

- soil preparation
- plant selection
- WSUD opportunities
- abutment design development
- drainage channels and water quality basins

Landscape

In consultation with Murawin and the CwCWG, there has been an exploration of landscape options, with a focus on ecological restoration and consideration of a living systems-based approach. Where possible within the SCAW scope the team is exploring design methods to improve ecological restoration and enhancements to living systems. These include:

- Increasing areas of native planting opportunities.
- Materials salvaged for reuse.
- Soils remain on site
- Ameliorated to match natural soil conditions.

Material Selection

Site specific material options have been explored to use appropriate materials and to reduce necessary importation of rocks and fill where possible. CwC collaboration has occurred in design investigation and the outcomes validated.

Species Selection

The selection of species is consistent with endemic communities and seeks to reinforce flora groups across the site. This work has been informed by ecological surveys undertaken in the Biodiversity Development Assessment Report prepared for the EIS which outlined the relevant ecological communities along the alignment.

Endemic species selection and deployment during the SCAW component underpins the whole project's landscape response and validation has been sought from the CWC WG.

Selection will also be informed by SCAW's pre-clearance vegetation survey 9 (as required by Conditions of Approval E13) by project ecologist and detailed in the Flora and Fauna Management Plan.

Soils

Sydney Metro has developed detailed requirements for the differential handling and placement of topsoil. A comprehensive soil strategy across the corridor involves the stockpiling of the first 100mm soil. This is intended to overcome the issue of weed-laden topsoils with elevated nutrient levels that pose challenges for the establishment of native vegetation.

Based on analysis and advice from soil specialists SESL, soils that are returned to the corridor will be treated and enhanced to help deliver the best landscape outcomes.

The remediation of soil can be seen as an opportunity in relation to Healing of Country through landscape outcomes.

4.3 Process

Murawin has been a key participant throughout the tender process and on award of the contract in the detailed design phase.

Sydney Metro has constituted a Connecting with Country Working Group charged with delivering a project-wide Indigenous response.

The SCAW team has engaged with the CWC WG to ensure that outcomes in this stage are consistent with the overall outcomes.

Key dates are:

Table 8 – Connecting With Country Consultation

Date	Meeting
29 June 2022	Sydney Metro
5 August 2022	Connecting with Country Working Group
19 October 2022	Walk on Country

5. Design of Permanent Built Elements

5. Design of permanent built elements

5.1 Viaducts

The SCAW enabling works package consists of the formation of the rail alignment between tunnel entries at Orchard Hills and the WSA Business Park. The scope includes:

- 3.6km of viaducts elevated above the plain at creeks, at future stations and across the Warragamba Pipeline.
- 205m of bridges - a 180m long bridge over the M12 and a 25m bridge across a drainage channel at Western Sydney Airport
- 6.9km of on-grade alignment

There will be a number of temporary and permanent roads formed.

5.1.1 Context

As the alignment crosses the site of the new Western Parkland City, the Western Sydney Airport Metro will be a new feature in this rural landscape and lead to significant change as development expands around the new city of Bradfield.

The project consists of approximately 10.6km of elevated viaducts and battered landscapes set in the gently undulating landscape of the Cumberland Plain. Crossing three creeks and some smaller tributaries, this landscape captures rainwater that ultimately feeds into South Creek – Wiannamatta. Little remnant vegetation exists of the threatened ecological communities that once scattered the plains.

Celebrating the new metro corridor as a green spine that connects communities north/south (along the metro and future cycleway), as well as east west, (along creek lines and under viaducts) will be key legacy.

The guiding principles that have shaped the place response are:

- Setting a respectful tone for the project, consider the needs of community, protect and enhance natural systems and begin a process of elevating indigenous culture.
- Developing a landscape-led approach which works with, rather than resisting natural systems.
- Designing to minimise 'hard engineering' elements and enable opportunities for natural systems to flourish, provide habitat and enhance biodiversity.
- Future thinking which considers future packages (including SSTOM and CLW), future communities and ongoing landscape opportunities.

Linear infrastructure can be a "divider". Optimising the vertical alignment through cut, fill and viaduct length facilitates crossings of the alignment that enables future growth and creates opportunities to protect creek connections. The preservation of flood corridors creates a connected green network through the plain.

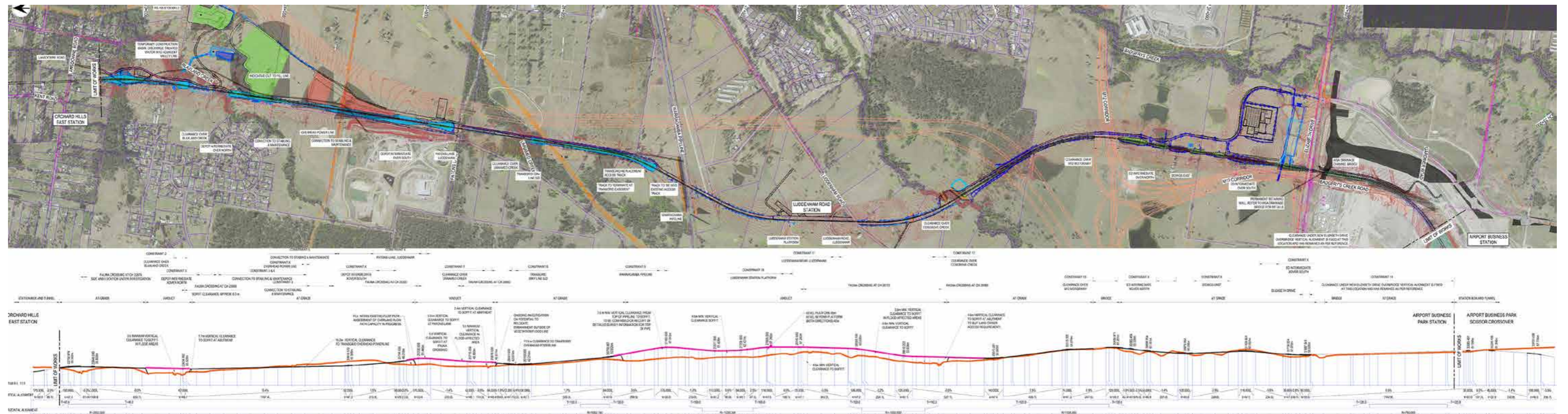


Figure 6: SCAW Viaducts and On-Grade Works

Visual Impact

The alignment seeks to keep the track at, or close to grade for most of the alignment. Where there are creek crossings or it crosses a road, the alignment will be on a viaduct. Across the alignment, there will be changes in level related to the existing ground plane, and in general, the clear heights below the viaducts are:

- Blaxland Creek – average 3.6m
- Unnamed Creek – average 3.6m
- Luddenham – Varies from 7.8m above the Warragamba Pipeline to 3.6m at Cosgroves Creek. Around the Luddenham Station location, the clear height at the viaduct is 4.6m

Views to the viaduct from the today's public domain are limited. Along Luddenham Road, views to the viaducts are blocked by either vegetation or low hills. Viaducts are only visible at the Leeholme site on Luddenham Road near Mamre Road (distant view beyond the Stabling and Maintenance Facility), or for a short zone where the viaduct crosses Luddenham Road.

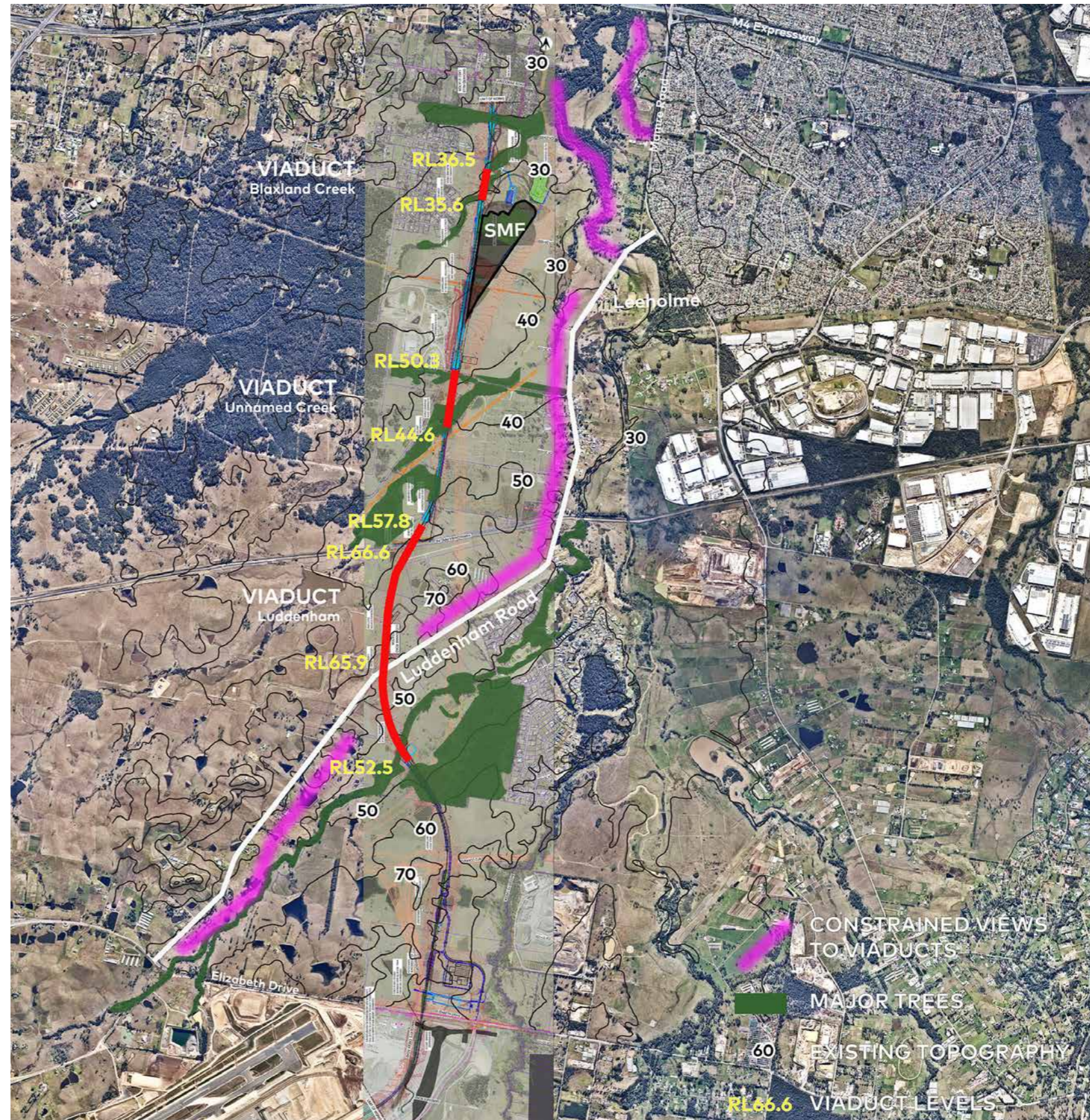


Figure 7: Viaduct Context

Land Use

A key consideration is the future character of development within the corridor. Areas north of the Warragamba Pipeline are currently zoned rural uses or in large part conservation areas at on the Defence Establishment site at Orchard Hills.

The precinct to the north of Luddenham Road was rezoned Mixed Use (18m-24m height limit). To the south of Luddenham Road, Enterprise uses (potentially up to 12m) are proposed.

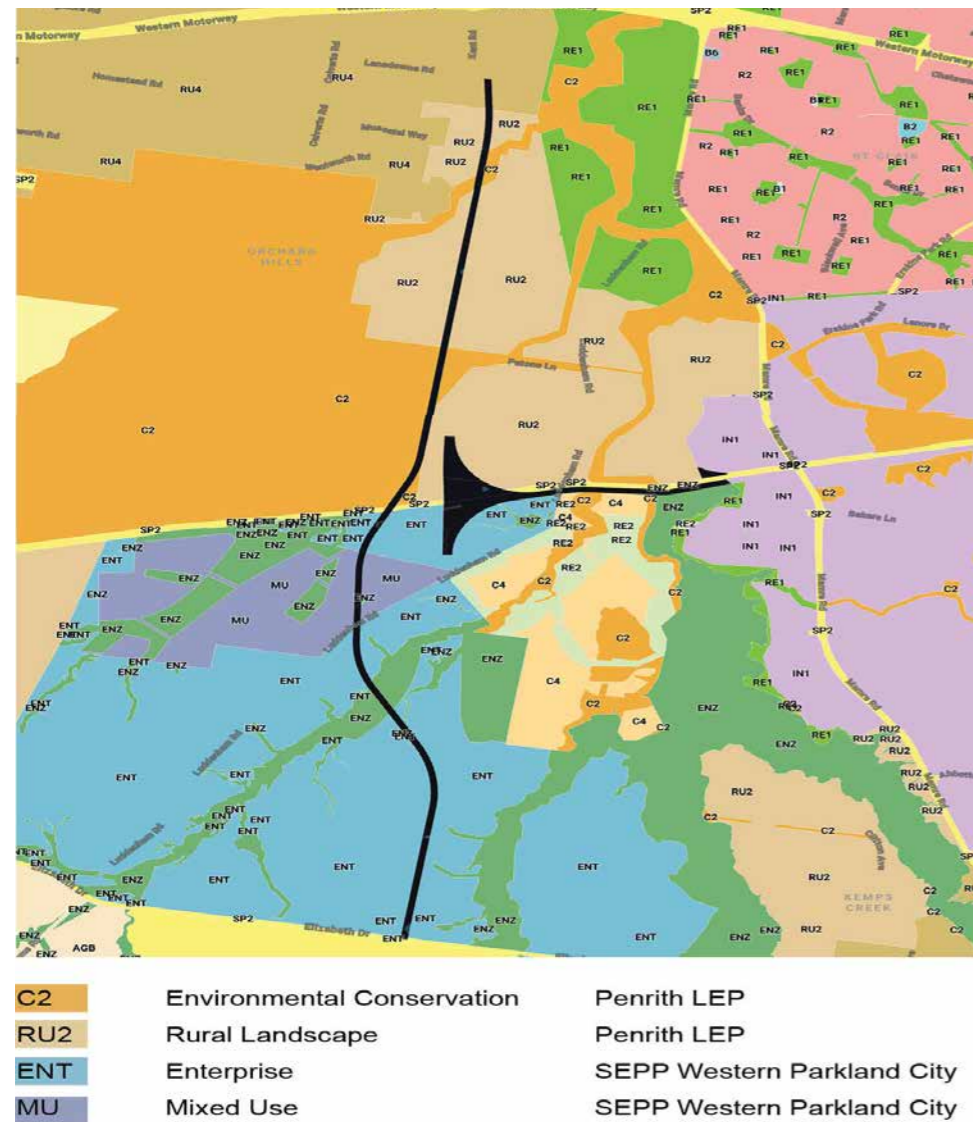


Figure 8: Planning Context

Scale

Within these Mixed Use and Enterprise areas, the final precinct plans were completed on March 2022. The relationship of new buildings to the viaduct within the Mixed Use zone are illustrated below.

Views of the viaduct at Luddenham Road will eventually be seen in the context of 5-7 storey buildings. The impact of viaduct works and future development along Luddenham Road are illustrated in Figures 10 and 11.

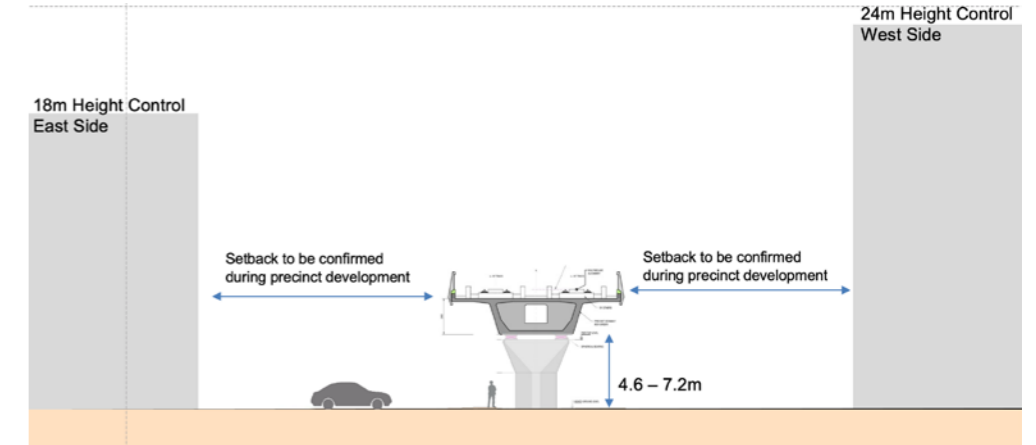


Figure 9: Viaduct Interface - Mixed Use Zoning North of Luddenham Road

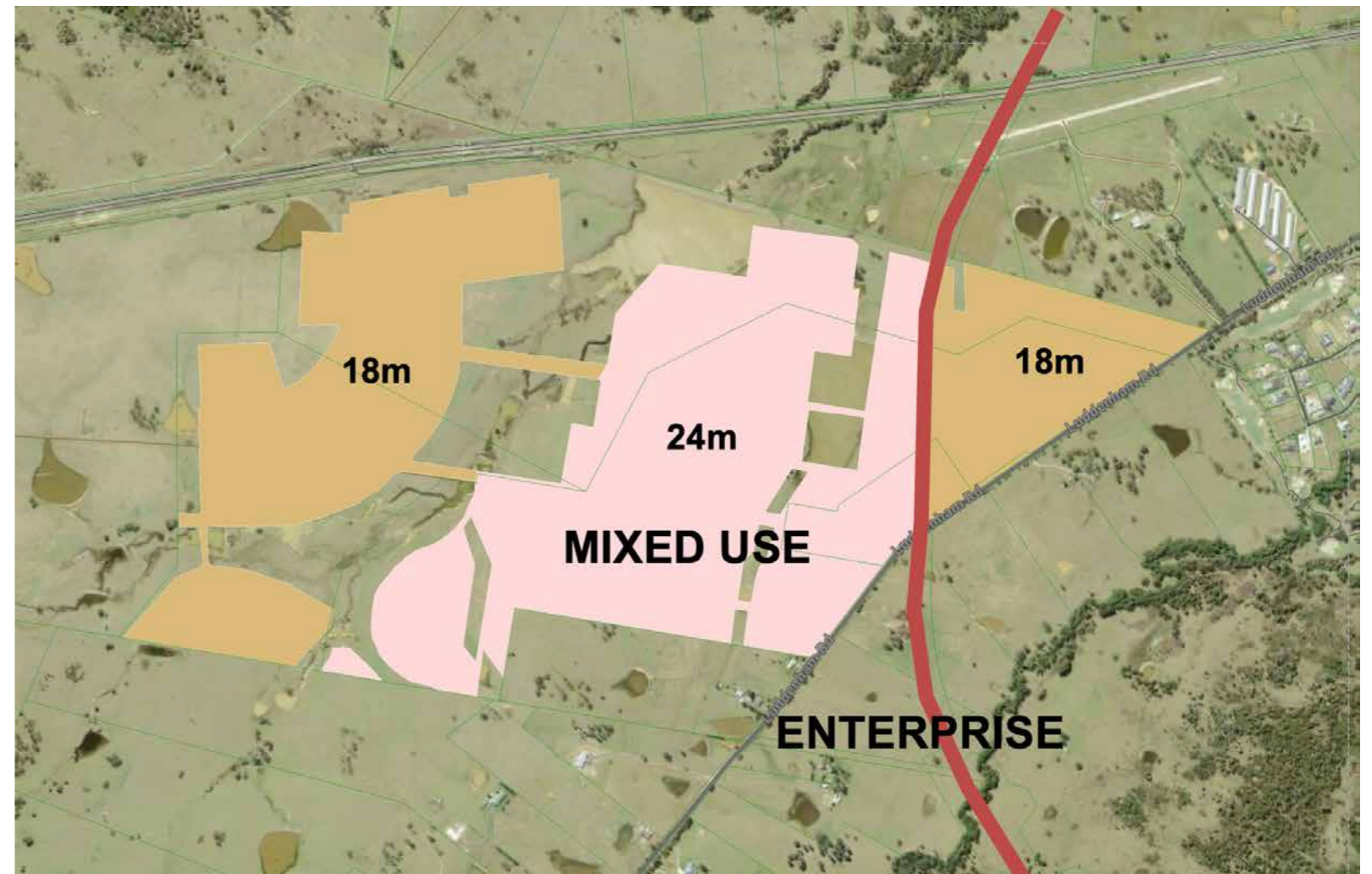


Figure 10: Height Controls at Luddenham Road



Figure 11: Luddenham Road looking South – Viaduct and Viaduct with Buildings



Figure 12: Luddenham Road looking North – Viaduct and Viaduct with Buildings

Heritage

The relationship of the project to heritage in and around the corridor is an important cultural consideration. Both Aboriginal and Non-Aboriginal heritage elements have been identified within the SCAW project site.

Non-Aboriginal heritage

The EIS identifies that the project will directly impact four key items south of the Warragamba pipeline in the SCAW project area – Kennetts Airfield, McMasters Farm (potential items), McGarvie-Smith Farm (previously listed as a heritage item in the Penrith LEP) and the Old Luddenham Road Alignment (currently listed in the Penrith LEP) The overall impact to the Warragamba Supply Scheme (a WaterNSW heritage listed item) has been assessed as Minor and Negligible.

The EIS has been approved noting the following major impacts in approving the project:

Kennett's Airfield. The airfield has been unserviceable since at least 2004. The viaduct structure over the western portion of this item will remove the western end of the runway, rendering the airfield inoperable. Existing airfield support structures (hangars), which are considered to be significant fabric, require removal.

McGarvie-Smith Farm - The project would result in major indirect impact to the McGarvie-Smith Farm through result of. The construction of surface rail track and rail sidings through the site will impact the heritage curtilage and change its visual setting, as well as requiring the demolition of two buildings of moderate significance and outbuildings, and extensive landscape modification.

Any direct impacts to these items within the SCAW scope will be mitigated through implementation of the SCAW Heritage Management Plan. Archaeological remains potentially affected by the project would be managed in accordance with an Archaeological proheriragaecedures strategy prepared for the project.

Several items currently listed in the Penrith LEP are located near the corridor (Figure 14).

- 228 Mamre House
- 229 Memorial Cairn
- 230 Memorial Cairn
- 232 Leeholme Horse Stud Rotunda
- 843 Old Luddenham Road Alignment

A review of the setting and proximity of the alignment – both on embankment and viaduct – confirms that due to distance away or screening by either topography or existing vegetation, there will be no significant impacts to these Penrith LEP heritage items.

Aboriginal heritage

The project has largely avoids direct impacts on known Aboriginal sites and minimises the potential interface with areas with high Aboriginal archaeological potential by providing viaducts over waterways. Further consultation and field survey is being undertaken and test excavations would be carried out at sites with higher Aboriginal archaeological potential.

The gathering of further cultural information with Aboriginal parties is on-going. Where Aboriginal archaeological remains are identified, assessment will be undertaken under the SCAW Heritage Management Plan. Archaeological results would be used for Aboriginal heritage interpretation in future stages, in consultation with Registered Aboriginal Parties.

Table 9 - EIS Heritage Impact Assessments

Item	Significance	Impacts					Overall
		Direct	Permanent Indirect	Temporary Indirect	Vibration	Settlement	
Kennett's Airfield	Potential Local	Major	-	-	-	-	Major
McMaster Farm	Potential Local	Minor	Minor	Minor	Negligible	Nil	Moderate
McGarvie-Smith Farm	Local	Moderate	Major	-	Minor	Nil	Major
Luddenham Road Alignment	Local	Nil	Minor	Minor	Nil	Nil	Minor
Warragamba Supply Scheme	State	Negligible	Minor	Minor	Minor	Nil	Minor

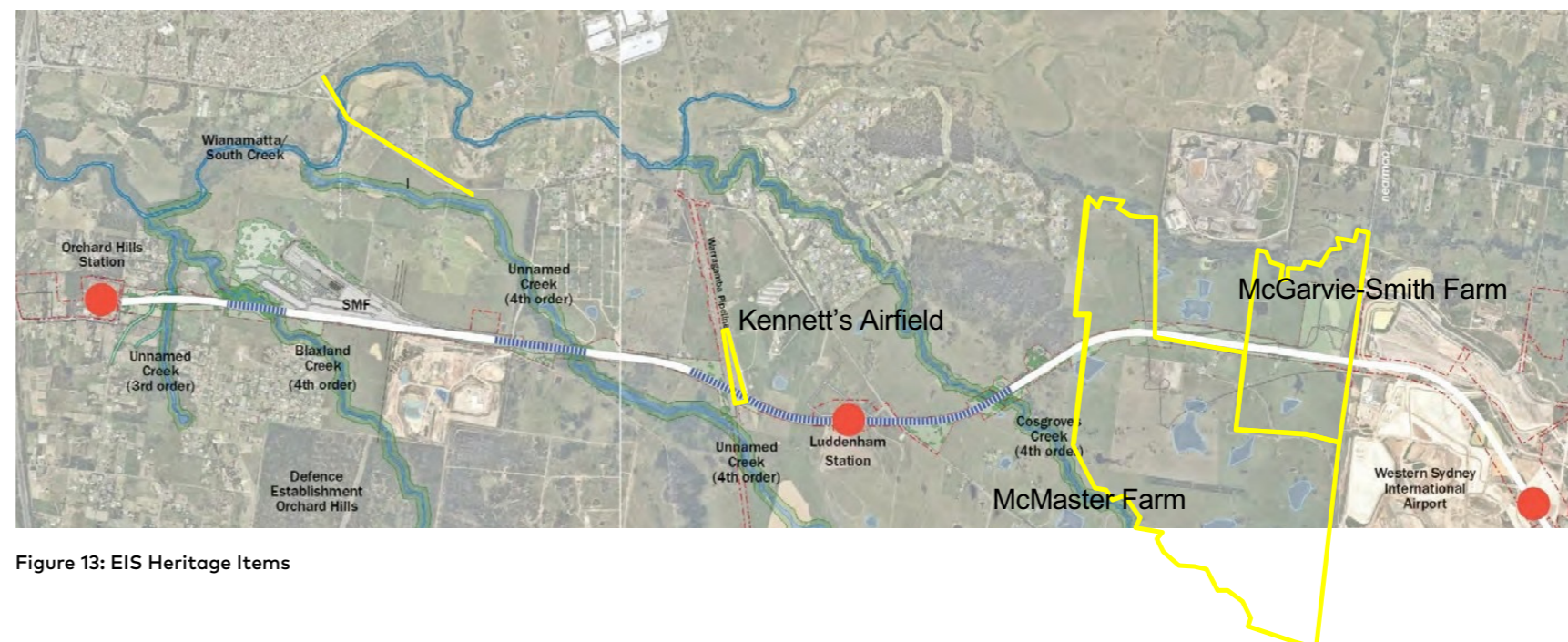


Figure 13: EIS Heritage Items

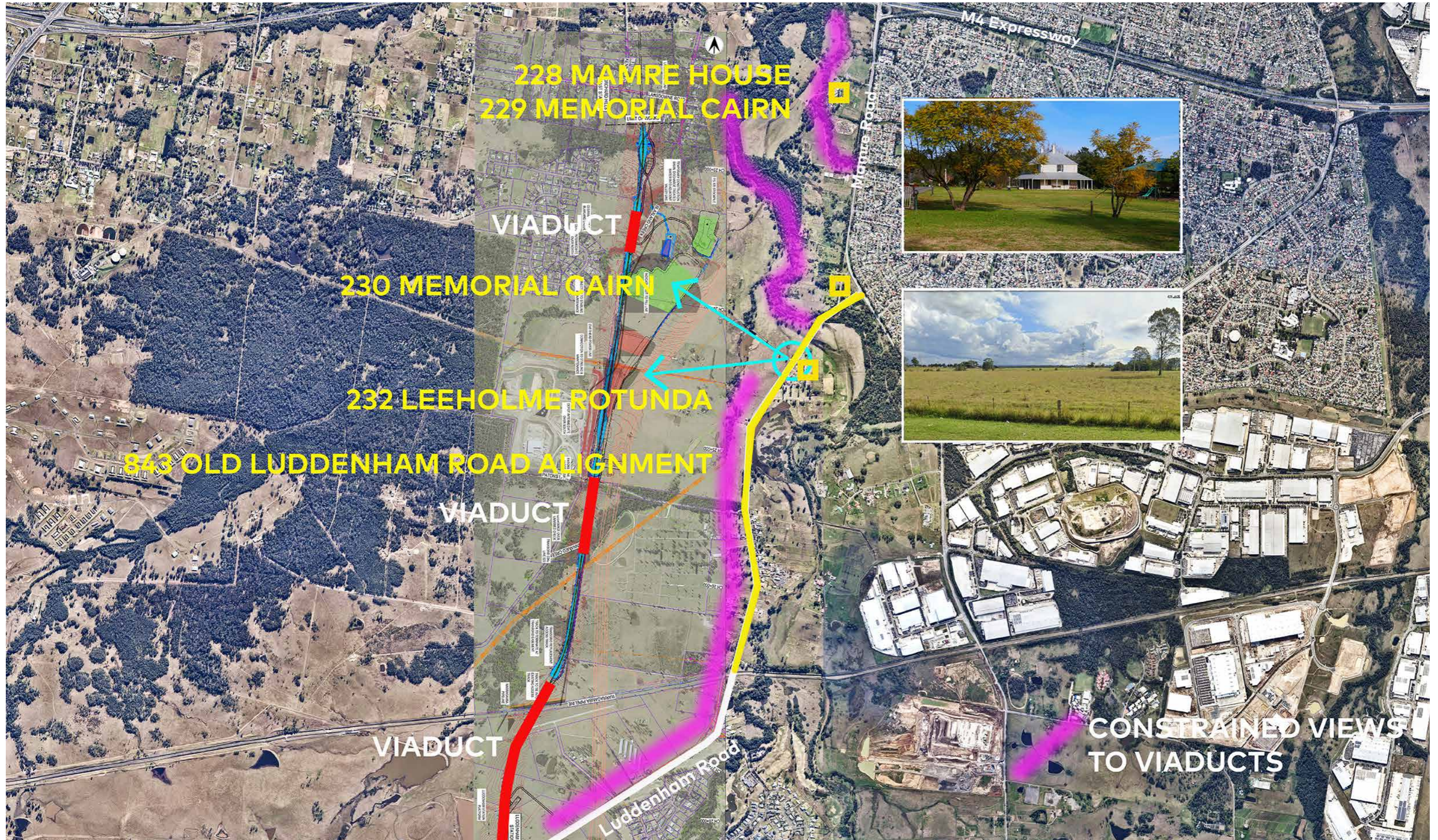


Figure 14: Penrith LEP Items - Heritage impacts

5.1.2 Viaduct Form

To validate the final design, two options were considered during the Tender Phase and evaluated against form, architectural expression, constructability and cost. These were:

- Traditional Box Girder; and
- U-Trough form.

The use of T-Beams was not one of the options considered.

While the U-Beam offers reduced depth and a simpler form, the complexity of the pier supports (single or double piers), unfamiliarity in the Australian construction environment and the cost meant that the Box Girder was selected.

Box girders are built in 3m butt jointed sections and post-tensioned on site. Parapets are attached after installation.

Typically, 40m simply supported spans, using a single cell box girder, are fabricated out of precast reinforced concrete segments. The longer 40m spans were specifically chosen to minimise the impact of the viaduct on the landscape and to maximise its slender appearance, however span lengths are reduced to 24m at Luddenham Station to meet the project specification requirements.

The structural capacity of the span is provided by the external prestressing tendons. These run the length of the span inside the void of the box girder and post-tension the precast segments together to form a monolithic span with the required strength to resist all applied loadings.

There are three viaduct sections along the route of the SCAW package, described as follows:

- Blaxland Creek Viaduct 324m
- Unnamed Creek Viaduct 648m
- Luddenham Viaduct 2,457m

Typical spans are 40m. At Luddenham Station four spans are reduced to 24m..

Construction

- Segments are cast in precast yard using short-bed method to ensure a perfect fit at segment joints.
- The external shape of the segment has been designed with obtuse angles and few curves to improve the de-moulding operations and reduce the risk of defects.
- The introduction of external post tensioning not only simplifies the pre-assembly of the reinforcement cage because it eliminates the internal ducts, but it also removes the need for chamfers on the side and soffit of the segment.
- Span-by-span erection method is taken in order to minimise the amount of construction activity at ground level as well as reducing environmentally unfriendly operations.
- An Underslung Temporary Beam (UTB) and a crawler crane will be used to erect each span. The beams of the UTB are supported at piers and segments are erected on the beams.
- Once the span is completed, the external post-tensioning is stressed in stages and the load of span is transferred onto temporary jacks at the support points. The use of external PT shortens the erection cycle and reduces the operations at height by removing the need of epoxy application prior to stressing.
- Once the deck is in final position, grouting of bearing, precast parapet installation and stitch pour construction can be commenced.

As an alternative and as the main methodology for the span over the Warragamba pipelines, the parapets have been designed so that they could be fixed onto the segments prior to being lifted on the UTB. This solution optimises the amount of the finishing works to be undertaken from the deck as the stitch pours will be constructed in-situ with parapets already installed and providing working at height control measures for the workforce.

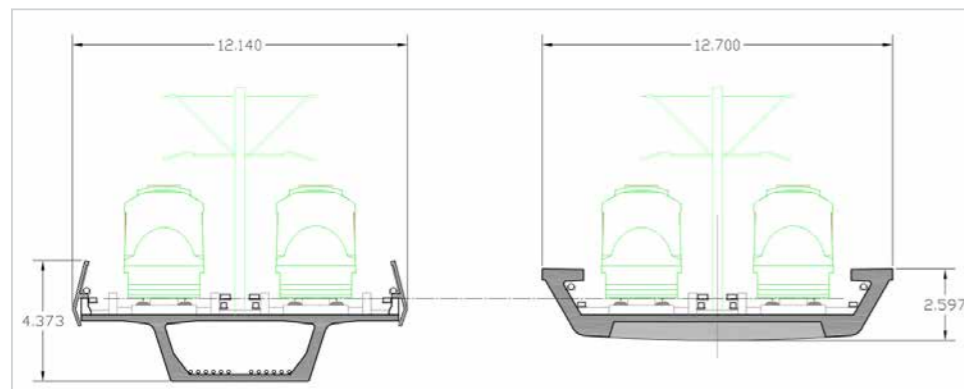


Figure 15: Viaducts Options – Box Girder and U-Beam.

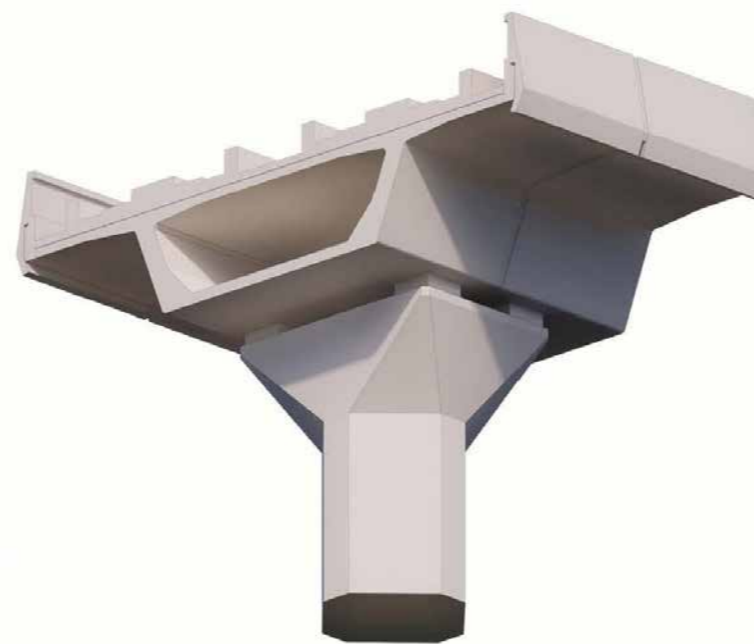


Figure 16: Box Girder Form



Figure 17: Viaduct South of Warragamba Pipeline Prior to Urban Development

5.1.3 Piers

Form

The piers have been developed to speak directly to the geometry of the Box Girder.

The Sydney Metro reference design nominated a single pier support structure with a faceted capital. The design however, was seen to have a number of drawbacks:

- The complexity of the faceted capital will add significant time (and cost) to the program
- The large capital form requires additional concrete
- The depth of the reference design capital complicates the interface with the ever-changing ground levels.

In response a simpler form with a cleaner and better integrated pier design has been developed which considers:

- consistency with the box girder design
- constructability
- cost
- scale
- materiality
- 120 year design life
- successful transition between capital and ground level

A number of options were considered in development of the design:

Option 1 – Circular pier

The simplest form, there is a contradiction between the circular pier and the angularity of the viaduct and the pier head.

Option 2 – Square pier

The square pier is more consistent with the angularity of the pier head and box girder. It adds to the quantity of concrete required in each pier.

Option 3 - Circular pier, Diamond capital

Option 3 maintains the circular column but transitions the corners of the capital

Option 4 – Octagonal pier

The octagonal pier is in much the same language as the viaduct structure and reduces the amount of concrete. The additional profiling of the pier capital helps unite the forms

Option 5 – Diamond pier

The diamond pier swings the orientation of the pier to 45° from the viaduct direction. The geometry of the turned form and the chamfering of the column form accentuates the angularity of the capital.

Option 5 – the diamond pier - offers optimises concrete volumes and successfully transitions between the simple form of the pier and the angular nature of the viaduct form. It creates a distinct form that has been designed to enrich the public domain.

The piers are formed by a square with chamfered corners to achieve a diamond appearance. The top of the pier flares both longitudinally and transversely to provide a larger pier top area, which provides sufficient space for the bearing plinths and the temporary works required for erection.

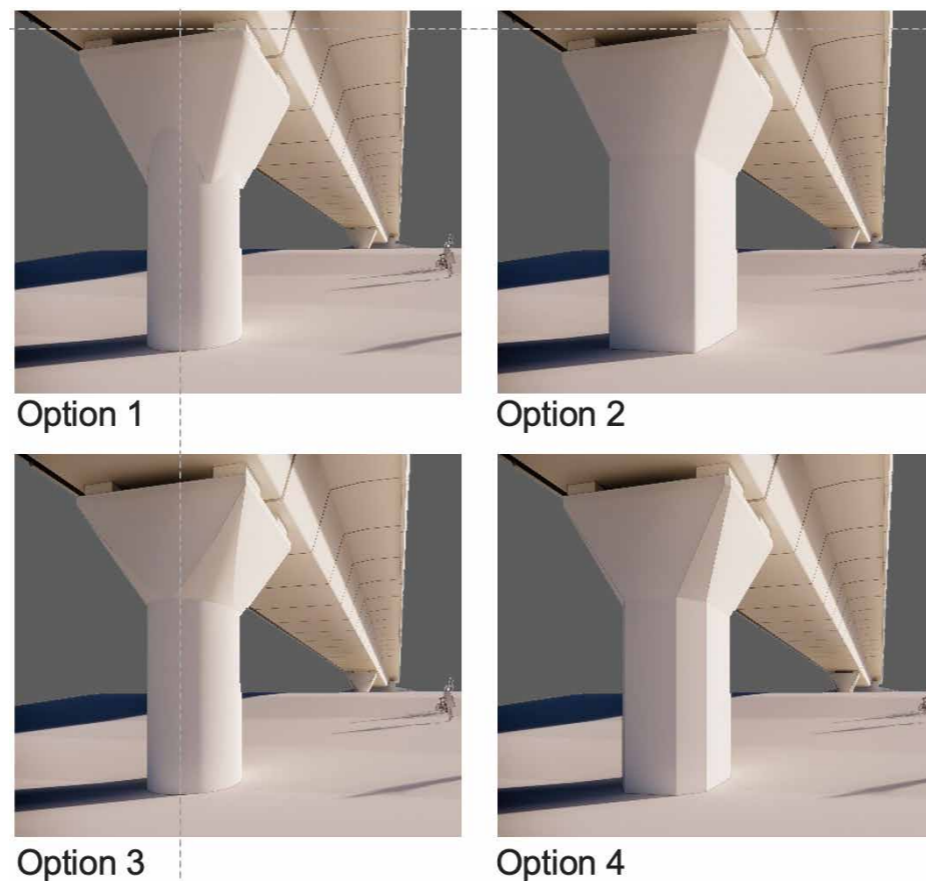


Figure 18 - Pier Options

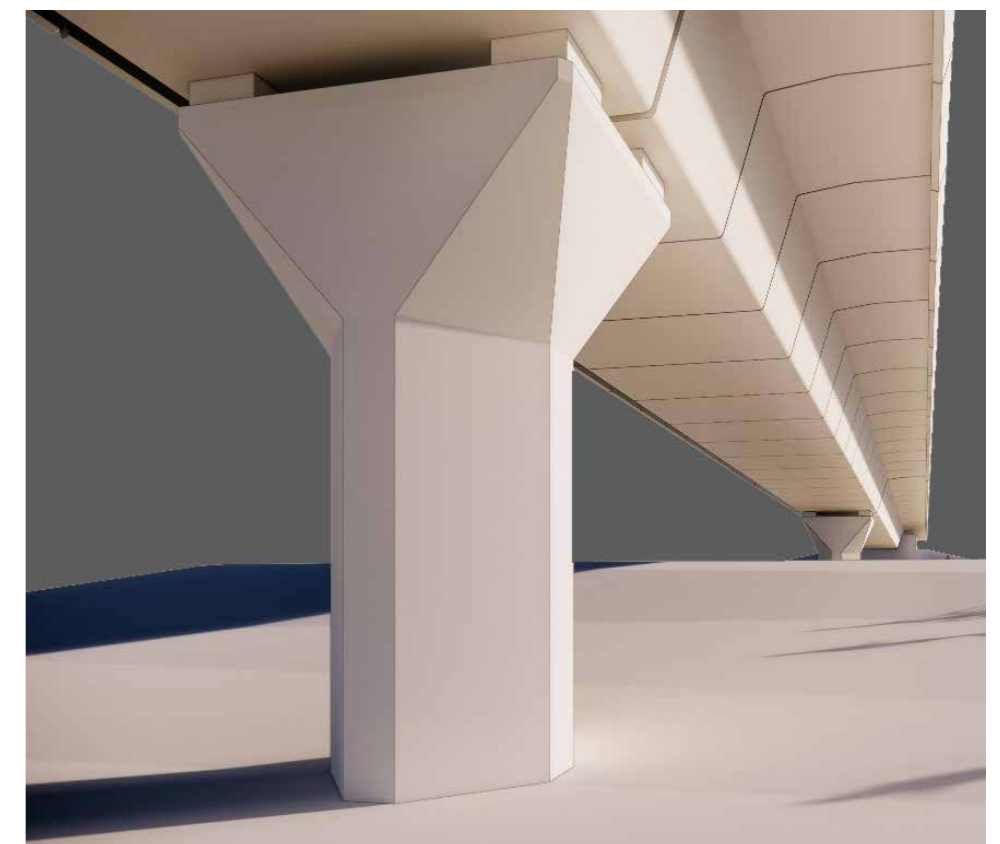


Figure 19 - Option 5 - Final Pier Design



Figure 20 - Illustration of Viaduct in Mixed Use Precinct

Construction

- The piers of the viaduct are supported by a monopile foundation except for the station spans where a group of piles and pile caps are planned.
- The monopile design solution has been adopted to shorten the construction cycle by eliminating the need for pile caps, while reducing land disturbance and pier face exposure to flood flows.
- The bored piles are constructed using standard method which includes drive of temporary casing into the ground, excavate the soil, installing the reinforcement cage and concreting.
- The pier reinforcement cages will be pre-fabricated and erected in-situ. The concrete will be poured using specially designed steel shutters, fabricated and assembled so that the full height of the pier shaft can be concreted in one operation.
- The steel shutters will be fabricated in sections and bolted together to provide a grout-tight seal for the casting of the concrete as well as accommodate the varying pier heights.
- Once the pier shaft has been poured, the construction of the pier capital can commence with the installation of the shutters and the prefabricated cage. A 3D model of pier and capital reinforcement has been developed in order to ensure constructability of the reinforcement cages and introduction of the cast-in elements.
- Spherical bearings are installed to top of pierhead after pier construction completed. They will be grouted to the bearing plinth once the deck is in final position.

5.1.4 Parapets

Parapets are fixed to the box girders after assembly to both minimise weight of elements and to protect these elements during transport. They are designed to accommodate horizontal runs of services and communications on the inside face.

The double angle form seeks to achieve a number of outcomes:

- Main face is tilted towards the sky to catch the light and to facilitate washing of dust
- The lower face tilts back to help minimise the overall width of the structure. The angle is common to the piers and box girder below.
- The form minimises concrete use through the structural efficiency of the bent form.

Parapets are designed with chamfered edges at joints. Joints are typically 20mm except at piers where they coincide with an expansion joint at box girders where a 50mm gap is proposed.



Figure 22 - Parapet Joints

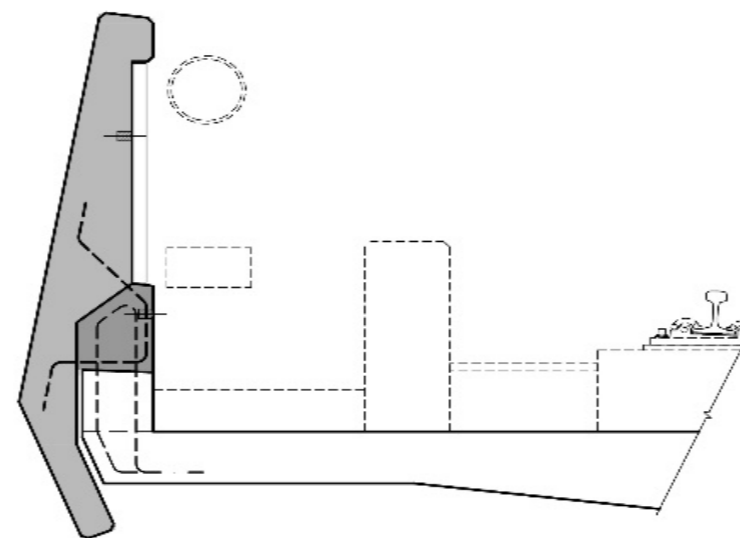


Figure 21 - Parapet Form

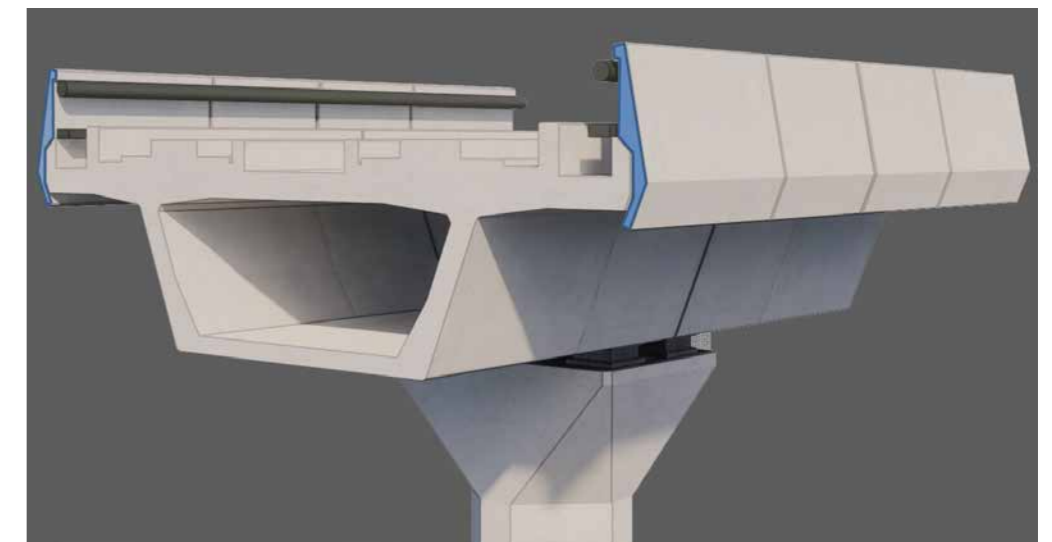




Figure 23 - Illustration of Viaduct at Unnamed Creek

5.1.5 Abutments

To minimise the visual impact, spill-through abutment form has been adopted at the six abutment locations. Unlike the large sheer wall abutments used on NorthWest Metro, the spill-through abutments rely on the embankment returning around the abutment and the extent of concrete is significantly reduced.

The landscape response has been developed to reduce the amount of imported rock fill at the abutment. In the tender design, a rock batter was proposed to deal with a 1:2 slope and potential scouring at floods.

Further review has confirmed that no scour protection is needed on vegetated embankments with slopes lower than 3:1. Rock will be used where the clearance is less than 2m and landscape is unlikely to survive.

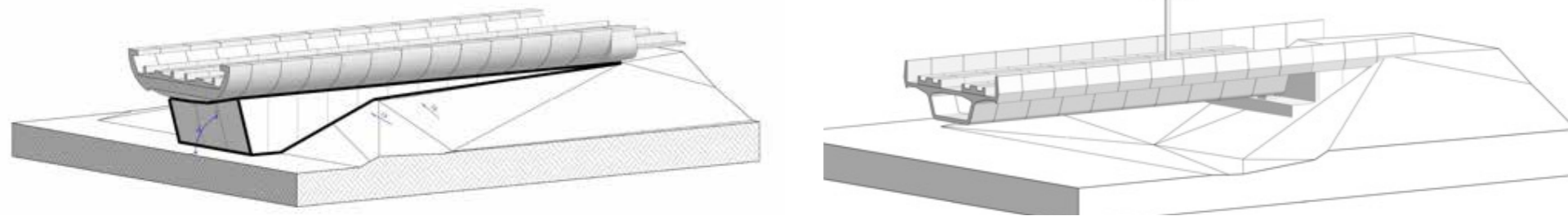


Figure 24 - Sheer Wall and Spill Through Parapets

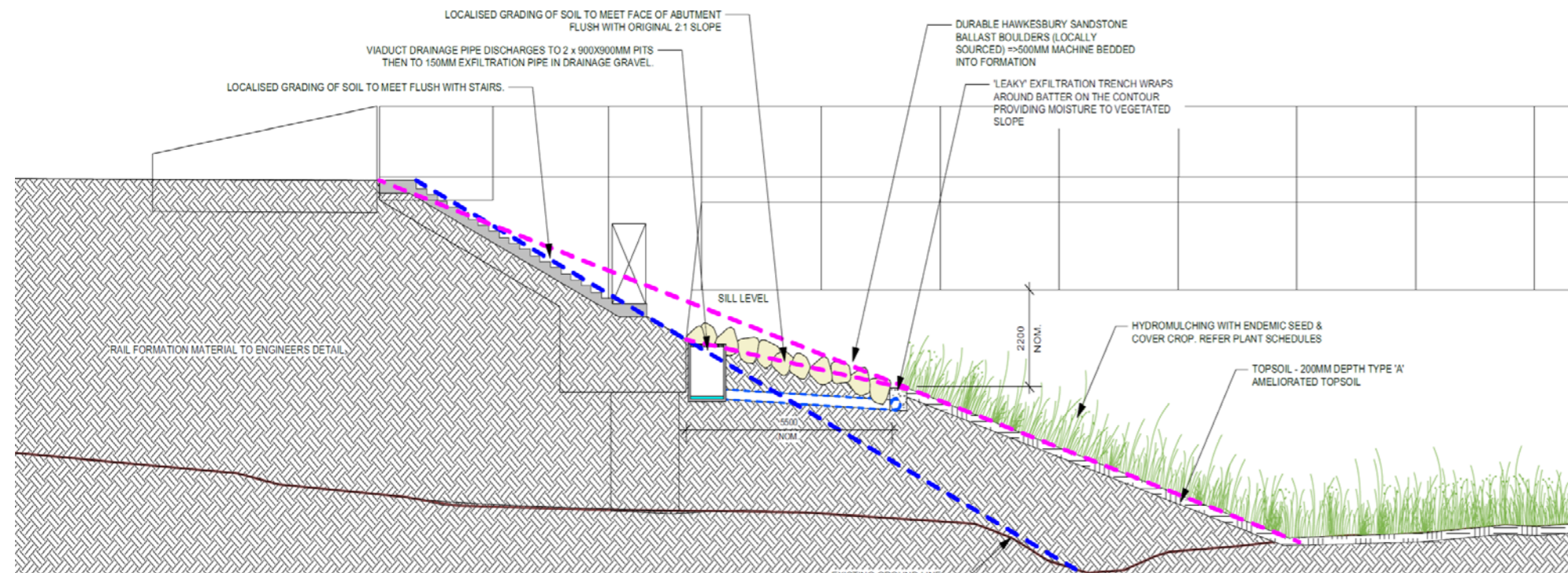
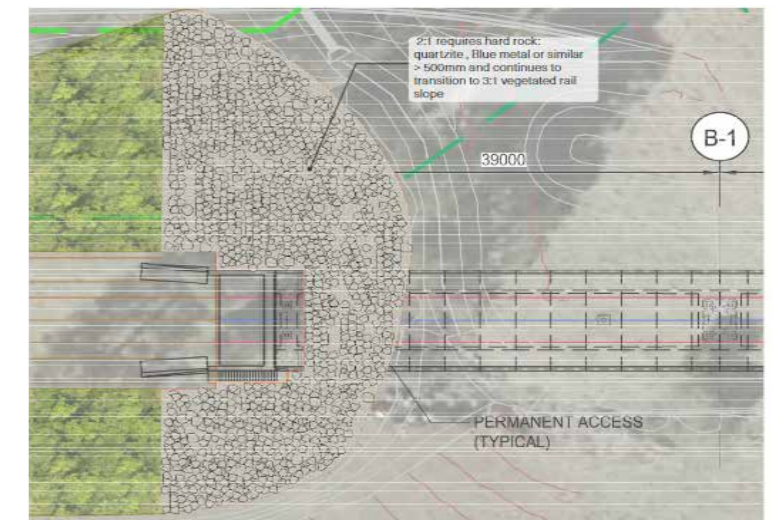
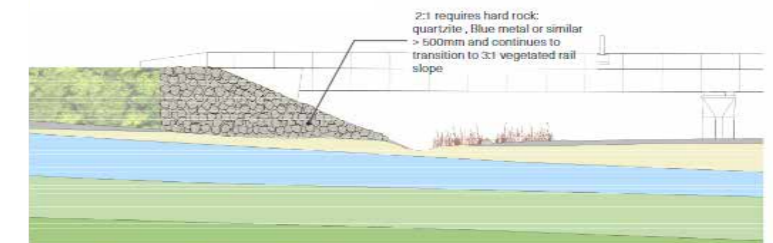


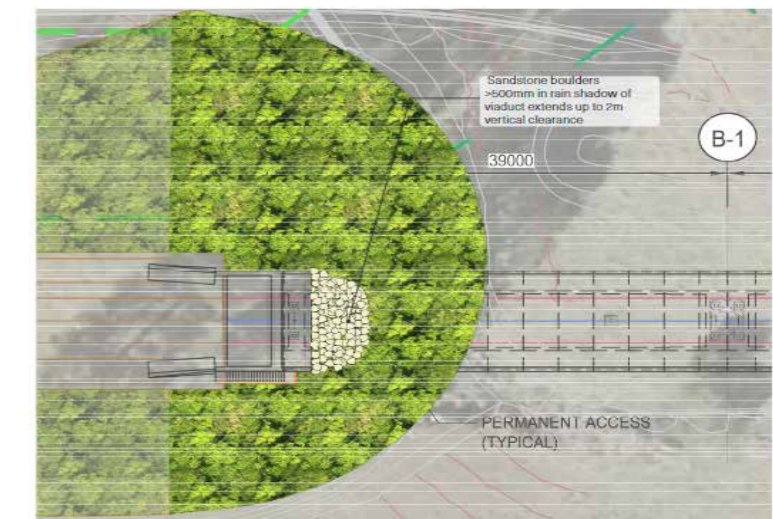
Figure 25 - Final design Spill Through Parapets



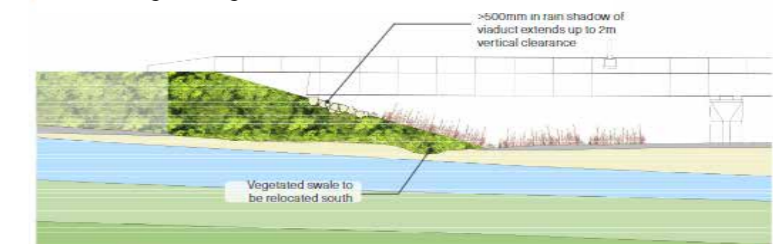
Tender Design 2:1 Abutment Plan



Tender Design 2:1 Abutment - Elevation

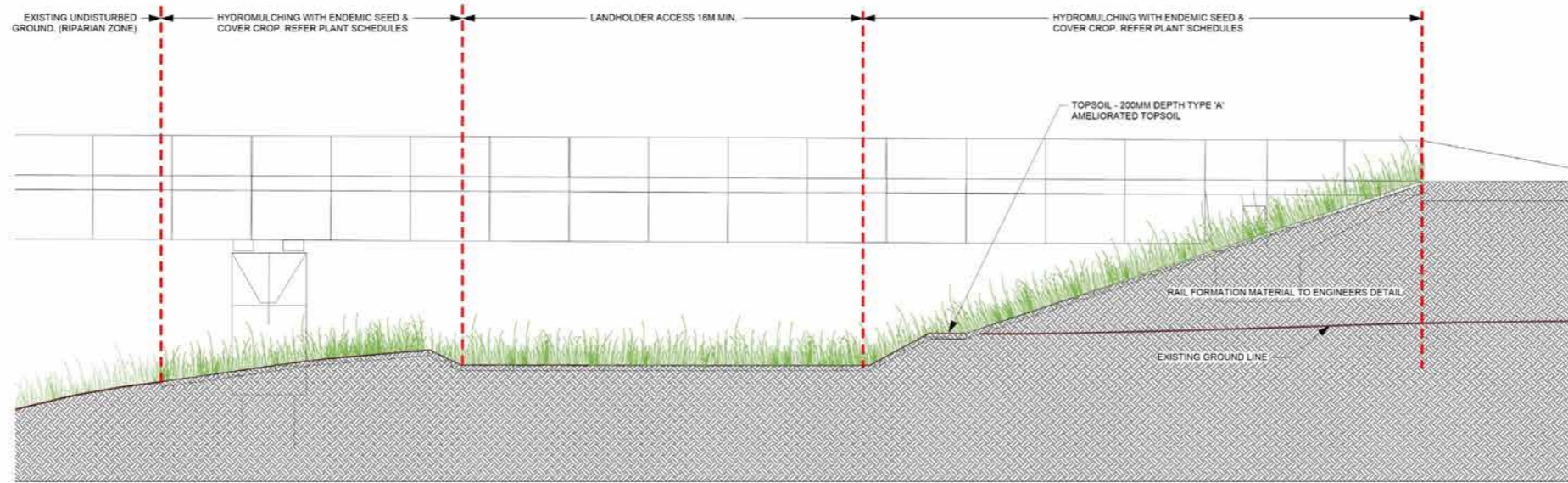


Revised Design 3:1 Vegetated Abutment - Plan



Revised Design 3:1 Vegetated Abutment - Elevation

Figure 26 - Abutment Landscape Options



1 Abutment south at Cosgroves Creek
Scale: 1:150

Figure 27 - Cosgroves Creek Abutment Elevation

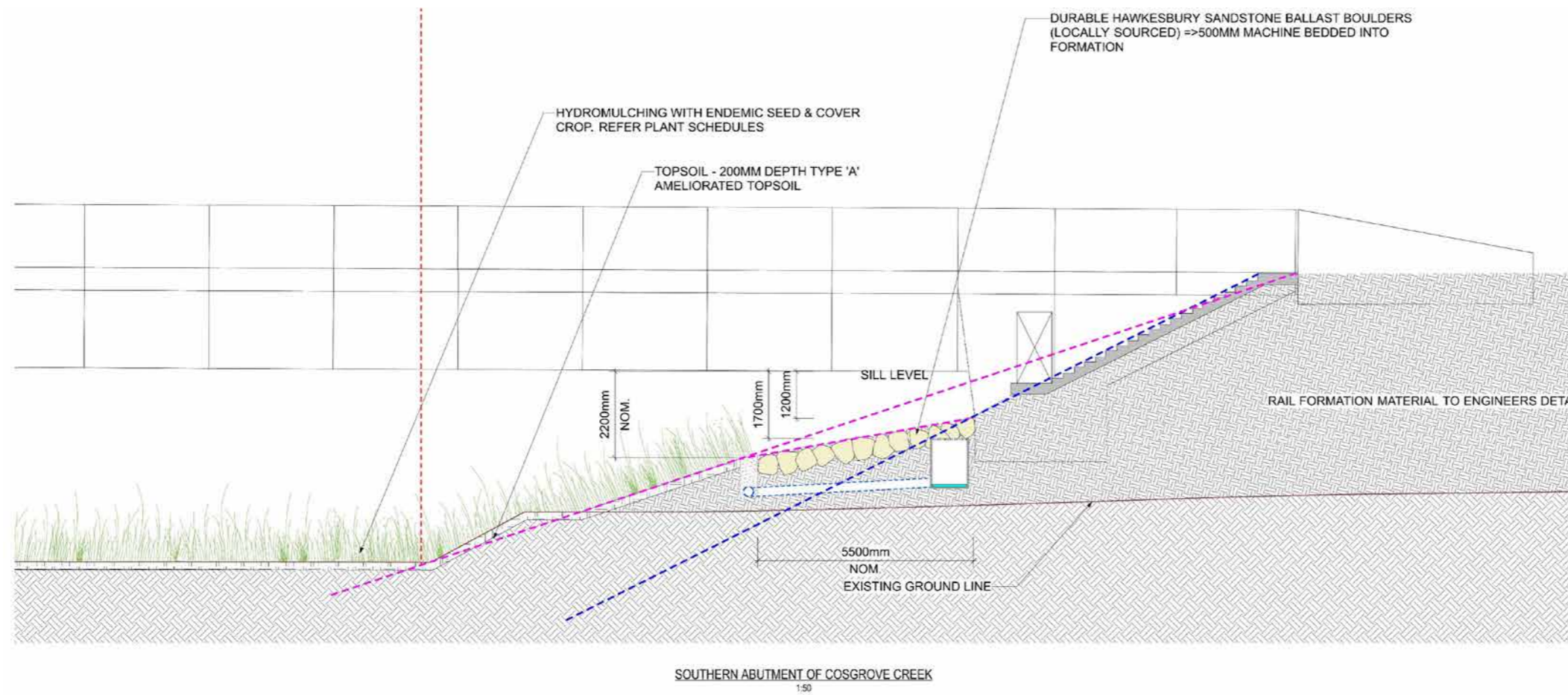


Figure 28 - Cosgroves Creek Abutment Detail



Figure 29 - Viaduct and Embankment

5.1.6 Design Integration

The language developed across the four key elements – box girder, pier, parapet and abutment – is based on shared geometries and common forms.

The language is set up by the angle of the box girder body which is reflected in the pier head, the angle of the lower parapet return and the inside face of the abutment.

Forms are optimised and the repetition of the geometry aims to tie the viaduct components together as a unified suite of elements.

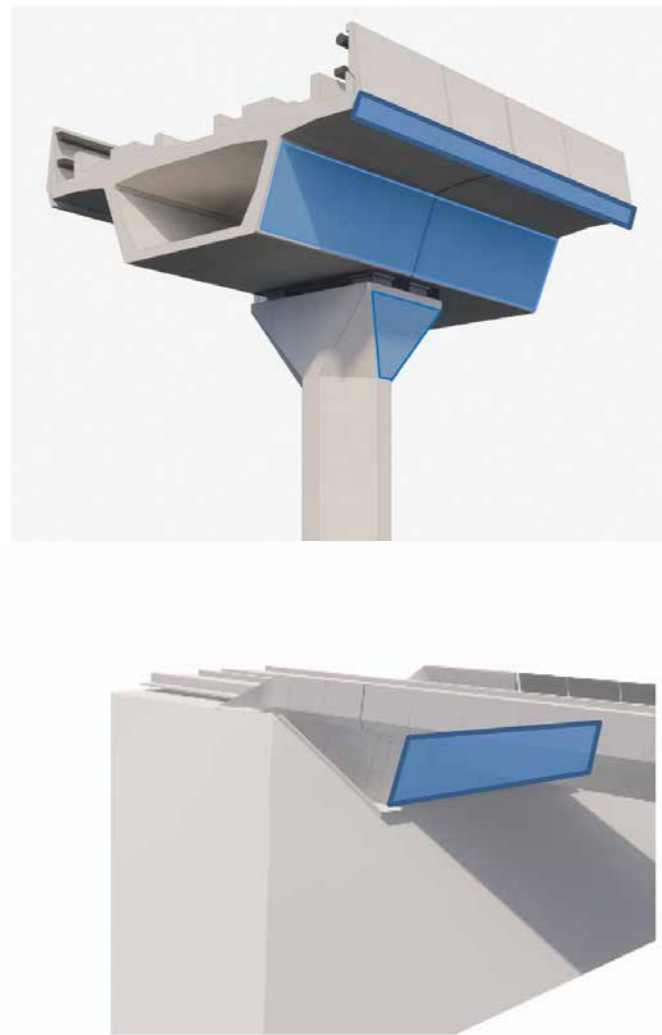


Figure 30 - Element Geometry

Parapet

Box Girder

Abutment

Pier

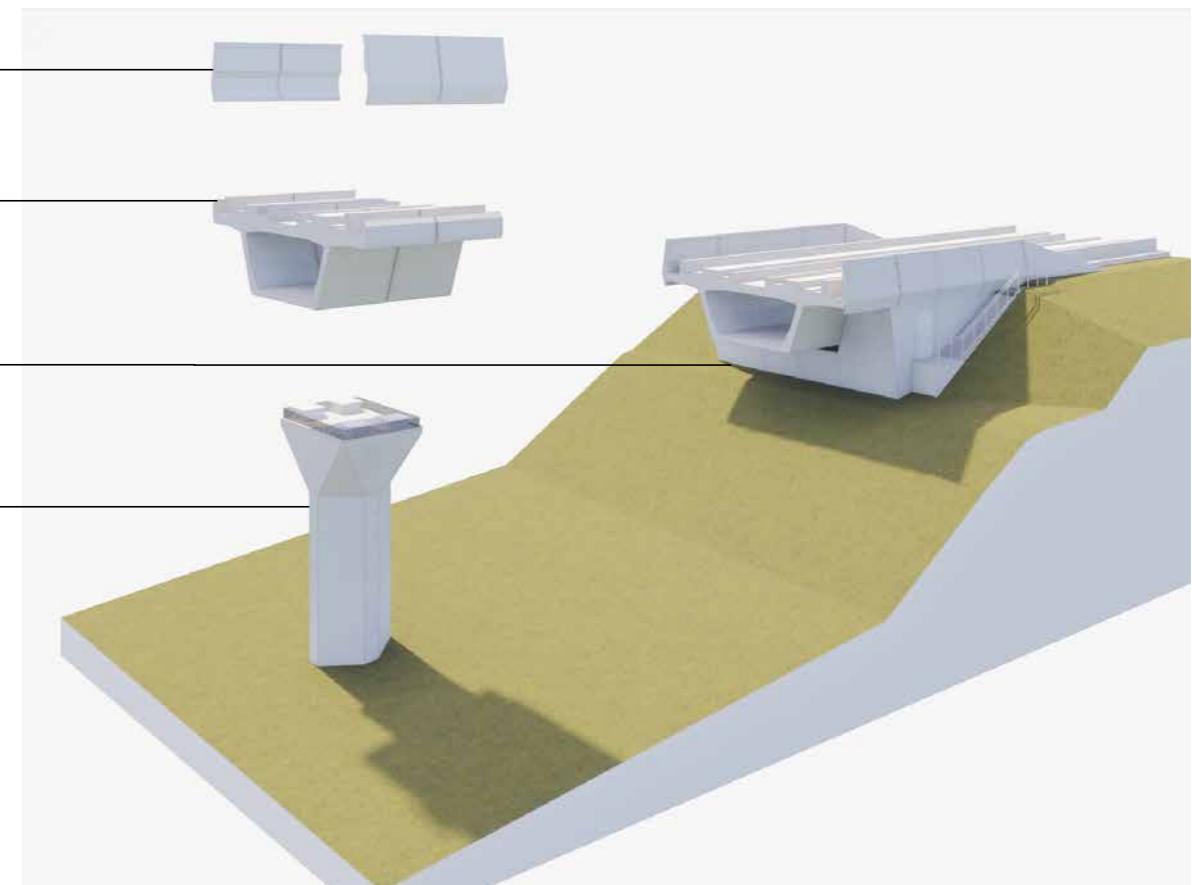


Figure 31 - Viaduct and Abutment Kit of Parts

5.2 Earthworks

In bringing the alignment to grade to reduce overall impacts, earthworks will be required to

5.2.1 Cuttings and Embankments

The design for the formation and embankments is considered conforming to the project technical requirements. The formation is typically 15m wide with 1(V):3(H) batters. Figure 31 – Typical embankment formation shows a typical embankment formation and Figure 32 – Typical cutting formation shows a typical cutting formation.

Flatter batters were considered, with the view to disposing of spoil material to flatten the batters, however Sydney Metro noted a preference against this approach due to the impacts on land over the long length of the project.

Embankment batters are generally no steeper than 1(V):3(H). In planted areas where batters may transition from 1(V):3(H) to 1(V):2(H), a compost blanket system may be required (as per Roads and Maritime Services (RMS) Guideline For Batter Stabilisation Using Vegetation – Fact Sheet 13).

Permanent fencing to the corridor is not within the SCAW scope and will be designed and installed by the SSTOM contractor.

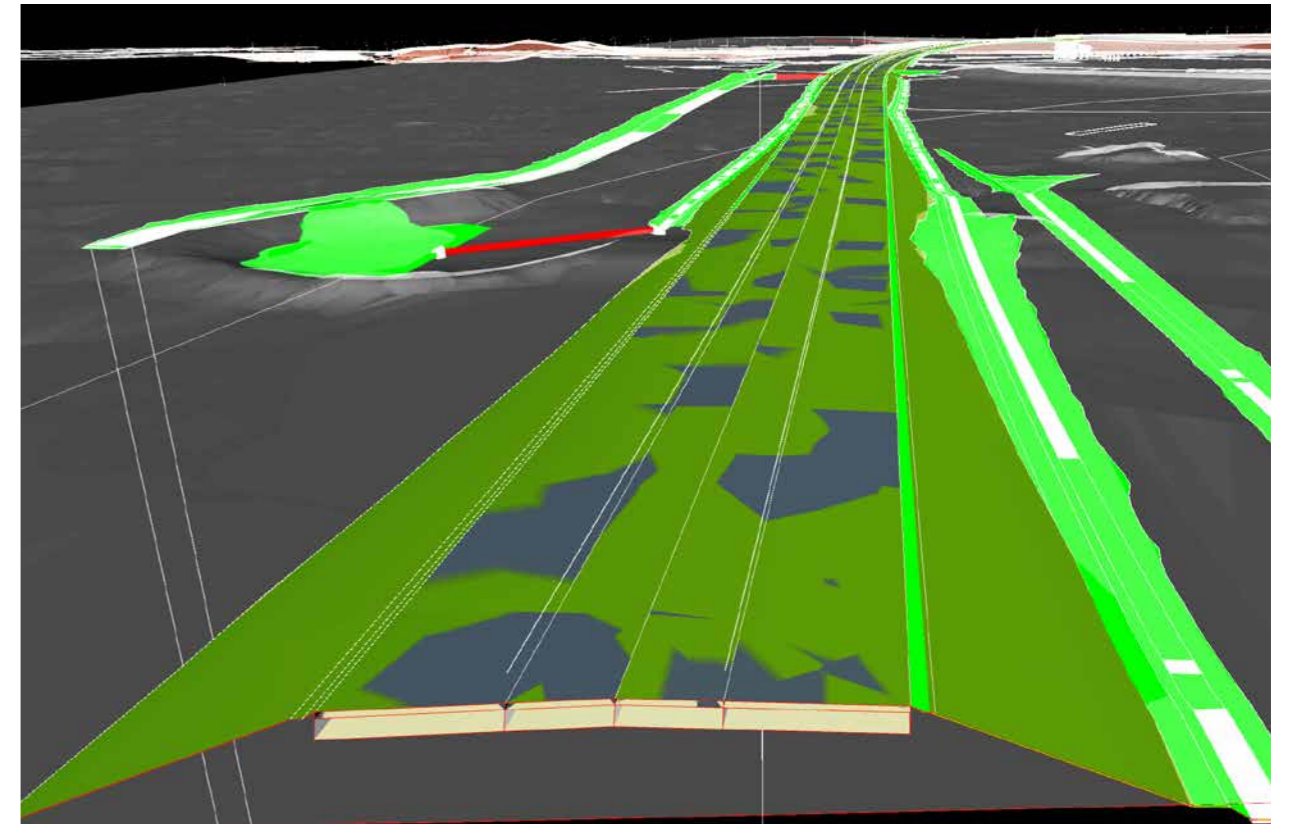


Figure 32 – Typical embankment formation

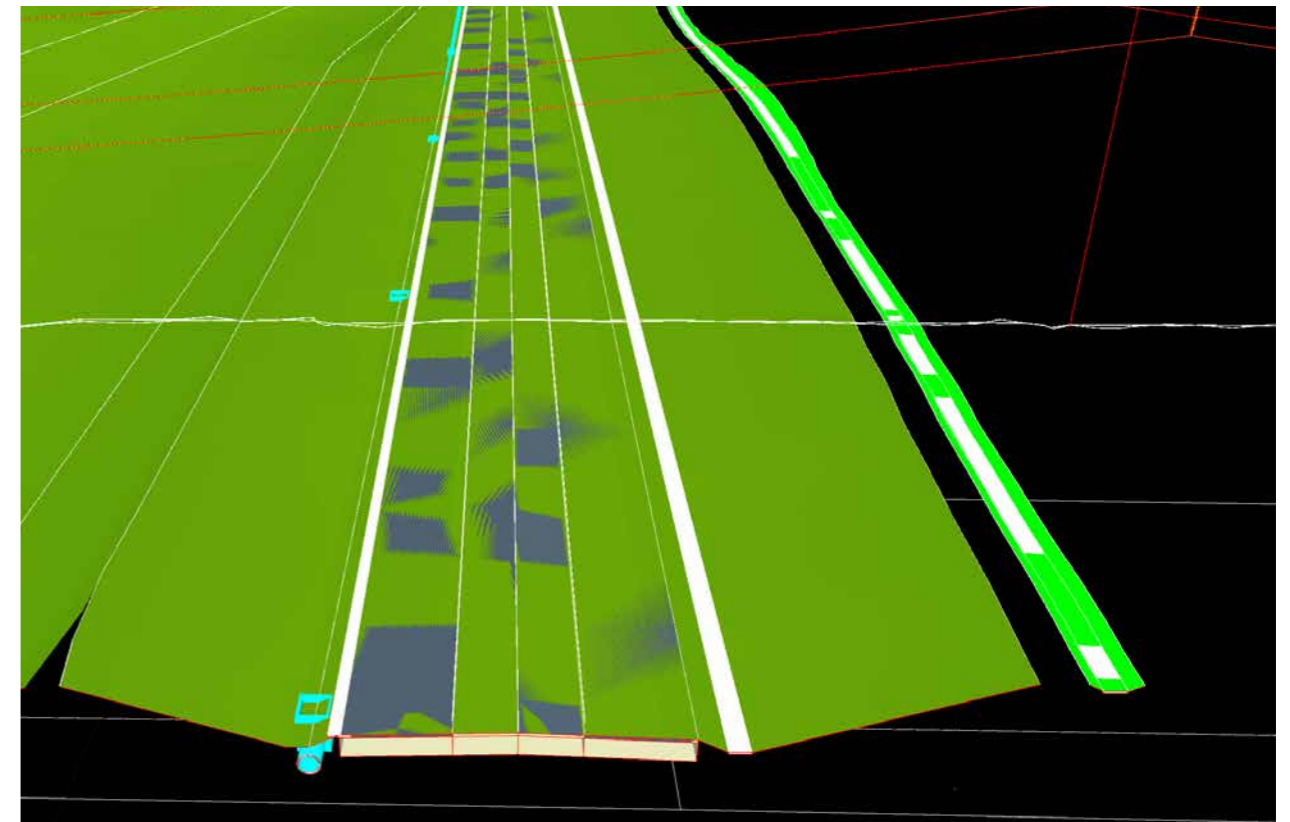


Figure 33– Typical cutting formation

5.2.2 Stabling and Maintenance Facility (SMF)

The SCAW contractor will create the base Stabling and Maintenance Facility (SMF) platform to the geometric requirements specified in the project specifications and reference design, with a connection to the mainline formation works.

Boundary constraints along the eastern perimeter of the SMF footprint have been reviewed and drainage designs configured to work within the space available. The large fill batters around the northern half of the SMF have been examined and the design maximises the placement of topsoil spoil on the fill embankments while still achieving geotechnical compliance.

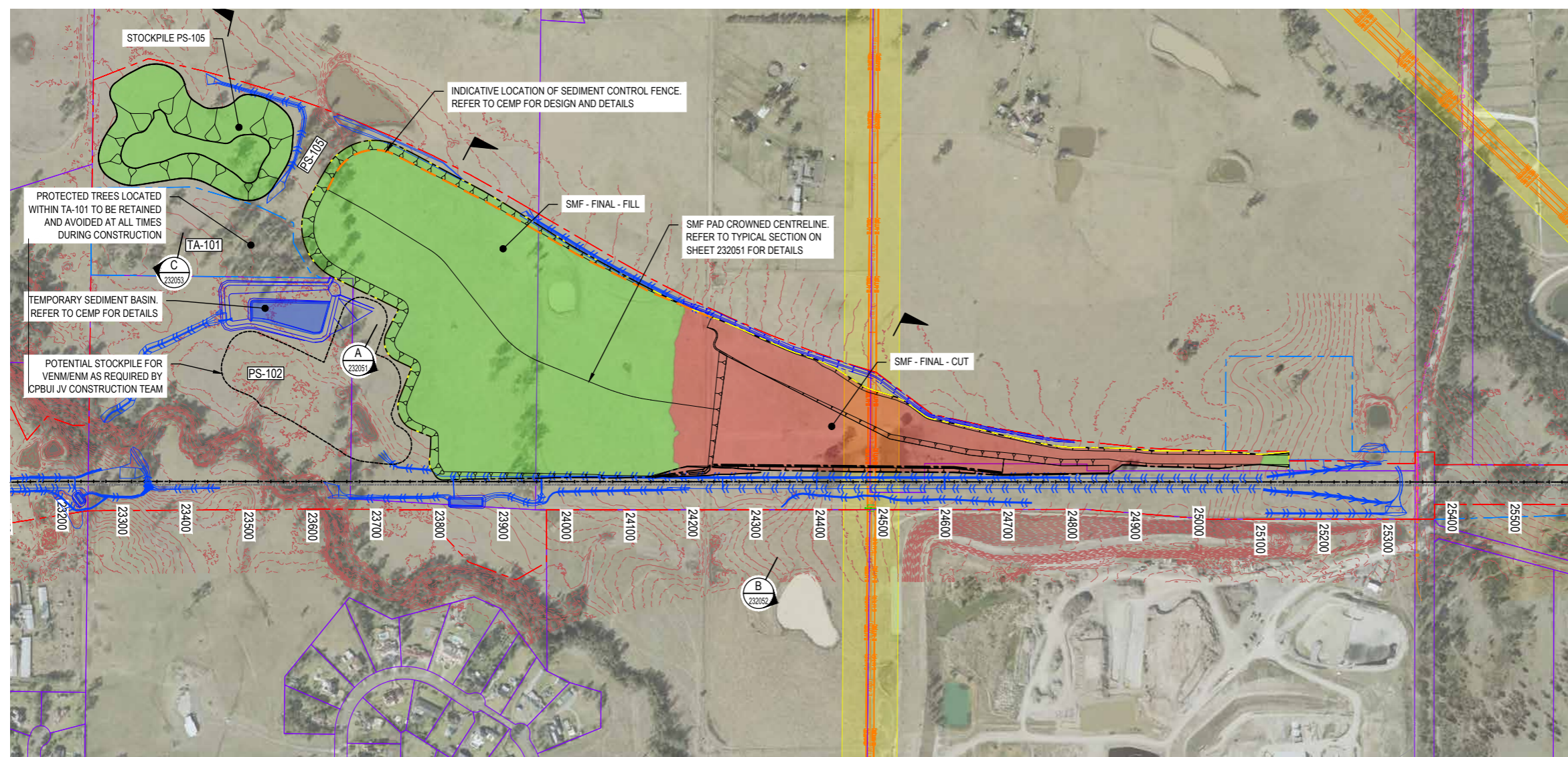


Figure 34 – SMF and Stockpile 105 Earthworks

5.2.3 Stockpile

In accordance with the soil specifications, the first 100mm of weed laden topsoil stripped on the site will be stockpiled and not reused on the project. A site north of the SMF has been nominated as the primary stockpile on the site.

In accordance with the project deed and Planning Approval related to landscaping, visual impact, flooding and drainage, the stockpile will meet the following conditions:

- Not placed within riparian buffer zones as defined by Guidelines for controlled activities on waterfront land riparian corridors and at least 60m from middle of creek, whichever is greater
- Naturally shaped with smooth transitions into the surrounding topography
- Constructed with batter slopes less than or equal to 3 (horizontal) to 1 (vertical)
- Covered by at least 400mm of topsoil to enable revegetation of the native bushlands

The stockpile can accommodate up to 300,000m³ but SCAW is likely to require only 240,000m³ at this site. It is not anticipated that SSTOM will require significantly more stockpiling. This results in a mound with a footprint of approximately 315m x 180m and a maximum height of 10m.

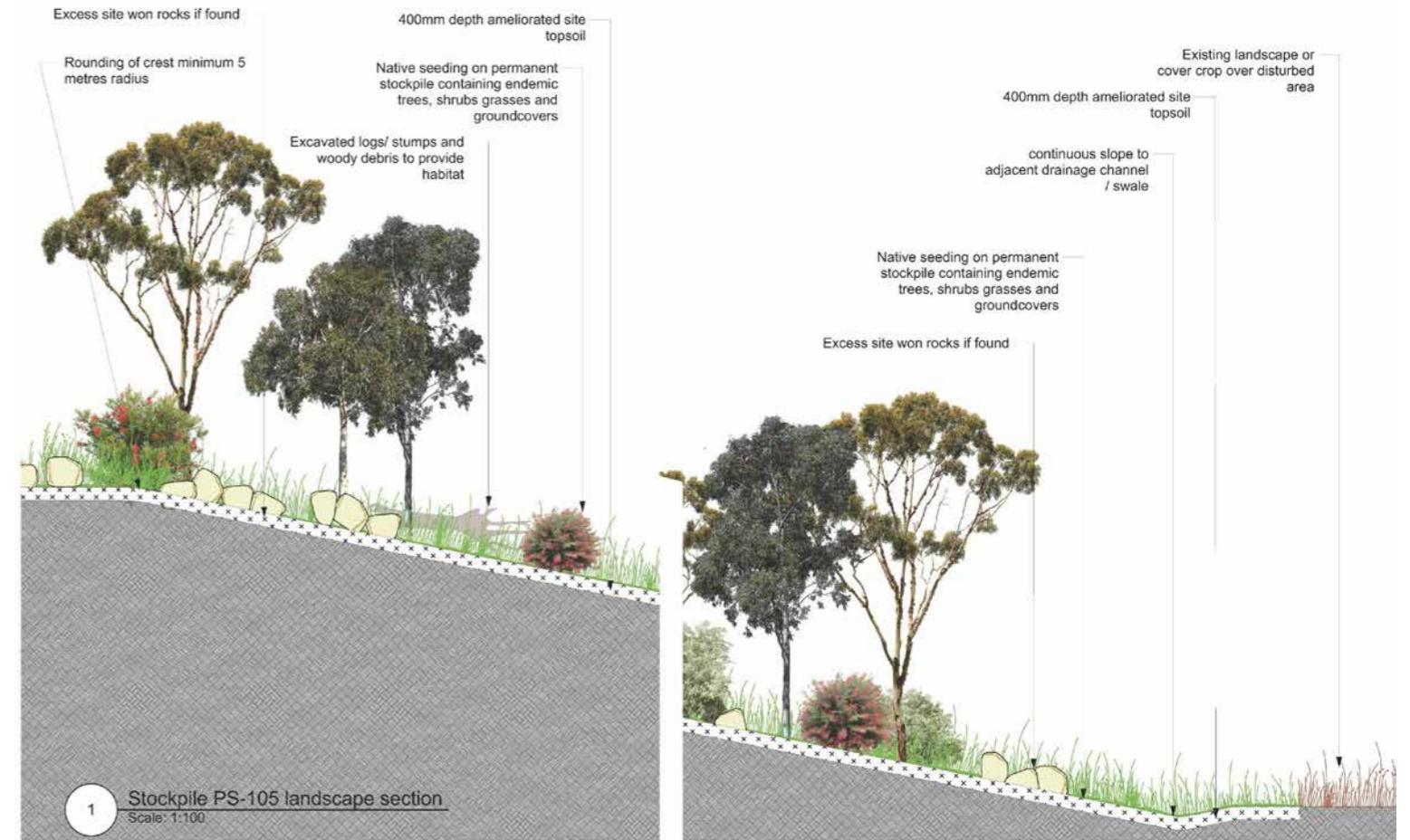


Figure 38 – Stockpile Section

Design Principles

Design principles developed and agreed with Murray – the varied profile, less engineered contours and response to the existing hydrology/honours Ngura and includes her Water Country.

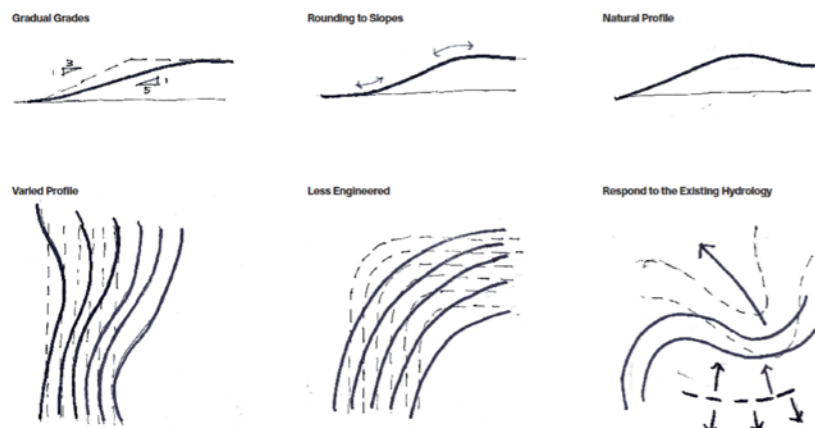


Figure 35 – Stockpile Principles

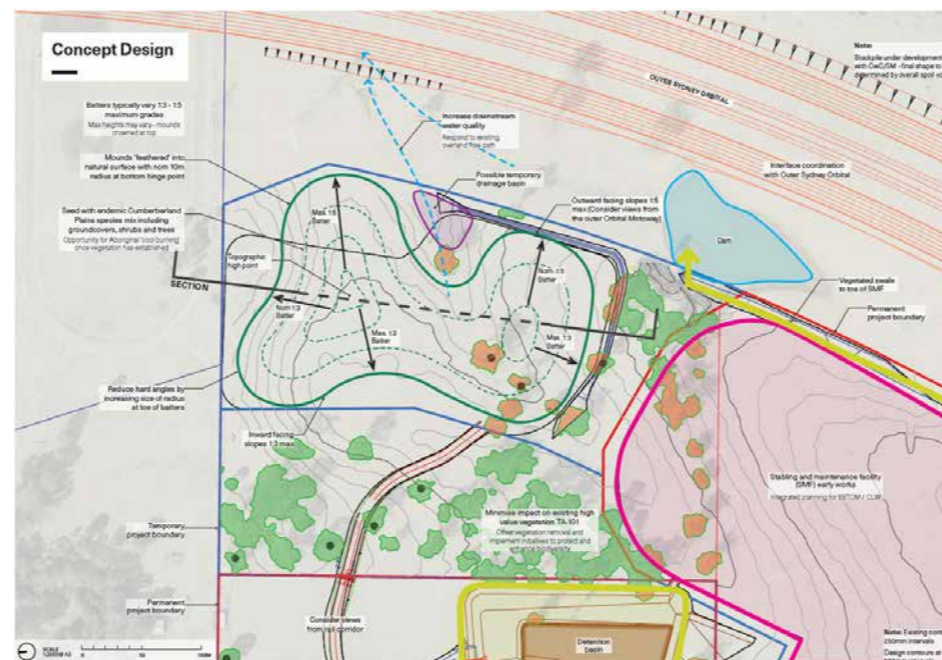


Figure 36 – Stockpile Concept

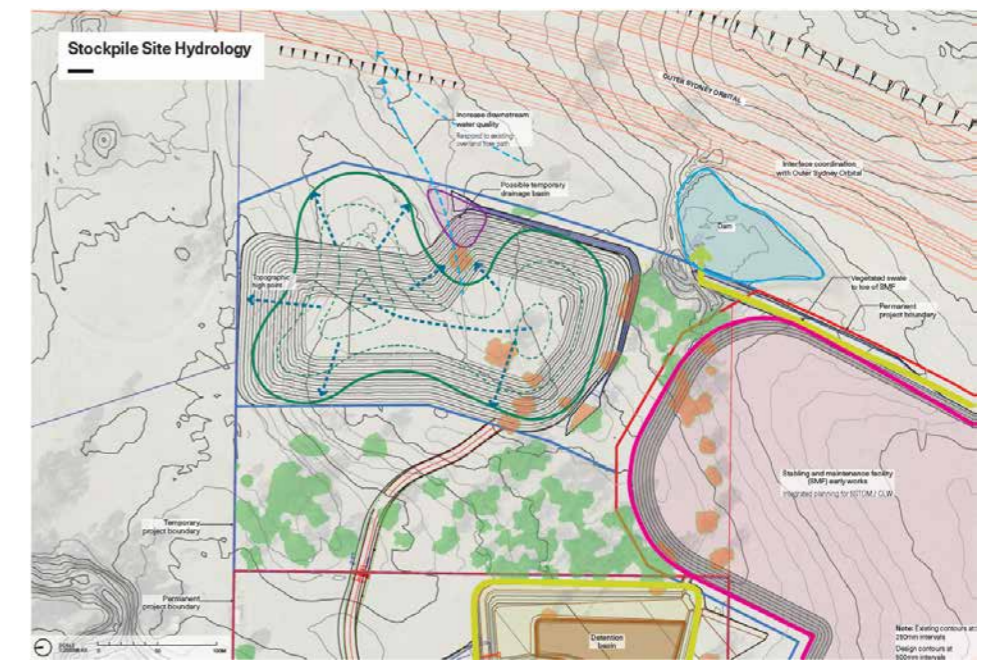


Figure 37 – Stockpile Hydrology

5.3 M12 Bridge

The project includes a bridge across the future M12. The bridge is a seven-span simply supported bridge over 180m. Each span comprises five Super-T girders which allow for a clear span arrangement over the future M12 Motorway, ramps and local access roads.

This bridge superstructure is intended to be built at approximately the same level as the existing ground at the bridge site. The piers and abutment foundations are installed by top-down construction methods. Once the M12 Motorway excavation works are complete, all exposed substructure elements of the bridge structure will be clad with precast concrete cladding panels.

The structure provides 5.4m minimum clearance over the future M12 Carriageway and M12 Eastbound and Westbound Ramps, as well as 4.6m minimum clearance over two local access roads. The bridge supports two standard gauge unballasted tracks, which are attached to track slab and contained by derailment kerbs along the full length of the bridge and adjacent approach slabs.

Parapets are for smooth, off form concrete finish to match the viaducts with elongated rounded (parabolic) noses and panel joints. This stage is achieved when all excavation work is complete, and access provided by the M12 Contractor.

5.4 WSI Drainage Channel Bridge

A small bridge will be constructed across a drainage channel just inside the Western Sydney International Airport site.

This simple plank structure will be finished with a parapet to match the Viaducts and the M12 bridge.

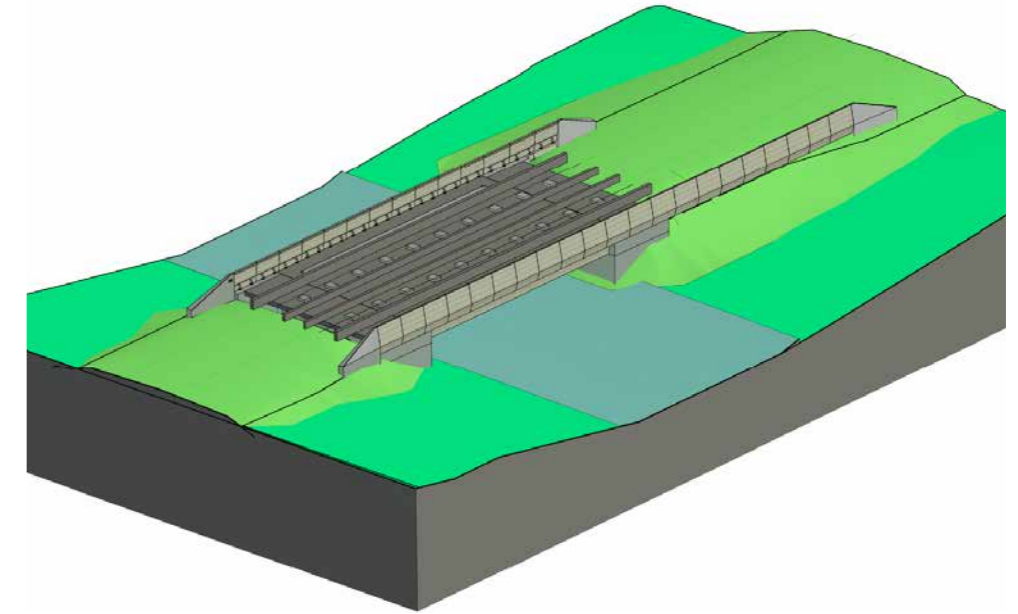


Figure 40 – WSI Drainage Channel Bridge

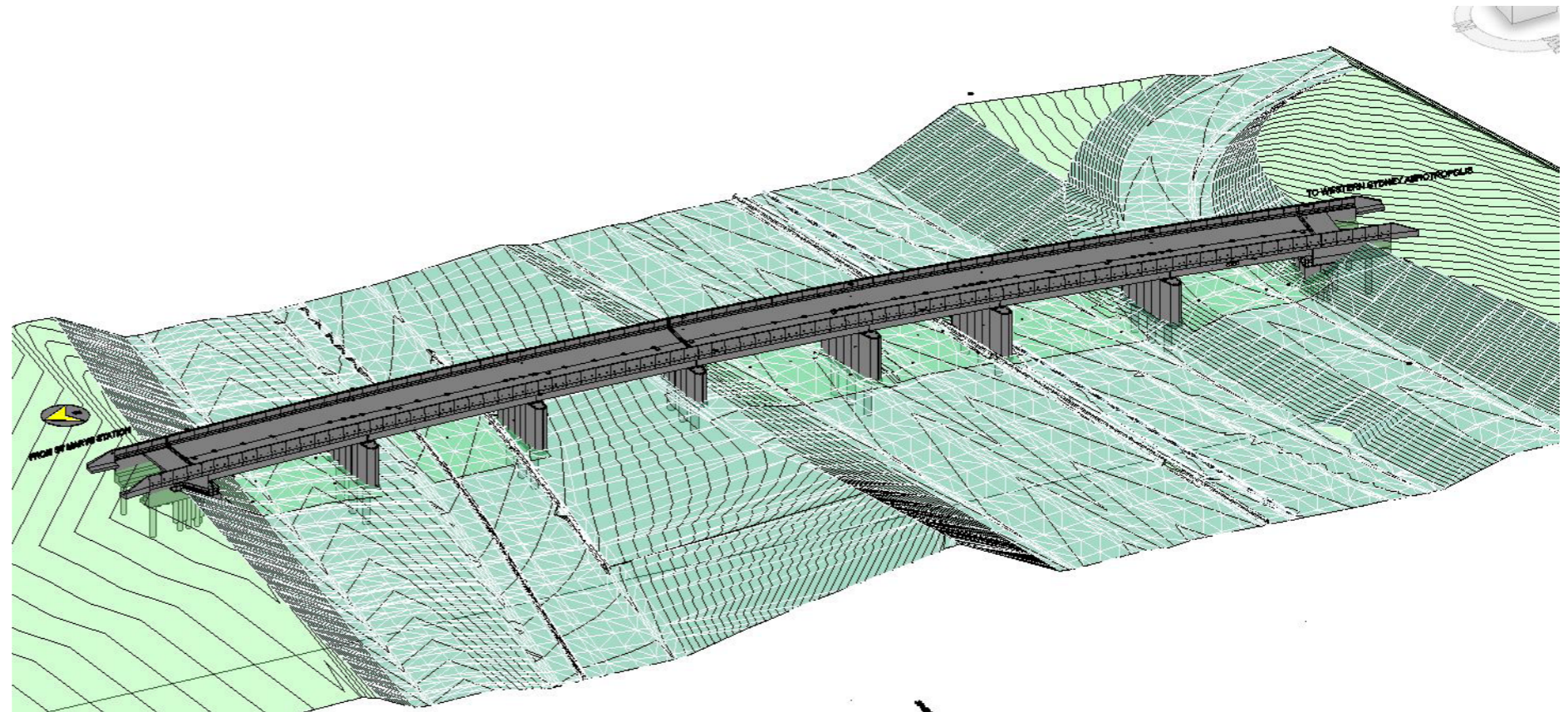


Figure 39 – M12 Bridge

6. Watercourse Crossings and East-West Corridor Movements

6. Watercourse crossings and east-west corridor movements

6.1 Watercourse Crossings

Along the alignment, watercourse crossings and the east-west regional corridor crossing at Patons Lane, have been designed to meet requirements outlined in the Conditions of Approval (Conditions E14 and E78). The design minimises clearing and disturbance of native vegetation and maximises native plant growth under the structures.

Table 10 – Condition E14 Requirements

Requirement		Response
(a) Design of viaducts	The Proponent must design the watercourse crossings and the east-west regional corridor (Patons Lane) crossing to achieve the following objectives:	
i. Connectivity	maintain and/or improve riparian/terrestrial connectivity under the viaduct and bridge structures to maximise the corridor function;	A clear height of 3.6m is generally provided at creek and regional crossings.
ii. Viaduct Span	maximise the viaduct and bridge structures span over the riparian corridor and/or remnant native vegetation whichever is the widest;	The viaduct span has been generally increased from 36m to 40m to minimise the impacts of piers
iii. Vegetation Clearing	minimise the clearing/disturbance of native vegetation and native riparian vegetation; and	The clearing and disturbance of native and riparian vegetation is minimised.
iv. Light and moisture	maximise light and moisture penetration under the viaduct and bridge structures to support native plant growth;	Design the overall width of the structure and the north-south alignment of the viaduct allows morning and afternoon sun to penetrate under the viaduct. Water from the viaduct will be released below the structure to provide moisture to elements in the rain shadow created by the viaduct.
(b) Culverts and crossings	The design of culverts and other crossings incorporates elements are to provide for movement of aquatic and terrestrial fauna,	

i. Fauna Crossings	elevated "dry" cells to encourage terrestrial movement, and recessed "wet" cells to facilitate the movement of aquatic fauna;	In consultation with Sydney Metro's environmental team, a number of fauna crossings will be provided: Wet – one at Blaxland Creek Culvert – two under the formation Viaduct – four nominated crossings below the viaduct
ii. Light penetration	maximise light penetration into the culvert structures;	Culverts are limited by the height of the embankment. Their east-west alignment however means that they will be penetrated by morning and afternoon sun
iii. Fauna Furniture	a naturalised base along the bed of the culvert; and 'fauna furniture' (such as rocks, logs, ropes and ledges) to facilitate fauna movement to maintain connectivity and provide fauna passage;	Dry fauna crossings are designed with "fauna furniture" to assist with movement of animals at culverts and crossings
(c) Scour Protection	design of scour protection using natural solutions such as the revegetation of banks with local native species; and	Hydraulic design has confirmed that no scour protection is needed on vegetated abutments. Rock protection may be used in creeks and this will be complemented by long stemmed plants that resist flood events.
(d) Remnant Vegetation	details of remnant native vegetation including riparian vegetation.	Strategies for protecting and rehabilitating vegetation are detailed below.

Condition E79 requires the PUDCLP to address the design of watercourse crossings and east-west corridor movements. This also a requirement of Condition E14.

Metro's vertical alignment has been designed to clear waterways and facilitate east-west crossings of the alignment. The alignment recognises three creeks that lie in the South Creek network along the corridor:

- Blaxland Creek
- Unnamed Creek
- Cosgroves Creek

The viaduct design has been developed to minimise impacts on the three creeks.

The increase of the viaduct span to 40m avoids piers being located in creeks and increases permeability at ground level through fewer piers. A safe operating viaduct is maintained. Some remedial work will be required where construction work might impact the creek banks and riparian corridors.

Rehabilitation work will be required at the three viaduct crossings. There will also need to be remediation of the haul road bridges at Cosgrove, Unnamed and Blaxland Creeks.

Works will be undertaken by the SCAW contractor unless SSTOM elects to keep the bridges for their system installation.

- Creekline
- Creek Revegetation Areas



Figure 41 – Creek/Pier Interface Blaxland Creek

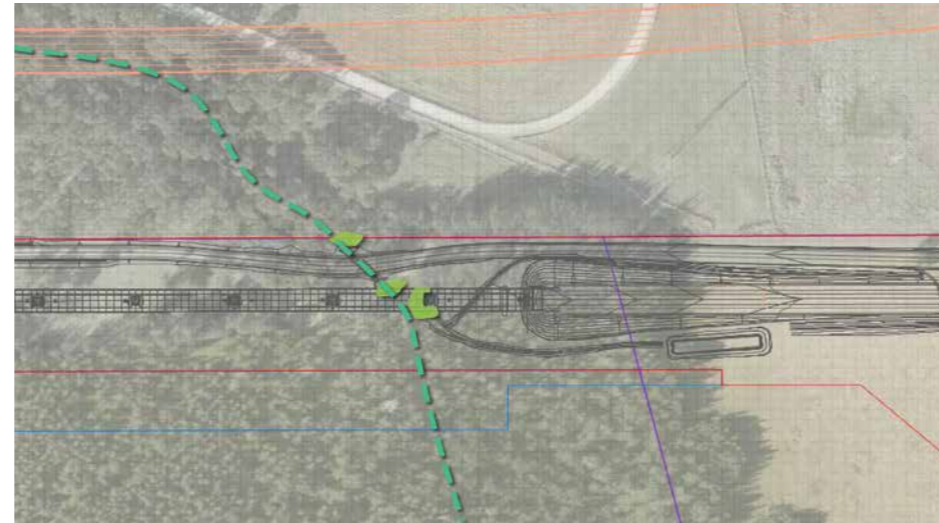


Figure 42 – Creek/Pier Interface Unnamed Creek



Figure 43 – Creek/Pier Interface Cosgroves Creek

6.2 Design of Culverts and Other Crossings to Provide for Movement of Aquatic and Terrestrial Fauna

As part of a strategy to allow east-west fauna movements, eight fauna crossings are proposed;

- 1 x Incidental wet fauna passage culvert at Ch: 22+840. The design provides a three cell, 3 m wide x 1.8 metres high RCBC with wingwalls. This culvert is for hydraulic connectivity and fish passage and includes the stabilisation of outlets with rock protection and riparian planting. CPBUI will consult with Fisheries to confirm the requirements for fish friendly passage design. At this stage, there is no specific furniture proposed. It has not been identified as a required terrestrial fauna crossing.
- 1 x dry fauna passage culvert at Ch: 22+870 (3 x 1.5 metres) (refer to diagrams on following page) at this location SCAW will provide fauna furniture and vegetation including refuge pipes, escape poles and rope crossings where required at the entrances to the crossing, particularly for small and medium sized mammals. Where possible, all the materials used such as logs, leaf litter, rocks etc, will be salvaged from excavation on-site.

- 1 x dry fauna passage culvert at Ch: 26+420 (1.5 x 1.5 metres). At this location SCAW will provide fauna furniture and vegetation including refuge pipes, escape poles and rope crossings where required at the western entrance to the crossing, particularly for small and medium sized mammals. Where possible, all the materials used such as logs, leaf litter, rocks etc, will be salvaged from excavation on-site. The eastern entrance of the culvert crossing is hard up against a haul road which will be handed over to SSTOM, so the crossing at this location will be completed and landscaped by SSTOM.
- 5 x under viaduct crossings. The under-viaduct crossings including tree planting, other vegetation and fauna furniture at these locations where the ground is disturbed by SCAW construction works will be provided by SCAW. Areas beyond the SCAW construction footprint will be completed by SSTOM.

In the first instance, planting at fauna crossings will match the existing vegetation community at the location of the crossing. The final selection of species to be established at each fauna crossing will then be confirmed with the Project Ecologist and species added or deleted as advised.

The design of fauna crossing structures will incorporate the following principles:

- Plantings of appropriate native species that provide habitat for threatened mammals and species consistent with that of the adjacent habitat to attract fauna and landscaping of the habitat corridor approach, not consisting of all rock and not consisting of scour protection
- Strategic revegetation with appropriate native species is to be undertaken to enhance landscape connections to culverts and combined underpasses and to link current isolated patches with potential habitat for threatened species.
- Unobstructed views to, and through the underpass, and strategic tree plantings for fauna refuge. For effective connectivity, the passage should consist of a natural substrate with refuge areas (scattered rocks, logs

Landscape works by CLW will include the various vegetation layers found in woodland communities as well as appropriate furniture to provide for a range of fauna including arboreal mammals.

Measures to assist the landscape establishment at the fauna culvert crossing include:

- Organic fibre mesh pinned to embankments steeper than 3H:1V and topsoiled to a minimum depth of 100mm where the side slope is about 2H:1V and up to 200mm depth where the side slope is about 3H:1V through which tubestock tussocks are planted. The mesh is to cover the embankment for the extent of disturbed ground.
- Site-won rocks of various size from 500-1000 millimetres in natural formation beyond the scour protection zone to assist holding down mesh and for scour protection where the new work interfaces with the existing creek channel.
- Only composted site mulch will be used where the fauna crossing is in the proximity of the riparian zones to prevent tannins from leaching into the waterway.
- Planting of riparian and tussock vegetation species including plants such as *Lomandra* sp. and sedges known to bind embankments and resist erosion at creek crossings and to provide habitat will be planted directly adjacent to the scour protection.
- A fauna escape pole will be located on the embankment out of the main channel and approximately two metres from the end of the headwall.

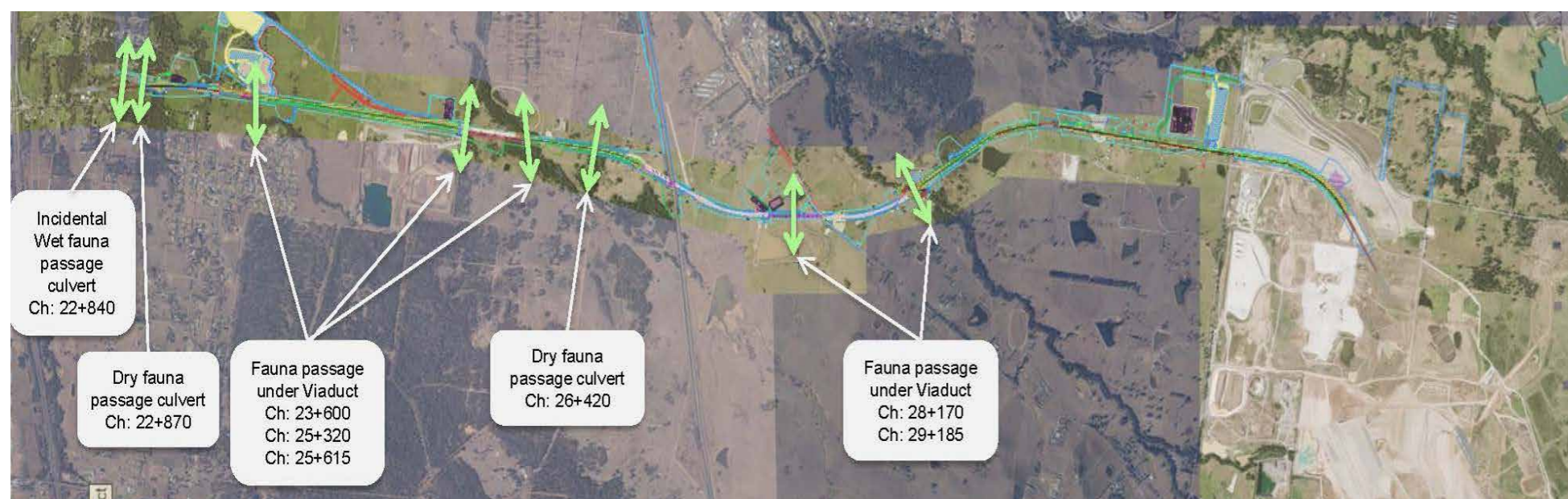


Figure 44 – Fauna Crossing

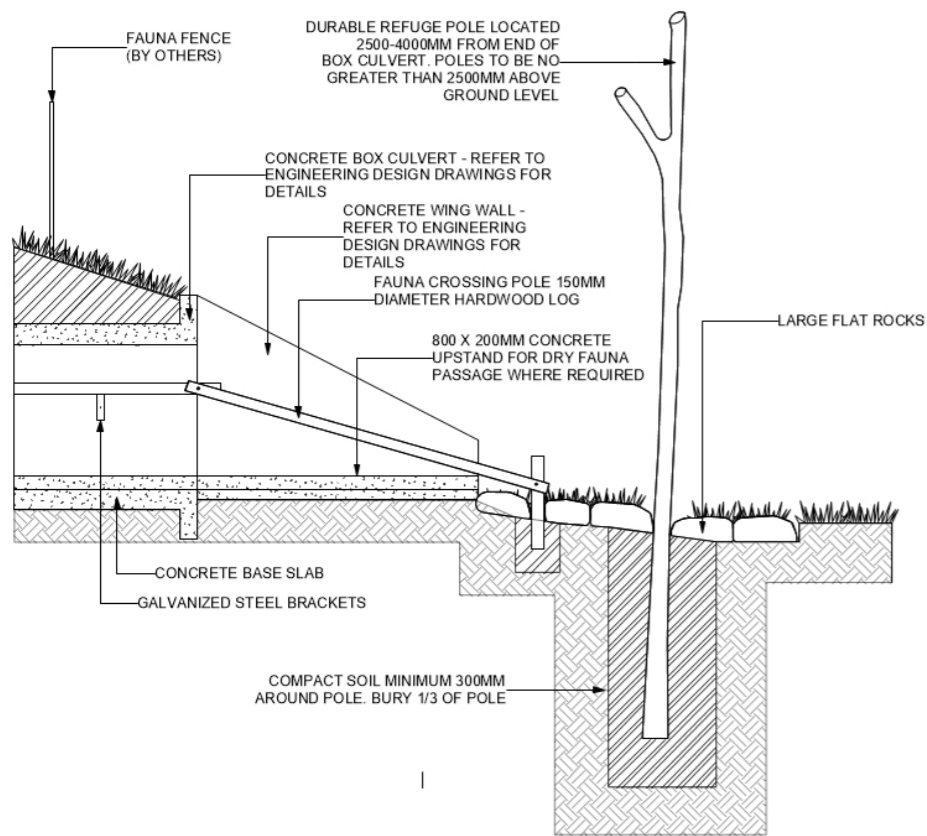


Figure 45 - Indicative box culvert fauna crossing section at chainage 22+870

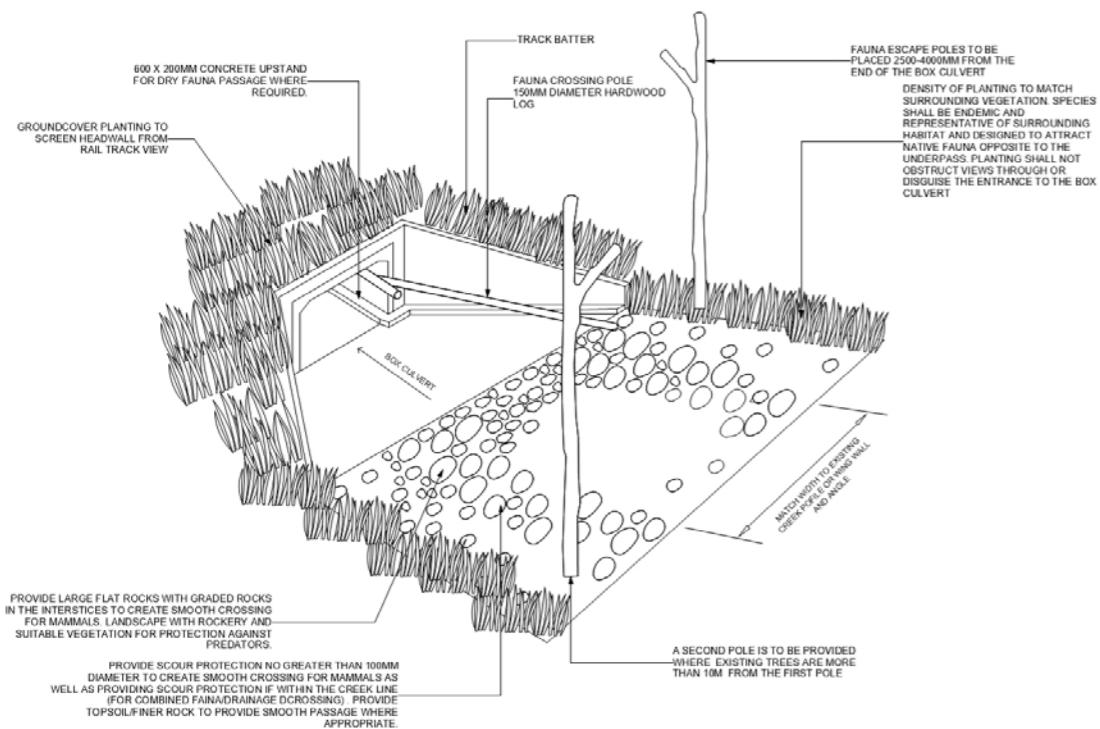


Figure 46 - Indicative box culvert fauna crossing sketch at chainage 22+870

6.3 Design of Scour Protection

Initial concepts included the provision of rock revetments at the spill through abutments.

Further analysis of the flood types and flows have concluded that no scour protection is needed at vegetated abutments where the embankments are at 3:1.

Scour protection may be required in creeks subject to final drainage design. Treatment as shown in Figure 47 will be a naturalised form with planting.

Procedures to avoid works in creeks and channels during rainfall events and the final design for scour protection will be outlined in the Hydrology and Flood Protection Report (to be submitted independently).

6.4 Remnant Native Vegetation and Riparian Vegetation

When land areas are broken up by human interference, native wildlife numbers decrease and can even become endangered.

Connecting ecological corridors can help stabilise wildlife population in three ways:

- **Populate:** animals can move and occupy new areas when food sources or other natural resources are scarce in certain areas. At the same time, this helps pollinators carry on their task to keep the ecosystem alive
- **Migration:** species that relocate seasonally can do so more safely and effectively, giving them a higher chance to survive and carry on with the next generation
- **Wildlife Integration:** animals can find new mates in neighbouring regions so that genetic diversity can increase and thus have a positive impact on the overall

The project crosses Cosgroves Creek, Unnamed Creek, Blaxland Creek and a tributary of Blaxland Creek, all of which feed into South Creek to the east. The historic removal of native planting along these creek lines for agricultural uses has left most of the creeks with only a narrow fringe of native vegetation along the rim of semi-eroded banks.

The reduction in native vegetation has led to higher levels of erosion, a rising water table and salinity in the soil along with a decrease in biodiversity and habitat provision for local fauna.

As a requirement of Conditions of Approval E79(f) to include details of strategies to rehabilitate, regenerate or revegetate disturbed areas, the following describes the Project for riparian zones.

The priority for creeks crossed by the alignment will be to leave them undisturbed by construction works where feasible and to minimize disturbance. Undisturbed riparian areas will be protected.

Where creeks are disturbed by construction (for example at some viaduct pier locations and at haul road crossings), they will be rehabilitated to return the creek to their former condition and to maximise wildlife habitat connectivity. The riparian zone will be rehabilitated for the full extent of the construction disturbance.

Appropriate landscape design principles for watercourses include;

- Use a diverse suite of endemic Cumberland Plain woodland species that are highly adapted to the challenges of hydromorphic structured vegetation along creeks and lower terraces.
- Use species that establish and will consolidate banks early at a high cover rate to reduce the opportunity for weed intrusion
- Maximise the on-going potential for natural colonisation of the planted species and adjacent existing vegetation
- Create naturalistic meanders and upper terraces.
- Maximise in-channel storage
- Spread the water out into slow flowing shallow sheets where feasible
- Design of scour protection using natural solutions including organic fibre mesh, site won rock and snags Retain as much permanent water storage in the landscape as possible for fish, turtles, frogs, yabbies and to assist with heat island cooling

The creeks include from north to south (with their corresponding vegetation community in parentheses);

- Tributary of Blaxland Creek (PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats)
- Blaxland Creek (PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats)
- Unnamed Creek (PCT 1800 - Swamp Oak open forest on riverflats)
- Cosgroves Creek (PCT 1800 - Swamp Oak open forest on riverflats)

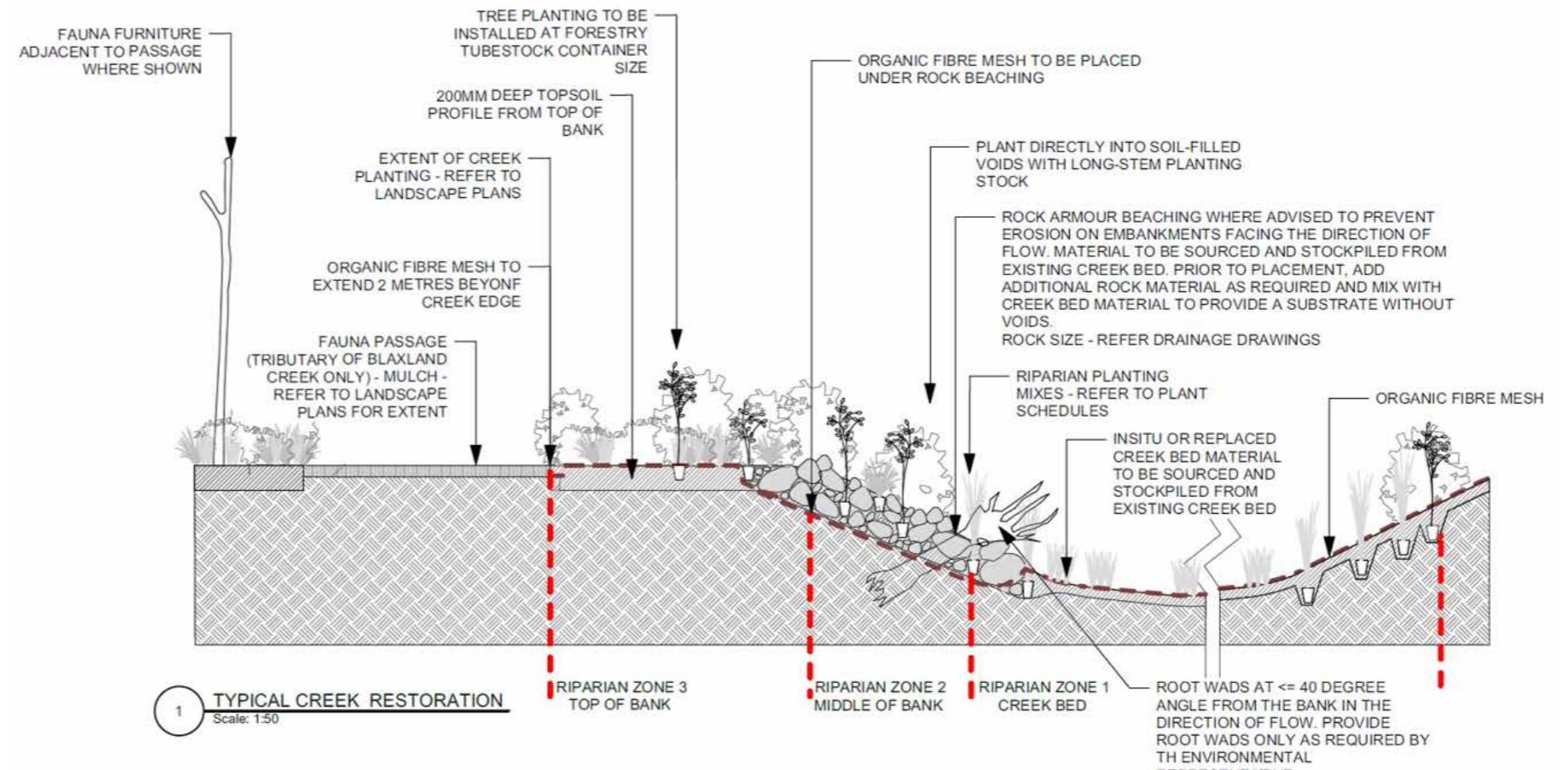


Figure 47 - Riparian Vegetation

The planting mix at each location where riparian rehabilitation is required will be selected from the extant plant community at that location and will be informed by the pre-clearance vegetation survey. Generally, riparian species will be planted directly into the in-situ or replaced creek bed material and on embankments which have been topsoiled if required.

Long-stem planting stock will be used to assist newly planted tubestock to resist being dislodged by high flows and floods. Tubestock will be planted with about three quarters of their length below the soil surface, which results in much of the woody stem being covered with soil. The deep planting protects the roots from substantial changes in soil temperature, allows the plant access to deeper soil moisture and reduces competition from weeds. Once planted, the seedling develops roots from the buried stem and leaf nodes. This promotes the development of a robust root network which gives the seedling a greater chance of survival.

Only long-stem planting will be used within the 5-year average flood extent. The full extent of the low-flow channel and riparian benches to the uppermost bank are to be lined with organic fibre mesh. Rock beaching and snags – both materials salvaged from on-site - will be incorporated within the creek bed and inset benches to prevent erosion on the embankments facing the direction of flow.

Where the soil material on the slopes of the creek cannot be readily planted into, for instance if it is comprised of substantial cobble, then provision will be made for the installation of 200mm-300mm depth of topsoil to each plant to facilitate planting. Any special fertiliser or amendment required in the planting hole, for instance low phosphorus fertiliser to discourage weeds, will be as advised by the projects soils specialist.

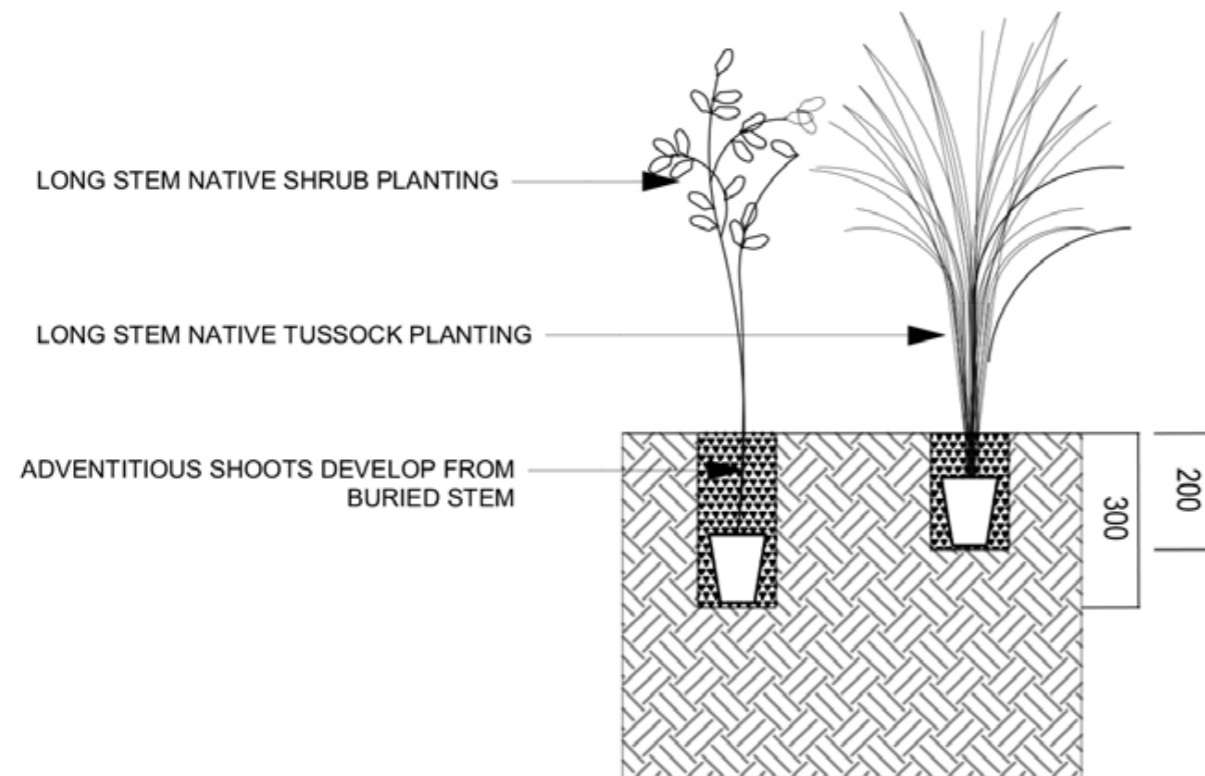


Figure 48: Long-stem Planting

7. Landscape

7. Landscape

7.1 Landscape Structure

7.1.1 Site Context

Geology

The soils of the Cumberland Plain have been made gently, with fine particulates that travelled in solution from up stream and were finally allowed to rest in the sinuous creek-lines and flooded plains of a river delta. Bringelly shale - a Liverpool sub-group - is one of a number of shales in the Wianamatta group that were formed this way in the triassic period. Our shale-derived soils and undulating landscape contrasts with the relatively infertile soils of the rugged sandstone plateaus.

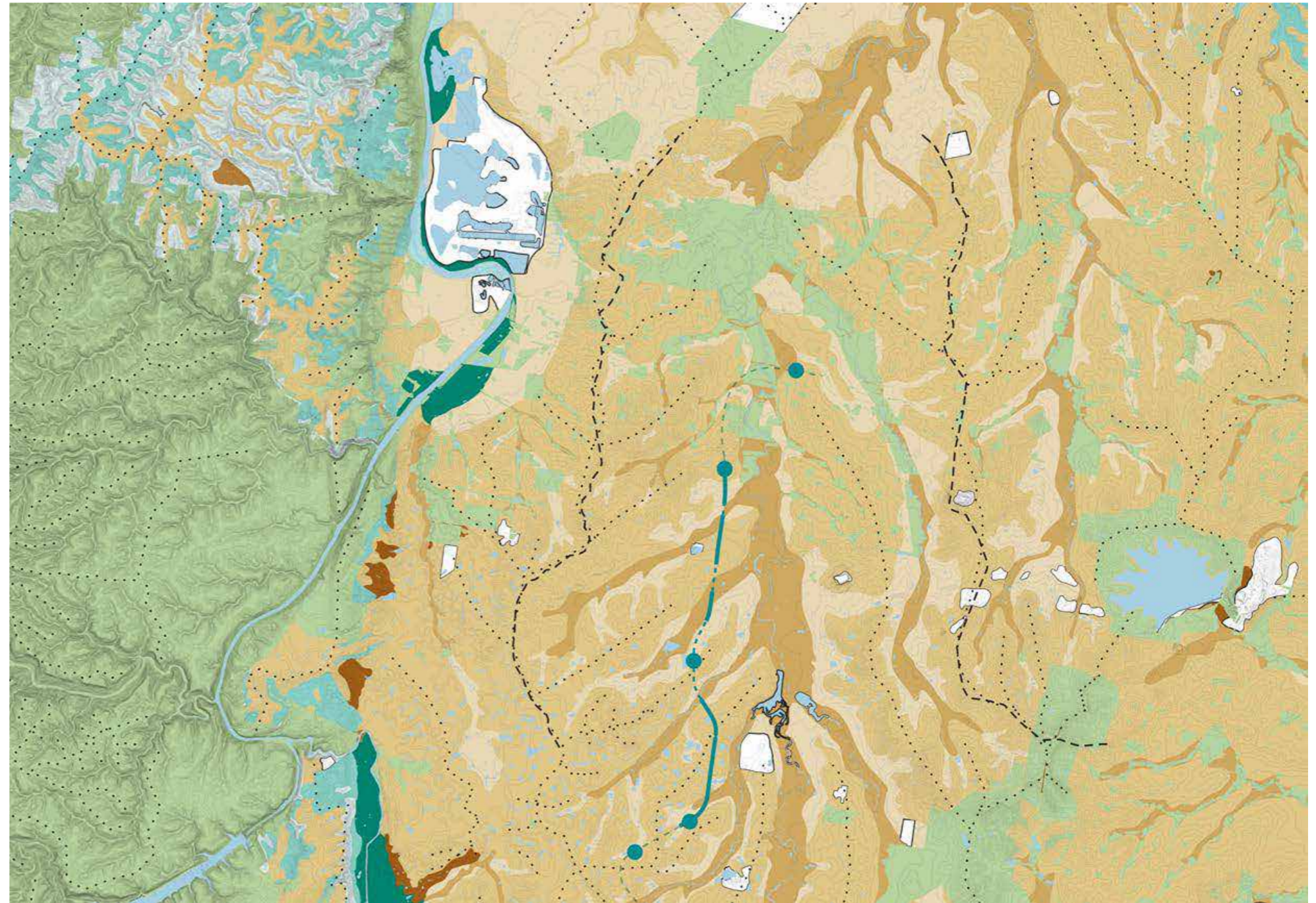
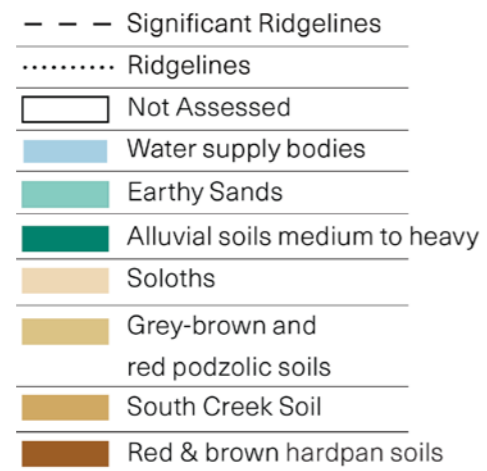


Figure 49 – Site Geology

Topography

The gently undulating Cumberland Plain is framed by the Blue Mountains rising to the west.

The countryside with its shale-derived soils contrasts with the ruggedness of the surrounding sandstone plateaus.

Suburban development and industry have transformed the landscape as it can be reshaped with relative ease.

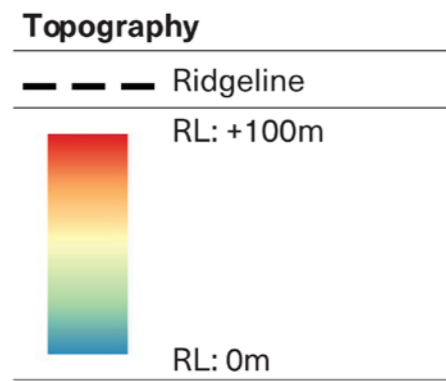


Figure 50 – Site Topography

Hydrology

The site lies in the Hawkesbury-Nepean area which covers around 500 square kilometres from Bents Basin, near Wallacia, to the Brooklyn Bridge on the Hawkesbury River in the north. Most of this broad shallow basin receives less than 800mm of rainfall per year.

The valley has the highest flood exposure in NSW because of its unique landscape and large existing population. Floods in the valley can be very deep and extensive, and can have a significant impact on people's lives, livelihoods and homes.

The Metro corridor crosses three creeks: Blaxland Creek, Unnamed Creek and Cosgroves Creek, all of which flow into the Wianamatta or South Creek. This watercourse rises approximately 4km north east of Narellan and 7km west of Minto and flows north for 70km until its waters join the Hawkesbury River, near Windsor.

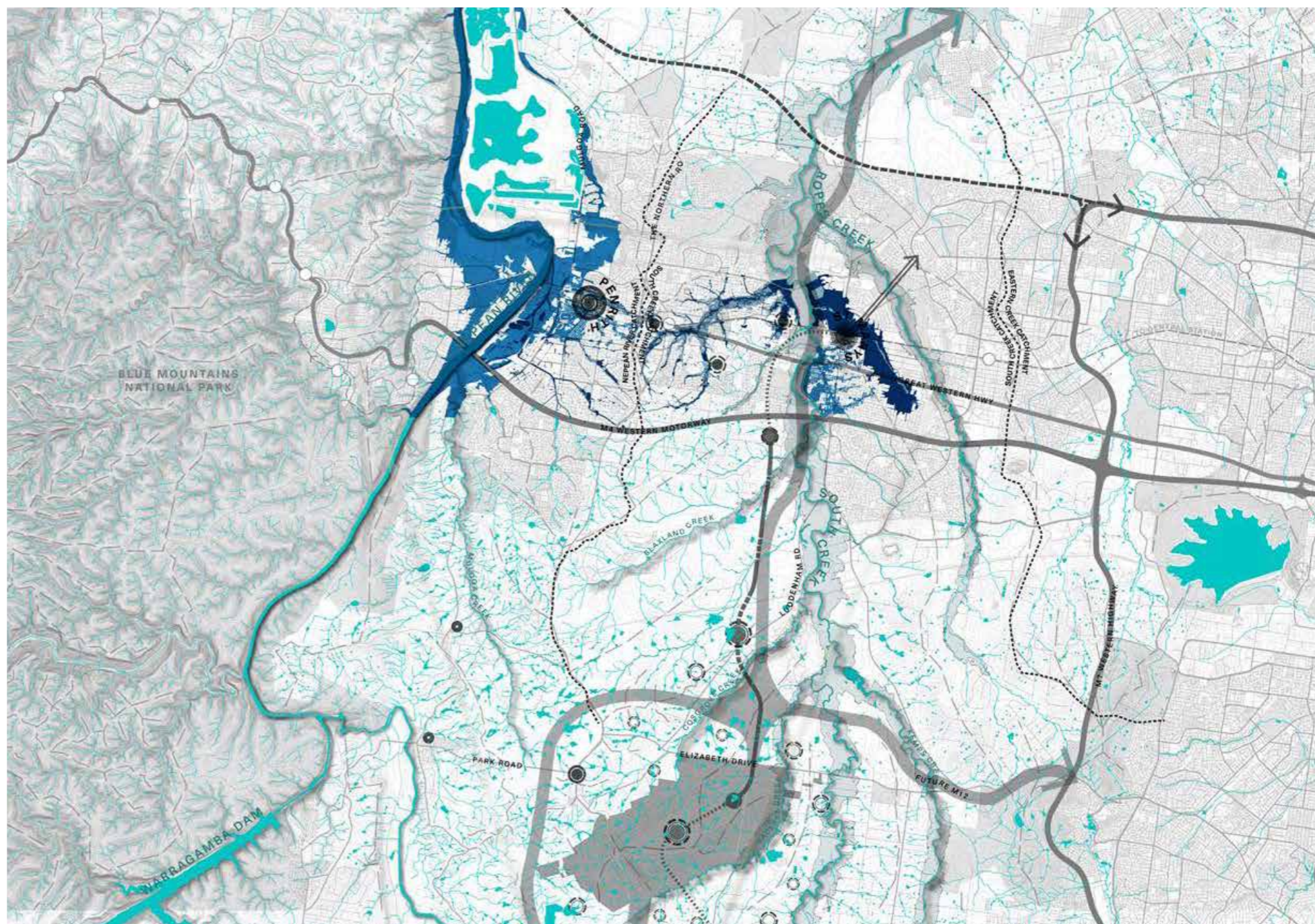
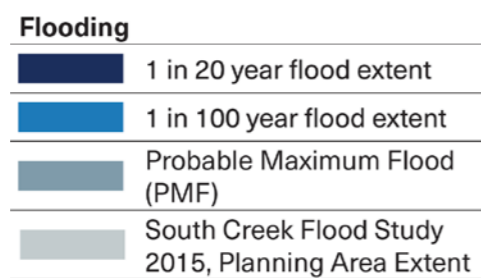


Figure 51 – Site Hydrology

Ecology

The vegetation communities across the Cumberland Plains are diverse and vary due to soil types, landform and drainage. High clearing rates with poor connectivity between remnant vegetation have caused a loss of habitat and biodiversity.

The biodiversity of the Cumberland Plain in western Sydney is among the most threatened in NSW and has been identified as a priority for conservation.

Lack of protective plant cover is the primary cause of erosion by water or wind. Grazing on fine grained shales can have a particular devastating affect, compacting soils resulting in poor water infiltration and increased runoff.

Riparian land - areas close to waterways, dams and wetlands - is generally highly productive and therefore often cleared and used intensively. Remaining creeklines are often fringed only with a minimal depth of trees and planting and are often dominated by weed species. Over clearing results in heavy rains moving quickly over the surface causing flooding, stripping of topsoil and accelerated erosion to the banks of waterways.

Revegetation with deep rooted endemic species can help minimise flood, contain nutrients and help lower water tables.

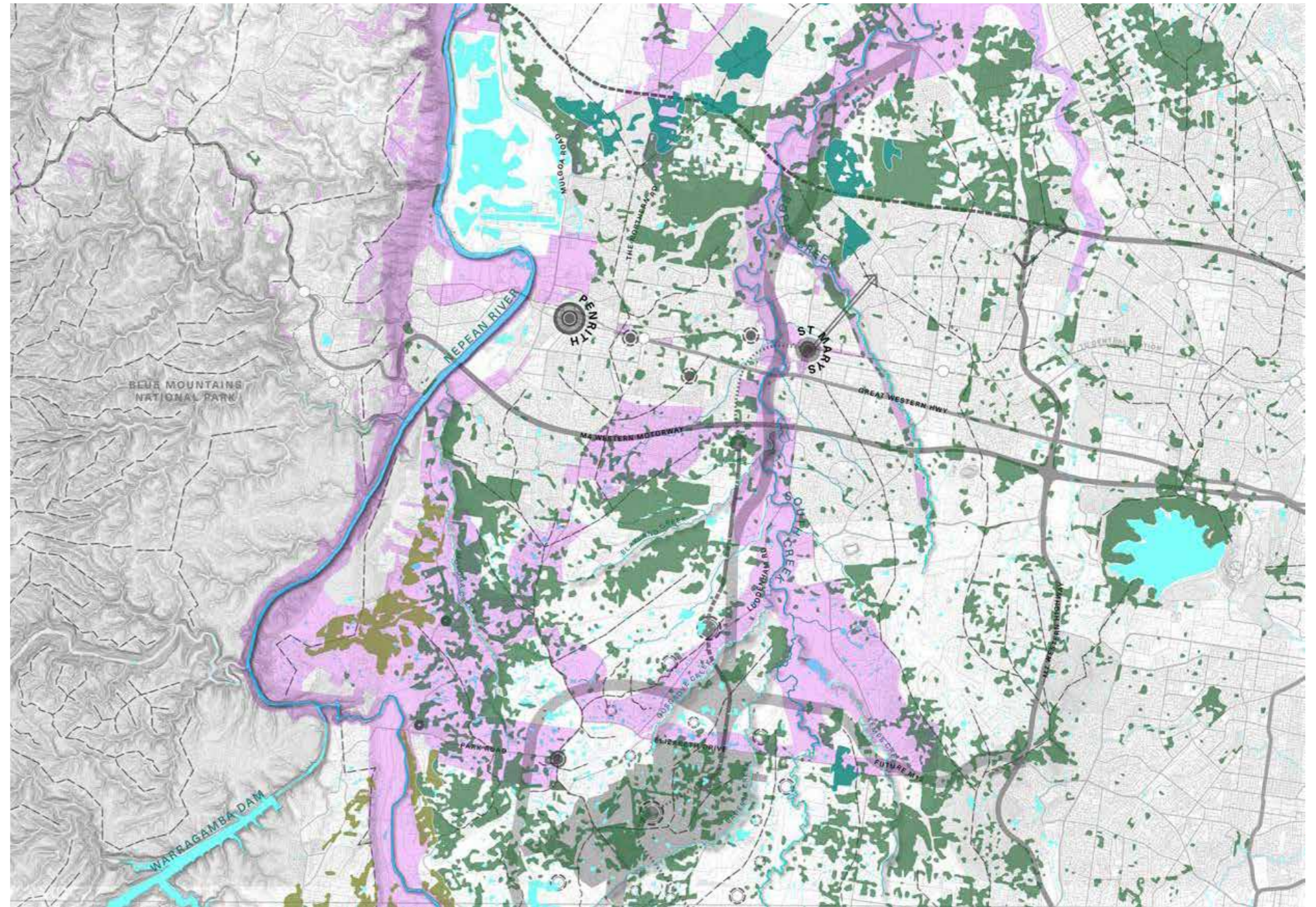
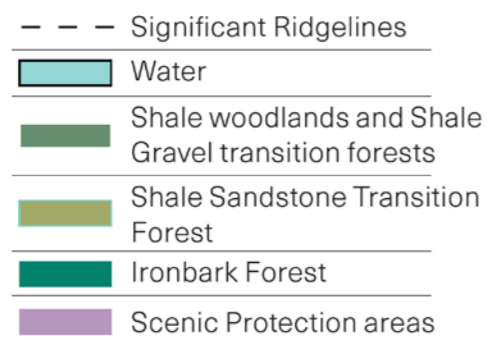


Figure 52 – Site Ecology

7.1.2 Landscape Including Hard and Soft Elements

Landscape Principles

SCAW is the enabling works package for the Western Sydney Airport Metro between Orchard Hills and Western Sydney Airport. Approximately 10.6 km of elevated viaducts and battered landscapes are set on the gently undulating landscape of the Cumberland Plains. Crossing three creeks and some smaller tributaries, this landscape captures rainwater that ultimately feeds into Winnamatta - South Creek.

Only remnant patches of vegetation remain of the threatened ecological communities that once covered the plains.

A Landscape Led Approach

Sydney Metro have designed a landscape strategy that departs from conventional landscape implementation on large infrastructure projects. The landscape strategy is one that is able to achieve the ecological outcomes through an holistic adaptive/flexible approach that can respond to existing and found site conditions following completion of civil construction.

For this reason, the SCAW stage of the project focusses on best practice earthworks, topsoils and stabilisation strategies which will provide the groundwork for the future SSTOM phase and Corridor Landscape Works (CLW) with specialist skills and experience in the rehabilitation of Cumberland Plain woodland ecologies who will complete the landscape restoration.

However certain areas of the project will have a final landscape treatment implemented during the SCAW phase. This is to reduce further impacts to these areas because of machinery and personnel encroachment and also to provide the permanent stabilisation solution in areas that are at higher risk from erosive forces.

These areas include.

- Rail embankments
- Under viaduct areas
- Creek crossings disturbed by construction
- Permanent drainage swales
- Water quality basin outer slopes
- The permanent stockpile (PS105)
- Fauna culvert crossings and under viaduct passages not affected by handover works (eg; haul roads).

SCAW landscape design seeks to minimise 'hard engineering' elements and enable opportunities for natural systems to flourish, provide habitat and enhance biodiversity.

With a subtle manipulation of landform we seek to create an extension of the rolling hills of the Cumberland Plains in a way that captures and filters water, provides increased habitat and through extensive use of native seeding and planting, begins reconstruction of a threatened ecology.

We believe healthy landscapes = healthy ecosystems = healthy people = healthy community.

Landscape Scope

The Sydney Metro SCAW design objectives support an integrated approach that places a high value on an enduring landscape and strong connection to country. Overall objectives are to:

- Develop a collaborative and integrated design approach to deliver high-quality outcomes
- Minimise impacts on the environment, including but not limited to, biodiversity, noise and vibration, air quality, traffic and transport, heritage, waste, water and energy management and embodied environmental impacts such as flooding, scour and sedimentation
- Maximise opportunities in relation to social sustainability
- Deliver durable, long-lasting and safe solutions that minimise on-going maintenance

An holistic landscape approach aims to minimise impacts on the natural environment and surrounding communities, while providing a basis for increased ecological benefits and supporting a strong connection to Country. The overall landscape objectives are:

- Contribute to the restoration of the natural qualities of the South Creek corridor
- Corridor landscape design will be an important component of the public identity of SM-WSA
- Corridor will contribute to revegetation of South Creek catchment and to an increase in Sydney's urban tree canopy and create a high level of amenity
- Landscape design to restore the natural ecology, based upon Cumberland Plain Woodland plant communities
- Green Infrastructure targets including 100% endemic vegetation

The overall permanent landscape will largely be delivered by the SSTOM and CLW contractors. Table 11 below outlines the SCAW landscape scope and responsibilities. This breakdown of landscape scope and responsibilities is illustrated in the indicative sections on the following page.

Table 11 – SCAW Landscape Responsibilities

Landscape Type	SCAW	SSTOM / CLW (Assumed)
Pre-Clearance Vegetation Survey	Prepare a tree survey undertaken during detail design identifying the number, type and location of any trees to be removed.	Provide a net increase in the number of trees at a ratio of 2:1 except trees offset under Condition E4
Minimise Clearing	Provide support and advice to the project team in order to minimize the impact and clearing of existing native vegetation.	Nil
Seed collection	Share pre-clearing survey information with the project's seed collection contractor and the Corridor Landscape Contractor. Provide access to the Project's seed collection contractor to maximise the opportunity to preserve native seeds suitable for collection	Nil - by seed collection contractor in parallel to SCAW construction activities
Topsoils	Prepare site topsoil for re-use as a landscape soil mix for use by SCAW. Remainder site topsoil to be stockpiled appropriately for amelioration and re-use by SSTOM	Ameliorate quantity of site topsoil required by the SSTOM /CLW landscape works
Plant Species selection	Select species from the extant vegetation communities for rehabilitation of SCAW landscape areas	Select species for rehabilitation of SSTOM /CLW landscape areas
Rail embankments and cuttings	Cut and fill batter preparation, topsoiling to 200mm depth and stabilization seeding via hydromulching with cover crop at the rate of 30kg/ha and native seeding at the rate of 9kg/ha	Nil except possible supplementary planting for biodiversity as required
Biofiltration basins and swales	Outside batter and crest preparation, topsoiling and stabilization seeding via hydromulching with cover crop at the rate of 30kg/ha and native seeding at the rate of 9kg/ha	Final planting/seeding and establishment of swales and basins inner slopes
Permanent vegetated swales/ channels	Batter preparation, Topsoiling and stabilization seeding via hydromulching with cover crop at the rate of 30kg/ha and native seeding at the rate of 9kg/ha	Maintenance
Viaduct piers construction area	Preparation, topsoiling and stabilization seeding via hydromulching with cover crop at the rate of 30kg/ha and native seeding at the rate of 9kg/ha	Maintenance
Riparian zones / Watercourse crossings	Rehabilitate the creek to its former condition where disturbed by construction using endemic long stem tubestock planting and stabilization techniques using site rocks, jute mesh, snags etc.	Restoration of riparian zones not disturbed by construction
Fauna Crossing	Rehabilitate the entrances of the culvert crossings with suitable surfaces, planting and fauna furniture, where not impacted by handover works.	Completed fauna fencing, fauna furniture and landscaping of under viaduct and culvert fauna crossings implemented under the SSTOM /CLW Package.
Permanent stockpile sites	Preparation, topsoiling and stabilization seeding via hydromulching with cover crop at the rate of 30kg/ha and native seeding at the rate of 9kg/ha	Restoration of those areas of stockpiles amended or required by SSTOM /CLW
Viaduct abutments	Design for abutment 3:1 surface treatment and 3:1 transition	Maintenance
Temporary landscape areas	(Eg: Haul road batter slopes). Preparation, topsoiling and stabilization seeding via hydromulching with cover crop at the rate of 50kg/ha	Final planting/seeding and establishment

Many locations along the corridor are previously disturbed environments associated with agriculture, while other locations feature remnant vegetation particularly in proximity to riparian corridors. The design is the first step in rehabilitating these corridors, which are critical to the health of creek systems and associated flora and fauna:

The design has been developed in spirit of collaboration grounded in an approach that cares for Country. Murawin have offered guidance on protocols and expectations when working on Dharug Country. Our aim is to leave Country we affect with more growth, cleaner water and greater habitat as a result of our work.

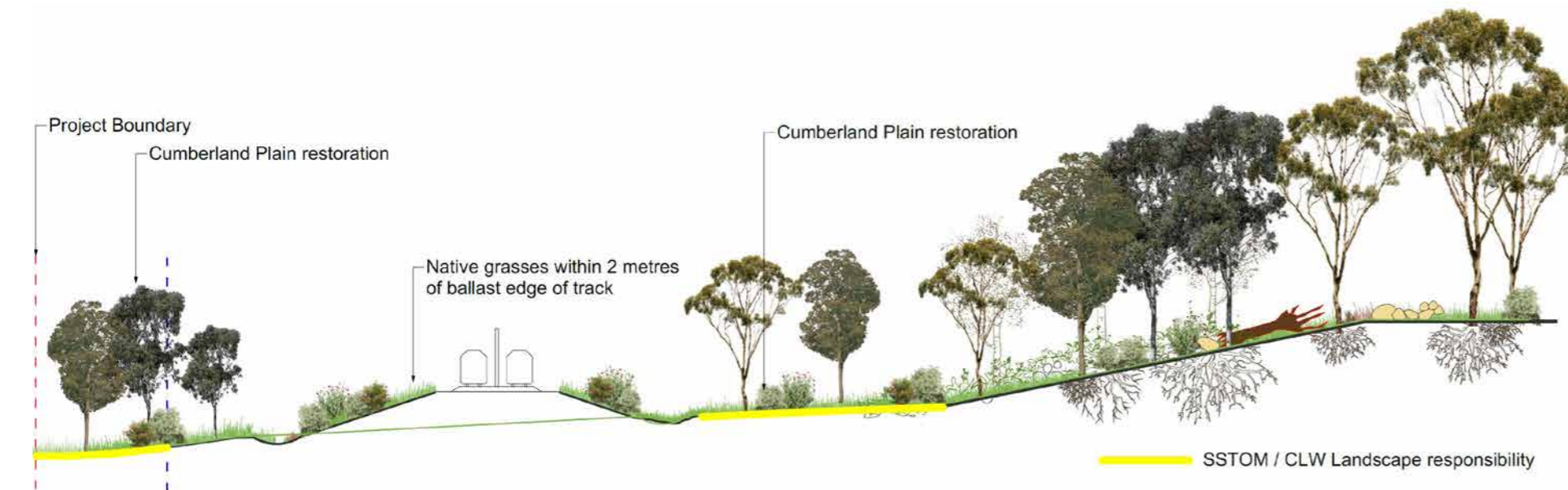
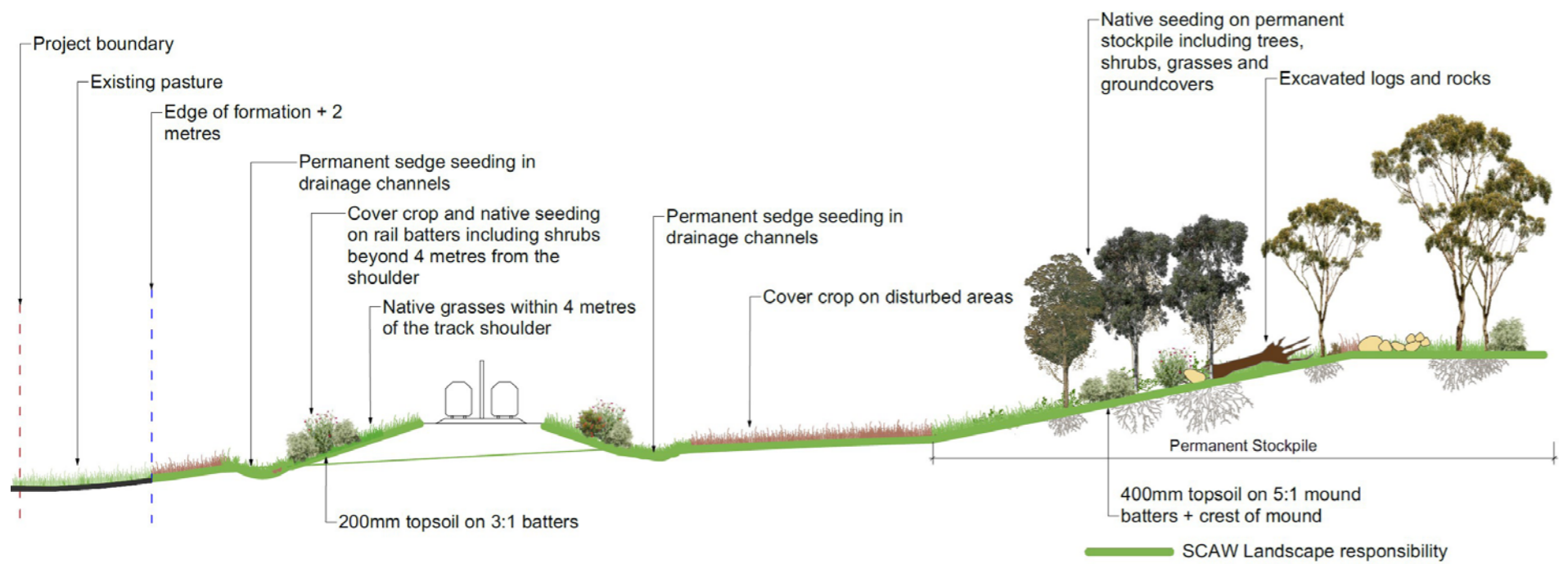


Figure 53 – Landscape Responsibilities

Soils

Over 100 years of grazing and agricultural uses across the corridor has led to the introduction of weeds and the degradation of soils, and the enabling works package will involve significant earthworks and impacts to the corridor landscape. Sydney Metro has developed a comprehensive soil strategy that seeks to underpin regeneration of Cumberland Plain ecosystems.

As a requirement of Conditions of Approval E79(f) to include details of strategies to rehabilitate, regenerate or revegetate disturbed areas, and for the landscape to be successful, attractive, and distinct, the key ingredient will be topsoil management. This requires careful topsoil preparation including the stripping and stockpiling procedures, amelioration of site topsoils, any and opportunities for preserving the site's soil seedbank, and the correct specification of imported soil additives, ameliorants, conditioners, composts and mulches. Capturing the detail of topsoil management within the SCAW scope will ensure best practice in landscape establishment for the SCAW project and for the future SSTOM / CLW works.

As required by section 3.4.4.5 of the PS, the SCAW works footprint plus an additional two metres beyond the footprint will be stripped of topsoil to a depth of 300mm below permanent works and 200mm below temporary works. The top 100mm of topsoil will be stripped (due to the weed seed load that it carries) and sent to on-site spoil mounds which will be shaped and revegetated.

The remaining 200mm will be stockpiled on site at the boundary of the corridor in mounds no higher than 1 metre and no wider than 8 metres for a period, subject to soil testing, ameliorated with organic matter and other amendments as required to make it suitable for reuse as a landscape topsoil. The topsoil is then respread over areas to be landscaped to a depth of 200mm across all disturbed areas and 400mm depth over the permanent stockpile.

Sydney Soil and Environmental Laboratory (SESL) have been engaged to provide specialist soil science advice to the SCAW Project. SESL will;

- Characterise the site soils, identify the amelioration requirements and design the soil profiles for each of the landscaping applications. The soil profiles and soil management strategies will factor in the identified limitations of the site such as site topography and slope; soil stratigraphy; subsoil chemistry; edaphology; soil hydraulics, run-off and natural drainage channels and the infrastructure associated with the SM-WSA line.
- Collect soil and subsoil samples for analysis to determine the quality and re-use potential and to inform the soil separation (into soil landscape types) and stockpile management
- Topsoil samples (an allowance of 10 samples) will be submitted for the following analysis suite:
 - pH
 - Electrical conductivity (EC)
 - Effective cation exchange capacity (eCEC) (Ca, Mg, Na, K)
 - Nitrate
 - Total phosphorus
 - Trace nutrients (Fe, Mg, Mn, Zn, Cu, B)
 - Dispersibility (4419 method)
 - Texture
 - Large particles
 - Visual contaminants
 - Wettability (4419 method)
 - Hydraulic conductivity @ 8, 16, 32 drops
 - Total organic carbon & organic matter
- Subsoil samples (allowance of 10) will be submitted for the following chemical characterisation:
 - pH
 - EC
 - eCEC
 - Chloride
 - Texture & structure
- Prepare a soil stripping and management report. This will include guidance on soil stripping, soil separation, weed control and stockpiled soil management.

- Prepare a soil re-use strategy report. The report will provide solutions to water management, erosion control, weed management and site-specific strategies to improve the establishment of the proposed species within each of the landscaping applications.
- Develop Soil design specifications. These will be prepared for each of the different landscaping treatments along the alignment to support the proposed landscapes types such as Cumberland Plain woodland, Shale Gravel Transition Forest, rain gardens and swales, batters adjacent to rail lines and grass mounds for excess spoil.

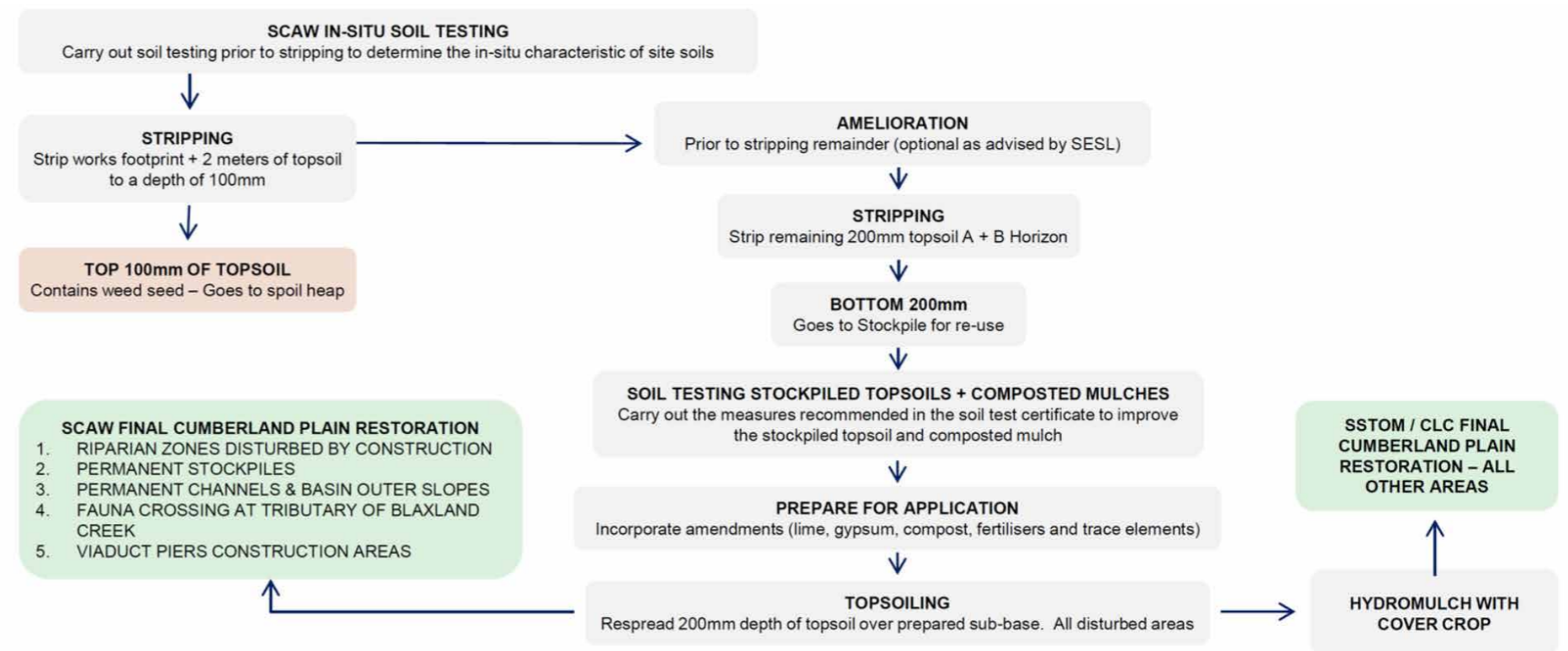


Figure 54 – Soil Rehabilitation Process

Station Precinct landscape plans

The SCAW landscape sits in a larger landscape scope however as enabling works, this PUDCLP does not address station precincts. These areas will be defined in subsequent submissions by the SSTOM contractor.

Corridor landscape plan

Ecological restoration of the Cumberland Plain context is a primary objective of the overall landscape strategy and an adaptive and flexible approach, together with a suite of site-tailored techniques is needed.

SSTOM will deliver the Corridor Landscape Master Plan that establishes the spatial layout and broad landscape character of the corridor. The Corridor Landscape Works (CLW) contract will deliver the bulk of the corridor landscape works with a focus on ecological restoration. The approach will be documented by Sydney Metro in a Corridor Landscape Plan of Management.

The advantages of the CLW approach are:

- Specialist ecologist with Cumberland Plain experience
- Landscape Plan of Management
- Qualified local restoration contractors
- Long term stewardship
- Sydney Metro direct management of contract

As enabling works, this PUDCLP only addresses discrete areas of the corridor landscape for which SCAW has responsibility.

CLW Landscape Plan of Management requirements

- Corridor outside the SSTOM Licensed Maintenance Area (LMA), including certain non-construction areas

CLW/Plan Requirements

- Coordination on SSTOM Corridor Landscape Master Plan
- Restoration objectives
- Reference plant communities and related zoning in Corridor
- Landscape plans outlining proposed landscape character, species, typical spacings and restoration zones
- Restoration performance outcomes
- Assessment regime including soil and weed testing
- Proposed handling, treatment and placement of topsoils with elevated nutrient and weed seed levels above those of reference plant communities
- Proposed range of actions and methodologies and their general sequence

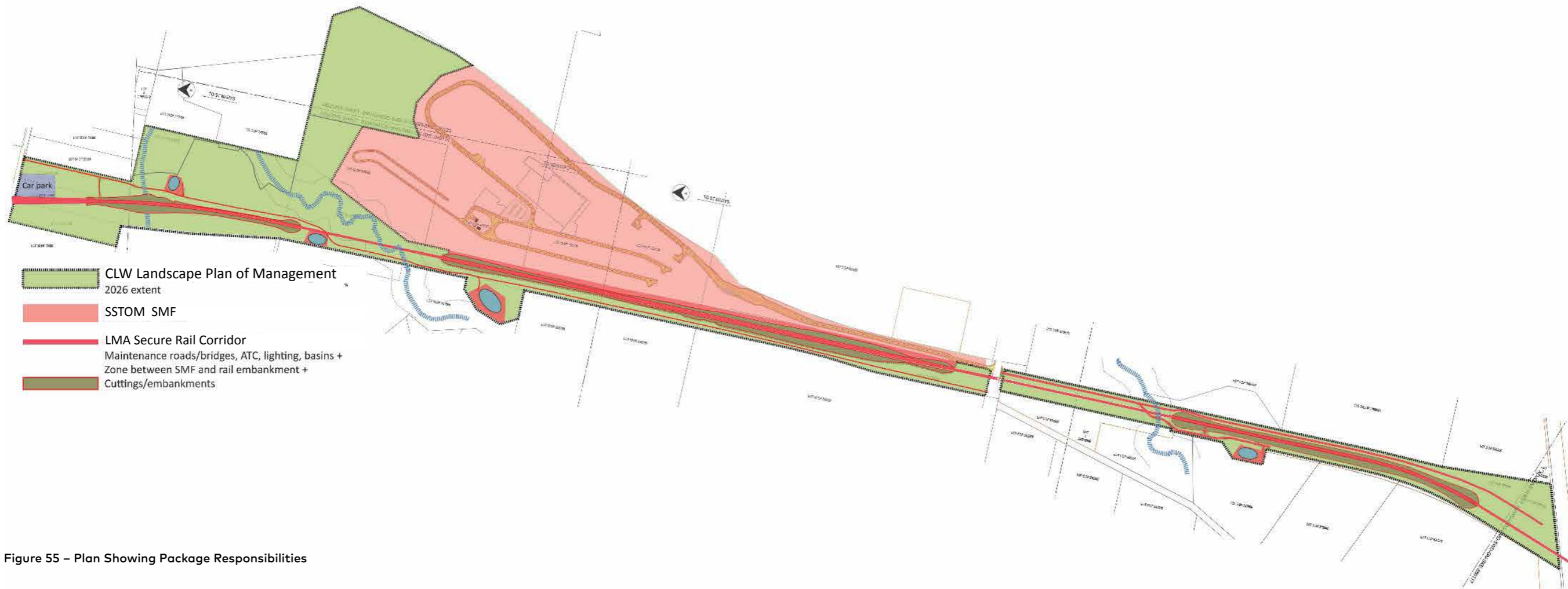


Figure 55 – Plan Showing Package Responsibilities

7.2 SCAW Planting

7.2.1 Use of Native Species from the Relevant Native Vegetation Community (or Communities)

Plant Selection

The endemic native species to be used where planting will be used within the SCAW scope (riparian zones disturbed by construction and the fauna culvert crossing at Tributary of Blaxland Creek) and where seeding is required (permanent vegetated swales and the permanent stockpile site), are selected from the plant community types (PCT) occurring on the project area. The PCT's occurring on the project area in order from largest (in area) to smallest are:

- PCT 724 - Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion
- PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.
- PCT 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter Valley
- PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

Sydney Metro's aim is to increase the diversity of species used with the opportunity to create 90 hectares of Cumberland Plain native woodland and grassland outside the secure rail corridor. Focused on riparian rehabilitation, SCAW project's stabilisation and limited native planting and seeding rehabilitation measures is a small but vital component at the commencement of this process.

Table 12 – Riparian Planting Mix (Alluvial Woodland)

Botanical Name	Common Name	Plant Type
<i>Angophora subvelutiwa</i>	Broad-leaved Apple	Tree
<i>Angophora floribunda</i>	Rough-barked Apple	Tree
<i>Alphitonia excelsa</i>	Red Ash	Tree
<i>Casuarina glauca</i>	Swamp Oak	Tree
<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark	Tree
<i>Eucalyptus amplifolia</i>	Cabbage Gum	Tree
<i>Eucalyptus moluccana</i>	Grey Box	Tree
<i>Eucalyptus tereticornis</i>	Forest Red Gum	Tree
<i>Acacia decurrens</i>	Green Wattle	Tree
<i>Melaleuca decora</i>	Prickly-leaved Paperbark	Tree
<i>Clematis glycinoides</i> ##	Headache Vine	Climber
<i>Leptospermum polygalifolium</i>	Tantoon	Shrub
<i>Bursaria spinosa</i>	Blackthorn	Shrub
<i>Indigofera australis</i>	Austral Indigo	Shrub
<i>Rubus parvifolius</i> ##	Native Raspberry	Shrub
<i>Dianella caerulea</i> ##	Blue Flax Lily	Lily
<i>Caesia parviflora</i> ##	Pale Grass lily	Lily
<i>Lomandra longifolia</i> ##	Mat Rush	Tussock
<i>Microseris lanceolata</i> ##	Murnong, Yam Daisy	Groundcover
<i>Geitonoplesium cymosum</i>	Scrambling Lily	Vine
<i>Entolasia marginata</i>	Bordered Panic	Native Grass
<i>Echinopogon caespitosus</i>	Tufted Hedgehog Grass	Native Grass
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	Native Grass
<i>Oplismenus aemulus</i>	Basket Grass	Native Grass
<i>Themeda triandra</i>	Kangaroo Grass	Native Grass
<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Native Grass
<i>Carex inversa</i>	Slender Flat-sedge	Sedge
<i>Fimbristylis dichotoma</i>	Common Fringe-sedge	Sedge



Figure 56 - Cumberland Plain Forest Peter Ridgeway DPIE



Figure 57 – Riparian planting mix for disturbed riparian areas

Rail Embankments and Cuttings

Permanent native seeding of rail trackside embankments and cuttings will be by SCAW. Following Handover, SSTOM/CLW may plant additional infill species where appropriate to increase biodiversity.

During the SCAW phase, the raw 3:1 batter slope will be scarified parallel to the contour (to help prevent slumping/slippage of the topsoil) and topsoiled to a depth of 200mm. The crest and toe of slope will be rounded to blend with the existing landform and to help minimise erosion from track drainage which flows over the batter. Seed Mix 2 and 4 will be applied over the topsoil via hydromulching with tackifier at the rate of 9Kg/Ha in conjunction with cover crop at the rate of 30kg/ha. Hydromulching will provide erosion protection until the cover crop vegetation establishes.

Two seed mix types have been developed for the rail embankment and cuttings in order to satisfy clearance and fencing requirements;

- Seed Mix 2- Trackside Rail Batters Mix – Low maintenance native grass and groundcover species within 4 metres of the crest shoulder of the track. Low plants within the first 4 metres will maintain clear rail sightlines, prevent vegetation overgrowing the track and allow for the installation of the rail side fence during the SSTOM phase.
- Seed Mix 3- Rail Batters - 4 metres beyond the crest shoulder of the track. This mix contains Indigenous native grass, groundcover and shrub species providing rapid establishment and a diversity of species providing habitat. Species height is generally under 4 metres. For species refer to Table 14. The composition of species in these mixes are selected from Cumberland Plain endemic species that are tolerant of dry conditions as would be experienced on batter slopes.

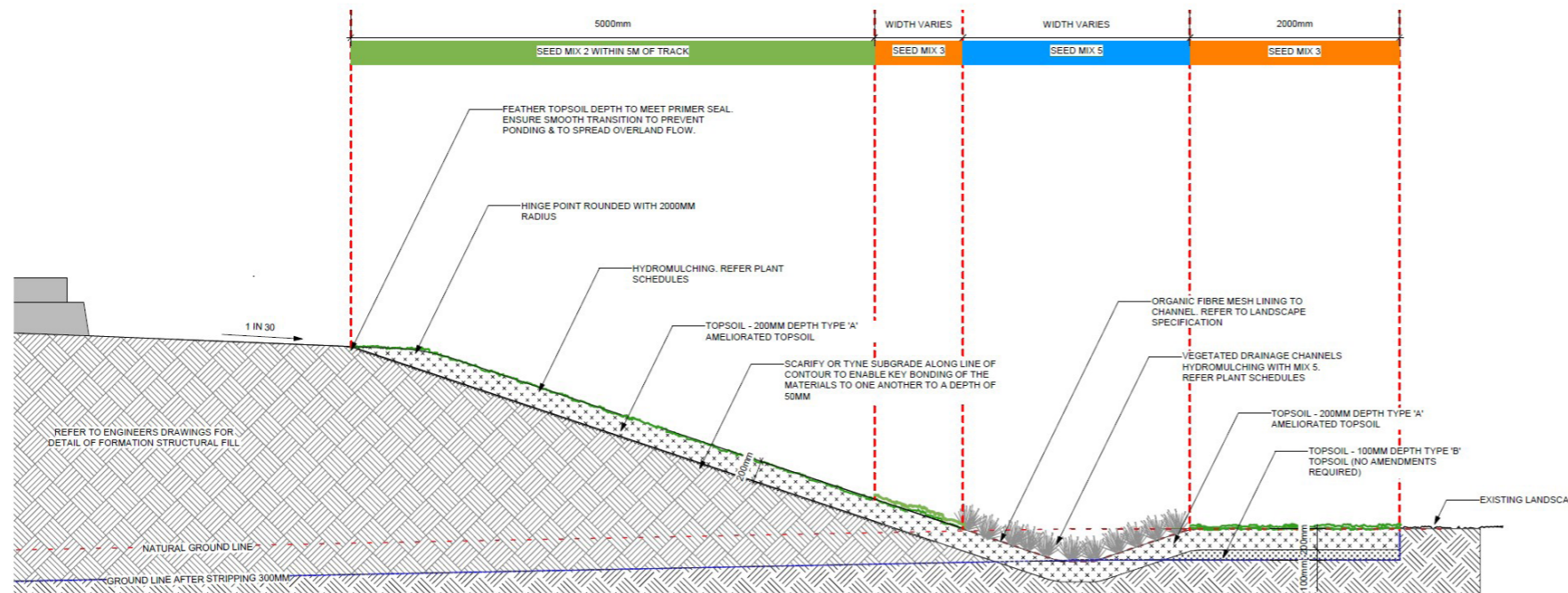


Figure 58 – Embankment Planting

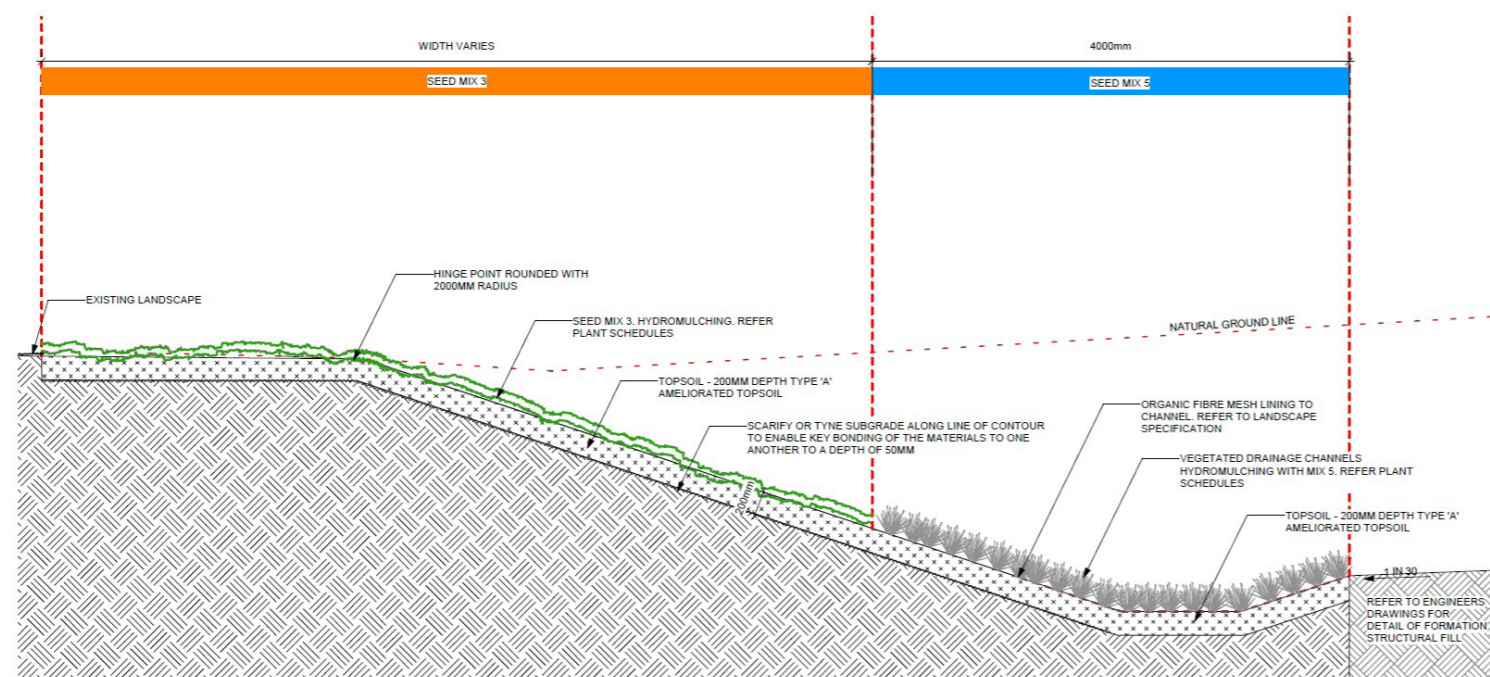


Figure 59 – Cutting Planting

Table 13 – Seed Mix 1 - Cover Crop mix - All temporary areas disturbed by construction

Botanical Name	Common Name	Plant Type
Echinochloa itilis (Sep-Mar Warm season) or Secale cereale (Apr-Aug Cool season)	Three-awned Spear Grass	Native Grass
Lolium multiflorum (All year)	Eclipse Rye	Grass

Table 14 – Seed Mix 2 - Trackside Rail Batters Mix - Groundcover species within 4 metres of the ballast shoulder of the track

Botanical Name	Common Name	Plant Type
Aristida vagans	Three-awned Spear Grass	Native Grass
Capillipedium spicigerum	Scented Top Grass	Native Grass
Chloris ventricosa	Tall Grass	Native Grass
Cymbopogon refractus	Barbed wire Grass	Native Grass
Dichelachne micrantha	Short-haired Plume Grass	Native Grass
Echinopogon caespitosus	Hedgehog Grass	Native Grass
Eragrostis leptostachya	Paddock Lovegrass	Native Grass
Poa labillardieri	Tussock Grass	Native Grass
Themeda triandra	Kangaroo Grass	Native Grass
Entolasia marginata	Bordered Panic	Native Grass
Echinopogon ovatus	Forest Hedgehog Grass	Native Grass
Wahlenbergia gracilis	Australian Bluebell	Native Grass
Microlaena stipoides var. stipoides	Weeping Grass	Native Grass
Asperula conferta	Common Woodruff	Forb
Brunoniella australis	Blue Trumpet	Forb
Grona varians	Slender Tick-trefoil	Forb
Opercularia diphylla	Twin Leaf Stinkweed	Forb
Lomandra filiformis subsp. filiformis	Mat Rush	Tussock
Lomandra multiflorus subsp. Multiflorus	Many flowered Mat Rush	Tussock
Dianella longifolia	Blue Flax Lily	Native Lily
Echinochloa itilis (Sep-Mar Warm season) or Secale cereale (Apr-Aug Cool season)	Japanese Millet or Rye Corn	Annual Grass
Lolium multiflorum (All year)	Eclipse Rye	Annual Grass

Table 15 – Seed Mix 3 - General Cumberland Plains Seed Mix - Viaduct construction areas

Botanical Name	Common Name	Plant Type
Acacia falcata **	hickory wattle	Shrub
Aristida vagans	Three-awned Spear Grass	Native Grass
Bursaria spinosa	Blackthorn	Shrub
Myoporum montanum	Water Bush	Shrub
Capillipedium spicigerum	Scented Top Grass	Native Grass
Carex inversa	Knob Sedge	Sedge
Chloris truncata	Windmill Grass	Native Grass
Cyperus gracilis	Slender Flat-sedge	Sedge
Chrysocephalum apiculatum	Everlasting Daisy	Groundcover
Daviesia ulicifolia **	Gorse Bitter Pea	Shrub
Dianella caerulea ##	Blue Flax Lily	Native Lily
Dichelachne micrantha	Short-haired Plume Grass	Native Grass
Echinopogon caespitosus	Hedgehog Grass	Native Grass
Eragrostis leptostachya	Paddock Lovegrass	Native Grass
Juncus usitatus	Common Rush	Sedge
Hardenbergia violacea **	Native Sarsaparilla	Native Grass
Indigofera australis **	Austral Indigo	Shrub
Lomandra filiformis	Wattle mat-rush	Tussock
Lomandra multiflora	Many-flowered mat-rush	Tussock
Lomandra longifolia ##	Mat Rush	Tussock
Melaleuca decora	White Feather Honey Myrtle	Shrub
Microlaena stipoides	Weeping Grass	Native Grass
Poa labillardieri	Tussock Grass	Native Grass
Ozothamnus diosmifolius	Rice Flower	Shrub
Pultenaea villosa **	Hairy Bush-Pea	Shrub
Jacksonia scoparia **	Dogwood	Shrub
Rytidosperma fulvum	Wallaby Grass	Native Grass
Themeda triandra	Kangaroo Grass	Native Grass
Echinochloa itilis (Sep-Mar Warm season) or Secale cereale (Apr-Aug Cool season)	Japanese Millet or Rye Corn	Annual Grass
Lolium multiflorum (All year)	Eclipse Rye	Annual Grass

Table 16 – Seed Mix 4 - Permanent Stockpile

Botanical Name	Common Name	Plant Type
Acacia falcata **	hickory wattle	Tree
Acacia implexa	weetjellan (D'harawal)	Tree
Angophora floribunda	Rough-barked Apple	Tree
Angophora subvelutina	Broad-leaved Apple	Tree
Eucalyptus fibrosa	Red Ironbark	Tree
Eucalyptus moluccana	Grey Box	Tree
Eucalyptus tereticornis	Forest Red Gum	Tree
Eucalyptus eugenioides	Thin-leaved Stringbark	Tree
Melaleuca decora	White Feather Honey Myrtle	Tree
Bursaria spinosa	Blackthorn	Shrub
Myoporum montanum	Water Bush	Shrub
Daviesia ulicifolia **	Gorse Bitter Pea	Shrub
Dillwynia sieberi	Bush Pea	Shrub
Dodonaea viscosa subsp. Cuneata	Hop Bush	Shrub
Grevillea juniperina supsp. Juniperina	Juniper-leaved Grevillea	Shrub
Leptospermum polygalifolium	Tantoon	Shrub
Lissanthe strigosa	Peach Heath	Shrub
Pultenaea microphylla **	Bush Pea	Shrub
Indigofera australis **	Austral Indigo	Shrub
Ozothamnus diosmifolius	Rice Flower	Shrub
Pultenaea villosa **	Hairy Bush-Pea	Shrub
Jacksonia scoparia **	Dogwood	Shrub
Einadia hastata	Berry Saltbush	Groundcover
Wahlenbergia gracilis	Australian Bluebell	Groundcover
Chrysocephalum apiculatum	Everlasting Daisy	Groundcover
Hardenbergia violacea **	Native Sarsaparilla	Groundcover
Arthropodium milleflorum ##	Vanilla Lily	Lily
Caesia parviflora ##	Pale Grass lily	Lily
Dianella longifolia ##	Blue Flax Lily	Lily
Dianella caerulea ##	Blue Flax Lily	Lily
Lomandra longifolia ##	Mat Rush	Tussock
Lomandra filiformis subsp. filiformis	Wattle mat-rush	Tussock
Lomandra multiflora	Many-flowered mat-rush	Tussock
Lomandra longifolia	Mat Rush	Tussock

Juncus usitatus	Common Rush	Sedge
Austrostipa verticillata	Slender Bamboo Grass	Native Grass
Aristida vagans	Three-awned Spear Grass	Native Grass
Capillipedium spicigerum	Scented Top Grass	Native Grass
Chloris truncata	Windmill Grass	Native Grass
Cyperus gracilis	Slender Flat-sedge	Native Grass
Dichelachne micrantha	Short-haired Plume Grass	Native Grass
Echinopogon caespitosus	Hedgehog Grass	Native Grass
Eragrostis leptostachya	Paddock Lovegrass	Native Grass
Microlaena stipoides	Weeping Grass	Native Grass
Poa labillardieri	Tussock Grass	Native Grass
Rytidosperma fulvum	Wallaby Grass	Native Grass
Themeda triandra	Kangaroo Grass	Native Grass
Echinochloa itilis (Sep-Mar Warm season) or Secale cereale (Apr-Aug Cool season)	Japanese Millet or Rye Corn	Annual Grass
Lolium multiflorum (All year)	Eclipse Rye	Annual Grass

Cover Crop
Useful plants/bush tucker/bush medicine

NOTE - ALL PLANT MIXES SUBJECT TO DESIGN DEVELOPMENT



Themeda triandra



Dichelachne micrantha



Microlaena stipoides



Imperata cylindrica



Poa labillardieri



Entolasia marginata



Echinopogon ovatus



Lomandra longifolia

Figure 60 – Rail batters mix

7.2.2 Planting Interfaces

The design has sought to minimise impacts on creeks and crossings along the alignment. Table 17 outlines the Conditions of Approval relevant to the Viaducts and Bridges and the overall approaches taken to meet the requirements.

In key locations, plant species will be introduced by planting. Where such locations are adjacent to the alignment, planting will control their distance from trackside or viaducts as well as prevent tall Eucalypts being located in positions where they will overhang the track.

Areas identified for planting include;

- All riparian zones disturbed by construction including riparian zones under viaducts
- Fauna Culvert Crossing at the tributary of Blaxland Creek
- Fauna Culvert Crossing at Chainage 26+420.

Planting adjacent to the alignment will observe specified planting offsets.

In riparian zones and in other locations where feasible, the plants will be of long stem planting stock to improve establishment success.

The riparian planting strategy has been developed as identified in Table 18

The design has sought to minimise impacts on creeks and crossings along the alignment. The Conditions of Approval contains the following conditions relevant to the Viaducts and Bridges:

Table 17 – Condition E14 relevant to Viaducts and Bridges

Conditions of Approval	Responses
(a) design of viaducts to retain and minimise clearing/disturbance of native vegetation and maximise native plant growth under the structures, (i) maintain and/or improve riparian/terrestrial connectivity under the viaduct and bridge structures to maximise the corridor function; (ii) maximise the viaduct and bridge structures span over the riparian corridor and/or remnant native vegetation which-ever is the widest; (iii) minimise the clearing/ disturbance of native vegetation and native riparian vegetation; and (iv) maximises light and moisture penetration under the viaduct and bridge structures to support native plant growth;	Pier spacings have been increased from 34m to 40m to help minimise impacts to creeks Piers have been positioned clear of waterways and in locations that minimise the need for clearance or vegetation. Where piers are close to creeks, rehabilitation works will be undertaken The north-south orientation of viaducts allows solar access beneath the viaduct and minimises overshadowing Landscape and water management strategies encourage vegetation growth below viaducts

Table 18 – Riparian Planting Locations

Planting Mix	Description	Where Used
Riparian planting mix (Long-Stem Planting stock where feasible)	Contains Indigenous native grasses, sedges, shrubs, small trees and tree species. Riparian planting mixes are specific to the vegetation communities in which they are applied with diagnostic species from the community being dominant.	<ul style="list-style-type: none"> • Blaxland Creek and Tributaries • Unnamed Creek (flows to South Creek) • Cosgroves Creek • Viaduct construction areas in riparian zones and floodplains • Fauna culvert crossing at tributary of Blaxland Creek and Ch: 26+420



Figure 61 – Blaxland Creek Landscape and Viaduct Interface

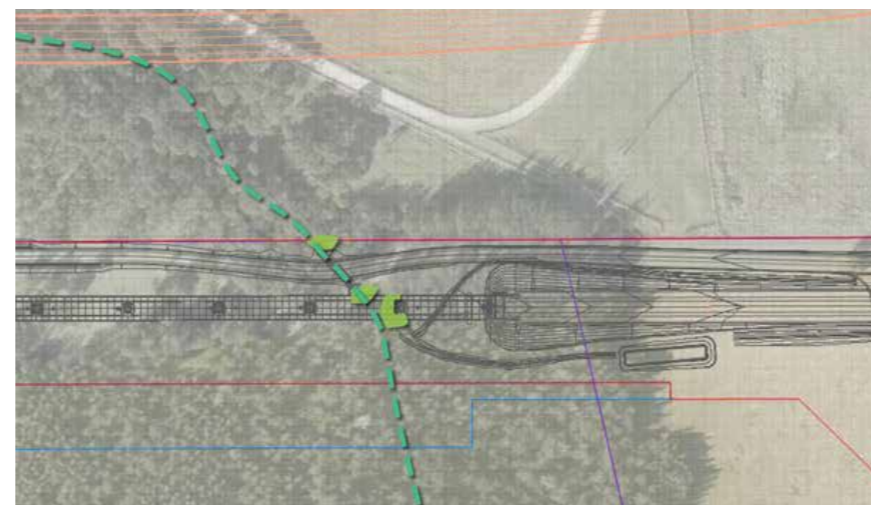


Figure 62 – Unnamed Creek Landscape and Viaduct Interface



Figure 63 – Cosgroves Creek Landscape and Viaduct Interface

7.2.3 Water Sensitive Urban Design Initiatives

Permanent Vegetated Drainage Swales

Vegetated drainage swales are used where the longitudinal grade of the completed drain is between 1% and 5% inclusive. Permanent vegetated drainage swales should have a sinuous shape and the width and side batter slopes should vary so they look more natural with minimum shape requirements being;

- Minimum Depth: 300mm
- Minimum Side Slope: Not steeper than 2H:1V
- Minimum Waterway Area: 0.2m².

Table 19 – Permanent Vegetated Swale Mix

Botanical Name	Common Name	Plant Type
<i>Carex inversa</i>	Knob Sedge	Sedge
<i>Aristida vagans</i>	Three-awned Spear Grass	Native Grass
<i>Capillipedium spicigerum</i>	Scented Top Grass	Native Grass
<i>Chloris truncata</i>	Windmill Grass	Native Grass
<i>Cyperus gracilis</i>	Slender Flat-sedge	Sedge
<i>Dianella caerulea</i>	Blue Flax Lily	Native Grass
<i>Dichelachne micrantha</i>	Short-haired Plume Grass	Native Grass
<i>Echinopogon caespitosus</i>	Hedgehog Grass	Native Grass
<i>Eragrostis leptostachya</i>	Paddock Lovegrass	Native Grass
<i>Fimbristylis dichotoma</i>	Common Fringe-sedge	Sedge
<i>Juncus usitatus</i>	Common Rush	Sedge
<i>Hardenbergia violacea</i> **	Native Sarsaparilla	Native Grass
<i>Imperata cylindrica</i>	Blady Grass	Native Grass
<i>Lomandra multiflora</i>	Many-flowered mat-rush	Native Grass
<i>Lomandra longifolia</i>	Mat Rush	Native Grass
<i>Microlaena stipoides</i>	Weeping Grass	Native Grass
<i>Philydrum lanuginosum</i>	Frogsmouth	Sedge
<i>Rytidosperma fulvum</i>	Wallaby Grass	Native Grass
<i>Themeda triandra</i>	Kangaroo Grass	Native Grass
<i>Echinochloa itilis</i> (Sep-Mar Warm season) or <i>Secale cereale</i> (Apr-Aug Cool season)	Japanese Millet or Rye Corn	Annual Grass
<i>Lolium multiflorum</i> (All year)	Eclipse Rye	Annual Grass

Vegetated drainage swales will be topsoiled to a minimum depth of 100mm where the side slope is about 2H:1V and can increase in depth up to 200mm where the side slope is about 3H:1V.

Seed will be applied over the topsoil via hydromulching with tackifier. Hydromulching will provide erosion protection until vegetation establishes.

Permanent vegetated drainage swales will be naturally shaped with smooth transitions into the surrounding topography. They will have a sinuous shape, where feasible, and the width and side batter slopes will vary so they look more natural.

Biofiltration Swales and Basins

Biofiltration swales treat water by filtering the runoff that enters them through mass planting and a graded filter media. A subsurface drainage system is provided below the filter media to convey the cleaned water to a receiving waterway. Biofiltration swales will be designed by the SCAW team but construction will be completed during the SSTOM phase. During the SCAW phase the basins will be used for detention, so only the outside batter slopes and crests will be topsoiled and stabilised with with Seed Mix 3 - Permanent Basin Batter Slopes Native at the rate of 9kg/ha and cover crop at the rate of 30kg/ha

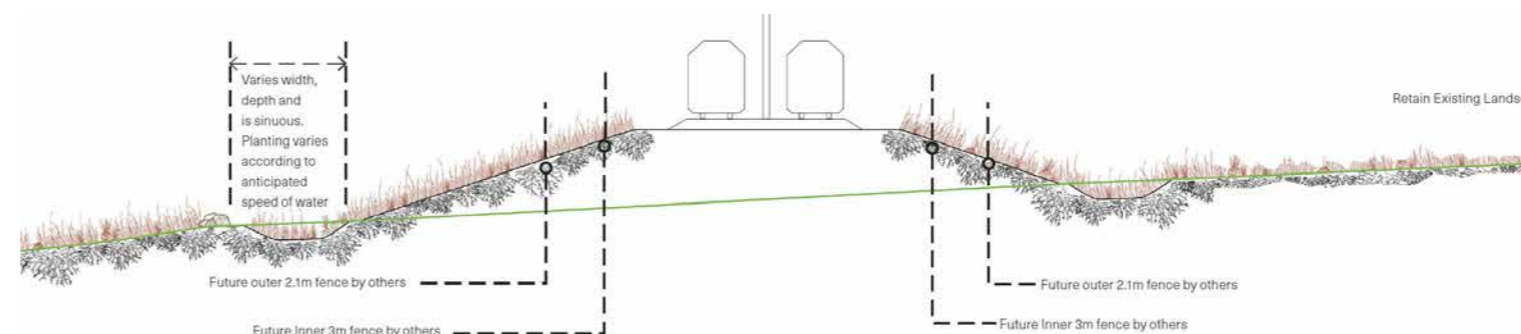


Figure 64 – Typical cross section of a native toe of batter and constrained by boundaries

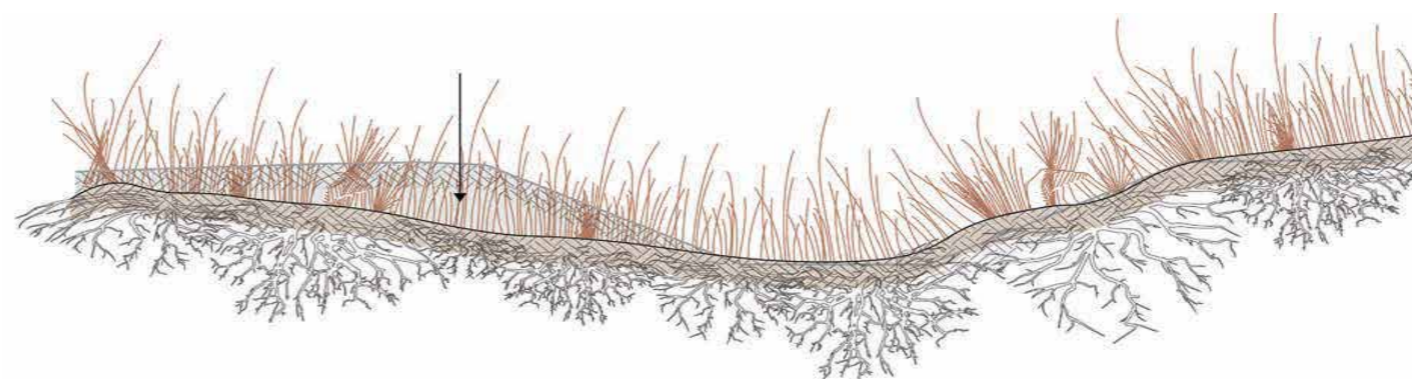


Figure 65 – Typical cross section of a native grass lined drainage swale

Permanent Water Quality Basins

Bioretention basins operate in a manner similar to the bio swales however rather than water flowing through the treatment device, runoff is directed to, and held, within a storage pond where initially mass planting is used remove nutrients then as the water seeps through the floor of the basin, it passes through a filter media which removes other pollutant. Finally, a subsurface pipe collects water from below the filter media and carries the treated water to a receiving waterway The inner slopes and inner basin of permanent water quality basins will not be seeded or planted during the SCAW phase because it is expected that they will be cleaned out at the commencement of the SSTOM works and prepared for permanent topsoiling and planting at that time.

The outer slopes of basins will be stabilised with seeding during the SCAW phase with Seed Mix 3-Permanent Basin Batter Slopes Native Mix at the rate of 9kg/ha and cover crop at the rate of 30kg/ha. The slopes will be topsoiled to a depth of 100mm where the side slope is about 2H:1V and can will increase in depth up to 200mm where the side slope is 3H:1V. or shallower.

Seed will be applied over the topsoil via hydromulching with tackifier. hydromulching will provide erosion protection until vegetation establishes. Organic fibre mesh will then be fixed over the topsoil and hydroseeding/hydromulching from the crest to the toe of the slope over any slopes steeper than 3:1.

Table 20 – Permanent Basin Batter Slopes Mix

Botanical Name	Common Name
<i>Lomandra multiflora</i>	Many-flowered mat-rush
<i>Melaleuca decora</i>	White Feather Honeymyrtle
<i>Microlaena stipoides</i>	Weeping Grass
<i>Myoporum montanum</i>	Water Bush
<i>Ozothamnus diosmifolius</i>	Rice Flower
<i>Poa labillardieri</i>	Tussock Grass
<i>Pultenaea villosa</i>	Hairy Bush-Pea
<i>Rytidosperma fulvum</i>	Wallaby Grass
<i>Themeda triandra</i>	Kangaroo Grass



Carex appressa



Dianella caerulea



Hardenbergia violacea



Dichelachne micrantha



Lomandra multiflora



Lomandra longifolia



Themeda triandra



Cyperus gracilis

Figure 66 – Swale/ detention basin and fast flow water areas

Drainage Under Viaducts

The Conditions of Approval E14 (iv) requires that light and moisture penetration are maximised under the viaduct and bridge structures to support native plant growth.

The project requirements for Viaduct and Bridge Drainage requires the SCAW Contractor must maximise the use of viaduct collected stormwater within landscape irrigation for the Project Works.

The viaduct stormwater is delivered to the ground via drainage pipes within each pier. It is proposed that the stormwater will discharge into a 900 x 900 x 900mm pit then discharge into exfiltration pipes laid in a gravel trench oriented perpendicular to the viaduct for the full width of the viaduct and allowed to seep to the surface and spread across the ground under the deck to promote vegetation growth in that area. This measure should ensure the runoff from these areas remain unchanged from the pre-development state and that the ground surface under the viaducts will support plant growth.

Vegetated low berms approximately 250-300mm high with crest acting as a level spreader will be provided to temporarily spread and slow surface flows and contain rainfall under viaduct. In addition, some of the cross-surface flows will be intercepted including some runoff from temporary haul roads before they enter vegetated swales. Swales will then deliver stormwater to the receiving creek or basin.

The ephemeral storage zone under the viaduct will be vegetated and is anticipated to provide water quality improvements. During design development, this may prove that some biofiltration basins and swales are not required. It may also mean that clean water crossflows do not need to be separated from the viaduct stormwater in some locations.

The length, shape, height, and frequency of the vegetated low berms would vary to suit the topography, depending on localised topography under viaduct and between each pier, ensuring that the landforming blends with the existing landscape. This drainage design concept under the viaducts is subject to further design development.

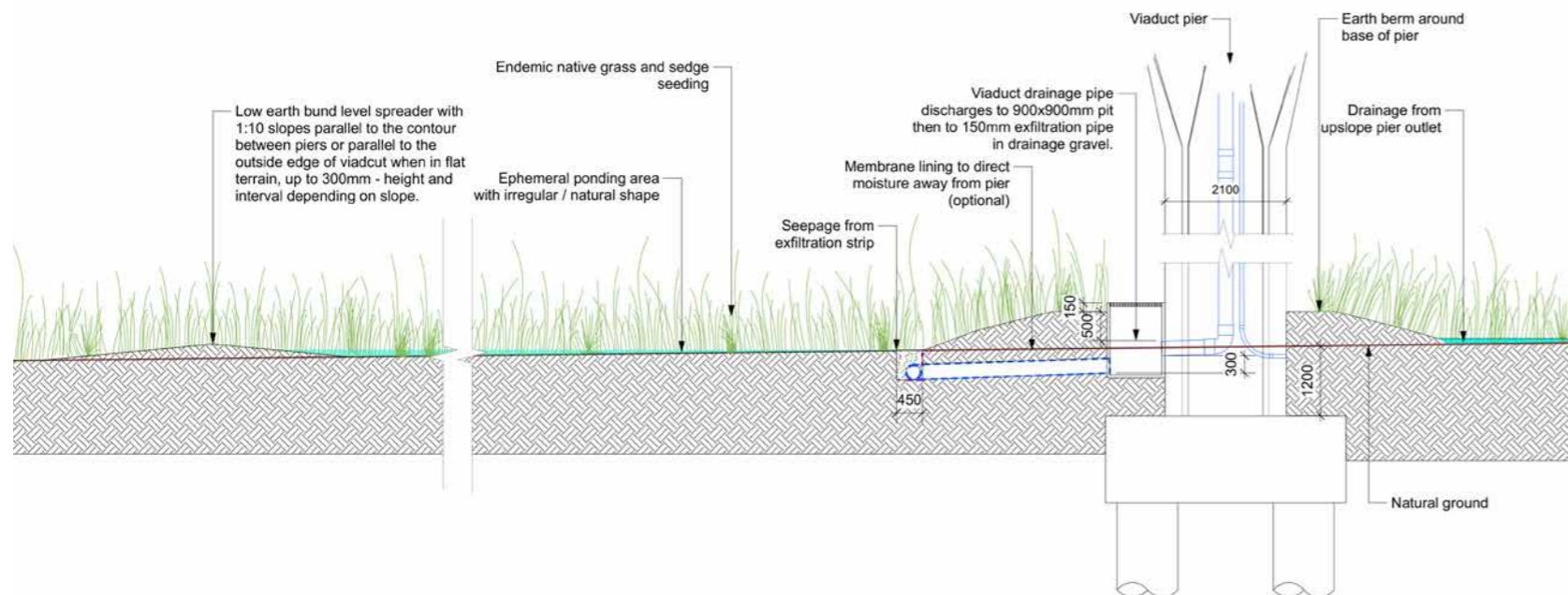
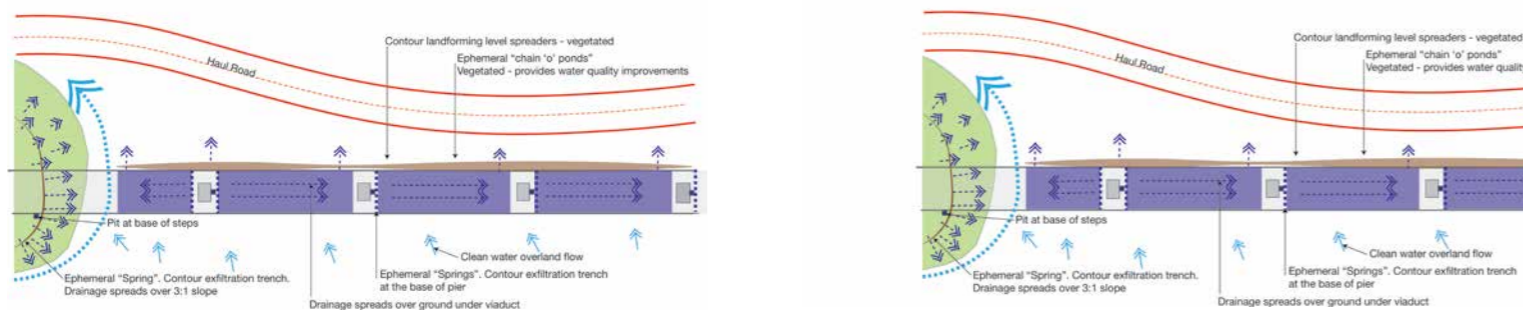


Figure 67 – Typical section of viaduct drainage concept

7.2.4 Re-use of Timber

The Conditions of Approval (Condition E12) require the salvaging of appropriate materials and the collection of seeds in habitat enhancement and rehabilitation work before pursuing disposal options:

- hollows, tree trunks (greater than 25-30 centimetres in diameter and 2-3 metres in length), mulch, bush rock and root balls salvaged from native vegetation impacted by the project; and
- collected plant material, seeds and/or propagated plants from native vegetation impacted by the project,

Where it is not possible for the project to reuse removed native trees and vegetation, Penrith City Council, NSW National Parks & Wildlife Service, Western Sydney Parklands Trust, Greater Sydney Local Land Services, Landcare groups, DPI Fisheries and any additional relevant government agencies will be consulted to determine if these materials can be reused.

7.2.5 Permanent Stockpile Landscape

The project specification requires that landscape mounds are naturally shaped with smooth transitions into the surrounding topography, constructed with batter slopes less than or equal to 3 horizontal to 1 vertically; and covered by at least 400mm of topsoil to enable revegetation of the native bushlands. The large stockpile in the north has been designed to reflect the topography of the location in which it is sited and has been designed with slopes varying from 1:5 up to 1:3 and with roundings at the crest and toe of slopes so that its shape is as natural as possible.

Stockpile sites will be prepared for landscape rehabilitation by topsoiling to a depth of 400mm followed by stabilization hydromulching with cover crop at the rate of 30kg/ha mixed with native seed at the rate of 9kg/ha (Seed mix 4) which will contain the full complement of vegetation types including native trees, shrubs, forbs and grasses. Where it is identified during design development that SSTOM /CLW may amend or require material from the stockpile, cover crop only will be applied, with native seed applied only to areas identified to be undisturbed.

Salvaged site materials including rocks and timber that have not been re-used in abutments riparian restoration and fauna crossings will be arranged on the stockpiles or stored for later re-use.



Mentoring Native Yam



Themeda triandra



Acacia falcata



Arthropodium milleflorum



Eucalyptus tereticornis



Ozothamnus diosmifolius



Pultenaea microphyllia



Grevillea juniperina

Figure 68 – General Cumberland Plains planting mix

7.3 Strategies To Rehabilitate, Regenerate or Revegetate Disturbed Areas

Progressive Rehabilitation

Several elements go together to make up the progressive establishment of re-vegetation across the Project. These are:

- Staged implementation of the landscape installation. As sections of the earthworks are prepared, the section is prepared as soon as practical for topsoiling, and then 200mm of topsoil will be spread over the area.
- Cover crop seeding, or where deemed necessary native seeding or planting will follow topsoiling in accordance with the planting and seeding schedules. All prepared areas requiring vegetation will be vegetated as soon as practical following preparation.

Where native seeding or planting is not proposed, cover crops will be applied to all disturbed areas for rapid stabilisation of bare soils. Cover crop may be applied separately or in conjunction with all other native seeding mixes

Planting is used for all riparian areas, and where trees, shrubs and ground covers are required for early landscape and visual effect and for early landscape establishment in fauna movement corridors and adjacent to underpasses and below bridge structures and at creek-sides

Maintenance inspection of vegetated areas will be carried out at least monthly and missing or dead plantings will be replaced.

Areas which receive erosive pressures such as watercourses, vegetated channels, and slopes steeper than 3H:1V, will have organic fibre mesh installed to improve the establishment of the re-vegetation.

Seed Application and Establishment

Each of the extant vegetation communities have grass, groundcover, shrub and tree species components, which are common to each. Where these species can be germinated easily and are known to establish well from seed they are used in seed mixes. Seed for embankment vegetation is selected from those vegetation communities where the influence of groundwater is low and therefore the plants are tolerant of dryness. For example, PCT 724 Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion occurs on slightly elevated areas associated with tertiary alluvial gravels within the project area, so is more suitable for batters and stockpiles than PCT 835 and 1800 which occur in riparian and floodplain areas.

The seed mixes have been developed taking the following factors into consideration:

- The seed mixes must be calibrated to satisfy clearance requirements for safety (eg distance from the trackside), maintenance requirements (eg for mowing) and height requirements
- Only seeds and plants known to be useful to the regeneration of disturbed ground have been included in the seeding and planting mixes and are those known to be hardy, drought tolerant and to establish quickly from seed.
- Species that are more difficult to establish from seed are not used in seed mixes and are included in planting mixes only.

All areas to be landscaped within the SSTOM / CLW phase and handover works will be seeded with Cover Crop Seed Mix. Where seeding is used it will be applied via hydromulching with tackifier. Hydromulching will provide erosion protection until vegetation establishes.



Before



After

Figure 69 - Planted drainage swale

Seed mixes have been developed for various purposes as identified in the table below:

Table 21 – Seed Mix

Seed Mix	Description	Where Used
Cover Crop Seed Mix	Sterile Cover crop composed of fast establishing annual species such as Japanese Millet, Rye Corn and Eclipse Rye. Cover crop may be applied separately or in conjunction with all other seeding mixes (where the rate is reduced to decrease competition with native seed. Red Clover must not be used in conjunction with native seeding, since their aggressive spreading growth may prevent germination of native seeds.)	For rapid stabilisation of all disturbed areas of the project except riparian areas to be planted. The purpose of the cover crop application is to stabilise the surface material, particularly batters, and to provide an effective barrier to erosion. Cover crop will also be used to minimise erosion and weed establishment on topsoil stockpiles. Cover crop is to be applied at the rate of 55kg/ha or 30kg/ha where mixed with native seed
Trackside Rail Batters within 4 metres of the shoulder of the track Seed Mix	Contains Indigenous native grass and groundcover species calibrated to satisfy clearance requirements and where occasional maintenance mowing may be required. The mix contains species that can withstand infrequent mowing.	Trackside from the ballast shoulder for 4 metres downslope.
Permanent Rail Batters 4 metres beyond the shoulder of the track and Permanent Basin Outer Batter Slopes Seed Mix	Contains Indigenous native grass, groundcover and shrub species providing rapid establishment and a diversity of species providing habitat. Species height generally under 4 metres.	Rail batters beyond the safety clearance zone. No large trees that have the potential to fall across the track are used under viaduct areas and outer slopes of basins.
Permanent Vegetated Swales Seed Mix	Contains Indigenous native grass, tussocks and sedge species that will persist where moist patches or standing water occurs. The mix contains species that can withstand infrequent mowing.	Permanent swales, minor watercourses and channels in association with Jute-mesh lining.
Permanent Stockpile Sites Seed Mix	Contains Indigenous native grasses, sedges, shrubs, small trees and tree species from the Shale Gravel Transition Forest which occurs generally in slightly elevated areas making this mix suitable for stockpiles and batter slopes	For permanent stockpile sites and other permanent disturbed areas on drier sites that will not be landscaped by SSTOM

Mulching

All planted areas will be mulched with hardwood mulch sourced from site in the first instance, and imported where there is a shortfall, to a nominal minimum depth of 75 millimetres. Mulch is to be stockpiled for six months where feasible prior to use in order to reduce the impacts of nitrogen draw-down on soils and its effect on plantings.

Composted mulches, derived from site-won mulch which has been windrowed for a minimum of six months in a manner to accelerate composting (or as advised by SESL), may be mixed with site topsoil where it is used on cut/fill slopes to be seeded. At a minimum, site topsoil mixed with composted site mulch or other organic component is to be spread on batter slopes receiving runoff to increase its organic (carbon) content and to aid in erosion resistance on batters. The component of organic material mixed with topsoils will be considered during the detailed design phase and will form part of the soil testing procedures with advice from the Project soil scientist conducting the testing. The general ratio is 60-75 per cent topsoil; 25 per cent composts.

Riparian plantings will only be mulched above the 5-year average flood extent.

Where there is a shortfall of site-won mulch, it will be imported. Imported mulch will be of a type that has been composted to reduce the impact of nitrogen draw-down and tannin leachate as advised by SESL.

Opportunities for Salvage and Reuse

During the clearing and grubbing, stripping and excavation processes it is anticipated that useful landscape materials may be gathered or dug up. These may include tree hollows, shale floaters, tree stumps, buried logs and old building material. These should be collected and stored separately for re-use in creek rehabilitation, fauna crossings and potentially viaduct abutment surfaces.

Trees to be removed will be chipped and the resulting mulch winnowed separately to allow for composting.

Construction Area Rehabilitation

Construction of the viaduct piers requires an extensive construction area footprint at their bases.

The viaduct construction footprint will be prepared for landscape stabilisation following removal of the construction platforms by first ripping the base material then topsoiling to a depth of 200mm or to a depth to bring the topsoil to surrounding surface levels, followed by stabilization seeding via hydromulching with cover crop at the rate of 30kg/ha and native seeding with grasses, sedges and groundcovers at the rate of 9kg/ha.

The viaduct construction footprint will be planted where construction of piers causes disturbance within riparian zones using Planting Mix No. 1 Riparian Planting Mix.

Haul roads not required by SSTOM will be similarly rehabilitated.

Revegetation

The provision of replacement trees is a key outcome of the project. New tree planting is to be at a ratio of 2:1, except trees that are offset under Condition E4 (biodiversity credits).

SSTOM and CLW contractors will undertake tree planting. SCAW will be responsible for the completion of a Tree Survey during detailed design that identifies the number, type and location of any trees to be removed (except for trees that are offset under Condition E4).

7.4 Wildlife strike

There are several conditions in the Draft Aerotropolis DCP 2021 that trigger a requirement for an independent review of the landscape design by a qualified ecologist and that need to be addressed within the PUDCLP, namely:

- If plant species that are not on the recommended Landscape Species List (Appendix B of the DCP) are proposed in Aerotropolis precincts (south of Warragamba Pipeline).
- If tree and shrub species from the Landscape Species List that have additional requirements are specified within the 3km buffer (excluding Western Parkland Vision Government Commitment Areas), for e.g. all local Eucalyptus species.
- Groupings and spacing that depart from the recommended planting arrangements of trees and shrubs within the 3km buffer zone but excluding Western Parkland Vision Government Commitment Areas:
- More than five trees in a single group
- Spacing between a group of five trees or more, of less than 100 metres

Additionally, there are some trees and at-risk shrubs that are not permitted in the 3km zone and a number of native grasses that are allowed but subject to monitoring and/or a maintenance plan.

The SCAW contract does not include the planting of trees or shrubs within the 3km zone of influence.

The SCAW contractor has assumed a primary bird strike zone of a 3km radius from the airport extending to the Warragamba Pipeline. Riparian zones are excluded from the provision. Within this zone species have been checked against those permitted by AirportCo and have been reviewed against the Western Sydney Airport's Wildlife Management Plan and other relevant guidelines, including the National Airports Safeguarding Framework (Guideline C) and Recommended Practices No. 1 – Standards for Aerodrome Bird/Wildlife Control (International Birdstrike Committee 2006). No Eucalypts or other trees are used within this zone except at Riparian Zones

8.0 Cohesive Final Design

8. Cohesive final design

The CSSI planning approval allows for the PUDCLP to be developed and considered in stages to facilitate design progression and construction on the basis that staging must facilitate a cohesive final design and not limit final design outcomes.

Elements covered by this PUDCLP have been developed within a clear framework established in the Metro reference design and as enabling works will underpin later packages. These elements will be integrated into other PUDCLPs developed for the project.

Coordination with SSTOM

All known interfaces for the SSTOM Contractor have been itemised a Project Interface Register. These have been developed in accordance with the project Interface Requirements Specification, which categorised these interfaces as below:

- Bridge and Viaducts – such as shear key and derailment kerb starter bars, cast in ferrules for future service routes, drainage system and deck waterproofing, etc.
- Luddenham Station – such as allowance in viaduct pier design to support future station platform.
- Alignment and Formation Earthworks – Such as earthwork quality and levels for future track construction, as well as earthwork interfaces at each end of the project alignment.
- Drainage – Bio-retention basins

SM-WSA Design Guidelines, SM Reference Design and Particular Specifications communicate desired and required outcomes for Corridor elements.

The SCAW project will manage these interfaces utilising the ICD process to ensure efficient and effective outcomes. Sydney Metro's Design Team SMEs actively review SSTOM design in relation to these requirements.

8.1 Permanent Works

The SCAW package will deliver permanent works that the following SSTOM package will fit out with rail, traction power, communications and station and emergency egress elements. SCAW will deliver permanent built works and initial landscape elements that include:

- Viaducts, Piers and Abutments
- Earthworks including new embankments and cuttings
- Drainage
- Landscape of impacted creeks

8.1.1 Vertical and Horizontal Alignment

The track geometry design considers the functional requirements of the Metro rolling stock and intended operations, including passenger comfort.

The whole of life analysis investigates the impacts of any proposed changes to the vertical alignment to follow-on contractors and the long-term operation and maintenance of the SM-WSA system, including:

- Operational journey time and on-time running
- Passenger comfort
- Capacity of the traction power system
- Total energy consumption
- Landowner access for impacted properties.

Passenger comfort compliance is met through compliance to geometric parameters. The approach to the rail alignment design has been to improve the reference design geometry where practical while looking to minimise associated civil works, with the core aim of reducing materials required across the project.

No horizontal changes have been undertaken, however vertical optimisation has been investigated, tested and approved by Sydney Metro.

8.1.2 Formation design

The formation and embankments have been designed both in terms of geometric properties and material specifications. The design meets the vertical and horizontal alignment requirements and seeks to deliver an optimised solution that:

- Minimises the construction access road footprint and allowing the design to be influenced by existing topography, particularly around riparian zones
- Positions temporary construction access roads adjacent to the rail corridor, where practical, to minimise unnecessary clearing and grubbing
- Limits impacts to traffic and transport on the local road network
- Minimises unnecessary waste from the project works through the Interface Contractor's use of the Handover Works
- Reuses as much topsoil as possible to reduce off-site disposal volumes
- Considers flooding in the design of the embankments (rapid drawdown instability)
- Designs the drainage system to capture pollutants from rainwater runoff while also facilitating the use of rainwater to landscape areas
- Facilitates fauna crossings below viaducts and through embankments at nominated locations.

8.1.3 Viaduct design

Viaducts have been designed to meet the spatial requirements and accommodate nominated services and communications elements.

8.1.4 Station Location

Only one stop is nominated at the mixed use Luddenham Precinct. Provision has been made for an 85m level section of viaduct (plus 40m each end) with 4.6m clearance below the viaduct structure.

8.1.5 Emergency egress

SSTOM will be responsible for the provision of emergency egress from the rail corridor.

On the embankments, SSTOM to nominate locations and paths of egress.

The SCAW contract will make provision on the viaduct at two locations – 615m north and south of Luddenham Station for future stair egress. A gap in the parapet will be provided 1000mm minimum clear width and 200mm minimum above top of rail.

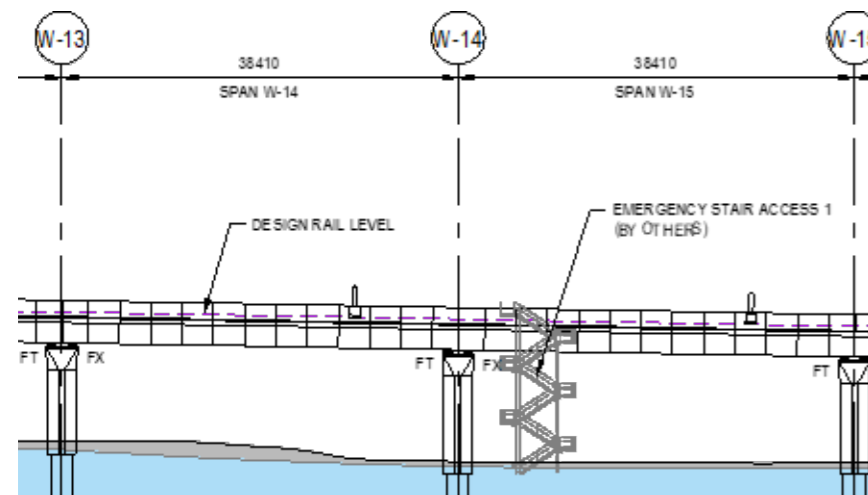


Figure 70 – Viaduct emergency egress

8.2 Planting

The extent of SCAW's permanent and temporary landscape across the corridor is a complex matrix tied to staging and the most efficient delivery of a coordinated whole landscape. As illustrated above, the definition of temporary and permanent elements is clear and has been developed to ensure that there are no gaps between packages.

The following diagrams outline the SCAW scope and responses.

Table 22 – SCAW Planting

Planting Areas
Tributary of Blaxland Creek - riparian zones each end of the culvert disturbed by construction - 3 zones
Tributary of Blaxland Creek - Fauna culvert entries
Blaxland Creek riparian zones disturbed by construction
Unnamed Creek riparian zones disturbed by construction
Dry fauna passage culvert at 23+600 (both sides) and 26+420 (western side only due to conflict with temporary haul road to the east)
Haul Road batter landscape temporary for up to 5 years
5 No. Fauna passages under viaducts (chainages 23+600, 25+320, 28+170, 28+815, 29+185)
Seeding Areas
Mix 1 - Cover Crop. Temporary haul roads, basins, channels and all other temporary areas disturbed by construction
Mix 2 - Trackside Rail Batters Mix - Groundcover species within 4 metres of the ballast shoulder of the track.
Mix 3 - General Cumberland Plains Seed Mix - Viaduct construction areas, batters beyond 4 metres from the track + abutments - Shrubs &
Mix 4 - Permanent Stockpile Sites and PS-105 - Trees, Shrubs & Groundcovers
Mix 5 - Swale mix - permanent vegetated swales.
Note: Cover crop is used in all seeding mixes at 30kg/ha (No clover) when mixed with native seed and 55 kg/ha (with Clover) when applied separately



KEY

PLANTING

- RIPARIAN PLANTING MIX 1
- RIPARIAN PLANTING MIX 2
- RIPARIAN PLANTING MIX 3

SEEDING

- SEED MIX 1 - COVER CROP
- SEED MIX 2 - TRACKSIDE RAIL BATTER MIX (GRASSES AND GROUNDCOVERS)
- SEED MIX 3 - GENERAL CUMBERLAND PLAINS SEED MIX
- SEED MIX 4 - PERMANENT STOCKPILE SEED MIX
- SEED MIX 5 - SWALE MIX

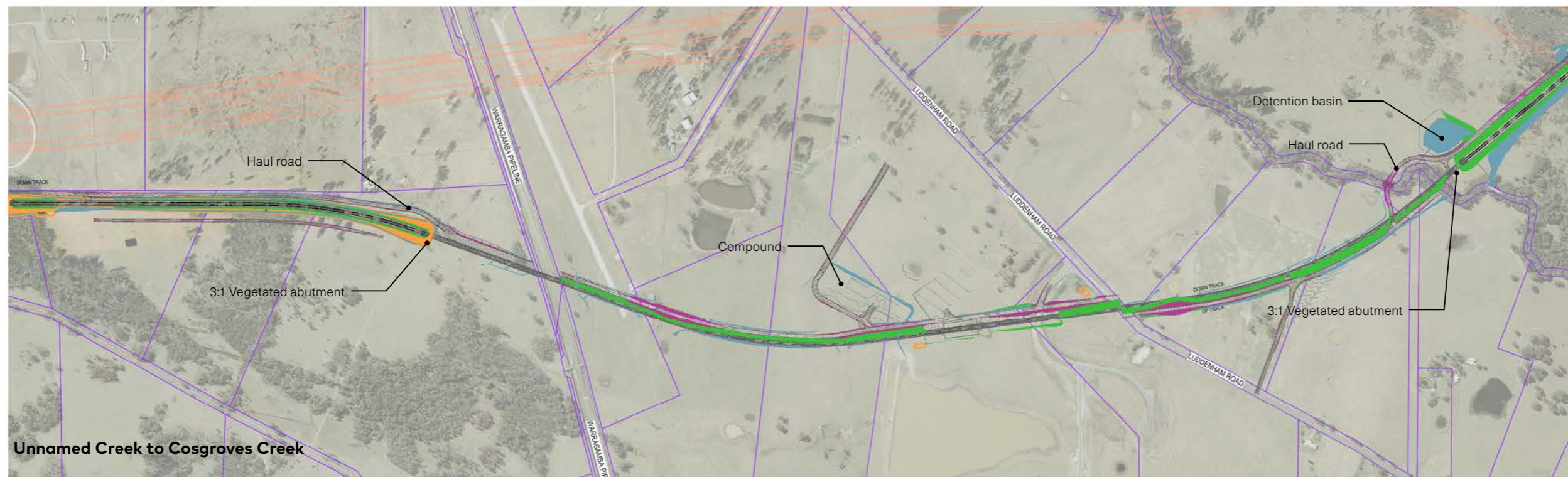


Figure 71 – SCAW Planting and Responsibilities

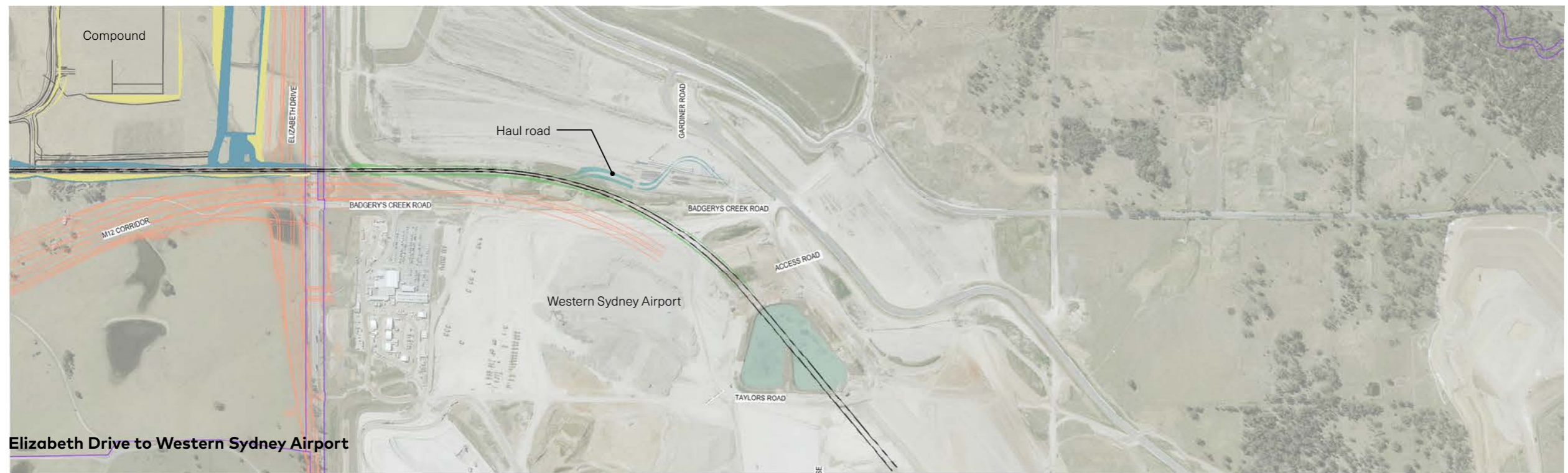
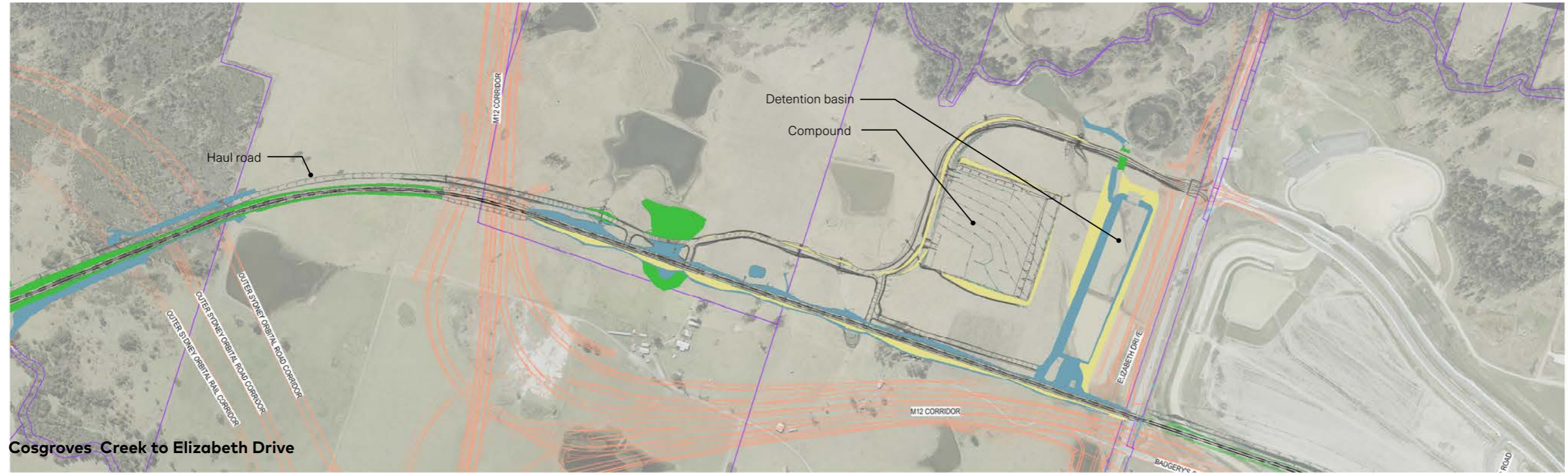


Figure 72 – SCAW Planting and Responsibilities

9. Sustainability

9. Sustainability

In order to achieve outstanding sustainability outcomes in the design and construction of SCAW, a 'Leading' Infrastructure Sustainability (IS) score of 75 with a stretch target of 81 has been adopted.

Collaboration between the sustainability and engineering teams during Tender has identified significant savings to reduce carbon-intensive material consumption (namely cement, concrete and steel), diesel fuel combustion and water demand for construction activities. This lean approach enables an efficient program and reduces community impacts as transportation is limited and environmental quality is preserved.

Limiting biodiversity impacts has been assessed by minimising land clearing wherever possible and maximising revegetation opportunities.

As part of the project's ongoing commitment to limit waste, maximise re-use potential, and procure recycled products, the project will include industry-first trials, including 40% Recycled Asphalt Pavement (RAP) with 5-10% recycled crushed glass for the wearing course on a section of flexible pavement.

The sustainability team is driving targets through innovation, diligent governance, collaboration with the supply chain and continuous engagement with the broader design and construction teams. A Sustainability Design Report will be prepared for Design Stages 1, 2 and 3 in accordance with project requirements

9.1 Green Infrastructure Targets

The overall project is committed to meeting Green Infrastructure Targets - strategies to reduce urban heat, maximising permeable surfaces, responding to green corridors etc.

- Demonstrate a minimum 5 per cent improvement in ecological value in the corridor area
- Target at least 25 per cent tree canopy cover in precinct areas, and aspire to 40 per cent canopy cover across the project area
- At least 50 per cent of station and plaza landscaping to use Australian native species
- At least 90 per cent with 100 per cent of corridor landscaping to use Australian native species, prioritising endemic plants to preserve Cumberland Plains identity in the Western Sydney region

- Integrate water sensitive urban design solutions, including the provision of vegetated swales where feasible and at least 80% of the corridor to be permeable surfaces. All station and plaza areas are to be at least 40%.
- Target 75 per cent of the project surface area (excluding track) to comprise elements which reduce the Urban Heat Island effect, including vegetation and permeable or lighter coloured surfaces

The SCAW component represents a small percentage of the overall corridor and will be initial landscape works to limited areas. The final landscape delivered by later stages will demonstrate compliance with the Green Infrastructure Targets.

Sustainability is also a key objective for Sydney Metro in the delivery of SM-WSA. With this in mind, we have investigated opportunities to avoid disposing earthworks spoil offsite.

Spoil generated from the project is a major element in the SCAW works and will predominantly be in the form of stripped topsoil material and the underlying Bringelly shales of varying strengths. A key sustainability outcome is to strategically place spoil material within the Project Site boundaries in a considered and sensitive manner that targets zero export of spoil.

The SCAW is required to achieve a verified Infrastructure Sustainability (IS) "design" rating score of at least 75 points, using the IS rating tool version 1.2 "Design and As Built". The Project is targeting Level 3 for IS Rating credit Mat-1 'Materials lifecycle impact measurement and reduction', which involves demonstrating a 30% reduction in materials lifecycle impacts compared to the base case footprint. Design optimisation associated with the abutment (including reduction of hard material and imported rock used) will contribute to achievement of this target. Further detail will be included in the Sustainability Design Report (SMWSASCA-CPU-SWD-EW000-SB-RPT-080101)

9.2 Permanent Element Sustainability Considerations

9.2.1 Concrete Elements

The project aims to achieve an SCM replacement of 30%, targeting a carbon footprint around 350-380 kg CO₂-e/m³ dependent on final concrete Value for Money outcomes. Sydney Metro approval will be required).

Seven concrete mixes have been investigated and tested and they vary from 420kg/m³ of cement and 365kg/m³ of cement. These will be validated through a sustainability and Value for Money review.

Colour and Finish

Colour will be impacted by material used. Colour consistency and finish are specified and consistency of colour is controlled under mechanisms within the ITPs

The attainment of a light colour concrete through concrete colouring and was investigated but was rejected due to potential variances.

The colour and finish of the concrete - a smooth off-form finish - is achieved under the specifications Class "2CX" as per AS:3610.1.

Textured concrete was considered but not adopted due to issues with maintenance, staining and constructability (impacts on formwork and construction program)

All concrete bridge elements are designed for a 120 year design life. Concrete grade and covers to reinforcement have been selected to provide an effectively maintenance free performance of the concrete elements over the design life of the bridge.

- Consideration has been given to the use of recycled aggregates in reinforced concrete elements.
- Cement replacement materials of either Fly Ash or GGBS have also been considered suitable for use and will be incorporated into the mix design process
- Appropriate steel with high recycled content has been considered where it does not compromise structural and durability performance.

9.1.2 Viaducts

- For the monopile arrangement, the shape of piers is designed to have larger plan area than pile. This avoid breaking down the pile concrete to expose the starter bar as in a traditional mono pile/pier interface to minimizes the wastage of material and speed up the construction
- The adoption of mono-piles reduces number of piles in the project in order to facilitate a quicker construction
- Internal post-tensioning tendon is avoided to minimise the thickness of flanges such that the deck and foundation quantity can be reduced.

9.1.3 Bridge over Future M12

- The tender design has reduced the number of Super-T girders required in each span of the bridge. Consequently, leading to a reduction in the overall volume of concrete within the bridge deck. It also allows for the reduction in the number of bridge bearings required.
- Furthermore, pier size has been optimised which can lead to faster construction time and lower material/overhead costs.

9.1.4 WSI Drainage Channel Bridge

- The tender design has reduced the number of Super-T girders in the span of the bridge. This leads to a reduction in the overall volume of concrete within the bridge deck.
- The tender design has reduced the number of piles at each abutment which results in less material for the substructure construction.
- The bridge is fully integral, which eliminates the need for bridge bearings. The superstructure to substructure interface of this bridge is therefore essentially maintenance free for the full design life of the structure.

9.3 Climate change considerations

The 120-year design life for major civil structures, means climate change has the potential to impact the infrastructure asset into the next century.

Climate change has heightened the risk of increased intensity and frequency of bushfires, droughts, extreme heat, heavy rainfall, and extreme winds in Western Sydney. The design has acknowledged related risks during construction or operation phases.

The approach to climate change risk assessment and adaptation has been guided by the *SM-WSA Climate Change Register* and the *SM-WSA Climate Change Risk Assessment Report*.

There is a commitment to the continued identification of climate change risks and implementation of measures to mitigate all classified as 'very high', 'high' and 'medium' are addressed to ensure the integrity and durability of the asset into the long-term.

Examples of adaptation measures are:

- A rainfall factor of 19.7% to assess the 1% AEP has been used climate change flood event.
- Increasing the design rainfall intensities by 30% and 40% will be assessed during detailed design phase.
- Pier positions for the viaduct, have been positioned to minimise or avoid any impact onto flood levels
- The structure soffit is set to a minimum level of 500mm above the 1% AEP flood level
- The clear span of the structure exceeds the width of the drainage channel below, and no structural elements have been introduced into the flow path within the channel.

10. Management, Maintenance and Implementation

10. Management, Maintenance and Implementation

In accordance with Condition E79(i), the timing and responsibility for implementation of the elements covered by this PUDCLP are described below.

10.1 Timing and responsibilities

It is essential that the Project is operational by the WSI airport opening. SCAW will progressively handover the completed portions of this enabling work package by the contracted dates for Substantial Completion and in accordance with the requirements of the D&C Deed

- Designing all handover items in accordance with the requirements of the project requirements to facilitate timely design reviews and approvals
- Developing the investigation and design program with the staged delivery requirements in mind
- An optimised alternative 2-stage design review process for packages relating to critical Handover Dates
- Standardising construction methodologies, where possible, to enable faster construction and maximise repeatability.

Refer Table 23 for Portion completion dates.

Table 23 – Key Elements and Timing

Portion	Element	Date of Substantial Completion
Portion 1	All Project Works and Handover Works within and associated with this part of the Construction Site from Orchard Hills East Station to north of the Warragamba Pipeline easement excluding Portion 1A and Portion 18	16 December 2024
Portion 1A	All Project Works and Handover Works within and associated with this part of the Construction Site within the Stabling and Maintenance Facility	4 July 2023
Portion 1B	All Project Works and Handover Works within and associated with this part of the Construction Site within the Stabling and Maintenance Facility	4 July 2023
Portion 1C	All Project Works and Handover Works within and associated with this part of the Construction Site from north of the Warragamba Pipeline easement to Luddenham Station excluding Luddenham Station (Portion 2 and Portion 2B)	28 February 2025
Portion 2	All Project Works and Handover Works within and associated with this part of the Construction Site, including Luddenham Station	19 October 2023
Portion 2A	All Project Works and Handover Works within and associated with this part of the Construction Site, from Luddenham Station to Luddenham Road	13 December 2023
Portion 2B	All Project Works and Handover Works within and associated with this part of the Construction Site adjacent to the Luddenham Station site (Portion 2)	28 August 2023
Portion 3	All Project Works and Handover Works within and associated with this part of the Construction Site, from Luddenham Road to the southern extent of PS-35 including any finishing works on top of the M12 Bridge, but excluding the M12 bridge substructure, superstructure and architectural panels.	26 June 2024
Portion 3A	All Project Works and Handover Works within and associated with this part of the Construction Site, including the M12 Bridge substructure and superstructure excluding any finishing works on top of the M12 Bridge and excluding the architectural panels	3 July 2023
Portion 3B	All Project Works and Handover Works within and associated with this part of the Construction Site, including the architectural panels	30 September 2024
Portion 4	All Project Works and Handover Works within and associated with this part of the Construction Site from the southern extent of 'PS-35' to (but excluding) Elizabeth Drive Overbridge	15 November 2024
Portion 4A	All Project Works and Handover Works within and associated with this part of the Construction Site including underneath Elizabeth Drive Overbridge and the existing Elizabeth Drive road corridor	12 December 2024
Portion 5	All Project Works and Handover Works within and associated with this part of the Construction Site from the south of the existing Elizabeth Drive road corridor to the and within the On-Airport corridor.	21 June 2024
Portion 6	All Project Works and Handover Works within and associated with this part of the Construction Site, including north of Airport Business Park Station	7 July 2023

10.2 Operational maintenance standards

The Operation and Maintenance Manuals (including any operational maintenance standards) are part of the Asset Management System whose development, implementation and maintenance are part of the scope of the OpCo or Shadow Operator, where OpCo is the entity selected by the Principal (Sydney Metro) to perform SSTOM Works.

The SCAW D&C Deed defines SSTOM Works to mean the stations, systems, trains and operations and maintenance public-private partnership for the Sydney Metro Western Sydney Airport including:

- the financing, design and construction of the stations
- linewise systems, rail systems, railway infrastructure, stabling and maintenance facilities, operations control centre and trains
- the operations and maintenance of the entire Sydney Metro Western Sydney Airport

10.3 Management and maintenance for design elements

Operational maintenance standards will be ultimately developed, implemented and maintained by SSTOM and not SCAW.

Once handed over, all elements become the responsibility of SSTOM or the CLW package.

10.4 Management and maintenance of landscaping

As enabling works, SCAW landscaping has been designed to facilitate the installation of permanent landscape by SSTOM and the CLW contractors,. No irrigation is to be provided in this package.

SCAW will be responsible for landscape maintenance until handover of their works to either SSTOM or CLW. Subsequently, the operator will be responsible for maintaining the landscaping in their licensed maintenance area to a high standard of health and appearance.

After installation until handover, the following horticultural practices shall be carried out to ensure plants are maintained in a vigorous condition. Landscape

Generally:-

- Maintain all vegetated areas until established or until Construction Completion, whichever occurs first.
- Water areas where and when required. Water by means of a fine spray which causes minimal disturbance to seeded areas.
- Clear dead vegetation from areas showing poor growth or damage and replace all lost topsoil. Then recultivate and reseed the area.
- Carry out maintenance inspections of the plantings at intervals not exceeding one month.
- Maintain all landscape planting works in accordance with the contract requirements of Clause 4 during the period of construction and, where specified in Annexure R179/A, during the Landscaping Maintenance Period, until Final Completion.

For Rehabilitation Areas:-

- Maintenance inspection of vegetated areas will be carried out at least monthly and missing or dead plantings will be replaced.

For trackside rail batters within 2 metres:-

- Contains Indigenous native grass and groundcover species calibrated to satisfy clearance requirements and where occasional maintenance mowing may be required. The mix contains species that can withstand infrequent mowing.

Watering

- Watering is required prior to the commencement of the Landscaping Maintenance Period .

- If Landscaping Maintenance Period is applicable, carry out maintenance watering at the following application rates:
 - I. 20 litres of water per plant at weekly intervals for the first 12 weeks;
 - II. 10 litres of water per plant at fourteen (14) day intervals thereafter.
- Notwithstanding the watering application rates specified above, ensure that a distinct level of moisture in the soil is maintained at all times during this Landscaping Maintenance Period and that plants do not dry out during this period.
- The frequency of watering may be varied during periods of adequate rainfall.

Mulch

- Maintain organic mulch in a weed free condition and reinstate the organic mulch/weedmat as necessary.
- During each Maintenance Inspection, inspect all mulched areas and, where necessary, top up all areas to maintain the depth of organic mulch as specified in the contract.

Weed Control

- Keep all planting areas, and up to the limit of clearing as specified in Clause 3.5.2, free of grass and weed.
- Carry out grass and weed removal at intervals of not more than four (4) weeks and ensure that weeds do not flower to form seed heads.

Disease and Insect Control

- Plants must be sprayed with pesticides to control disease and insect infestation when and where necessary.

Plant replacement

- Replace any missing or dead plants, or plants nominated by the Principal as unsatisfactory, within fourteen (14) days of detection. Replacement plants must be of similar size and quality and of identical species and variety to the plant being replaced.

Stakes and Ties / tree Guards

- Repair any tree ties that have been broken and replace any missing stakes.
- Maintain the tree guards around each plant so that the natural plant growth is not impeded or restricted. Replace damaged and missing tree guards

Appendix A

Evidence of collaboration and consultation

Appendix A - Evidence of Collaboration and Consultation

The project team used Microsoft Teams to consult the following stakeholders on the Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works Place, Urban Design and Corridor Landscape Plan (PUDCLP), recordings and transcripts were saved documenting the online Teams meeting consultations:

- Liverpool City Council – Wednesday 13 July 2022
- Regional authorities – Thursday 14 July 2022
- Agencies – Friday 15 July 2022
- Penrith City Council – Tuesday 2 August 2022

The SM-WSA, SCAW Community Team offered Celestino (Sydney Science Park) a personal briefing of the PUDCLP on Wednesday, 17 August 2022. A representative of Celestino advised on Friday, 26 August 2022, that they were satisfied with the Virtual Engagement Room information. They undertook to contact the project team if a further briefing on the PUDCLP was required. No further communication was received from Celestino on the PUDCLP.

The SM-WSA, SCAW Community Team distributed a letter to residents along the project alignment on Friday, 19 August 2022, inviting feedback on the PUDCLP via the Virtual Information Room. This included a QR code and link to enable fast access to this online resource. An email campaign sending a copy of the letter was also sent to stakeholders on the projects' email distribution list (total of 1024) on Friday 19 August 2022.

The SM-WSA, SCAW Community Team has additionally made phone calls and emailed affected landowners since the Virtual Engagement Room went live. This is recorded in Sydney Metro's Consultation Manager database. The project team has received no feedback from the community on the PUDCLP via any of the touchpoints – email, form in Virtual Engagement Room or phone call. Some subsequent doorknocking of some of the alignment also provided an opportunity for comment. Stakeholders were invited in face-to-face meetings if they had feedback but none was forthcoming.



**Sydney Metro –
Western Sydney Airport**

Notification – Orchard Hills and Luddenham

19 August 2022

Sydney Metro is Australia's biggest public transport project.

Sydney Metro – Western Sydney Airport is the new metro railway line which will service Greater Western Sydney and the new Western Sydney International (Nancy-Bird Walton) Airport. A city-shaping project, the 23-kilometre new railway will connect the Western Sydney Aerotropolis in the south with St Marys in the north – where customers can connect to the existing Sydney Trains suburban T1 Western Line. The NSW and Australian governments have a shared objective of having Sydney Metro – Western Sydney Airport operational when the airport opens for passenger services.

CPB Contractors and United Infrastructure Joint Venture (CPBUI JV) was awarded the surface and civil alignment works contract for Sydney Metro – Western Sydney Airport in March 2022.

Place, Urban Design and Corridor Landscape Plan: community consultation

CPBUI JV is responsible for preparing a Place, Urban Design and Corridor Landscape Plan (PUDCLP) that documents and illustrates the permanent built works and landscape designs of the surface and civil alignment works and how these works will be maintained. The PUDCLP includes designs of the bridges, earthworks, and viaducts that will make up the 10.6 kilometres of the above ground section of the Sydney Metro – Western Sydney Airport project.

Consultation with the community is a key aspect of the plan. CPBUI JV is offering residents and landowners an opportunity to learn more about the proposed designs for this package of works.

We can provide a face-to-face briefing on the plan to those who are interested in hearing from us.

Alternatively, you can scan the QR code or click on this link <https://caportal.com.au/cpb/smw-pudclp/virtual?hview=modalWelcome> to access the virtual information room where you will find lots of information and maps. You can also provide us with feedback through this room.

The period for consultation will end on 9 September 2022. We will directly respond to each submission during the consultation period and provide a summary of the feedback and responses in the virtual information room with all published feedback to be anonymous.



Figure A1 – Virtual Engagement Room Invitation

Table A1 – Consultation Process and Outcomes

Consultation	Mode	Date	Action
Penrith Council	Presentation	2/8/22	Completed 2/8/22
Liverpool Council	Presentation	13/7/22	Completed 13/7/2022
Department of Planning and Environment, Energy, Environment and Science [Condition E14]	Presentation	15/7/22	Invited but did not attend the briefing
Department of Primary Industries, Fisheries [Condition E14]	Presentation	15/7/22	Invited but did not attend the briefing
Western Parklands City Authority	Presentation	14/7/22	Invited but did not attend the briefing
Western Sydney Planning Partnership	Presentation	15/7/22	Invited but did not attend the briefing
NSW National Parks and Wildlife Service	Presentation	15/7/22	Invited but declined to attend briefing
Transport for NSW	Presentation	15/7/22	Completed 15/7/22
Western Sydney Airport Co	Presentation	14/7/22	Completed 14/7/22
Department of Planning, Industry and Environment, GPEC	Presentation	15/7/22	Completed 15/7/22
Sydney Water	Presentation	15/7/22	Completed 15/7/22
Water NSW	Presentation	15/7/22	Invited but declined to attend briefing
Greater Sydney Parklands	Presentation	15/7/22	Invited but did not attend the briefing
Department of Planning and Environment	Presentation	15/7/22	Completed 15/7/22
Telstra	Presentation	15/7/22	Completed 15/7/22
Ausconnex	Presentation	15/7/22	Completed 15/7/22
Local Land Services	Presentation	15/7/22	Completed 15/7/22
Greater Sydney Landcare	Presentation	15/7/22	Completed 15/7/22
Connecting with Country Working Group	Presentation	5/8/22	On-going consultation
Affected landowners and businesses	Virtual Engagement Room	19/8/22-9/9/22	Offered briefings – to date only Celestino has expressed interest in a briefing. Date TBA
The local community as identified and defined	Virtual Engagement Room	19/8/22-9/9/22	Hard copy and soft copy notifications sent to the local community 19 August with follow up phone calls to some known community members starting on 25 August and continuing.

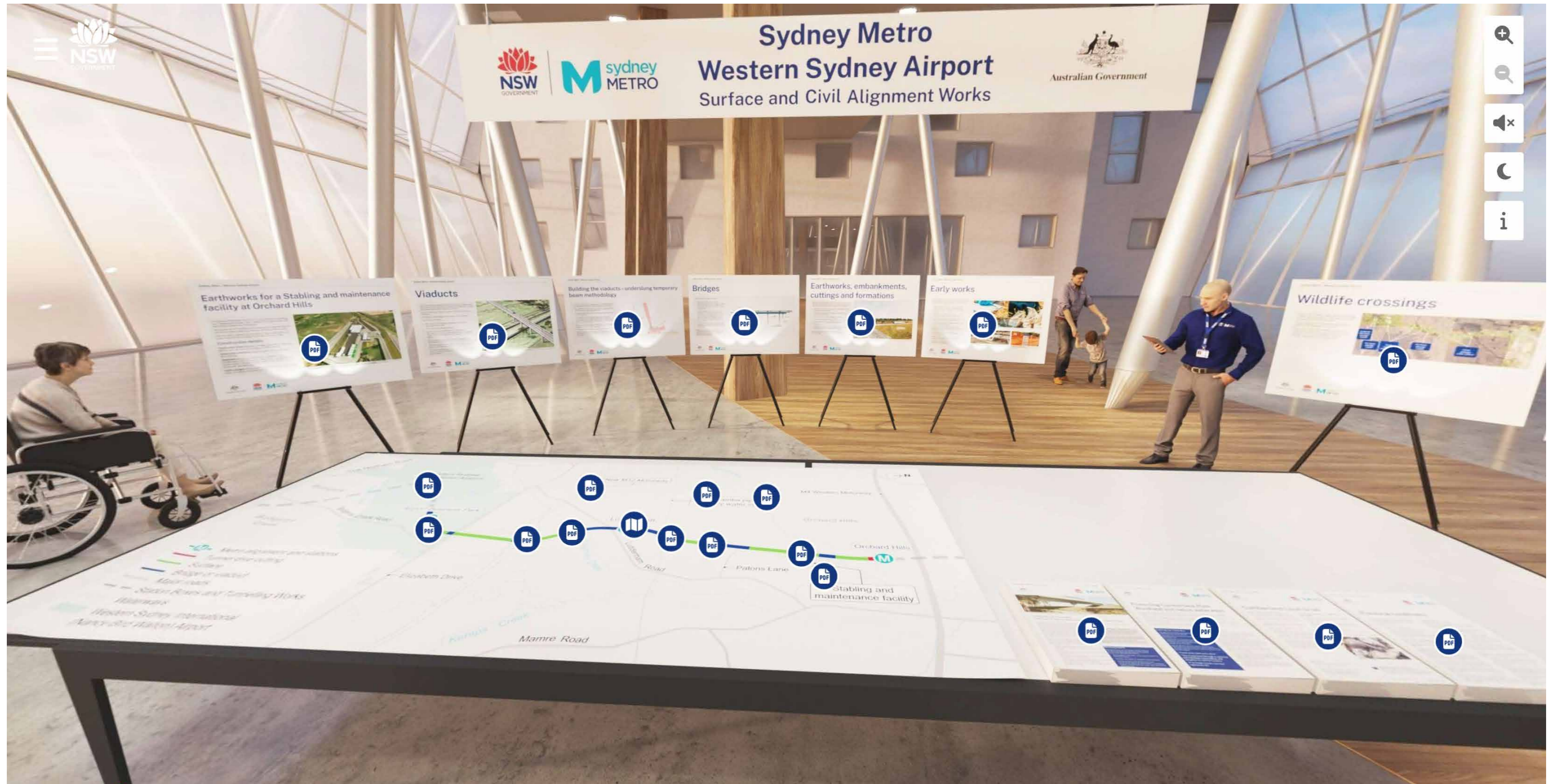


Figure A3 – Virtual Engagement Room Home Page

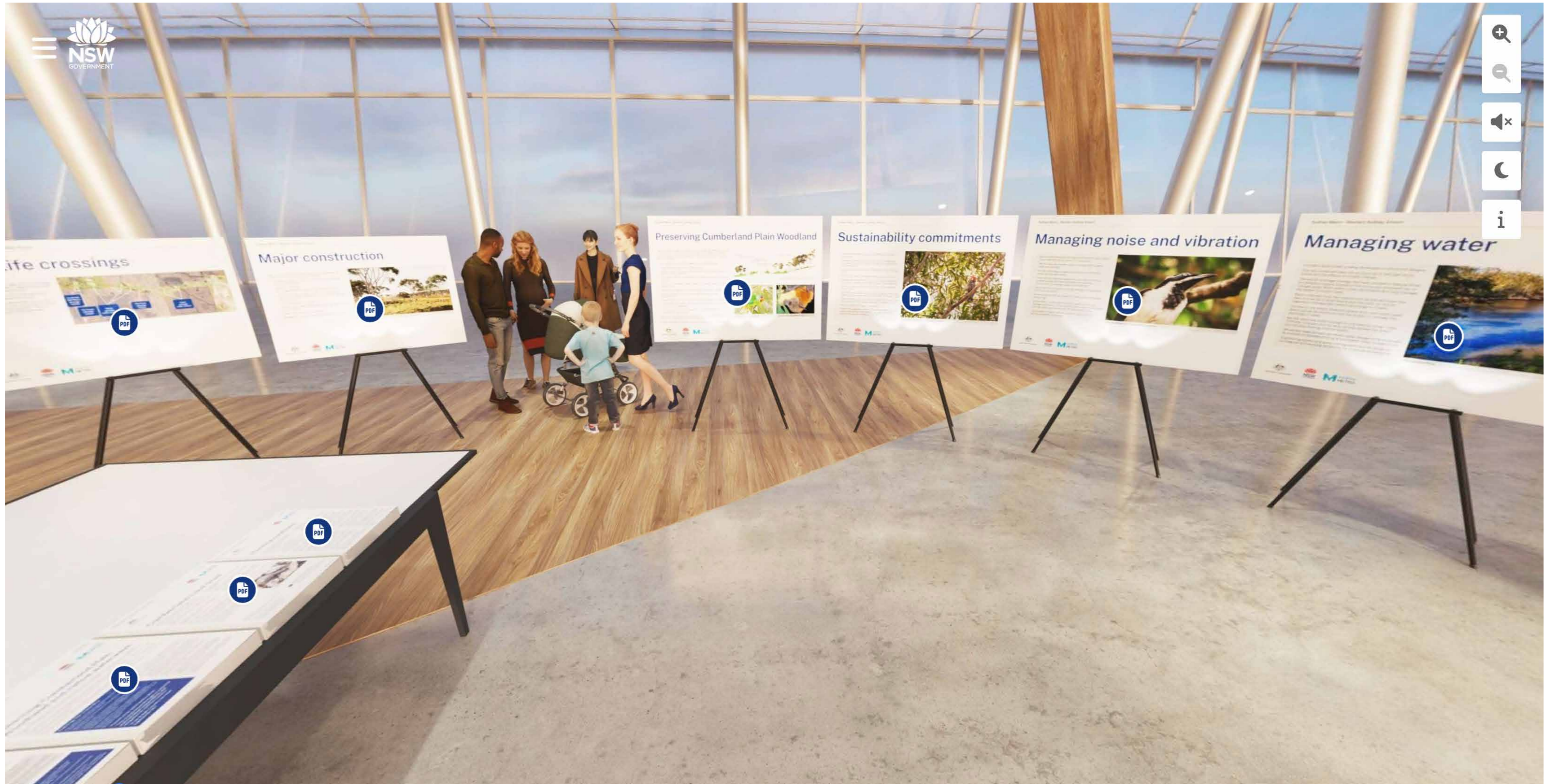


Figure A3 – Virtual Engagement Room Home Page

Appendix B

Feedback from Consultation

Appendix B - Feedback from Consultation

The following table details how the feedback received during consultation with the stakeholders and the community has been addressed in the PUDCLP.

Stakeholder	Issue raised	How it has been addressed in this plan
Water NSW	Water discharge from the Warragamba Pipelines viaduct	<p>The project team emailed this stakeholder to explain that the viaducts are being designed to prevent water discharges entering the Warragamba Pipeline area.</p> <p>The associated bunds and flow channels are currently in design to achieve this outcome too.</p> <p>Response to be added to the Virtual Engagement Room</p>
SES	Stakeholder requested the project consider the impact of flooding and community on the project. Will the site design and stormwater management minimise any risk to the community? Stakeholder requested that staff be made aware of flood risks with the use of signage. Stakeholder requested the project develops an emergency plan to prepare, respond, and recover from flooding (stakeholder provide a template for the project to use due to their experience and expertise).	<p>Response attached</p> <p>Response to be added to the Virtual Engagement Room</p>
Penrith City Council	This stakeholder raised multiple concerns. Their submission has been appended to this document.	<p>Response attached.</p> <p>Response to be added to the Virtual Engagement Room</p>
DPI Fisheries	DPI Fisheries acknowledge that Condition E14 of CSSI-10051 has been met by CPB Contractors/ United Infrastructure on behalf of Sydney Metro	Response attached.
DPE Environment and Heritage	EHG does not have the resources to comment on E14	Response attached.

Response to State Emergency Services (SES)

The State Emergency Service (SES) provided comments to the Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works Place, Urban Design and Corridor Landscape Plan which required a response.

The project team gratefully acknowledges the input we have received from the SES in this matter.

These are the comments and responses.

SES Comment: Consider the impact of flooding and community on the infrastructure up to and including a probable maximum flood event. The site appears to be impacted by flooding (Penrith Overland Flow Flood “Overview Study” 2006). It is acknowledged that a project flood model is being developed to inform the project designs.

A flood assessment has been undertaken in support of the project development. A TUFLOW model (Baseline Flood Model provided by Sydney Metro as a basis for this assessment) has been adapted to provide a flood model for this Surface and Civil Alignment Works package for the Sydney Metro – Western Sydney Airport project. One of the main objectives for the flood assessment is to establish flooding predictions along the project alignment to ensure flood impacts are compliant with the project’s Environmental Impact Statement and project Conditions of Approval. Mitigation arrangements including retention basins will also be constructed.

The mitigation measures adopted in the project design include:

- Adoption of viaducts across major creek crossing areas to minimise the impact of flooding
- Incorporating earthworks and drainage design that enables specified flood immunity for different components of the project in accordance with project specifications
- Assessment of scouring for piers, abutments and embankments, and the design of appropriate protection measures.

Advice from relevant subject matter experts indicates that the above measures will manage and mitigate impacts of any flood events.

Pursue, if relevant, site design and stormwater management that minimises any risk to the community.

A flood assessment was undertaken in support of the design to demonstrate that the proposed construction will not result in flood impacts in the surrounding areas beyond the limits specified for the project. The project has a number of flood impact criteria to minimise impacts on surrounding areas that it is required to meet.

It is noted that the Conditions of Approval for the project require assessment of the impacts for flood events up to and including the 1% annual exceedance probability (AEP) design event inclusive of climate change impacts, with flood impacts for the probable maximum flood event also being assessed.

Ensure workers and people using the facility during and after the upgrades are aware of the flood risk, for example by using signage.

The contractor undertaking the Surface and Civil Alignment Works as part of the Sydney Metro – Western Sydney Airport project, CPB Contractors and United Infrastructure Joint Venture (CPBUI JV),

PUDCLP – SES submission

The State Emergency Service (SES) provided comments to the Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works Place, Urban Design and Corridor Landscape Plan which required a response.

The project team gratefully acknowledges the input we have received from the SES in this matter.

These are the comments and responses.

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Ensure workers and people using the facility during and after the upgrades are aware of the flood risk, for example by using signage.

The contractor undertaking the Surface and Civil Alignment Works as part of the Sydney Metro – Western Sydney Airport project, CPB Contractors and United Infrastructure Joint Venture (CPBUI JV),

Response to Penrith City Council

Itemised response to topics raised in submission from Penrith City Council re Sydney Metro Western - Sydney Airport, Surface and Civil Alignment Works, Place Urban Design Corridor Landscape Plan (PUDCLP).

The Surface and Civil Alignment Works (SCAW) package of the Sydney Metro – Western Sydney Airport project will deliver 10.6 kilometres of viaducts, bridges, embankments and earthworks for the above ground section between Orchard Hills and the Airport Business Park station. The preparation of a PUDCLP for this package of works is a requirement of Condition E77 of the Sydney Metro – Western Sydney Airport project approval SSI-10051.

Key components of the SCAW PUDCLP include:

- Landscape plans and the protection / conservation of Cumberland Plain Woodland vegetation
- Flood management and mitigation
- Initial creek rehabilitation
- Connecting with Country considerations in design
- Viaduct and bridge design
- Wildlife crossings to provide safe passage for native animals

Definition of terms

Term	Description
CLW	Corridor Landscape Works
DRP	Design Review Panel
EIS	Environmental Impact Statement
PCC	Penrith City Council
PUDCLP	Place, Urban Design and Corridor Landscape Plan
SCAW	Surface and Civil Alignment Works
SM-WSA	Sydney Metro – Western Sydney Airport
SMF	Stabling and Maintenance Facility
SSTOM	Stations, Systems, Trains, Operations and Maintenance

This table has been developed in response to the submission lodged by Penrith City Council during the PUDCLP consultation phase. It identifies matters that are relevant to the SCAW PUDCLP as well as matters that will be considered in future design stages by the relevant contractor(s).

Item No	Penrith Council Input	Sydney Metro - Western Sydney Airport Response
1	The information provided is presented as being subject to change. This gives Council uncertainty of what will be committed to and delivered	The Place, Urban Design and Corridor Landscape Plan (PUDCLP) is prepared to document and illustrate the permanent built works and landscape design of the Critical State Significant Infrastructure (CSSI) and how these

		works will be maintained as they apply to the Surface and Civil Alignment Works (SCAW) contract scope of works. The PUDCLP identifies key principles and design approaches that are relevant to the SCAW scope of works. The scope of the SCAW works is limited to: <ul style="list-style-type: none"> • earthworks for embankments and the Stabling and Maintenance Facility site • viaducts and bridges • initial rehabilitation of creeks, • drainage works as well as stockpiling prior to further works.
2	An overarching Public Domain & Landscape Strategy needs to be developed that directs the individual PUDCLP's so that all bodies of work are aligned and work together.	Sydney Metro - Western Sydney Airport Design Guidelines, Concept Design and specifications articulate and define the overall Public Domain & Landscape Strategy for the project. The Corridor Landscape Strategy outlines the vision for the corridor and presentations have been made to Penrith City Council (PCC) on these project components. The SCAW package is an enabling package that includes, but is limited to, permanent rail structures such as viaducts, bridges and formations as well as a largely temporary landscape. Further public domain and landscaping strategy is to be developed as part of the Stations, Systems, Trains, Operations and Maintenance (SSTOM) and Corridor Landscape Works (CLW) scope of works packages.
3	Public domain principles are needed to outline vision and outcomes. These principles should inform delivery of: <ul style="list-style-type: none"> - Public Domain Strategy; - A Landscape Urban Design Concept Plan. 	There are established Sydney Metro - Western Sydney Airport Design Guidelines, Station Design Principles and specifications that outline the vision and desired outcome. Refer to comment above in item 2.
4	A Place Making Strategy is required for the corridor.	The SSTOM and CLW PUDCLPs will address the corridor works.
5	A Heritage Interpretation Strategy which includes methods for ensuring quality outcomes in the design and delivery of interpretation is required.	There are no known or identified heritage impacts associated with the SCAW scope of works.
6	A landscape and visual impact assessment should be developed and include:	Visual impacts of the corridor of the SCAW works have been addressed in the SCAW PUDCLP and were presented to the Design

	<ul style="list-style-type: none"> - Assessment that considers future development. - Identified effects and categorised potential impact. - An outline of constraints within the corridor and proposed mitigation methods. - Details of the built elements proposed for the Orchard Hills Stabling and Maintenance Facility, its visual impact and how that impact will be managed through design and delivery of the PUDCLP. 	Review Plan (DRP) session 8 on 1 September 2022. While the SCAW scope includes earthworks of the SCAW formation levels, the final ground levels and the infrastructure at the Stabling and Maintenance Facility (SMF) will be by SSTOM. As a result, the visual impacts of the built elements for the SMF will be addressed in the SSTOM PUDCLP. CLW will provide some landscape-related inputs to the SSTOM PUDCLP.
7	It is not clear how the SCAW PUDCLP works overlap with other work packages and the remainder of the corridor in regards to materials, palette, design and place, and delivery timeframe.	The contracts will be implemented sequentially and follow one another. The PUDCLPs for SCAW, SSTOM, Footbridge St Marys (FSM), CLW will be developed sequentially. SCAW material considerations are largely confined to civil structures and are specified. Design and place considerations are addressed in PUDCLPs although these considerations sit largely with SSTOM, as the contract that delivers the rail operational infrastructure, SMF, stations and precincts.
8	Whilst maintaining structural integrity, abutments and embankments should be planted with a variety of suitable species and spacings, and not just native grasses.	Careful consideration has been given to native plantings across all stages of the project. During construction of the SSTOM works, there will be impacts to the zone along the alignment. Rather than providing permanent landscape on embankments that may be impacted by future works, SCAW provides stabilisation with native grasses with final landscaping solutions for the embankments provided by SSTOM. SCAW provides permanent treatments to abutments, which includes a variety of native species. A palette of initial groundcovers, shrubs and grasses will be included in final landscape treatments in the SCAW PUDCLP. SSTOM will install permanent planting to embankments after completion of their works.
9	Suitable rock material (sandstone, quartz, river pebble) should be used in all culvert outlets and waterway scour protection works. Blue metal or basalt should not be used due to the potential negative impact to water quality.	DRP session 8 on 1 September 2022 had a discussion on the use of sandstone and how the uses of this material may have varying connotations for Aboriginal heritage. SCAW is developing further details in relation to material selection. The preference is for a chip cut sandstone at scour zones and culvert outlets but subject to design development.

10	Council's Senior Policy Officer – Aboriginal would be available to be consulted and invited to collaborate on Connecting with Country and Indigenous Engagement initiatives and design.	The SCAW project team has been working closely with Connecting With Country consultancy Murawin and also with Sydney Metro's Connecting with Ngura Working Group. Sydney Metro - Western Sydney Airport welcomes this involvement subject to the agreement of the Connecting with Ngura Working Group.
11	Bushfire risk and management of vegetation along the rail corridor, and flood risk and management of the floodplain, should be considered and addressed.	Bushfire SCAW will prepare a Bushfire Management Plan to manage bushfire risk during construction. The operational bushfire risk and management of the vegetated rail corridor is part of the SSTOM and CLW scope. These considerations will be addressed in SSTOM management plans for their part of the corridor and CLW in their Landscape Plan of Management for the balance of the corridor. The future SSTOM PUDCLP will include details of the proposed management structure. Flooding SCAW has developed initial flood modelling that demonstrates that the enabling works do not impact the corridor and adjacent properties and is within the project planning conditions. Further flood modelling will be provided by SSTOM. The SCAW flood model report will be provided to PCC when it is finalised at the end of 2022. A presentation of the SCAW flood modelling to PCC was held on 2 August 2022. Flood modelling information has also been provided to the NSW State Emergency Service.
12	Clear guidance on what, if any, of the proposed assets or landscaped areas are planned to be handed over to Council in the end state and what will Sydney Metro retain.	No corridor areas will be handed to Penrith City Council. They will remain under Sydney Metro ownership and management. Further discussion about the management of precinct roads, footpaths and landscaping in these road reserves will be undertaken with PCC.
13	A landscape plan with design and treatment details, including cross sections at selected intervals or points of interest, and materiality and planting schedules. Confirmation is required as to whether this detail will be included in the PUDCLP when it is developed.	For the permanent landscaping, the SSTOM Corridor Landscape Master Plan and detailed design for Licensed Maintenance Areas will detail the landscape design. The CLW Landscape Plan of Management will detail objectives, landscape zoning, species, performance outcomes and monitoring regime for wider corridor landscape. The SSTOM PUDCLP will illustrate these approaches.
14	A general arrangement plan would assist in Council's understanding of the spatial	A PCC representative attended a DRP presentation on 1 September 2022 where the

	context of the proposed works and how wide the corridor is at various points along the alignment.	general arrangement diagrams for the corridor were exhibited. This presentation illustrated the SCAW scope/construction footprint, SSTOM scope and CLW scope. If required, these diagrams can be provided to PCC. The final scope boundaries and design are subject to the outcome of SSTOM and CLW contracts.
15	Details on the planned establishment, maintenance and ongoing maintenance of landscaped areas and responsibilities for maintenance.	The future SSTOM PUDCLP will detail their maintenance regime. CLW Landscape Plan of Management will detail objectives, performance outcomes and monitoring regime for wider corridor landscape.
16	Plans and sections detailing specific locations of the viaduct piers and abutments in relation to riparian zones, and flood extents and depths. It is expected that the piers and abutments would be located to not adversely impact riparian areas, not constrain flows and be suitably protected from scour if they are within a flow path.	Specific planning approval obligations have guided the outcomes in and around riparian zones. SCAW has completed a design, which positions viaduct piers away from riparian zones. SCAW will complete detailed site investigations to survey the riparian zones and validate the design methodology. Details of this site investigation can be provided for information when complete.
17	Demonstration and information as to how the riparian zones were determined.	NSW Guidelines for controlled activities on waterfront land outline the width of vegetated riparian zones based on the watercourse order and these zones were defined under the EIS. Where areas within the riparian zones are modified by SCAW construction activities, they will be rehabilitated in accordance with the Guidelines to return the creek to its former condition.
18	Plans and sections detailing the specific locations of viaduct piers in relation to Luddenham Road, demonstrating consideration and provision of future road widening and active transport links.	Viaduct pier locations adjacent to Luddenham Road have been prescribed in the Particular Specification and have been set out to account for the future widening. The viaduct design package which includes these pier locations has been provided to PCC for review.
19	Plans and sections detailing active transport links throughout	Active Transport Links are not part of the SCAW package.

	the rail corridor and how these are to be located within the landscape and in relation to stormwater management assets.	<p>Penrith City Council has been part of the development of the Active Transport Strategy and has been presented with the scope of work. A recent DRP presentation and a previous presentation to PCC included the Active Transport Corridor.</p> <p>The final alignment of the Active Transport Corridor between Orchard Hills and the Warragamba Pipelines will be determined as part of the SSTOM Corridor Landscape Master Plan.</p>
20	Design details of swales, channels, connections to watercourses and any Water Sensitive Urban Design elements.	<p>SCAW has developed a water management strategy that rationalises the number of water quality basins and manages water along the alignment. The Drainage, Water Quality and Flooding design package SCASD2420 has been provided to PCC for review.</p> <p>Vegetated drainage swales are used where the longitudinal grade of the completed drain is between 1% and 5% inclusive. Permanent vegetated drainage swales will have a sinuous shape and the width and side batter slopes will vary so they look more natural with minimum shape requirements being;</p> <ul style="list-style-type: none"> - Minimum Depth: 300mm - Minimum Side Slope: Not steeper than 2H:1V - Minimum Waterway Area: 0.2m². <p>Vegetated drainage swales will be topsoiled to a minimum depth of 100mm where the side slope is approximately 2H:1V and can increase in depth up to 200mm where the side slope is approximately 3H:1V.</p>
21	Riparian zone rehabilitation and planting details.	<p>Riparian zone treatments and planting mixes are detailed in the SCAW PUDCLP document. Landscape design principles for watercourses include;</p> <ul style="list-style-type: none"> - Use a diverse suite of endemic Cumberland Plain Woodland species that are highly adapted to the challenges of hydromorphic structured vegetation along creeks and lower terraces. - Use of species that establish and will consolidate banks early at a high cover rate to reduce the opportunity for weed intrusion - Maximise the on-going potential for natural colonisation of the planted species and adjacent existing vegetation - Create naturalistic meanders and upper terraces - Maximise in-channel storage - Spread the water out into slow flowing shallow

		<ul style="list-style-type: none"> - Design of scour protection using natural solutions including organic fibre mesh, site won rock and snags - Retain as much permanent water storage in the landscape as possible for fish, turtles, frogs, yabbies and to assist with heat island cooling.
22	Details on the timing between delivery of the SCAW PUDCLP, the SSTOM PUDCLP and the Corridor Landscape Works contract (CLW).	<p>The delivery program previously been presented to PCC remains unchanged.</p> <p>Works under each of the contracts will be performed sequentially.</p> <p>The SSTOM PUDCLP will be developed in 2023 with certain landscape related inputs from the CLW.</p> <p>CLW works are not expected to commence before SSTOM construction in the corridor is complete, expected to be late 2025.</p>
23	Details in plan and section, the areas within the scope of the SCAW PUDCLP and that of the SSTOM PUDCLP and CLW.	<p>General arrangement diagrams of the corridor were prepared by Sydney Metro and presented to the DRP on 1 September 2022. A PCC representative attended this presentation.</p> <p>The presentation included SCAW scope/construction footprint, SSTOM scope and CLW scope.</p> <p>Final scope boundaries and design are subject to the outcome of SSTOM and CLW contracts.</p>
24	Provision and design of maintenance access, including all weather access, required to access hard and soft assets and landscape areas. Council approval is to be received for any access to assets planned to be handed over to Council.	<p>No corridor assets are proposed to be handed over to PCC.</p> <p>Maintenance access will be determined through SSTOM Corridor Landscape Master Plan and delivered by SSTOM.</p>
25	A lighting plan for the corridor including specific detail to security lighting, lighting in and around the viaducts, and potential impacts from the planned lighting to wildlife or adjoining properties in both the existence and future scenarios.	<p>Permanent lighting is beyond the scope of the SCAW activities.</p> <p>Lighting is a requirement as set out in the EIS Conditions of Approval (E79(c)) and this condition is assigned to SSTOM.</p> <p>Corridor lighting to the Active Transport Corridor will be determined through the SSTOM Corridor Landscape Master Plan.</p> <p>The Stabling and Maintenance Facility and precinct lighting will also be determined by the SSTOM contractor.</p>
26	Canopy cover that can be achieved and whether there are any restrictions or setbacks for	<p>Canopy cover targets are governed by Green Infrastructure commitments and by the project's Condition of Approval for tree replacement at the rate of two new trees for each tree removed by</p>

	canopy cover in relation to the rail line or viaduct.	the project. These details were presented to the DRP on 1 September 2022, attended by a PCC representative, illustrating vegetation offsets to rail.
27	Permitted canopy cover between any future multi-storey high density living/commercial development adjacent to the viaduct and whether restrictions on canopy are to be put in place.	The viaduct runs (typically) in a 60m wide corridor; this governs the offset from rail infrastructure to future development. Urban strategy and landscape interface to viaduct will be addressed by the future SSTOM contractor.
28	Screening or visual impact mitigation measures that will be provided and whether vegetated buffers will be provided at the outer edges of the corridor for screening and canopy offsets.	Perimeter screening is envisaged in the CLW scope although open views in certain areas are also anticipated. Design will be undertaken through development of the Landscape Plan of Management during 2023.
29	Design details of any fencing within the corridor and how fencing may be screened with vegetation.	Part of the DRP presentation on 1 September 2022, attended by a PCC representative, illustrated rail fencing types and related vegetation issues. Permanent fencing solutions are within SSTOM scope.
30	Demonstrated public access provisions or inclusions, including provision and/or inclusion of active transport links.	Refer to comment above in item 19.
31	Details in regard to graffiti management and maintenance responsibility, and how the design aims to reduce opportunity for graffiti to abutments, viaducts and piers.	Anti-graffiti coatings will be applied to piers, abutments, parapets and accessible surfaces. Abutments will be protected by security fencing however SCAW will ensure maintainable abutments that do not promote graffiti. The future SSTOM contractor will have graffiti related requirements in their operations and maintenance responsibilities.
32	Design interventions with consideration of key vistas. Has the design considered plan view, when viewed from adjacent built form that is higher than the viaduct or surface alignment? Will there be any building restrictions within proximity to the rail corridor?	Building heights will be determined by planning zoning, not by adjacency to rail. The corridor provides space for landscape to mitigate the visual impact of the rail formation and viaducts.
33	What are the clearance requirements to the parapet of the viaduct for adjoining land uses and built form?	Horizontal clearances determined by rail corridor (60m) and vertical clearances provide for minimum height clearances for existing and future road crossings (e.g. 5.4m clearance at Luddenham).

		Typical interfaces to the viaduct were included in a presentation to the DRP on 1 September 2022 which was attended by a PCC representative.
34	Detail demonstrating how stormwater from the viaducts is spread, slowed and conveyed to receiving basins and watercourses.	Viaduct stormwater is delivered to the ground via drainage pipes inside each pier. It is proposed that the stormwater will discharge into a 900 x 900 x 900mm pit then discharge into exfiltration pipes laid in a gravel trench oriented perpendicular to the viaduct for the full width of the viaduct and allowed to seep to the surface and spread across the ground under the deck to promote vegetation growth in that area. This measure should ensure the runoff from these areas remains unchanged from the pre-development state and that the ground under the viaducts will support plant growth.
35	Demonstration of how cooling and canopy targets and outcomes are going to be achieved.	As previously presented to PCC, canopy targets are dictated by Green Infrastructure commitments as well as a 2:1 tree replacement program as per the project's Conditions of Approval. Green Infrastructure targets provide a full range of cooling initiatives. The responsibility to achieve these targets largely sits with the SSTOM and CLW contracts.
36	Details of areas of vegetation to be retained and the methods to protect these areas during construction.	A vegetation survey along the alignment will be undertaken by SCAW. There will be areas of existing vegetation that will be retained and protected from works. SCAW will develop a strategy for tree protection and will provide details to PCC when it is available.
37	Emissions being measured and offset. Do the emissions include the concrete used in creating the viaducts?	SCAW is committed to offsetting all Scope 1 and 2 construction emissions, including diesel, petrol and electricity consumed. SCAW are reporting on all of their carbon emissions. In addition to Scope 1 and 2, this includes Scope 3 emissions such as from concrete (including concrete used in viaduct construction) and other materials. SCAW are committed to reducing emissions compared to business-as-usual including those associated with concrete in the Sydney Metro – Western Sydney Airport project.
38	Slide 5 of the PUDCLP presentation to Council-Requirement states that a PUDCLP must be prepared to document and illustrate the	No landscape areas from the project will be handed over to PCC for maintenance. The future SSTOM PUDCLP will detail maintenance regime for SSTOM areas.

	permanent built works and landscape design and how these works are to be maintained. Landscape design and how these works will be maintained has not been provided for review and comment.	CLW Landscape Plan of Management will detail management of the balance of the corridor.
39	Slide 12 – Condition E79 states that the PUDCLP must include descriptions and visualisations of items to be delivered by SCAW including watercourse crossings; east-west corridor movements; landscaping; strategies for rehabilitation, regeneration and revegetation; management and routine maintenance for design elements and landscaping work; and the timing and responsibilities for implementation of elements included within the PUDCLP. This information has not been provided for review and comment.	All required elements are addressed in the SCAW PUDCLP document. The SCAW PUDCLP document will be made available for information to PCC when it is finalised.
40	Slide 14 & 15 – PUDCLP Contents lists the PUDCLP contents, however, content details that address each of the points listed have not been made available for review and comment.	Refer to comment above in item 39.
41	Slide 33 – Viaduct Interface. Whilst visibility of the viaduct may be limited from local main roads, demonstrated consideration needs to be given to the visual impact to areas planned to be developed along the rail corridor.	An assessment of visual impacts is included in the SCAW PUDCLP document. Information in relation to this topic was included in a presentation to the DRP on 1 September 2022 at which a PCC representative was present.
42	Slide 39 – Water Management. Flood modelling should include assessment and consideration of a range of events, particularly the smaller channel forming flow events, not only the 1 in 100-year ARI, or 1% AEP.	SCAW presented to PCC on the current flood modelling status on 2 August 2022. Sydney Metro will provide PCC with the Flood Modelling report when it is finalised at the end of 2022.
43	Slide 40 – Water Management. Council requests confirmation that the proposed basins will remain on Sydney Metro owned land and be owned, managed	Basins will be on Sydney Metro owned and managed land. Details of flood modelling will be provided to PCC at the end of 2022 when the design is finalised.

	and maintained by Sydney Metro. Details on the outflows from the basins to adjoining watercourses and/or adjoining land is requested for review and comment.	The flood modelling will show compliance with the requirements of the project's approvals and conditions surrounding the EIS. The Drainage, Water Quality and Flooding design package SCASD2420 has been provided to PCC for review.
44	Slide 41 – Stormwater & Drainage Management Strategy states that water from the deck of the viaduct is to be drained down the viaduct piers to a series of basins and channels before being discharged to downstream receiving watercourses. It also lists cut drains, toe drains, diversion drains and clean water open drains. Details in this regard are requested for review and comment, and confirmation received that the basins, channels etc. will be owned, managed and maintained by Sydney Metro.	Refer to comment above in item 43.
45	Slide 41 – Stormwater & Drainage Management Strategy. Draining water from the deck of the viaduct down the viaduct piers needs to be further considered in regard to the potential for undesirable staining of the concrete as can be seen on Sydney Metro – North West.	A different method of drainage will be employed on this project, with water being drained inside the piers via pipes. Each span drains to the end where there is a hopper through the girder and into the downpipe within the pier. The Viaduct design packages SCABR4170 and SCABR4180 have been provided to PCC for review and include the downpipe details.
46	Slide 41 – Stormwater & Drainage Management Strategy. Seed mix in vegetated swales, embankments or any flow path should not be used. Seeds placed in these locations will be displaced by wind or wet weather, leaving an area susceptible to erosion and may cause unwanted growth in downstream receiving waterways. Similarly, with reference to Slide 50 – SCAW Landscape, hydro mulch and hydroseeding for stabilisation should be avoided, or used in conjunction with other methods of stabilisation.	Swale and embankment treatments are detailed in the SCAW PUDCLP document and will be to world best practice standards. In accordance with project requirements, all earthwork areas must be re-topsoiled and grassed or hydro-seeded with native grasses as soon as possible after completion of the earthworks and drainage, and that landscape mounds are naturally shaped with smooth transitions into the surrounding topography. These elements will remain in Sydney Metro ownership.

47	Slide 42 – Water Management. Design details of culvert and swale outlets to receiving watercourses is requested for review and comment. Design details should include appropriate grades, scour protection and landscaping, with detail on the expected flow rates, depths and extent of inundation for a range of storm events, particularly the smaller, more frequent, channel forming events.	<p>Details of the Water Management system will be outlined in a separate report.</p> <p>This information will be provided to PCC for information once Stage 3 design is finalised.</p>
48	Slide 44 – Condition 14. Details of how the PUDCLP responds to the items listed is requested for review and comment.	<p>The SCAW PUDCLP includes details specifically addressing the requirements of Condition of Approval E14 - Watercourse Crossings. Compliance will be confirmed by the Independent Reviewer. The SCAW PUDCLP document addresses:</p> <p>(a) Design of viaducts i) Connectivity ii) Viaduct Span iii) Vegetation Clearing iv) Light and moisture (b) Culverts and crossings i) Fauna Crossings ii) Light penetration iii) Fauna Furniture (c) Scour Protection (d) Remnant Vegetation</p>
49	Slide 47 – Fauna Crossings. Demonstrated consideration to safety-in-design of the fauna crossings is required in regards to public access and potential anti-social behaviour at these locations.	<p>Safety in design will be considered for the final fauna connectivity measures, particularly the fauna furniture.</p> <p>As maintaining full across-the-corridors access is the primary goal of the fauna connectivity, fencing to exclude members of the public would be redundant. At some culverts, fauna fencing has been suggested to be included to discourage fauna from travelling above the culverts and to help 'funnel' fauna through the crossings. The packages by future contractors will need to determine appropriate fauna fencing to realise these outcomes.</p> <p>Fauna crossings have been designed to have clear and unobstructed views to and through the passage. This feature of their design will contribute to passive surveillance of the crossings.</p>
50	Slide 49 – SCAW Landscape. Restoration details for waterways affected during	The SCAW PUDCLP document outlines waterway restoration plans.

	construction are requested for review and comment. Consideration must be given to vegetation species, densities and locations, in addition to other restorative measures.	
51	Slide 51 – Embankments & Cuttings. Embankment details are requested for review and comment. Design details are to specify the height, slope and finishing surface treatment.	<p>SCAW will establish batter slopes and design details. These will typically be 3:1 maximum slopes with variable height. Local zones of 2:1 batters (e.g. adjacent Transgrid Tower 632) has been provided where space is limited.</p> <p>During the SCAW phase, the raw 3:1 batter slope will be scarified parallel to the contour (to help prevent slumping/slippage of the topsoil) and topsoiled to a depth of 200mm. Seed Mix 1-Cover Crop Mix seed will be applied over the topsoil via hydro mulching with tackifier at the rate of 55kg/ha. Hydro mulching will provide erosion protection until the cover crop vegetation establishes.</p> <p>Final landscape treatment of embankments and cuttings are a part of the SSTOM scope.</p>
52	Slide 54 – SCAW Scope. Seeding in drainage channels needs to be avoided. Refer also to Council's comment on Slide 41 and Slide 50 above.	<p>Vegetated drainage swales are used where the longitudinal grade of the completed drain is between 1% and 5% inclusive. Permanent vegetated drainage swales should have a sinuous shape and the width and side batter slopes should vary so they look more natural with minimum shape requirements being;</p> <ul style="list-style-type: none"> - Minimum Depth: 300mm - Minimum Side Slope: Not steeper than 2H:1V - Minimum Waterway Area: 0.2m². <p>Vegetated drainage swales will be topsoiled to a minimum depth of 100mm where the side slope is approximately 2H:1V and increase in depth up to 200mm where the side slope is approximately 3H:1V. Seed will be applied over the topsoil via hydro mulching with tackifier. Hydro mulching and cover crop plants will provide erosion protection until native vegetation establishes.</p> <p>In addition, organic fibre mesh will be fixed over the topsoil and hydro mulching for the full width of the channel and for 300mm beyond the crest on both sides to further improve erosion resistance. Seed mix for permanent drainage swales will include Cover Crop Mix at the rate of 30kg/ha and native seed at the rate of 9kg/ha applied together.</p> <p>The native seed mix for swales includes local native sedge and grass species. Where seeding</p>

		fails to take hold, the affected area will be re-topsoiled and re-seeded.
53	Slide 59 – SCAW Responsibility Summary Table. Design details of the biofiltration basins and swales, permanent vegetated swales/channels, riparian zone/watercourse crossings, and fauna crossings are requested for review and comment.	Final design details of all elements are in development. The SCAW PUDCLP document outlines design principles. The SCAW PUDCLP document will be made available for information to PCC. Packages for review by PCC are outlined in the PCC interface agreement
54	Slide 61 & 62 – Riparian Rehabilitation Strategy. Council requests opportunity for review and comment on detailed design of the proposed riparian rehabilitation, including extent of areas anticipated to be impacted by construction and any areas planned to be handed over to Council.	There will be no handover of Sydney Metro lands to PCC. Refer to comment above in item 53.
55	Slides 63-67 – Connecting with Country. Council requests opportunity for involvement and collaboration on Connecting with Country. Contact may be established with Council's Senior Policy Officer – Aboriginal.	Refer to comment above in item 10.
56	Caring for Country. - Council's Senior Policy Officer – As stated in item 55, Aboriginal may be contacted for inclusion and collaboration on Caring for Country and Indigenous initiatives. - Further detail is requested on how Caring for Country is planned to be incorporated and achieved in the project.	Refer to comment above under item 55.
57	Early Works. Council requests opportunity to review and comment on the details for the items listed.	SCAW have had ongoing consultation with PCC during the development of: - Preparatory CEMP (through the submission of the Soil & Water Management Sub-plan and Air Quality Management Sub-plan) -Main Works CEMP (through the submission of Soil & Water Management Sub-plan, Air Quality Management Sub-plan, Noise & Vibration Management Sub-plan, Non-Aboriginal Management Sub-plan and Flora & Fauna Management Sub-plan) -Preparation of Construction Traffic Management Plans

58	Environmental Protections. Council requests opportunity for review and comment on details of the proposed environmental protection measures.	There has been ongoing engagement between SCAW and PCC during the development of the SCAW Mains Works Construction Environmental Management Plan (CEMP) and the associated sub-plans as required by SSI 10051 Conditions of Approval C5 and C13. This included providing the following sub-plans and monitoring programs to PCC for their information and review: - Noise & Vibration Management Sub-plan and Noise & Vibration Monitoring Program (Sent 24 June 2022) - Flora & Fauna Management Sub-plan (Sent 17 June 2022) - Soil & Water Management Sub-plan and Surface Water Monitoring Program (Sent 10 June 2022) - Non-Aboriginal Management Sub-plan (Sent 22 June 2022) -Air Quality Management Sub-plan and Air Quality Water Monitoring Program (Sent 10 June 2022) Subsequent to PCC review, SCAW can confirm it has considered the comments and updated the sub-plans and monitoring where necessary.
59	Major Construction. Details are requested for review and comment on the method to be applied for draining farm dams, with consideration to potential aquatic fauna, aquatic weed, contaminated material and poor water quality.	The details of dewatering farm dams are contained in the Flora & Fauna Management Sub-plan that was sent to PCC in accordance with Condition of Approval C5 on 17 June 2022. Following approval of this Sub-plan by the Department of Planning and Environment, a copy will be publicly available on the SCAW project website: https://www.cpbcon.com.au/en/our-projects/2022/sydney-metro-western-sydney-airport-surface-and-civil-alignment-works
60	Managing Water. - Further details are requested for review and comment on the expected outflows from the site to receiving waterways and the expected impact. - Water drained down the viaduct piers will likely create undesirable staining. Further detail and demonstrated consideration in this regard is requested for review and comment. - It is stated that water draining down viaduct piers will be received by a series of local	Refer to comment above in item 45. In addition, Sydney Metro advises that Water Management will be subject to separate submissions and is not part of the SCAW PUDCLP. SCAW however is committed to good outcomes and the Water Management design ensures no increases in flooding due to the project. Integration with the existing water ecosystem: • Existing flow patterns are maintained to the greatest extent practicable • All major waterways and their flood plains are crossed using viaducts

	are no details provided. Council requests further details for review and comment.	<p>crossings</p> <ul style="list-style-type: none"> • Water quality measures have been incorporated in all discharge points • Scour protection will be included where needed. <p>Temporary/end state of the water eco-system:</p> <ul style="list-style-type: none"> • Access roads and piling pads to be built to allow site access • Reduced impacts at all creek crossing by narrowing road crossings • Viaduct piles and piers constructed, and viaduct decks lifted into place over waterways • Viaduct pile pads removed • Embankment formation constructed • Rail track slab and other rail works undertaken by SSTOM • Removal of haul road, final rehabilitation of impacted creeks and installation of bio filtration media will be undertaken by SSTOM. <p>Mitigation:</p> <ul style="list-style-type: none"> • Sediment and erosion will be in place prior to and maintained throughout construction program • Culverts have been placed under the temporary haul road to ensure flow patterns are unchanged • Creek crossing low impact design undertaken • Pile pads for construction will be removed as soon as practical and revegetated • Bio media will be installed in the bio swales and bio retention basins only after exposed areas are stabilised.
61	Planning Conditions Fact Sheet. Details are not provided which adequately demonstrate achievement of and compliance with the planning conditions.	<p>A Compliance Matrix will be provided in the final SCAW PUDCLP, which will be made available for information to PCC.</p> <p>The SCAW PUDCLP will only address the relevant Project Conditions of Approval relevant to the SCAW scope of works as outlined in the document.</p>
62	Stockpile Storage Site. How will the stockpile be protected/covered whilst it is being added to before the final surface treatments are put in place?	<p>Stockpiles will be progressively stabilised during construction in accordance with Progressive Erosion and Sediment Control Plans and the Stockpile Management Protocol contained in the Soil and Water Management sub-plan. The stabilisation will be in the form of temporary measures until the final shape / landform is determined and may include:</p> <ul style="list-style-type: none"> - Batters track rolled - Slopes maintained at 2:1 - Use of soil binders - Spray grassed; or - Covered with geofabric / plastic.

63	Wildlife Crossings. Whilst eight wildlife crossings will be provided, what ability to cross the embankments will be provided for pedestrians and cyclists?	<p>The embankments form part of an active, secure rail corridor, as such, no surface level crossings will be provided.</p> <p>South of the Warragamba Pipelines the viaduct provides permeability throughout the Northern Gateway/Sydney Science Park precinct.</p> <p>There is no public access proposed on Day 1 south of Luddenham Road.</p> <p>North of the pipeline three sections of viaduct provide east-west permeability for fauna and people.</p> <p>Active Transport Links are not part of the SCAW package.</p> <p>PCC has been part of the development of the Active Transport Strategy and has been presented with the scope of work. A recent DRP presentation and a previous presentation to PCC included the Active Transport Corridor.</p> <p>The final alignment of the Active Transport Corridor (Orchard Hills to Warragamba Pipelines) will be determined through the future SSTOM Corridor Landscape Master Plan.</p>
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Response from DPI Fisheries



Our Ref: C22/491

10 August 2022

Your Ref: CSSI-10051

Environmental manager
CPB Contractors/United Infrastructure
(on behalf of Sydney Metro)
Level 5, 60 Miller Street
North Sydney NSW 2060

Consultation for the Sydney Metro Western Sydney Airport Project (CSSI-10051) – Condition E14 – Waterway Crossings

Thank you for your referral seeking comment on the proposal from DPI Fisheries, a division of NSW Department of Primary Industries on the proposed works stated above.

DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, DPI Fisheries ensures that developments comply with the requirements of the *Fisheries Management Act 1994* (FM Act) (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Fish Habitat Conservation and Management (2013)*. DPI Fisheries is also responsible for ensuring the sustainable management of commercial, recreational and Aboriginal cultural fishing, aquaculture, marine parks and aquatic reserves within NSW.

Following a meeting with your team in relation to this matter on 9 August 2022, and review of the submitted documents, DPI Fisheries have the following comments:

- There are four (4) waterway crossings over Key Fish Habitat proposed:
 1. Chainage 22+840 – Unnamed Tributary to Blaxland Creek
 2. Chainage 23+600 – Blaxland Creek
 3. Chainage 25+615 – Unnamed Tributary to South Creek
 4. Chainage 29+185 – Cosgrove Creek
- Chainage 23+600, 25+615 & 29+185 are able to have viaducts with piers and abutments outside bed and banks. Except Chainage 25+600 where a single pile and associated bank works may be required (toward top of bank). Chainage 22+840 is proposed to have three (3) 1800mm box culverts.
- The temporary and haul road waterway crossings are to be pipe culverts and the need for bed recessed low flow construction methods was discussed. The temporary crossings are expected to be in place for approximately 7 years and the responsibility for removal and environmental rectification of these structures will fall to the SSTOM contractors. DPI Fisheries are keen to ensure this work is flagged as an important legacy issue for the new contractors to take responsibility of.
- DPI Fisheries is aware that there is a project wide landscape plan that will be appropriate to revegetate riparian areas to prevent bank erosion and sediment entering the waterway.
- As planning for this project progresses, DPI Fisheries request to be sent 80% Design Detail of the final structures and the Environmental Work Method Statements for the temporary structures.

C22/491

DPI Fisheries
Mail to: R. Philips, 1243 Bruxner Hwy, Wollongbar NSW 2477
Email: ahp.central@dpi.nsw.gov.au
ABN 20770707468

Page 1 of 2



DPI Fisheries acknowledge that Condition E14 of CSSI-10051 has been met by CPB Contractors/United Infrastructure on behalf of Sydney Metro. Thank you for the opportunity to comment on this important infrastructure project.

If you require any further information, please contact me on (02) 4222 8311 or josi.hollywood@dpi.nsw.gov.au

Yours sincerely,

Fisheries Manager, Coastal Systems Unit

C22/491

DPI Fisheries
Mail to: R. Philips, 1243 Bruxner Hwy, Wollongbar NSW 2477
Email: ahp.central@dpi.nsw.gov.au
ABN 20770707468

Page 2 of 2

Response from DPE Environment and Heritage

Friday, November 18, 2022 at 15:04:44 Australian Eastern Daylight Time

Subject: RE: HPE CM: Sydney Metro - WSA: SCAW - Watercourse crossing consultation with CPBUI
Date: Monday, 8 August 2022 at 3:07:24 pm Australian Eastern Standard Time
From: [REDACTED]
To: [REDACTED]
CC: OEH ROG Greater Sydney Region Planning Unit Mailbox, [REDACTED]
Attachments: image002.jpg, image001.jpg

CAUTION: This email originated from outside of the Organisation.

Hi [REDACTED]
Thank you for phoning earlier and for sending the invitation below to EHG to attend the consultation session tomorrow for the Sydney Metro - WSA: SCAW - Watercourse crossing design

EHG gives its apologies for tomorrow's meeting. As discussed EHG did not ask to have a consultation role in Condition E14 for this SSI. Also we do not have the resources to be able to participate at present.

Thanks [REDACTED]
kind regards from

[REDACTED]
8/8/2022

Senior Conservation Planning Officer
Greater Sydney

Biodiversity & Conservation | Environment and Heritage
Department of Planning and Environment

[REDACTED]
Level 6, 12 Darcy Street, 4 Parramatta Square, Parramatta NSW 2150 | Locked Bag 5022

www.dpie.nsw.gov.au

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: [REDACTED]
Sent: Monday, 25 July 2022 3:15 PM
To: [REDACTED]
Cc: OEH ROG Greater Sydney Region Planning Unit Mailbox <rog.gsrplanning@environment.nsw.gov.au>; [REDACTED]
Subject: HPE CM: Sydney Metro - WSA: SCAW - Watercourse crossing consultation with CPBUI

Dear [REDACTED]

CPB Contractors United Infrastructure (CPBUI) joint venture have been awarded the Surface Civil and Alignment Works (SCAW) component of the Sydney Metro Western Sydney Airport Project (CSSI 10051).

Under Condition E14 of the Project Planning Approval, CPBUI, on behalf of Sydney Metro have a requirement to consult with **DPIE EES** (now assumed to be **DPE – Environment and Heritage Group (EHG)**) during the design of the watercourse crossings:

Watercourse Crossings

E14 The Proponent must design the watercourse crossings and the east-west re (Patons Lane) crossing to achieve the following objectives:

- (a) design of viaducts to retain and minimise clearing/disturbance of native vegetation and maximise native plant growth under the structures,
 - (i) maintain and/or improve riparian/terrestrial connectivity under the viaduct structures to maximise the corridor function;
 - (ii) maximise the viaduct and bridge structures span over the riparian corridor to retain remnant native vegetation whichever is the widest;
 - (iii) minimise the clearing/disturbance of native vegetation and native riparian vegetation;
 - (iv) maximise light and moisture penetration under the viaduct and bridge structures to support native plant growth;
- (b) design of culverts and other crossings incorporate the following into the design to facilitate movement of aquatic and terrestrial fauna,
 - (i) elevated "dry" cells to encourage terrestrial movement, and recessed cells to facilitate the movement of aquatic fauna;
 - (ii) maximise light penetration into the culvert structures;
 - (iii) a naturalised base along the bed of the culvert; and 'fauna furniture' (logs, ropes and ledges) to facilitate fauna movement to maintain connectivity and provide fauna passage;
- (c) design of scour protection using natural solutions such as the revegetation of riparian local native species; and
- (d) details of remnant native vegetation including riparian vegetation.

The Proponent must consult with DPIE EES, DPI Fisheries and engage suitably qualified consultants in fauna crossing design to achieve the outcomes of this condition.

Note: These design objectives must form part of the **Place, Urban Design and Corridor Land Use Plan** required under Condition E79.

As CPBUI design progresses we are seeking to consult with **EHG** and offer an information session to be held either at the CPBUI office (Level 5 / 60 Miller Street, North Sydney) or via Microsoft Teams. **DPI Fisheries** will also be invited to the consultation session. A copy of the current watercourse crossing design will be sent to you prior to the session to assist your understanding of the project.

Could **EHG** please confirm the following in relation to the consultation:

- Availability for the tentative date of **Tuesday 9 August 2022 at 14:00 to 15:00**
- Confirmation of **EHG** staff members to be invited (and their method of attendance –In-person or Microsoft Teams)

Should you have any questions please feel free to contact me on the numbers or email below.

Regards

[REDACTED]
Environment Manager



Level 5, 60 Miller St, Street North Sydney NSW 2060

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PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL

Reference Groups

The staged design process has required on-going liaison with and review by, Sydney Metro of all design packages. The outputs from this design process has informed the PUDCLP contents.

The PUDCLP has been developed with inputs from key reference groups:.

Group	Meeting Dates
Design Review Panel	9 June 2022
	21 July 2022
	4 August 2022
	1 September 2022
Connecting with Country Working Group	21 October 2022
	29 June 2022
	5 August 2022
Concrete Working Group	19 October 2022
	4 May 2022
	1 June 2022
	28 June 2022
	12 July 2022
	26 July 2022
	13 September 2022

Connecting With Country Meeting Minutes



CwC Working Group Presentation Meeting Minutes

Details	
Title:	SCAW CwC Working Group Presentation Meeting Minutes
Date:	05/08/2022
Location:	Microsoft Teams

Attendees		
██████████	Murawin	
██████████	CPB	
██████████	Senior Consultant	
██████████	Aspect	
██████████	Aspect	
██████████	CPB	
██████████	CPB	
██████████	Cox	
██████████	Sydney Metro	
██████████	Sydney Metro	
██████████	Sydney Metro	
██████████	Zion	
██████████		
██████████		
██████████		
██████████		
Others Attended together		
Optional		
Apologies		

Previous Actions

Item/Meeting	ACTION	Resp.	Action
	N/A		



Minutes

Item	Minutes	Resp.	Due Date
1	<p>Presentation to the Sydney Metro Connecting with Country Working Group (SM-CwC-WG).</p> <p>Comments by (SM-CwC-WG):</p> <ul style="list-style-type: none"> G - Water?, Flooding & stormwater issues – would like to know how CPB will work with what they have. G - Have you been working with Sydney Water Department, connect with them. G - Identify natural waterways used as stormwater infrastructure. Greg Edwards CPB response – CPB have had no engagement with Sydney Water, this work does not impact it. G - Feeling overwhelmed, remember not to look at things in isolation, it's all connected. Concerned with topsoil removal. ██████████ – Aspect Studio explained due to the soil containing so many introduced plant species seeds, the best chance to restore Country is to remove it. Several members are concerned with Cultural Heritage artifacts being located in that topsoil that is going to be removed. Elle - Archaeologists are attending the next SM-CwC-WG meeting, will ask. CPB has an unexpected find procedure EW – concerned with soil dump Member asked – who has the authority to identify the finds. Murawin – would you like to include more language into the project documents? Member response – Language is extremely important. Dharug and Darrawal language very important in this project. Murawin – Would the SM-CwC-WG like to conduct a Walk on Country? E – has CPB or Murawin walked Country yet? Response – not yet CL – sees great respect in this work and that is unusual. CL – does not like the abutments and train line so prominent on Country. Agrees with language use, water ways (maybe not songline relevant), bunya trees, Feels the Respect in this project. Consensus – yes Walk on Country very welcome. ██████████ – aware of consultation fatigue, thanked SM-CwC-WG for their time. 		

END

SCAW CWG Comments Register

Item	Discipline	Topic	Action Required	Outcome/Result/Note	Responsible Owner	Status	Meeting Name	Date Recorded	Due Date	Date closed
1	STRUCTURES	Concrete Test Plan	Concrete Test Plan - Concrete requirements to be received middle next week from [redacted] Draft Concrete Test Plan to be issued for information next week, noting contract due date of 29/04/22	SI 27/5 Rev A submitted to	CPBUI	CLOSED	SCAW Concrete Working Group	4/5/2022	27/5/2022	27/5/2022
2	STRUCTURES	Concrete Requirements	Difficulties discussed in achieving sustainability and workability for 50Mpa concrete as slag reduces workability.	SI 27/5 considerations included in testing plan		NOTE	SCAW Concrete Working Group	4/5/2022		
3	STRUCTURES	Early Strength	Stripping is performed after 12 hours after pour for cantilever and web elements - 12Mpa	SI 27/5 considerations included in testing plan		NOTE	SCAW Concrete Working Group	4/5/2022		
4	STRUCTURES	Mix Design	Working group will be investigating a 20mm and 10mm mix.	SI 27/5 considerations included in testing plan		NOTE	SCAW Concrete Working Group	4/5/2022		
5	STRUCTURES	Tonal range	Tonal ranges to be considered by CUJV as per AS 3610 as the mix is developed. Colour will be grey and CUJV will aim to achieve minimal variations in colour.	SI 27/5 considerations included in testing plan		NOTE	SCAW Concrete Working Group	4/5/2022		
6	ADMIN	Meetings	Meetings will be every fortnight moving forward	SI 27/5 considerations included in testing plan		NOTE	SCAW Concrete Working Group	4/5/2022		
7	STRUCTURES	Mix Design	35% SCM replacement has been publically committed by SM and needs to be achieved as a Minimum Requirement in the Baseline 2 mix design	SI 27/5 considerations included in testing plan		NOTE	SCAW Concrete Working Group	4/5/2022		
8	STRUCTURES	SCC	CBPUI to investigate SCC mix design	28/6 SI SCC mix is not planned for the mixing program following consultation with construction team.	CPBUI	CLOSED	SCAW Concrete Working Group	1/6/2022		
9	STRUCTURES	Workability	It was noted that currently the only measure of workability defined is the slump test. Slump retention test is to be performed. Additional workability testing need to be developed. Various prototype elements to be developed to be able to understand how concrete will behaviours through placement.			NOTE	SCAW Concrete Working Group	1/6/2022		
10	STRUCTURES	Tonal range	It was noted that colour would be a results of mix design constituents. There is no intention of colouring the concrete.	28/6 SI This item has been addressed in the concrete testing plan and communicated that Mix ingredients will dictate the colour and this will be governed by material procurement. It is difficult to achieve a specific colour. CPBUI's preference is not to colour the concrete.		NOTE	SCAW Concrete Working Group	1/6/2022		
11	STRUCTURES	Testing Plan	Testing plan submitted to SM 27/5. CPBUI are awaiting comments from SM.	SI 28/6 Comments received by SM. CPBUI have updated the testing plan accordingly and sent back comments. Plan and comment responses have been issued via Team Binder as of 27/6.	SM	CLOSED	SCAW Concrete Working Group	1/6/2022	10/6/2022	28/6/2022
12	STRUCTURES	Testing	Testing for mixes A,B,C have begun. Results to be shared with the CWG in due course.	SI 28/6 Results shared as part of CWG	CPBUI	CLOSED	SCAW Concrete Working Group	1/6/2022	16/6/2022	28/6/2022
13	STRUCTURES	Testing	Additional Testing on heat Curve for actual element sizes to be developed	SI 28/6 temp curves have been shared and applied to strength results as shown in CWG	CPBUI	CLOSED	SCAW Concrete Working Group	1/6/2022	16/6/2022	28/6/2022
14	STRUCTURES	Mix Design	Development of option mixes pending result from initial mix designs	SI 28/6 Mixes D,E,F have been prepared and mixed	CPBUI	CLOSED	SCAW Concrete Working Group	1/6/2022	16/6/2022	28/6/2022
15	STRUCTURES	Testing Checklist	Please fill out checklist to demonstrate the requirements	SI 28/6 Update of testing checklist presented at CWG. In the processing of updating and cleaning data SI 12/7 Completed and presented to the group 12/7	David Mahaffey	CLOSED	SCAW Concrete Working Group	1/6/2022	16/6/2022	12/7/2022
16	STRUCTURES	Temp Curves	Please amend the curves so to: - Define all legends and axis - Provide explanation on the temperature differentials so we can understand the predicted results and how they were adjust and produced - Explain the lab conditions	SI 28/6 Update of testing checklist presented at CWG. In the processing of updating and cleaning data SI 12/7 Completed and presented to the group 12/7	David Mahaffey	CLOSED	SCAW Concrete Working Group	1/6/2022	16/6/2022	12/7/2022
17	STRUCTURES	Mix Design	Develop next batch of mixes for review	SI 28/6 Mixes D,E,F have been prepared and mixed	David Mahaffey	CLOSED	SCAW Concrete Working Group	1/6/2022	16/6/2022	28/6/2022
18	STRUCTURES	Results summary	Update summary of results and clean any Data errors for issue and presentation at CWG	SI 12/7 Completed and presented to the group 12/7	David Mahaffey	CLOSED	SCAW Concrete Working Group	28/6/2022	12/6/2022	13/9/2022
19	STRUCTURES	Thermal Blanket for Mix F	Thermal blanket will be used for mix F			NOTE	SCAW Concrete Working Group	28/6/2022	12/6/2022	
20	STRUCTURES	Carbon optimisation mixes	It was noted that Mix C is not considered one of the minimum 2 carbon optimisation mix as it was not agreed with Sydney Metro prior to testing			NOTE	SCAW Concrete Working Group	28/6/2022		
21	STRUCTURES	Consistent testing methodology	It was noted that a consistent testing methodology should be applied to mixes including proposed video of concrete mix "stickiness" characteristics			NOTE	SCAW Concrete Working Group	28/6/2022		
22	STRUCTURES	Optimisation	[redacted] to discuss optimisation of mixes B and D	26/7 This item was further noted in the 26/7 Meeting where David will aim to further optimise mix D with early age additive	David Mahaffey	CLOSED	SCAW Concrete Working Group	12/7/2022	3/8/2022	13/9/2022
23	STRUCTURES	Admixtures	[redacted] to investigation admixtures for mixes B and D	26/7 This item was further noted in the 26/7 Meeting where David will aim to further optimise mix D with early age additive	David Mahaffey	CLOSED	SCAW Concrete Working Group	12/7/2022	3/8/2022	13/9/2022
24	STRUCTURES	Maturity	It was noted that the maturity curves would be adjusted when the optimised mix D is achieved as [redacted] needs to mix additional cylinders to adjust maturity		David Mahaffey	CLOSED	SCAW Concrete Working Group	26/7/2022	3/8/2022	13/9/2022
25	STRUCTURES	VIM Workshop	VIM workshop will be held 15th September			NOTE	SCAW Concrete Working Group	26/7/2022	3/8/2022	
26	STRUCTURES	VIM Report	VIM report is underway and will likely represent the Testing checklist			NOTE	SCAW Concrete Working Group	26/7/2022	3/8/2022	
27	STRUCTURES	VFM Report	Draft VFM report completed. Finalisation of VFM report will be completed after field trials.			NOTE	SCAW Concrete Working Group	13/9/2022		
28	STRUCTURES	Fields Trials	Field trials are schedules in October			NOTE	SCAW Concrete Working Group	13/9/2022		
29	STRUCTURES	Field Trial Criteria	Field trial criteria to be agreed			OPEN	SCAW Concrete Working Group	13/9/2022		
30	STRUCTURES	Next meeting	Next meeting to be schedule after the long weekend			NOTE	SCAW Concrete Working Group	13/9/2022		

Concrete Working Group Meetings

Letter To Planning E63



Attn: [REDACTED]
 Acting Director – Infrastructure Management
 NSW Department of Planning and Environment
 Locked Bag 5022
 Parramatta NSW 2124

Dear [REDACTED]

**Sydney Metro Western Sydney Airport
 Submission of Design Review Panel review outcomes for information
 Surface and Civil Alignment Works (SCAW) Package**

The Conditions of Approval for Sydney Metro Western Sydney Airport Critical State significant infrastructure (SSI-10051) outlines the project design requirements and necessary submissions.

Condition of Approval E63 requires the following:

E63 The CSSI must be designed with consideration of:

- a) the design objectives, principles and guidelines identified in documents listed in Condition A1;
- b) the principles and objectives of the draft Connecting with Country Framework;
- c) relevant land use changes, masterplans and initiatives, where this information is known and/or available;
- d) existing and proposed future local context and character; and
- e) transport and land use integration and system functionality in the context of precincts, to the extent it is known and/or defined.

Responses to items (a) – (e) must be reviewed by the Design Review Panel (DRP) to inform the design of permanent built works and landscape design of the CSSI. The outcome of the DRP review must be provided to the Planning Secretary prior to the submission of the Place, Urban Design and Corridor Landscape Plan (PUDCLP).

Note: In accordance with **Condition A10** and **Condition A16**, the requirements of this condition can be staged

This memo has been prepared to outline that the SCAW design responds to Condition E63 and to summarise the outcome of the DRP review of the SCAW design response. In accordance with Condition of Approval E63, this memo is submitted to the Secretary for information prior to lodgement of the SCAW Place, Urban Design and Corridor Landscape Plan (PUDCLP).

The following requirements of Condition of Approval E63 have been addressed by the SCAW Project Design response as noted in the Table below:

Condition E63 Requirement	SCAW Design Response
a) the design objectives, principles and guidelines identified in documents listed in Condition A1;	a) Design development has considered the objectives, principles and guidelines identified in the EIS and Submissions Report, to the satisfaction of the DRP.
b) the principles and objectives of the draft Connecting with Country Framework;	b) The principles and objectives of Connecting with Country has been incorporated into the design response. Connecting with Country has informed the SCAW design since the original tender phase. Consultation with Sydney Metro's Connecting with Country Working Group is on-going.
c) relevant land use changes, masterplans and initiatives, where this information is known and/or available;	c) Where known, land use and master plans have been considered in design development.
d) existing and proposed future local context and character;	d) Existing conditions and future planning outcomes (where known) were considered in the design development.
e) transport and land use integration and system functionality in the context of precincts, to the extent it is known and/or defined.	e) N/A to the SCAW Project Stage. Precinct transport and land use integration and system functionality will be addressed by follow on Contractor; Stations, Systems, Trains Operation and Maintenance (SSTOM).



As an enabling works package, the SCAW design response was presented to the DRP and the DRP's feedback and the Project's response was recorded within the SCAW design Action Tracker. As a record of reviews and responses, the Action Tracker from DRP meetings held between April and September 2022 is attached.

The Design Review Panel has been advised that this letter is to be submitted prior to the submission of the PUDCLP to the Planning Secretary. At the DRP meeting on 10 November 2022, it was confirmed in consultation with the DRP and a representative from the Department of Planning and Environment Infrastructure Management team, that this letter would be sufficient to address Condition of Approval E63.

As agreed in this meeting, the Government Architect Letter of Advice provided to date are attached (Enclosure 2), to provide additional context for the content of the Action Tracker.

Further detail on the SCAW design is presented in the SCAW Place, Urban Design and Corridor Landscape Package (PUDCLP), which will be issued to DPE for information in accordance with Condition of Approval E77.

Encl: Enclosure 1: DRP Advice & Recommendations

Enclosure 2: Government Architect Letter of Advice sheets

Yours Sincerely,

[Redacted signature]

[Redacted name]

Project Director



Appendix C

DRP Advice and Recommendations

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Design Review Panel Action Tracker

PACKAGE	MEETING DATE	ITEM #	GEOGRAPHIC LOCATION	THEME	DRP ADVICE	TEAM TO RESPOND	ACTION / RESPONSE	STATUS
SCAW	14/4/2022	2.02	Line Wide	Planning Approvals	The Panel's ongoing role in advising on the Place Urban Design Corridor Landscape Plans (PUDCLP).	Precinct Team	The Panel's role is primarily to advise on design through the SCAW design stages. The PUDCLP is the document that covers the design process and the outcome of the process. The PUDCLP must include CoA E63-E65 and DRP advice.	Closed by SM noting additional briefings to the Panel on future PUDCLPS
SCAW	14/4/2022	2.03	Line Wide	Planning Approvals	The timelines for the independent review mechanism for each PUDCLP, and the Panel's role in nominating one, or a number, of experts to review each document.	Precinct Team / ESP Team	CPBUI outlined the SCAW Design / PUDCLP programme. The Panel is to select a qualified independent person to review the PUDCLP in-line with the CoA and the independent reviewer is to work to the CPBUI proposed programme.	Closed for SCAW, noting additional briefings to the Panel on future PUDCLPS
SCAW	14/4/2022	2.05	Line Wide	Built form	The Panel requests further information on the logic of the viaduct parapet design and how this element sits with the design of the pier and box girder.	CPBUI	The viaduct parapet joints of the girders and parapet will be aligned. Parapet expansion joints will be wider (50-75mm) with 20mm joints typically	Closed by SM noting not all Panel advice adopted.
SCAW	14/4/2022	2.06	Line Wide	Materials & finishes	The Panel requests further information on potential strategies for managing the differences in colour and finish across the various concrete elements.	CPBUI	SM and the SCAW Contractor have noted the Panels comments and provides the following justification in response: The SCAW Contractor has a specified criteria that has been mandated in the project Particular Specification. To summarise these requirements, the viaducts, elevated structures and bridges must achieve: - a concrete surface finish of Class 2CX as per AS3610 'formwork for concrete - Colour 2 as per AS3610 - not use pigments or applied surface finish to achieve colour consistency - all grout and epoxy products must match the colour and finish - adjacent viaduct segments and parapets must be cast in succession to minimise colour variation along the structure and ensure consistency. The SCAW Contractor has developed a match cast specification which applies to precast segment casting. This specification includes hold and witness points relating to the fabrication of the segments.	Closed by SM
SCAW	14/4/2022	2.07	Line Wide	Materials & finishes	Information on how design issues will be managed in the Concrete Working Group.	CPBUI	The Concrete Working Group is a contract requirement of SCAW with the objective of meeting the performance and constructability characteristics of the project whilst optimising the carbon footprint by reducing the weight of Portland Cement. To date, the SCAW Contractor has completed a series of concrete tests on a variety of mix designs to determine the suitable material properties of the concrete whilst optimising cement content. A significant driver of the mix design has been a requirement to achieve a high early age strength to enable stripping of formwork at required timelines. The testing process has resulted in a reduction of cement content of approximately 50kg/m3 from the baseline mix design. The next phases of the project will include the development of prototypes which will enable design issues to be evaluated in more detail. It is noted that the prototypes are not covered within the remit of the Concrete Working Group but are a separate project requirement.	Closed by SM noting not all Panel advice adopted.
SCAW	14/4/2022	2.08	Line Wide	Materials & finishes	Further thought and presentation on the holistic impact of the SCAW works, showing how the detailed elements come together – in both the short and long-term – with other aspects of the development of this part of Western Sydney (e.g. M12, the Outer Sydney Orbital etc).	CBPUI	SCAW landscape works will have minimal impact on the M12 and Outer Sydney Orbital.	Closed
SCAW	14/4/2022	2.09	Line Wide	Landscape	Briefing on the background, contextual work already carried out on soils and hydrology and how the Corridor Vision & Design Principles established for the project are being put into practice as specific strategies in the SCAW. Of particular interest are: a. Construction footprint reduction allowing increase in areas being protected and conserved b. Stormwater and drainage management strategy (including the impact of permanent stockpiles) related to protection of both overland and groundwater to conservation and revegetation areas c. Riparian rehabilitation strategy.	CPBUI	Abutment footprints reduced. Increased span of viaducts to reduce pier impacts. Riparian planting information presented.	Closed
GENERAL	14/4/2022	2.10	Line Wide	Landscape	Development of a comprehensive soils management strategy that considers the interface between SCAW, SSTOM and CLC, and how SCAW can establish the conditions for the success of these subsequent landscape packages.	CPBUI & SM Design Team	Soil management requirements identified across the three contracts. SM will not be developing a soil management strategy - these issues have been addressed through particular specifications. The ecological specialist will be charged with detailed site investigation, including soils to determine suitable treatment and amelioration to underpin the ultimate landscape works. Topsoil is being stripped to remove the weeds and herbicides and restore ground to pre-farming condition. Contamination study scope to be outlined.	Closed
SCAW	14/4/2022	2.11	Line Wide	Precinct Design	A clear statement at the commencement of each future presentation on the aspects of the design the contractor seeks advice on, and what is being presented for information only. This will ensure the Panel's time is used effectively and attention is directed to where advice and recommendations can be beneficial.	CPBUI & SM Design Team	Advice has been relayed to each future presenter.	Closed by SM for the purpose of SCAW. Matter to be addressed by other/future design packages (SSTOM and CLW).
SCAW	14/4/2022	2.15	Line Wide	Additional presentations	The Panel would like a follow up presentation on SCAW viaduct design.	CPBUI	Refer to comment 2.05.	Closed
SCAW	14/4/2022	2.17	Line Wide	Additional presentations	The Panel would like to be updated from the soon-to-be-convened Concrete Working Group.	CPBUI	SM and the SCAW Contractor have noted the Panels comments and provide the following justification in response: At high level, the concrete working group was established in May and testing has been completed on 12 concrete mix designs. The 12 mix designs have been evaluated against a number of material property criteria (e.g. slump, 12hr strength, code and specification requirements). A preferred concrete mix has been determined which has ~365kg/m3 of cement content and uses 195kg/m3 of fly ash. Prototypes using the preferred concrete mix will progress outside of the Concrete Working Group.	Closed by SM noting not all Panel advice adopted.
SCAW	9/6/2022	4.01	Line Wide	Concrete elements	Explore opportunities to introduce texture/s to the different concrete elements.	SM Design Team	SM specification requires a Class 2CX finish as per AS 3610 - smooth off form finish to viaduct elements.	Closed
SCAW	9/6/2022	4.02	Line Wide	Concrete elements	Provide further information on concrete types and demonstrate the most sustainable concrete will be adopted across the project to reduce carbon footprint.	CPBUI /ESP Team	SM and the SCAW Contractor have noted the Panels comments and provide the following justification: As noted in 2.07 and 2.17, the Concrete Working Group has tested 12 concrete mix designs against a series of requirements. The baseline mix that has been used on previous CPB projects has a carbon content of 408kgCO2-e/m3. Mix solutions were evaluated down to 278kgCO2-e/m3 - this mix had unfavourable properties which were not favourable for construction. The optimised concrete mix which meets the required parameters and reduces the carbon content (Mix G) achieves a carbon content of 360kgCO2-e/m3.	Closed by SM noting not all Panel advice adopted

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SCAW	9/6/2022	4.03	Line Wide	Joints	It was confirmed that the joints of the girders and the parapet will be aligned. This is supported by the Panel and should be retained. The Panel would like SCAW contractor to further explore the expression of the joints to either achieve an even joint width across all (movement and abutting) or a differentiation so that the movement joint appears intentional and not as a construction error.	CPBUI	A chamfered joint has been incorporated into the segment joints after consideration to the aesthetics of square joints vs shadow line vs chamfered edges. This design solution has been developed in consideration as to how the joints are read when contrasting the box girder joints against the parapet joints. DRP to clarify what component of the original comment is not to DRP satisfaction.	Closed
SCAW	9/6/2022	4.04	Line Wide	Built form	Illustrate the overall viaduct structure showing how it sits in the landscape. a. Provide the logic for the expression of each run/section and illustrate how all the sections come together. b. Illustrate how the horizontal alignment relates to the planting strategy and existing and proposed topography and landforms. c. Explain and illustrate treatments at low points and over the creeks.	CPBUI	Viaduct relationship to the landscape (existing) and future development reviewed and presented to DRP.	Closed
SCAW	9/6/2022	4.05	Line Wide	Landscape	Explain how the Country approach is manifest in the scheme as a living system (e.g. through approaches to water, soil, biodiversity etc).	CPBUI	Ongoing liaison with Murawin and CwC to inform material selection, landscape options, ecological restoration, species selection and identify roles for First Nations enterprises in the design and construction.	Closed
SCAW	9/6/2022	4.10	Line Wide	Systems	In the project context the new metro infrastructure is a system that needs to establish ways to relate to other existing systems: water, biodiversity, soil etc. Be more explicit in illustrating and articulating how the different systems relate, interact and can support each other.	SM Design Team	CPBUI presented detail on site hydrology and drainage as this contract determines the altered drainage pattern resulting from the new infrastructure. Fauna related requirements must be met in the SCAW contract and certain of these will be passed on to SSTOM and CLW where appropriate. Each contract is subject to detailed requirements controlling the handling and reuse of topsoil. Similarly each contract includes requirements covering the use of native vegetation. The CLW contract will be fashioned as an ecological, i.e. systems based, approach to landscape restoration. A specialist ecological and bush regeneration consultant will be engaged by Sydney Metro to refine the scope and requirements for the Corridor Landscape Works.	Closed
SCAW	9/6/2022	4.12	Line Wide	Systems	Provide three-dimensional illustrations of stockpiling areas to show: a. how the hydrology of each area works: how the water moves from the structure to the soil and between areas. b. the relationship and integration of proposed structures with existing and proposed landforms.	CPBUI	SM and the SCAW Contractor have noted the Panels comments and provide the following justification: The stockpile profile has been developed to seek a more natural shape and the batters have been flattened to 5:1 to be consistent with the landscape. The profile has been finalised in consideration of feedback from the CwC working group. Design development of the stockpile is generally complete with the Stage 3 (100%) design of the stockpile (the final stockpile profile) submitted to Sydney Metro at the end of September.	Closed by SM for SCAW noting no additional briefing has been provided at this stage and will be provided to the Panel as part of SSTOM.
SCAW	9/6/2022	4.15	Line Wide	Abutment areas	The change of materiality at abutment areas from Nepean River pebbles to sandstone blocks is questioned, noting that sandstone is not a naturally occurring rock type in this area. Review and revisit.	CPBUI	The Panel notes that stone is currently proposed as the most appropriate material for the abutments based on scour, flooding and proposed grades. Presentation from Murawin. DPR generally supportive of use of chipcut sandstone.	Closed
SCAW	9/6/2022	4.16	Line Wide	Abutment areas	Illustrate any access stairs, maintenance ramps and/or security fences required in these areas.	CPBUI / SM Design Team	Issue closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
SCAW	9/6/2022	4.17	Landscape	Heritage	Expand the heritage analysis to include the visual impacts to these elements from afar, including areas outside the project area that may be significant. For example, the heritage values of the Old Luddenham Road should include how it moves in the landscape and captures views. How will this relate or be impacted by the viaduct.	CPBUI	Heritage analysis presented to DRP. No further comments required.	Closed
OTHER	9/6/2022	4.21	Line Wide	Interfaces and coordination	Outline any contamination issues and how these will be addressed.	ESP Team	Environmental Impact Statement: Figure 16-2 (attached) indicates the 'Areas of Environmental Concern (AEC)' across the Project alignment which have a medium to high risk of existing contamination. In accordance with the SM-WSA Planning Approval, our Contractors have an obligation to conduct site investigations within these AEC, where they disturb ground. The Contractors' obligations regarding contamination management are outlined in SM-WSA Conditions of Approval (CoA) E92-E97. It is too early in the project cycle to know the nature of any potential contamination across the site, or remediation methodologies (if required), until sampling, analysis and reporting has been carried out by our Contractors in accordance with the CoA. Contamination between contracts is currently being managed by Sydney Metro's Integration team, in consultation with the SM-WSA Environment, Sustainability and Planning team and SCAW, SBT and SSTOM delivery teams. SM's Contractors are responsible for remediation where required in accordance with the CoA. Our Contractors are currently conducting sampling, analysis and reporting in accordance with the CoA, and it is too early to provide Ongoing collaboration with the CWC working group as required by SCAW.	Closed
SCAW	21/7/2022	5.01	Line Wide	Connecting with Country	Engage with Murawin and the Connecting with Country Working Group as soon as possible to progress a meaningful integration of their knowledge and insights.	CPBUI	Update provided on liaison with Murawin and CwC group and connecting with country initiatives.	Closed by SM for SCAW. Matter to be addressed by other/future design packages (SSTOM, CLW)
SCAW	21/7/2022	5.02	Line Wide	Connecting with Country	Provide a presentation at the next meeting on this engagement and how the contractor team is responding to these inputs, to include: a. material selection b. exploration of landscape options, with a focus on ecological restoration c. identified roles for First Nations enterprises in the design and construction (e.g. compost production) d. species selection e. soil amendments f. refer also to the advice from DRP 4, where a number of additional items for consideration have been raised g. provide feedback to the Connecting with Country WG on project development and how their advice and input has been addressed and incorporated.	CPBUI	Continuing dialogue between the groups.	Closed
SCAW	21/7/2022	5.03	LDN	Built form	Provide further testing of viaduct scale from the south along Luddenham Road.	CPBUI	Luddenham Road context (existing and future) reviewed	Closed
SCAW	21/7/2022	5.04	Line Wide	Built form	Consider the perception of the viaduct (i.e., where it is viewed at proximity and where from a distance) in light of the scale of future development in order to confirm current approaches.	CPBUI	Context of the viaducts when viewed in proximity and distance reviewed.	Closed
SCAW	21/7/2022	5.05	Line Wide	Built form	Formalise the drawing "Viaduct Interface" (p.14 of the presentation) for inclusion in the PUDCLP to illustrate the context for the viaduct at different locations along Luddenham Road, as well as in relation to heritage curtilages (pp. 54-55). Include: a. contours b. key levels along the line c. key levels related to topography d. minimum clearances, including over creeks e. existing and potential future stands of vegetation.	CPBUI	The formalised drawing of the 'Viaduct Interface' will be included in the PUDCLP document.	Closed by DRP? This information provided in the PUDCLP

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SCAW	21/7/2022	5.06	Line Wide	Built form	Review the design of the viaduct piers to consider the slim central section of the shaft to ensure this element is legible from a distance.	CPBUI	Form, initial geometry and resolution of viaduct piers reviewed. Refer to comment 2.05.	Closed
SCAW	21/7/2022	5.07	LDN	Built form	The image of the elevated viaduct at Luddenham (p.19) indicates that the box girder soffit will form a partial ceiling to public spaces below. The contractor is strongly encouraged to turn their attention to the refinement of this element. Consider the detail and experience of the viaduct soffit as it contributes to the experience of public space, particularly around stations.	CPBUI	Scale adjusted. Final urban treatment by SSTOM. Uplighting not in SCAW scope. This	Closed
SCAW	21/7/2022	5.08	Line Wide	Built form	Ensure the integration of all horizontal services, including any lighting that might be deemed necessary through the above design review.	CPBUI	Confirmed no horizontal services on outside of viaduct. All services integrated into the viaduct.	Closed
SCAW	21/7/2022	5.09	LDN	Built form	Provide more detail on bird-proofing at junctions, noting that approaches at locations where the viaduct can be seen close up require more attention than when distant.	CPBUI	Information provided to SM. 30x30x3mm stainless steel mesh is provided at the top of all viaduct piers to prevent a ledge for birds/vermin. The mesh is set-back approximately 100mm to avoid a significant visual impact of a mesh fixed to the face of the pier. The 100mm setback has been determined to allow fixing of concealed baseplates sufficiently away from the pier face and to allow installation. The arrangement balances the requirements of an aesthetic and functional design outcome. See attached detail	Closed by SM
SCAW	21/7/2022	5.10	LDN	Built form	Demonstrate how the up lighting indicated in the renderings (delivered by SSTOM) will enhance the experience of the structure at these locations.	CPBUI	Final treatment by SSTOM and subject to separate PUDCLP. Uplighting not in SCAW scope. Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
SCAW	21/7/2022	5.11	Line Wide	Joints	Present further options for the viaduct jointing to understand how different treatments may affect visibility of the joint from a distance, and to ensure an architectural resolution of this key detail.	CPBUI	Viaduct joints tested. Expansion joint 50mm and 20mm chamfer. Better outcome to reduce risk of damage to the elements. Sets up hierarchy of joint widths. Refer comment 2.05.	Closed by SM noting not all Panel advice adopted
SCAW	21/7/2022	5.12	Line Wide	Built form	The current design of the piers illustrates that refinements to a base engineering element can make a positive contribution to design quality. Revisit the design and demonstrate options for the parapets that explore how refinements to the design of this element can contribute to the architectural expression of the viaduct.	CPBUI	Presentation to DRP on form. Form reassessed. initial geometry and resolution of viaduct piers re-stated from tender design. No proposed change. Options presented for parapet joints only. Preferred parapet joint to be chamfered.	Closed by SM noting not all Panel advice adopted
SCAW	21/7/2022	5.13	Line Wide	Concrete elements	Continue to provide updates on ongoing work on concrete design mix and testing, carbon reduction etc.	CPBUI	Refer to comments 2.17 and 4.02.	Closed by SM. SM will continue to monitor ongoing progress.
SCAW	21/7/2022	5.14	Line Wide	Concrete elements	Investigate how a lighter-coloured concrete can be achieved to assist in reducing the visual impact of the structure.	CPBUI	As noted in response to comment 2.17, 12 mix designs have been evaluated against a number of material property criteria (e.g. slump, 12hr strength, code and specification requirements). A preferred concrete mix has been determined which has ~365kg/m3 of cement content and uses 195kg/m3 of fly ash. The colour and finish requirements of the concrete are prescribed as noted in comment 2.06 response. The light colouring of concrete is a competing variable with sustainability in that cement replacement materials (fly ash, slag) tends to darken the concrete. Prototypes using the preferred concrete mix will progress outside of the Concrete Working Group.	Closed by SM. SM will continue to monitor ongoing progress.
SCAW	21/7/2022	5.15	Line Wide	Concrete elements	A simple textured finish for selective use should not be excluded, explore options and present at next session. Noting that staining and weathering can contribute positively to the design quality when understood and designed.	CPBUI	Smooth finishes required and recommended. Metro Specification requires Class 2CX as per AS3610, implying a smooth off-form finish. Textured concrete will result in issues with maintenance, staining and constructability. Refer comment 4.01.	Closed
SCAW	21/7/2022	5.16	Line Wide	Abutment areas	Demonstrate that the contractor's architects and landscape architects are closely involved in the design and resolution of the abutments so that a sensitive, high quality design solution is achieved that economizes on built area and materials and maximises landscape outcomes.	CPBUI	Design developed in consultation with Murawin and CWC group - kit of parts and overall form.	Closed
SCAW	21/7/2022	5.17	Line Wide	Abutment areas	Engage with the connecting with Country consultant to progress the design and materiality of the abutments.	CPBUI	Design developed in consultation with Murawin and CWC group.	Closed
SCAW	21/7/2022	5.18	Line Wide	Abutment areas	Demonstrate use of infrastructure sustainability and GreenStar tools to inform the final selection of material for the abutment finish.	CPBUI	The SCAW package is required to achieve a verified Infrastructure Sustainability (IS) "design" rating score of at least 75 points, using the IS rating tool version 1.2 "Design and As Built". The Project is targeting Level 3 for IS Rating credit Mat-1 'Materials lifecycle impact measurement and reduction', which involves demonstrating a 30% reduction in materials lifecycle impacts compared to the base case footprint. Design optimisation associated with the abutment (including reduction of hard material and imported rock used) will contribute to achievement of this target. Further detail will be included in the Sustainability Design Report (SMWSASCA-CPU-SWD-EW000-SB-RPT-080101). It is noted that the Project is not required to attain a Green Star rating.	Closed by SM for SCAW noting that this advice will be conveyed to SSTOM and CLW
SCAW	21/7/2022	5.19	Line Wide	Abutment areas	Outline the coordination needed between SCAW and SSTOM to ensure that security fencing is well integrated with the abutment design and junctions well executed.	SM Design Team	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
SCAW	21/7/2022	5.20	Line Wide	Abutment areas	Provide more information about emergency exit points from both the abutments and viaducts and how these relate to future development.	SM Design Team	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed

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PACKAGE	MEETING DATE	ITEM #	GEOGRAPHIC LOCATION	THEME	DRP ADVICE	TEAM TO RESPOND	ACTION / RESPONSE	STATUS
SCAW	21/7/2022	5.21	Line Wide	Soils	Investigate the soil biology of an operating natural eco-system, ideally close to the creeks on the alignment where the vegetation is less disturbed to help inform the rehabilitation of soils in this project.	CPBUI	The project soil scientist (SESL) has advised that they will be testing soils for organic carbon content, including within the Defence Lands where the vegetation is less disturbed. This will show the proportion of organic matter to be added to the site soils to be re-used for landscaping. The addition of organic matter is the simplest way to commence the complex process of building soil microflora/soil biology. SESL's recommendations in terms of amelioration will naturally promote the proliferation of microorganisms and labile carbon by creating a suitable / improved environment. SESL has advised that they can do additional testing (FDA and PPOX) to determine microbial activity, but this would not influence their soil amelioration recommendations and SESL does not recommend inoculation using microbe based products without relevant literature backing its efficacy. Sydney Metro is satisfied with SESL recommendation on soil testing and amelioration. Sydney Metro's Ecologica Restoration Specialist will be able to undertake more extensive soil testing if they determine that soil microbiology testing is a useful to proposed restoration approach. Refer 5.22 for soil rehabilitation	Closed by SM for SCAW. Matter to be addressed by other/future design packages (SSTOM, CLW)
SCAW	21/7/2022	5.22	Landscape	Soils	Target composts that improve soil biology and water-holding capacity.	CPBUI	The addition of compost (composted organic matter) is the simplest way to commence the complex process of building soil microflora/soil biology. SESL's recommendations in terms of amelioration will naturally promote the proliferation of microorganisms and labile carbon by creating a suitable / improved environment.	Closed by SM for SCAW. Matter to be addressed by other/future design packages (SSTOM, CLW)
SCAW	21/7/2022	5.23	Line Wide	Soils	Work with the connecting with Country consultant and Working Group to understand the interface between soil improvement and cultural practices.	CPBUI	Strategy identified and presented to DRP. The CwC WG will have the opportunity to review the implementation of the Corridor Landscape Strategy by the CLW.	Closed
SCAW	21/7/2022	5.24	Line Wide	Soils	Utilize the landscape expertise in the contractor team to direct how the stockpile will be designed, ensuring a landscape rather than purely engineering solution.	CPBUI	Strategy identified. Design considerations for the current design of the stockpile within PS-105. Current design of stockpile sympathetic to undulating environment, not placed within riparian buffer zone. Design principles agreed with Murawin.	Closed
SCAW	21/7/2022	5.25	Line Wide	Soils	Provide a presentation on stockpile design prepared by the landscape architect at a future meeting, indicating how the stockpile will be shaped, including: a. its relationship to the flood plain (at minimum relationship to 1:100 year flood line and PMF) b. how its associated hydrology will be managed c. how its design anticipates future changes necessary as part of the SSTOM works (e.g. what is the maximum amount that can be added to the stockpile in future; what is maximum subtraction? Where on the stockpile should these additions and subtractions be made, and how will this effect planting being delivered by SCAW? What are the temporary and permanent iterations of the stockpile?) d. proposed species.	CPBUI	Refer comment 4.12	Closed by SM for SCAW. Matter to be addressed by other/future design packages (SSTOM, CLW)
SCAW	21/7/2022	5.26	Line Wide	Soils	Provide information to assist a broad scale understanding of the disturbance and movement of topsoils and spoil on the project. Indicate: a. location and treatment of any soil from other contracts that will be incorporated into the SCAW works b. extent and location of material and proposed handling/ remedial treatment to facilitate SCAW works c. anticipated locations for topsoil striping in SSTOM	CPBUI / SM Design Team	Detail presented 1.09.2022	Closed
SCAW	21/7/2022	5.27	Landscape	Hydrology	Provide more information on how the overall hydrology and drainage of the project is being developed, with consideration to: a. how the proposed works integrate with the existing water ecosystem b. how the water eco-system is managed in relation to temporary stages of work through to the desired finished state c. extent of flooding around abutments and in relation to viaduct heights and future development.	CPBUI	Strategy identified: - Minimise change where possible. - Existing flow patterns maintained, all major waterways and their floor plans are crossed using viaducts. - Limit clearing of existing vegetation at creek crossings. Water quality measures have been incorporated in all discharge points. - Scour protection will be included where needed.	Closed
GENERAL	21/7/2022	5.28	General	Interfaces and coordination	Identify and itemise all known interface issues and present to the DRP at the next session.	SM Design Team	All known interfaces with SSTOM Contractor itemised in the Project Interface Register. These have been developed in accordance with the project Interface Requirements Specification which categorise the interfaces as follows: - Bridge and viaducts - such as shear key and derailment kerb starter bars, cast in ferrules for future service routes, drainage systems and deck waterproofing etc. - Luddenham Station - such as allowance in viaduct pier design to support future station platform. - Alignment and Formation Earthworks - such as earthwork quality and levels for future track construction, as well as earthwork interfaces at each end of the project alignment. - Drainage - bio-retention basins. SCAW will assess these interfaces using the ICR process to ensure that the design and construction of the interfaces meet the requirements of the reference design and particular specifications as well as an informed design management team to communicate requirements.	Closed
GENERAL	21/7/2022	5.29	General	Interfaces and coordination	SM to consider how to best communicate and inform the SSTOM team of interface issues to ensure desired design outcomes (e.g., design guidelines for abutment fencing).	SM Design Team	SM-WSA Guidelines, SM Reference Design and Particular Specifications communicate desired and required outcomes for Corridor elements including fencing. SM Design Team SME's review SSTOM design in relation to these requirements.	Closed
SCAW	8/4/2022	6.01	Line Wide	Joints	Develop a deliberate and considered architectural treatment for the viaduct that informs detailed design decisions around jointing and other details. Consideration may be given to: a. expressing, rather than minimising, the sectional nature of the viaduct. b. other joint techniques such as a shadow line, which may alleviate the issue of damage during construction while providing coverage to services behind.	CBPUI	Refer comment 2.05.	Closed by SM noting not all Panel advice adopted
SCAW	8/4/2022	6.02	Line Wide	Joints	Demonstrate that design decisions around joint design are informed by buildability, to ensure that damage to edges is minimised.	CPBUI	Chamfered joints recommended to address buildability and damage issues. Refer comment 2.05.	Closed
SCAW	8/4/2022	6.03	Line Wide	Abutment areas	Prepare sketch options and a succinct performance brief to guide the future SSTOM contractor towards optimal outcomes for fencing and gates around the abutments, and to make allowance now for any adjustments within the SCAW design to accommodate this optimal outcome.	CPBUI	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
SCAW	8/4/2022	6.04	Line Wide	Abutment areas	There are two lines of fencing at the abutments creating the Asset Protection Zone (or sterile zone) around the abutment areas. The inner face fence must provide the primary deterrent with the outer fence acting as a secondary deterrent. It was also confirmed that there will be 7 to 8km of double fencing where the tracks are at-grade. SM to provide illustrations of proposed fencing.	SM Design Team	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
SCAW	8/4/2022	6.05	Line Wide	Abutment areas	Provide more detail on the planting that can be used to minimise the visual impacts and defensive qualities of fencing around the abutments.	SM Design Team	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed

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PACKAGE	MEETING DATE	ITEM #	GEOGRAPHIC LOCATION	THEME	DRP ADVICE	TEAM TO RESPOND	ACTION / RESPONSE	STATUS
SCAW	8/4/2022	6.06	Line Wide	Abutment areas	SM to provide a range of cross sections to illustrate: a. the planting possibilities (zones for shrubs, location of tree planting) both around abutments and along the line where fencing is in evidence. b. the scapae of planting SM will be maintaining.	SM Design Team	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
SCAW	8/4/2022	6.07	Line Wide	Viaduct	SM to provide : a. sections and diagrams to indicate the potential location of these egress points. b. images to illustrate examples from other Metro projects.	SM Design Team	Item closed for SCAW. This issue has been noted by SM and will be listed as an item for SSTOM to address.	Closed
GENERAL	8/4/2022	6.08	Line Wide	Interfaces and coordination	SM to circulate a list of known interface and coordination issues to be added to on an ongoing basis.	SM Design Team	Refer comment 5.29	Closed
OTHER	8/4/2022	6.10	Line Wide	Independent Reviewer	SM to confirm a definition of 'independent' in terms of the PUDCLP review.	ESP Team / Precinct Team	Information has been provided to the Panel Advisor on the definition of 'Independent' in terms of the PUDCLP review. The guidelines referred to in CoA A25 provide the definition and DPE expectations when they use the word 'independent' in conditions of approval. The relevant section in the guidelines headed 'Consideration taken into account by the Department when approving an independent expert'.	Closed
OTHER	8/4/2022	6.12	Line Wide	Independent Reviewer	SM to confirm if two reviewers could be appointed to a single PUDCLP to ensure appropriate levels of expertise across different disciplines.	Precinct Team	Clarification has been provided to Panel Advisor on the role of the Independent Reviewer, number of reviewers per PUDCLP (1 for SCAW and 1 for FSM - 2 may be permitted for SSTOM). Independent Reviewer to be nominated by the DRP for each PUDCLP but can be the same reviewer across all PUDCLPS.	Closed
OTHER	9/1/2022	8.01	Line Wide	Connecting with Country	Consider the opportunities for collaboration between Aboriginal consultants across the various packages. While this is occurring organically due to Murawin's involvement in both SCAW and SSTOM, a more structured and deliberate collaboration, guided by SM and the Connecting with Country Working Group, would undoubtedly be fruitful and establish a new benchmark for Design Excellence in this area.	CwC	Noted by SM and will be raised with SSTOM.	Closed
SCAW	9/1/2022	8.04	Line Wide	Connecting with Country	Provide a program for meetings between the contractor's Aboriginal consultant (Murawin) and the CwC WG to ensure the latter is actively and continuously engaged, with their advice fully integrated into the PUDCLP and future stages.	CwC / CPBUI	Program developed and provided to SM.	Closed by SM. SM CwC SME to continue to monitor ongoing progress.
SCAW	9/1/2022	8.05	Line Wide	Connecting with Country	Provide regular updates from the contractor's Aboriginal consultant on the outcomes of the collaboration with the CwC WG.	CPBUI	CwC Working Group and Contractors Aboriginal Consultant will continue to collaborate and provide updates to SM. A Walk on Country with the Connecting with Country Working Group occurred on 19/10/2022	Closed by SM.
SCAW	9/1/2022	8.06	Line Wide	Connecting with Country	Expedite the discussed Walk on Country (or a series of walks if needed) to ensure this important act of knowledge-sharing informs project thinking as soon as possible.	CwC	CWC confirmed that this is being organised between CWC WG and CPBUI.	Closed
SCAW	9/1/2022	8.07	Line Wide	Connecting with Country	Explore opportunities for the integration of Aboriginal language and naming in SCAW works.	CwC / Precinct Team	SM Precinct Team will look into naming.	Closed
SCAW	9/1/2022	8.08	Line Wide	Built Form	Identify where the viaduct will be viewed at close proximity, and consider the design refinements that could be made to ensure legibility of the pier form.	Design Team	Refer comment 4.04	Closed
SCAW	9/1/2022	8.09	Line Wide	Built Form	Provide further detail on the depth of bird proofing mesh inserts.	CPBUI	Refer to comment 5.09	Closed by SM.
SCAW	9/1/2022	8.10	Line Wide	Concrete elements	Outline the measures taken to mitigate the risk of colour inconsistencies between non-standard 'make-up' sections of the parapet and standard panels.	CPBUI / Design Team	Refer to comment 2.06 .	Closed by SM noting not all Panel advice adopted.
SCAW	9/1/2022	8.11	Line Wide	Concrete elements	It was noted that the current target for the carbon footprint of the concrete is 350-380 kg CO ₂ -e/m ³ , and the contractor believes they are tracking to meet this - Provide regular updates on how the concrete carbon footprint is tracking against this target	CPBUI / Design Team	After 12 concrete mix design tests, a preferred concrete mix has been determined which has ~365kg/m ³ of cement content and uses 195kg/m ³ of fly ash. Minor refinements will occur but the cement content is unlikely to change significantly. Change to RED - ongoing updates Refer to comment 2.17.	Closed
SCAW	9/1/2022	8.14	Line Wide	Soils	Allow for testing of soil microbiology in addition to tests being conducted by SESL.	CPBUI / Design Team	Sydney Metro satisfied with SESL recommendation on soil testing and aemlioration. Sydney Metro's Ecologica Restoration Specialist will be able to undertake more extensive soil testing if they determine that soil microbiology testing is a useful to proposed restoration approach. Refer comment 5.21	Closed by SM noting not all Panel advice adopted.
SCAW	9/1/2022	8.16	Line Wide	Landscape	Provide ongoing updates on the development of the stockpile design.	CPBUI	Refer comment 4.12	Closed by SM noting not all Panel advice adopted.
SCAW	9/1/2022	8.17	Line Wide	Flooding	Provide sectional information on the location of piers in relation to flooding in the riparian zones.	CPBUI / Design Team	The piers have been positioned based on a topographical model with the riparian zones At Blaxland Cree, detailed site surveys of the riparian zones have now confirmed that during general flows the pier is located outside of the main creek zone. The pier does will get wet in events as low as 1:2yr, but in these situations the water has swollen out of the creek line and spread between both spans.	Closed by SM.
SCAW	9/1/2022	8.18	Line Wide	Flooding	Demonstrate that consideration has been given to a range of flood events, not only major ones.	CPBUI / Design Team	Technical assessment has been completed. Stage 3 Hydrology and Flood Report will be finalised by the end of the year and the DRP can be provided with a copy.	Closed by SM
SCAW	9/1/2022	8.19	Line Wide	Flooding	Provide a copy of the hydrology report for the Panel's information.	CPBUI	CPBUI are starting to consult with adjacent land owners with respect to any local flooding impacts. Finalised Stage 3 Hydrology and Flood report will be provided at the end of the year. The DRP and PCC will be provided with a copy of the SCAW Hydrology and Flood report when it is finalised	Closed
OTHER	15/9/2022	9.17	Line Wide	Planning Approvals	SM to meet with DPE out-of-session and as soon as possible to clarify and confirm issues related to this CoA, including whether a separate report authored by the DRP is required to meet this condition. DRP Panel Chair and Panel Advisor to attend.	ESP / Precinct Team	Response and steps to CoA E63: - The SM-WSA Contractors hold the obligation for complying with CoA E63. - CPBUI's intent is to prepare a memo which summarises how their design response addresses CoA E63(a)-(e). - CPBUI's submission will include relevant information that had been presented to the DRP, any feedback they received from DRP and how this was addressed (or not). - SM to review and submit to Planning Secretary (DPE). DPE attended DRP panel session 10 November to discuss CoA E63.	Closed by SM.
OTHER	15/9/2022	9.19	Line Wide	Planning Approvals	SM to schedule a meeting to allow the SCAW PUDCLP Independent Reviewer to seek clarifications from the DRP	Precinct Team	Meeting between DRP and Independent Reviewer undertaken 10 November 2022. The Independent Reviewer is to seek clarification from the SM SCAW Contractor in relation to the PUDCLP. The DRP is independent of the review process and role is to provide design advice to the SCAW design elements brought before the Panel as per the ToR. The Independent Reviewer will present their findings to the DRP once the review is finalised.	Closed by SM.

Appendix D

Qualified and Experienced Personnel

Appendix D - Qualified and Experienced Personnel

Key Personnel

The PUDCLP has been prepared by qualified and experienced personnel:

██████████ Cox Architecture

██████████ Woods Bagot

██████████ Aspect

Their CVs are included at the end of this appendix.

Specialist Consultants

The PUDCLP has been prepared with inputs from the wider SCAW design team.

The PUDCLP has been formulated with inputs from this wider team

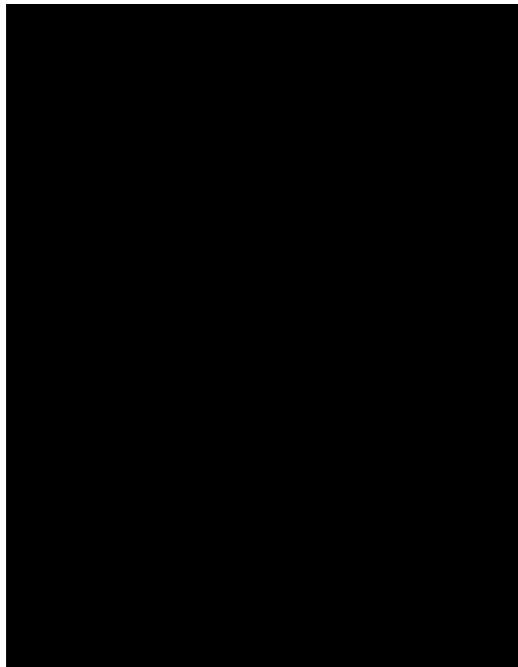
Architecture And Urban Design	Cox Architecture/Woods Bagot
Landscape	Aspect
Fauna Assessment	Aurecon Hatch Joint Venture
Soil Biology	Aurecon Hatch Joint Venture
Soil Sciences	SESL
Structural Engineers	Aurecon Hatch Joint Venture
Civil Design	Aurecon Hatch Joint Venture
Utility Design	Aurecon Hatch Joint Venture
Viaduct Design	Tony Gee and Partners (Hong Kong)
Drainage, Water Quality, Flooding/ Scour Protection	Aurecon Hatch Joint Venture
Hydrology and Flood Protection Report	Aurecon Hatch Joint Venture
Water Quality Assessment	Aurecon Hatch Joint Venture
Acoustic Assessment	Resonate
Geotechnical Assessment and Earthworks Design	Douglas Partners
Contamination Report	Douglas Partners
Sustainability and Climate Change	Aurecon Hatch Joint Venture
Rail Alignment	Aurecon Hatch Joint Venture
Traffic Report	Aurecon Hatch Joint Venture
Vegetation Assessment	Sydney Metro

Key Inputs

A range of supporting documents and studies, as well as inputs from the design team's specialist consultants have been used in developing the PUDCLP. These include specific inputs prepared and/or used to fulfil approval conditions and support the PUDCLP.

Specific inputs include:

SCAW reference design and supporting studies	Sydney Metro
Viaduct, abutment and pier design	Tony Gee and Partners (Hong Kong)
Rail Alignment – vertical and horizontal	Aurecon Hatch JV
Vegetation Assessment	Sydney Metro
Landscape Strategy and design packages	Aspect
Drainage, Water Quality, Flooding/ Scour Protection	Aurecon Hatch JV
Earthworks Design for Stockpile design	Douglas Partners/ Aurecon Hatch JV
Soil profiles and treatments	SESL



Director

BArch (Hons)

With both architectural and urban design degrees, Ian has more than thirty years of built form and urban design experience. He brings to projects extensive knowledge of urban renewal, land use strategies, master planning and urban design solutions, and innovative control mechanisms. Ian has worked on all scales of projects from large scale strategic planning down to the street level public domain and urban realms. He has a strong record in transport projects, particularly new light rail systems that transform urban environments.

His experience in urban design and renewal projects in Australia and overseas brings a global perspective to the development of new built form outcomes.

As a Director he leads Sydney's urban design and planning studio to provide strategic advice, leadership, vision and innovation in the delivery of complete urban outcomes on many complex projects. Ian is directly involved in the stakeholder engagement process, including leading and facilitating design workshops and community interaction.

■ has been actively involved in the Australian Institute of Architects (NSW Chapter) as a Committee Member, Committee and Board Chairman, Council Member and Vice President. He has tutored at both the University of NSW and Sydney University and has been guest editor of the AIA (NSW Chapter) Bulletin Magazine.

Education

MS (Architecture & Urban Design)
Columbia University, New York City, 1984

BArch (Hons)
University of Sydney, 1981, ARAIA

Memberships & Affiliations

Member, NSW Chapter RAI Marketing and Information Board, 1993

Vice President, NSW Chapter RAI Marketing and Information Board, 1993

Councillor, NSW Chapter RAI, 1992-1985

Steering Committee, RAI Representative, "Core Housing Designs" Study (NSW Department of Planning HECS), 1991-1992

Chairman, NSW Chapter RAI Urban Design Committee, 1991-1993

Professional Experience

Transport & Connection

- Greater River City Light Rail - Stage 1 Infrastructure Works, Parramatta, 2022
- Canberra Light Rail Stage 2, Canberra, 2022
- Newcastle Light Rail Reference Design, TfNSW, 2016
- Parramatta Light Rail Feasibility Design, 2016
- Sydney and Southwest Metro Urban Design 2015-2016
- Canberra Light Rail, ACT 2015
- Macquarie Park Bus Interchange, Macquarie Park, NSW 2015
- Newcastle Light Rail Scoping Design, TfNSW, 2014
- CBD and South East Light Rail Bid, Sydney, 2014
- Sydney Rapid Transit Second Crossing Land Use Study, Transport for NSW, Sydney, 2013
- Macquarie Park Town Centre, Sydney, 2013
- North West Rail Link Strategic Precinct Planning Sydney, 2012
- City Rail Expansion Program, Transport for NSW, Sydney, 2012
- Macquarie Street Light Rail Study, Parramatta, Parramatta Council, 2012

- Sydney CBD Light Rail Transport Study Phase 1, Transport for NSW, Sydney, 2010/2011
- Sydney Light Rail Extension Study, 2010/2011, Sydney, Transport NSW
- Wynyard Walk Pedestrian Tunnel, 2011 - Wynyard Station Precinct, 2011
- Western Express Rail Study, 2010
- Regional Rail Link, Urban Design Strategy, VIC, 2010
- SydneyMetro Network, CBD Stage 1 Urban Design Strategy, 2009
- Sydney Metro Stage 2 Urban Design 2009, 2010

Education

- Newcastle University CBD Campus, 2017
- Western Sydney University, Campbelltown Campus Stage 6, 2017
- Ascham School Campus Master Plan, 2016
- University of Western Sydney, Werrington Estate Master Plan
- University of Wollongong in Dubai
- Northern Sydney Institute (TAFE NSW), Meadowbank Campus Master Plan
- Northern Sydney Institute (TAFE NSW), Hornsby Campus Master Plan
- Sydney TAFE, St George College

Living

- Ivanhoe Estate Concept Plan, 2016
- ING/Panthers Mixed Use Master Plan and DCP, Penrith NSW, 2008
- The Ponds Creek Master Plan and DCP
- Zhong Guan Cun Housing and Master Plan, Beijing, China 2002
- Riverstone East, Vineyard and Ingleside ILPs
- Sydney Olympic Village Design Guidelines, Newington, 1996

Planning & Urban Design

- Newcastle University City Development Plan – Honeysuckle, current
- Westmead Innovation District Master Plan, current
- Ivanhoe Estate Concept Plan, 2016
- Waterloo Estate Concept Plan, 2016
- New Parramatta Road Urban Transformation Programme, 2015
- Camellia Precinct Land Use and Infrastructure Strategy, Sydney, NSW, 2015
- University of Wollongong, Wollongong Campus Spacial Needs Analysis, 2015
- WestConnex/Parramatta Road Urban Renewal Program, Urban Growth, 2014
- Ingleside Master Plan & DCP, Ingleside, NSW, 2014
- Marsden Park North Precinct
- Project Management & Master Planning, NSW, 2014
- North West Rail Link Corridor Strategy, Transport for NSW, Sydney, 2012-2013
- North Ryde Station Precinct TOD, 2013
- Royal Botanic Gardens and Domain Master Plan, Sydney, 2014
- Granville Urban Renewal Area, Auto Alley, 2012
- Northern Beaches Hospital Precinct Master Plan, Sydney, NSW, 2012
- Mt Buller Master Plan, Mt Buller, VIC, 2012
- Frenchs Forest Strategic Centre, Sydney, NSW, 2011
- Macquarie University Academic Core, 2012
- Macquarie University Master Plan, NSW, 2014
- UAE University Al-Ain Campus, UAE, 2012
- Auto Alley Options Study and Preferred Option Study, 2012
- Auto Alley Study, Parramatta, 2011
- Council Works Brief for 12-14 Philip Street and 333 Church Street
- The Parramatta Discovery Centre, 2011

- Macquarie University Precinct E Urban Design Plan, 2010
- The Gosford Challenge Urban Master Plan, 2009
- Dubai Waterfront Islands Structure Plan, 2008
- Dubai Waterfront Islands Island 1 Detailed Master Plan, 2008
- Singapore Polytechnic Master Plan, 2008
- Dubai Exhibition City Master Plan and Urban Design Controls, 2007
- Abu Dhabi General Exhibition Centre Master Plan, 2006
- Dubai Festival City Zones 2 and 3 Master Plan, 2004
- Suzhou River Urban Design, Shanghai, 2004
- Singapore River Schematic Design, 2003
- Nanjing Waterfront, China, 2003
- Huangpu River Master Plans, 2002-2004
- Shanghai Huangpu River Structure Plan, 2001
- Macquarie University Structure Plan, Sydney, NSW, 1999
- Maritime Square Urban Renewal, Singapore, Master Plan 1999
- Victoria Park Masterplan, Zetland, NSW, 1998
- Singapore Second Crossing 1993 New Township, Malaysia, 1995
- Sudirman CBD, Jakarta, Indonesia, 1993
- Pymont Point Master Plan, Pymont, NSW, 1993
- Penang Sports Complex, Batu Kawan, Penang, Malaysia, 1996
- CSR Master Plan Pymont, 1996
- Kuwait Pearls Sea Cities, Kuwait, 1995
- AXXESS Corporate Park, Vic, 2012
- Al Badia Business Park, Dubai Festival City Zone 14 Master Plan, 2005
- Qinzhou Industrial City Master Plan Guangxi Province, China, 2001
- Cagayan Special Economic Zone and Freeport, Philippines, 1999

Conferences & Speaking Engagements

- Keynote Speaker High Density Housing Conference Sydney, 2015
- Speaker Mixed Use Development Conference, Kuala Lumpur, 2015
- Guest Speaker UNSW Dubai Showcase, 2008
- Art Gallery of New South Wales Lecture "The Art of Architecture – The Dubai Dream", 2008
- Property Council of Australia Seminar Presenter, 2005-2007
- Guest Speaker Sports Conference Jakarta – "Olympic City Legacies", 1997
- Design Studio Critic Master of Urban Design UNSW, 1995-1996
- Tutor, Master of Architecture, University of NSW, 1993
- External Board of Review, Urban Design Program University of Sydney, 1991-1992
- Critic, School of Architecture, Texas A&M University, 1990
- Tutor, Design Theory School of Architecture University of Sydney, 1988-1990

Publications & Awards

- Guest Editor, Urban Design Issue NSW Chapter RAI Bulletin, 1991
- Guest Editor, Environment Issue NSW Chapter RAI Bulletin, 1990
- Showground Contest Review NSW Chapter RAI Bulletin, 1989
- Article, Espie Dodds and Norman Day in New York, article NSW Chapter RAI Bulletin, 1987

Regional Transport Leader

has over 25 years' multi-sector design leadership experience with a focus in urban transport. As Lead Design Architect, recent and current projects include the Western Sydney Airport, Sydney's North West Metro, Sydney's Central Station Main Works, Sydney Yard Access Bridge, Crows Nest Station and the reference design for Brisbane's Cross River Rail including as Technical Advisor and a member of the CRRDA's Design Review Panel.

has expertise in urban design, master planning, design and delivery of large complex infrastructure projects. Central to work ethic is to enable design quality collaboratively with public and private sector clients often within large integrated multi-disciplined teams.

Experience

Transport

- METRONET Morley to Ellenbrook Train Line, Tender Bid, WA, Australia
- Central Station Main Works, Sydney, NSW, Australia: 1,600 sqm (17,200 sf)
- Crows Nest Metro Station & ISD, Crows Nest, NSW, Australia: 20,000 sqm (215,280 sf)
- Tibby Cotter Bridge, Sydney, NSW, Australia
- Sydney Yard Access Bridge, Sydney, NSW, Australia
- North West Metro SVC Bid, Windsor Road Bridge, Sydney, NSW, Australia
- Mernda Rail Extension, McConnell Dowell with Arup, Melbourne, VIC, Australia
- Western Sydney Airport Design Competition and D&C, Sydney, NSW, Australia: 76,000 sqm (818,060 sf)
- Sydney Metro Western Sydney Airport SSTOM Tender, Sydney, NSW, Australia
- Hobart Airport International Terminal Expansion, Hobart, TAS, Australia: 33,000 sqm (355,210 sf)
- Melbourne Metro RFP, Melbourne, VIC, Australia
- North West Metro bid, Sydney, NSW, Australia*
- Gold Coast Rapid Transport Urban Design Study, Gold Coast, QLD, Australia*
- Brisbane Cross River Rail, Surface and Underground stations, Brisbane, QLD, Australia*
- Brisbane Airport ITB Northern Concourse Expansion, Brisbane, QLD, Australia

- Sydney CBD Metro Stations - Reference Design, Sydney, NSW, Australia*
- Bangkok MRT- Underground Rail South Line, Bangkok, Thailand: 9 stations*
- Christchurch Integrated Terminal Project, Christchurch, New Zealand*
- Sydney Airport Terminal 2, Sydney, NSW, Australia*

Civic & Events

- World Trade Centre, Sydney, NSW, Australia: 2,200,000 sqm (23,680,600 sf)

Education

- Queensland University of Technology, Creative Industries Precinct Stage 2, Brisbane, QLD, Australia*
- UNSW Science & Research Precinct Masterplan, Sydney, NSW, Australia*
- University of Canberra, Schools of Engineering & Nursing, Canberra, ACT, Australia*
- Nanyang Polytechnical Institute competition master plan, Singapore*
- Pfizer Pharmaceutical Conference & Training Facility & stage 2 Master Plan, Sydney, NSW, Australia*

Qualifications

- Bachelor of Architecture, University of South Australia (SAIT), 1990

Professional Affiliations

- Registered Architect, NSW, No. 6182

* Experience prior to Woods Bagot

Senior Associate, Sydney

Since joining ASPECT Studios in January 2015 he has been a key member of the design team for delivering Sydney CBD and South East Light Rail. Providing project management, urban and landscape design, coordination with the engineering team and an overall design review role.

has over 20 years experience in designing and project managing urban design, master planning, infrastructure and landscape architectural projects in Australia, UK, Middle East, China and Pacific region. These include award winning transport infrastructure, town centre regeneration projects, urban expansions, design guidelines and public open space improvements.

design experience includes, concept urban design studies and reports, visual assessments, master planning transit orientated developments and town centre regeneration projects focussed on transport interchanges. He has also worked on urban design guidelines and detailed design and construction documentation of major transport infrastructure projects including light rail stops and interchanges, bridges, noise walls, retaining walls and public domain improvements. He has proven management and leadership skills managing the urban landscape team; for business development, tender production and quality control for urban landscape, infrastructure design and master planning projects.

Registered Landscape Architect, AILA

Master of Arts in Urban Design with Merit, University of Westminster, London

Bachelor of Landscape Architecture, Manchester Metropolitan University

Bachelor of Arts in Landscape Design (Hons), Manchester Metropolitan University

Experience

INFRASTRUCTURE DESIGN

- Sydney Metro West Engineering Design Services, 2021 -ongoing
- Waterloo Station ISD, bid design through documentation, 2019-ongoing
- North Sydney Integrated Transport Program 2020 Parramatta Light Rail Stage 2 - scoping design and definition design, 2018 - 2019
- Sydney CBD and South East Light Rail - detailed design, documentation, construction, 2014 - 2019
- Sydney Light Rail Inner West Extension- tender to completion
- Hunter Expressway: F3 to Banxton Design Alliance D&C - detailed design to completion
- Arncliffe and Kingswood Station Upgrades
- Great Western Highway Upgrade: Bullaburra East - Design Alliance - detailed design and tender documentation
- Great Western Highway Upgrade: Lawson 1A - design alliance for detailed design and tender documentation
- Pacific Highway: Sapphire to Woolgoolga Upgrade- design, construct and maintain tender
- Bringelly Road Concept Urban Design Study. Project manager and urban designer for the concept urban design development and visual assessment of the upgrade of Bringelly Road for the RTA

URBAN DESIGN AND MASTER PLANNING

- UNSW Science and Engineering Building Public Domain
- St. Columba's Master Plan, Springwood for Diocese of Parramatta.
- Maya Island, Abu Dhabi for Capital Investment - Concept Master Plan
- Paita Sports & Recreation Master Plan, New Caledonia
- Glendale & Cardiff Town Centres for Lake Macquarie City Council - Urban Design Guidelines
- Munibung Hill / Pasmenco Site Land Use Strategy for Lake Macquarie City Council.
- South Deebling Creek Master Plan, Ripley Valley, Qld - Development Application
- Ripley Valley Sites, Qld for the Rawlings Group - Concept Master Plan
- Kennedy's Road, Kilcoy - Masterplanning and Concept Subdivision Design
- Breakfast Point DCP for Canada Bay Council. Urban design and landscape input
- Morriset Town Centre for Lake Macquarie City Council - Urban design strategy and master plan

URBAN LANDSCAPE

- Orange CBD Street Upgrades - Urban designer for street upgrades
- Orange CBD Strategic Action Plan - site analysis, concepts and strategic development
- Blacktown Village Green Design Development
- Randwick Urban Elements Design Guide

Project imagery on the page that follows:

- 01 Morley Ellenbrook
Perth, Australia
- 02 Crows Nest Metro Station & ISD
Sydney, Australia
- 03 Western Sydney International Airport
Sydney, Australia
- 04 Central Station Main Works
Sydney, Australia

WOODS BAGOT

ASPECT Studios

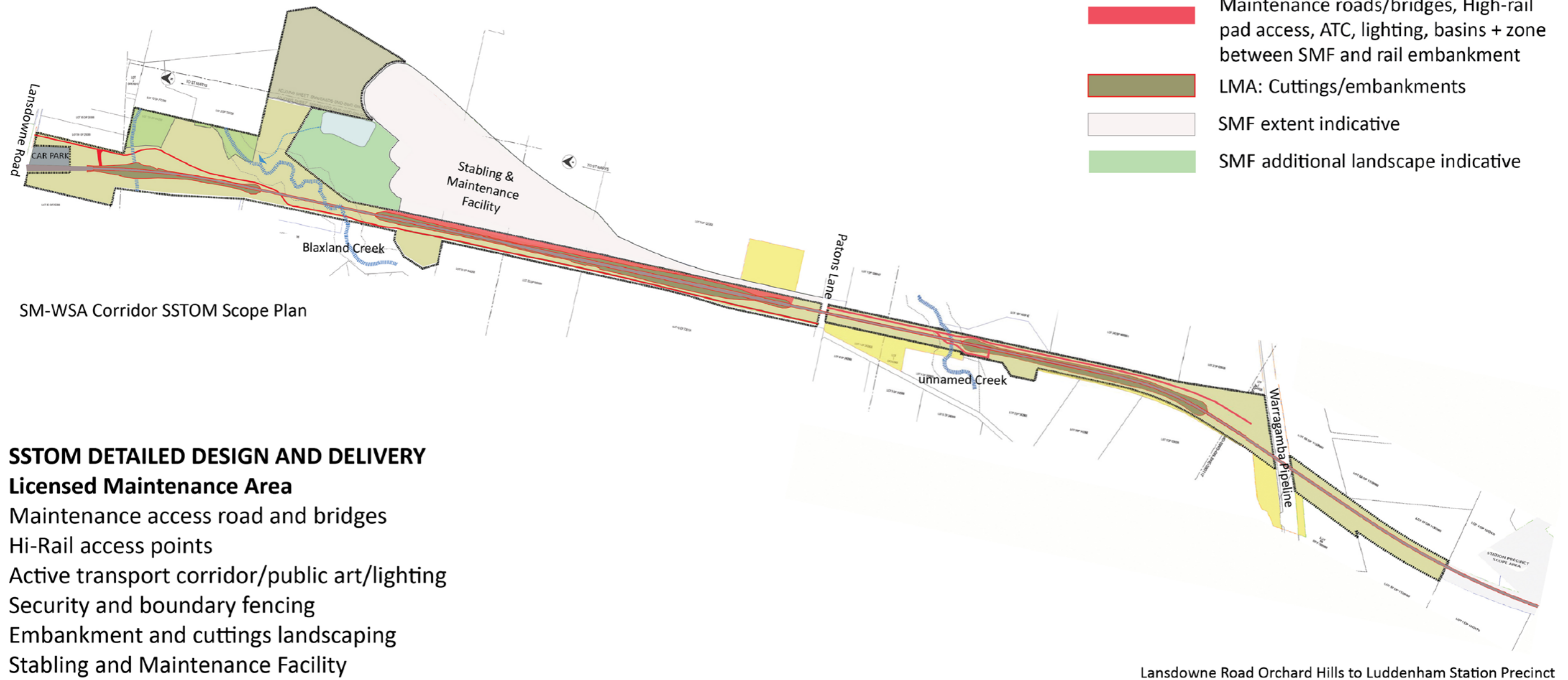
Appendix E
SSTOM and Corridor Landscape Works
Landscape Scope

SSTOM CORRIDOR LANDSCAPE REQUIREMENTS

The Corridor Landscape Master Plan must respond to the SM-WSA Corridor Landscape Strategy and include the proposed approach to landscape character, landscape types and zoning based on reference plant community types, geology and hydrology.

Landscape design for SSTOM Licensed Maintenance Area will seek to restore the natural ecology of the area, based upon the appropriate Cumberland Plain Woodland vegetation communities.

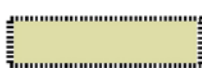

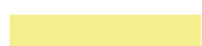




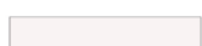



Landscape works must include the differential handling of topsoil to ensure that upper layers (100mm minimum) of weed-laden, nutrient rich topsoil is stripped and separated from the underlying topsoil.



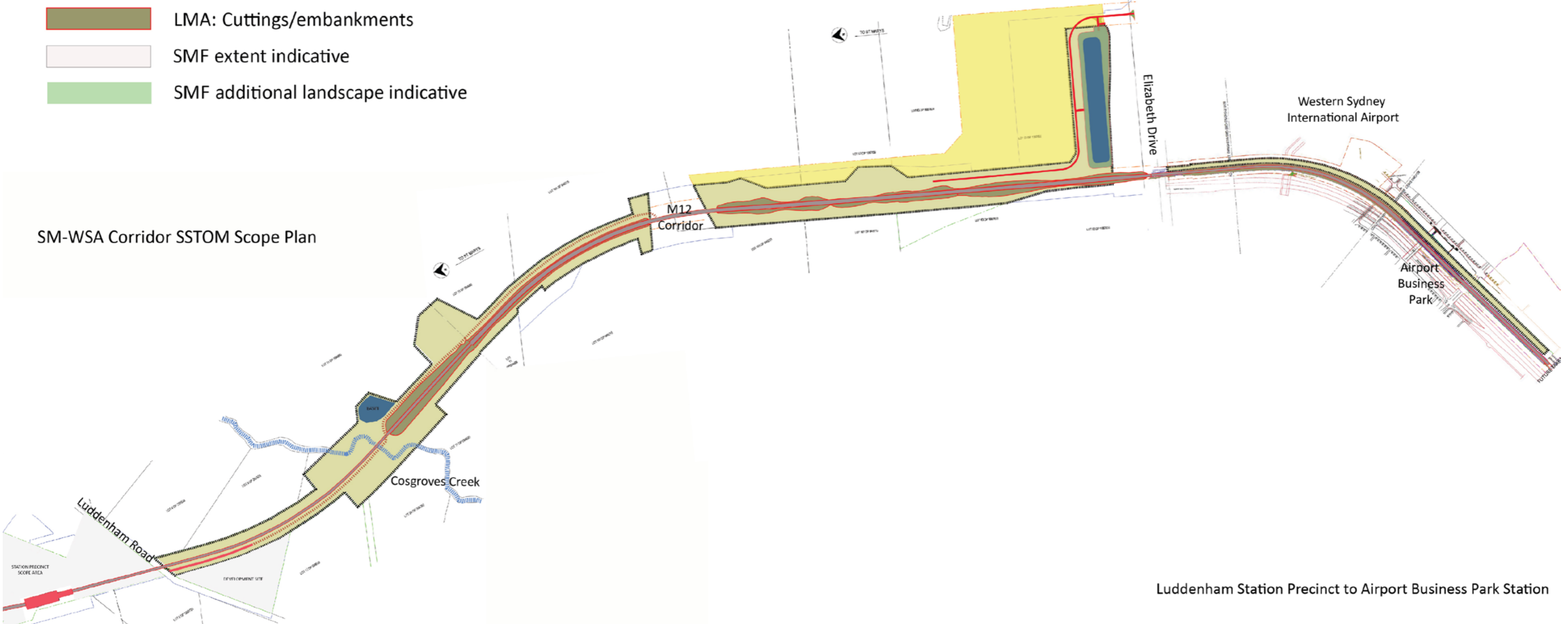
SSTOM CORRIDOR LANDSCAPE MASTER PLAN

Whole corridor

Broad spatial layout and landscape character

-  SSTOM master plan extents
 -  Earthworks/Civil/Landscape Design
 -  non-construction areas
 -  leased areas
-
-  LMA: Secure rail corridor +
 -  Maintenance roads/bridges, High-rail
 -  pad access, ATC, lighting, basins + zone
 -  between SMF and rail embankment
 -  LMA: Cuttings/embankments
 -  SMF extent indicative
 -  SMF additional landscape indicative

SM-WSA Corridor SSTOM Scope Plan



Luddenham Station Precinct to Airport Business Park Station

SSTOM DETAILED DESIGN AND DELIVERY

Licensed Maintenance Area

- Maintenance access road and bridges
- Hi-Rail access points
- Active transport corridor/public art/lighting
- Security and boundary fencing
- Embankment and cuttings landscaping
- Stabling and Maintenance Facility

CORRIDOR LANDSCAPE WORKS (CLW) REQUIREMENTS

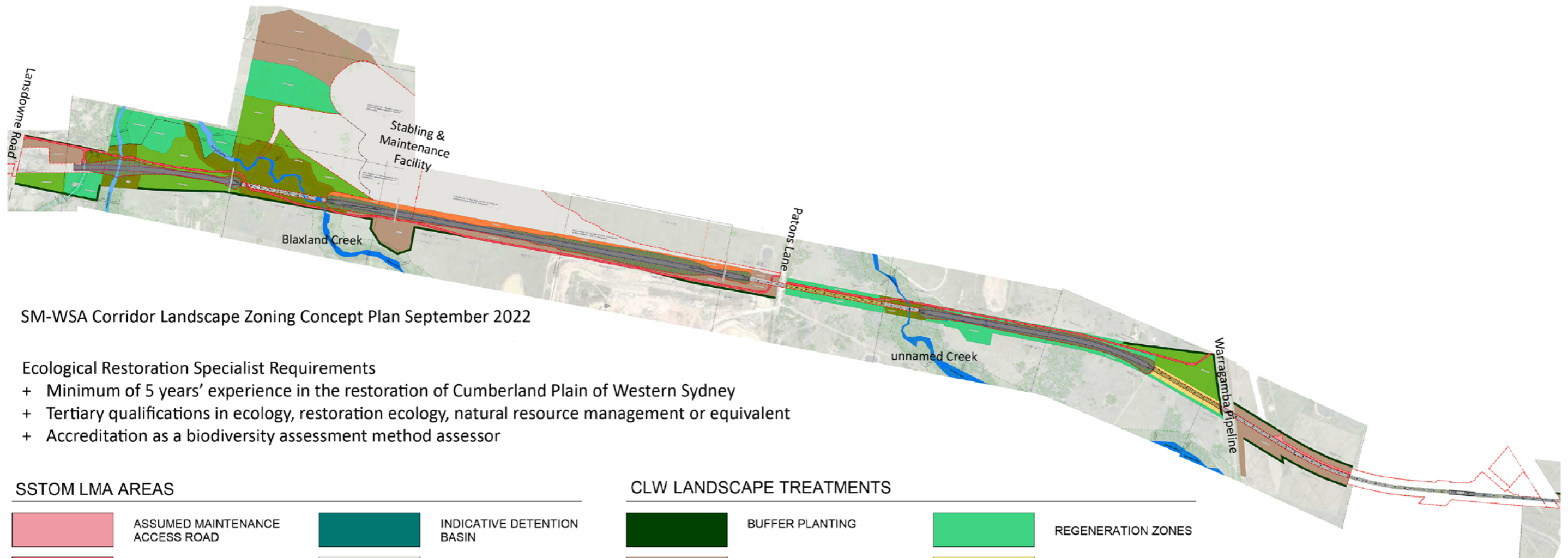
LANDSCAPE PLAN OF MANAGEMENT (LPoM)

The Sydney Metro Ecological Restoration Specialist (ERS) will be engaged by the second quarter of 2023 to assist Sydney Metro in the review of the Corridor Landscape Master Plan and the SSTOM Place Urban Design and Corridor Plan (PUDCLP) and provide inputs to the plans.

The LPoM must respond to the SM-WSA Corridor Landscape Strategy and include landscape types and zoning, proposed species, restoration requirements and methods, performance outcomes and monitoring regime.

The ERS will provide support for procurement of the CLW Delivery Contractor(s) and will develop a performance-based specification, assist with tender evaluation and initial stakeholder consultation and collaboration.

The ERS will provide ongoing site assessment and update the LPoM including design adjustments in response to seasonal, climatic and site factors, as well as ongoing stakeholder consultation and collaboration, review of CLW Delivery Contractor(s) plans and methodologies and site based ecological monitoring of CLW Delivery Contractor(s) performance.



SM-WSA Corridor Landscape Zoning Concept Plan September 2022

Ecological Restoration Specialist Requirements

- + Minimum of 5 years' experience in the restoration of Cumberland Plain of Western Sydney
- + Tertiary qualifications in ecology, restoration ecology, natural resource management or equivalent
- + Accreditation as a biodiversity assessment method assessor

SSTOM LMA AREAS

	ASSUMED MAINTENANCE ACCESS ROAD		INDICATIVE DETENTION BASIN
	MAINTENANCE ACCESS ROAD / ATC		SMF
	EMBANKMENT AND CUTTINGS PLANTING		STATION PRECINCT
	GENERAL AREAS		

CLW LANDSCAPE TREATMENTS

	BUFFER PLANTING		REGENERATION ZONES
	SIMPLIFIED WOODLAND		VIADUCT MODIFIED WOODLAND
	SIMPLIFIED GRASSLAND		RIPARIAN AREAS
	GRASSY WOODLAND		*EXISTING TREES RETAINED

Lansdowne Road Orchard Hills to Luddenham Station Precinct

CORRIDOR LANDSCAPE WORKS (CLW) REQUIREMENTS

The procurement program for the CLW package is being refined and will be scheduled sometime between 2024 and mid-2025. It will include an implementation phase and a management phase.

Implementation

Implementation of landscape restoration methodologies, including weed control and soil preparation, natural regeneration, direct seeding and planting and potentially other methods.

A period of landscape establishment based on performance outcomes defined by the ERS.

Management

Ongoing development and management of vegetation and the landscape.

Corridor Landscape Works Contractor Requirements

- + Minimum Certificate IV in Conservation and Land Management, or equivalent
- + Minimum 2 years experience in the restoration of Cumberland Plain plant communities
- + Australian Bush Regenerators accreditation

SM-WSA Corridor Landscape Zoning Concept Plan September 2022

