Appendix B2

Flora and Fauna CEMP Sub-plan

M6 Motorway Stage 1

December 2021

Document Number: M6S1-CGU-NWW-ENPE-PLN-000404
Revision: 02

THIS PAGE LEFT INTENTIONALLY BLANK

Contents

Glossary/ Abbreviations

Abbreviations	Expanded text
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BCC	Biodiversity Credit Calculator
BOS	Biodiversity Offsetting Scheme
BS Act	*Biosecurity Act 2015*
CEMP	Construction Environmental Management Plan
CGU	CPB Contractors, Ghella and UGL Joint Venture
CoA	Conditions of Approval
DPIE	Department of Planning, Industry and Environment
ER	Environmental Representative
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EWMS	Environmental Work Method Statements
FFMP	Flora and Fauna CEMP Sub-plan
FM Act	*Fisheries Management Act 1994*
GGBF	Green and Golden Bell Frog
NPW Act	*National Parks and Wildlife Act 1974*
OEH	NSW Office of Environment and Heritage
Roads and Maritime	NSW Roads and Maritime Services
TEC	Threatened Ecological Community
TfNSW	Transport for New South Wales

Document control

Approval and authorisation

Title	M6 Stage 1- Flora and Fauna CEMP Sub-Plan
Endorsed by Environment Representative	Derek Low
Signed	
Dated	16/12/2021
Approved on behalf of TfNSW by	David Lehrbach
Signed	David Lehrbach
Dated	17/12/2021
Approved on behalf of CGU by	Craig Gibson
Signed	Craig Gibson
Dated	16/12/2021

Document control

Revision	Date	Description	Approval
A.01	08/10/21	For consultation and review	
00	17/11/21	Issued for Approval	
01	6/12/2021	DPIE comments addressed. Issued for Approval	
02	16/12/2021	DPIE comments addressed. Issued for Approval	

Distribution of controlled copies

This Flora and Fauna CEMP Sub-plan (FFMP) as part of the CEMP is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the FFMP as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office.

Copy number	Issued to	Version

1 Introduction

1.1 Context

This Flora and Fauna CEMP Sub-plan (FFMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the M6 Motorway Stage 1 Project (the Project).

The FFMP has been prepared to address the requirements of the Minister's Conditions of approval (CoA) and the environmental management measures (EMM) listed in the F6 Extension Stage 1 Environmental Impact Statement (EIS) and all applicable legislation.

1.2 Background and Project description

The Project comprises a new twin motorway tunnel (around four kilometres in length) between the M8 Motorway at Arncliffe and President Avenue at Kogarah with a tunnel portal and entry and exit ramps connecting the tunnels to the surface (Figure 1). Works will include a connection to the M8 Motorway, line marking of additional travel lanes between the St Peters interchange to the M6 Stage 1 tunnels, an intersection with President Avenue (including widening and raising of President Avenue), and intersection improvements at the President Avenue/Princes Highway intersection. Mainline tunnel stubs would be constructed to allow for connections to future stages of the M6 Extension.

The Project was declared as a Critical State Significant Infrastructure (CSSI) and the M6 Stage 1 Project was approved by the Minister for Planning and Public Spaces on 18 December 2019.

Key features of the Project include:

- Mainline tunnels approximately 3.0km in length, sized for three lanes of traffic and line marked for two lanes on opening of the motorway;
- Entry and exit ramp tunnels approximately 1.5km in length and a tunnel portal connecting the tunnels to a surface intersection with President Avenue;
- Provision of a new intersection at President Avenue including the widening and raising of President Avenue at this location;
- Upgrade of the President Avenue and Princes Highway intersection to improve capacity and network integration;
- Provision of a new shared cycle and pedestrian pathways;
- Mainline tunnel stubs for a future connection to extend the Project to the south;
- Two motorway operation complexes (MOCs) as follows:
    - Arncliffe: including mechanical and electrical fit-out of the ventilation facility built by the New M5 Motorway Project, and provision of a new water treatment plant and substation.
    - Rockdale (south): including a ventilation building, Disaster Recover Site (DRS), substation and power supply, deluge tanks.
- A tunnel ventilation system, including ventilation facilities located at Marsh Street, Arncliffe and West Botany Street, Rockdale, and in-tunnel ventilation systems (jet fans and ventilation ducts);
- New Utility Services, and modifications and connections to existing Utility Services;
- A permanent power supply connection to the Rockdale Ventilation Facility Site MOC from Ausgrid's Canterbury Sub-Transmission Substation;
- Emergency access and evacuation facilities, including pedestrian and vehicular cross, long passages, fire and safety life systems;

- Ancillary infrastructure for motorway operations including operations management and control systems, permanent power supply, communications, lighting, electronic toll collection system, toll gantries and traffic control and signage (both fixed and variable signage);
- Drainage infrastructure to collect surface water and groundwater inflows for treatment;
- Reinstatement of Bicentennial Park and recreation facilities;
- Reinstatement and rehabilitation of construction leased areas within the Arncliffe site;
- Minor adjustments to local roads in the Project area;
- Development and implementation of systems integration and operating procedures with WestConnex Motorways to ensure safe operation of the interfaces between the Project and the WestConnex Motorways; and
- Any other works as required to complete the Project within the scope of the Environmental Impact Statement (EIS), Preferred Infrastructure Report (PIR), Submissions report (including EMMs) and CoA requirements.

The following six surface compounds will facilitate construction of the Project:

- Arncliffe construction ancillary facility (C1), an existing construction site which was used for the construction of the M8 Motorway;
- Rockdale construction ancillary facility (C2), within an existing TfNSW depot;
- President Avenue construction ancillary facility (C3) at Rockdale, within Rockdale Bicentennial Park and an industrial area west of West Botany Street;
- Construction ancillary facilities (C4 and C5) near Muddy Creek to support construction of the Active Transport Corridor; and
- Princes Highway construction ancillary facility (C6) on the corner of Princes Highway and President Avenue, Kogarah to support the intersection surface works.

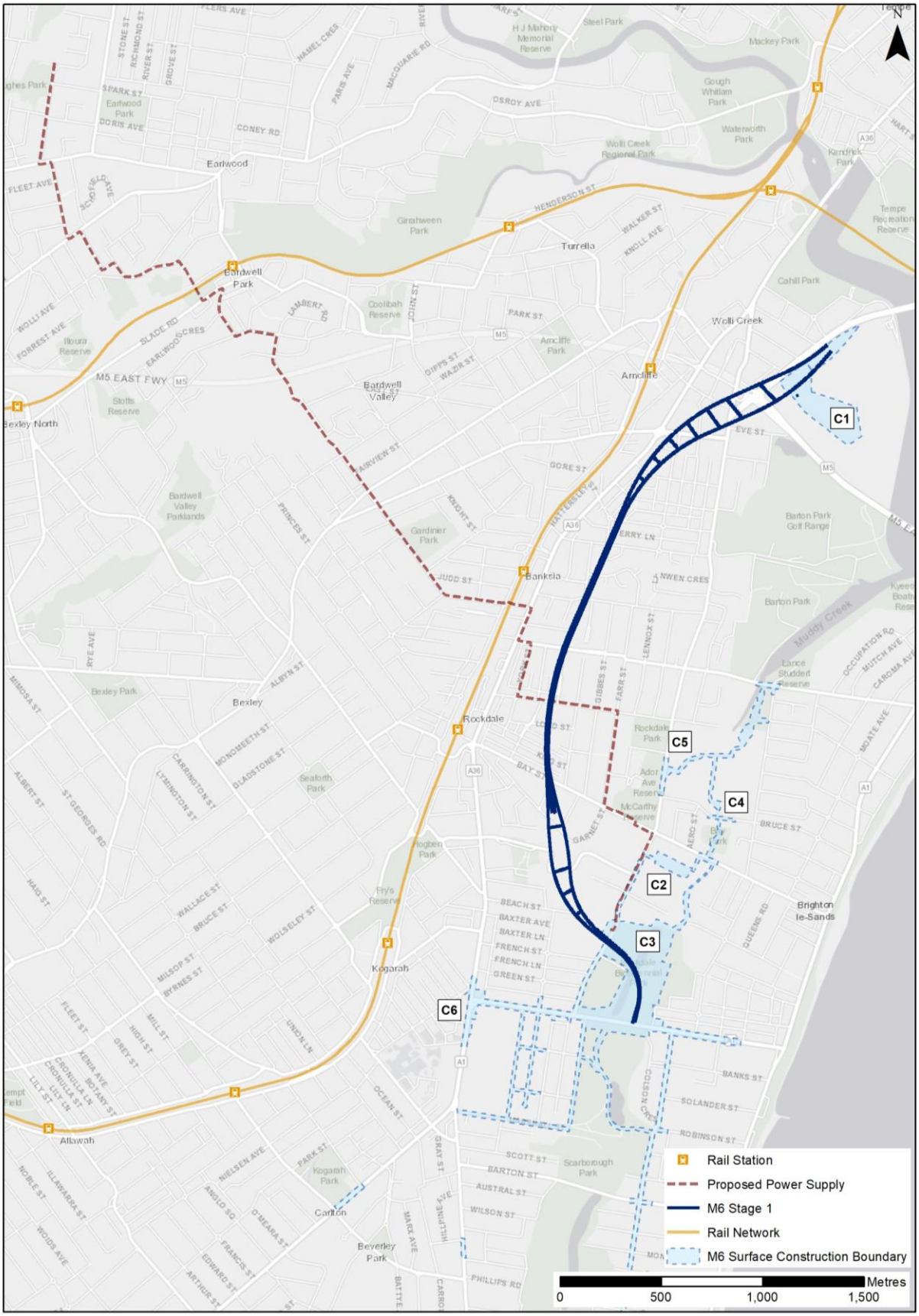


Figure 1: Project overview

2 Purpose and objectives

2.1 Purpose

The purpose of this plan is to describe how impacts on flora and fauna from construction of the Project will be minimised and managed during the construction of the Project. The plan will summarise CoA's and EMM's relevant to flora and fauna management on the Project and will detail specific environmental management and mitigation measures to be undertaken on the Project to achieve the Objectives of the Project EIS. The plan does not cover post-construction operation of the Project.

2.2 Objectives

The objective of the FFMP is to ensure that all avoidance, mitigation and management measures relevant to the protection of native flora and fauna including threatened species and Threatened Ecological Communities (TECs) are implemented. The relevant avoidance, mitigation and management measures are referred to in:

- The Environmental Assessment prepared for M6 Stage 1 Project, including the EIS, the Response to Submissions on the EIS, the PIR and Response to Submissions on the PIR.
- Conditions of Approval (SSI 8931) granted to the Project on 18 December 2019.
- Roads and Maritime specifications G36

2.3 Environmental performance outcomes and targets

The target of the FFMP is to describe and implement all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Within this framework, Biodiversity Offsets and/or supplementary measures, which are equivalent to any residual impacts of Project construction and operation, are implemented to achieve the desired targets.

The environmental performance outcomes related to biodiversity outlined from Chapter 24 of the EIS, are to design, construct and operate the Project in a manner that minimises biodiversity impacts to the greatest practicable extent. Construction activities will be managed in accordance with this Sub-plan to meet Project biodiversity performance outcomes. Construction biodiversity environmental performance outcomes and targets are summarised in Table 1.

Table 1: Project performance outcomes

Performance Outcome	Project Outcome	Reference
The Project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of	Areas of Green and Golden Bell Frog habitat have the potential to be affected indirectly. Potential Grey-headed Flying-fox and Southern Myotis habitat would be directly affected by the Project however no significant impacts are expected to either species as a result of the loss of habitat.	Section 6.9 Appendix F Appendix J Appendix A6 of CEMP
	27 ecosystem credits would be required to offset the removal of two threatened flora communities. No species credits would be required by the Project.	Section 6.11

Performance Outcome	Project Outcome	Reference
Project construction and operation.	Overall impacts to aquatic biodiversity would be relatively minor, considering existing conditions, scale and recovery potential.	Section 6
	Compensatory tree planting will be completed following completion of construction.	Urban Design and Landscape Plan

The environmental mitigation and management measures detailed in this FFMP aim to minimise the risk that additional residual impacts are generated form the construction of the Project. By implementing this FFMP, the biodiversity performance outcomes will be consistent with those detailed in Chapter 24 of the EIS.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

All legislation relevant to this FFMP is included in Appendix A1 of the CEMP. Legislation directly relevant to this FFMP includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Biodiversity Conservation Act 2016* (BC Act) including *Biodiversity Regulation 2017*
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Fisheries Management Act 1994* (FM Act)
- *Water Management Act 2000* (WM Act)
- *Biosecurity Act 2015* (BS Act)
- *National Parks and Wildlife Act 1974* (NPW Act)
- *State Environmental Planning Policy* (Coastal Management) 2018 (Coastal Management SEPP)

3.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include but are not limited to:

- Roads and Maritime QA Specification G36 – Environmental Protection (Management System).
- Roads and Maritime QA Specification G40– Clearing and Grubbing.
- Roads and Maritime Biodiversity Guidelines (September 2011).
- Department of Primary Industries 'Policy and Guidelines for Fish Habitat Conservation and Management (DPI 2013)
- Fishnote – Policy and Guidelines for Fish Friendly Waterway Crossings – November 2003;
- DECCW. 2008. Hygiene protocol for the control of disease in frogs.
- Australian Standard AS 4373 Pruning of Amenity Trees
- Australian Standard 4970 – 2009 Protection of Trees
- Hygiene Protocol for the Control of Disease in Frogs (DECC 2008)
- Hygiene protocols for the control of diseases in Australian frogs (Murray *et al*. 2011)
- Green and Golden Bell Frog Plan of Management – Arncliffe (ELA 2018)

3.2 Ministers Conditions of Approval

CoA relevant to this Plan are shown in Table 2. A reference is included to indicate where the condition is addressed in this Plan or other Project document.

Table 2: CoA

<table>
<tr><th>CoA</th><th>Condition Requirements</th><th>Reference</th></tr>
<tr><td>A1</td><td>The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the EIS, the Response to Submissions on the EIS, the PIR and Response to Submissions on the PIR.</td><td>Construction Environmental Management Plan (CEMP)</td></tr>
<tr><td>C4</td><td>CEMP Sub-plans must be prepared in consultation with the relevant government agency(s) and council(s) as identified for each CEMP Sub-plan in Table 4.

Table 4: CEMP Sub-plan and relevant public authorities
<table><tr><th></th><th>Required CEMP Sub-plan</th><th>Relevant government agencies and council(s) to be consulted for each CEMP Sub-plan</th></tr><tr><td>(c)</td><td>Flora and Fauna</td><td>EES and relevant council(s)</td></tr></table></td><td>This Plan

Consultation is addressed in Section 3.4</td></tr>
<tr><td rowspan="2">C5</td><td>The CEMP Sub-plans must state how:

(a) the environmental performance outcomes identified in the documents listed in Condition A1 as modified by these conditions will be achieved;</td><td>Section 2.3</td></tr>
<tr><td>(b) the mitigation measures identified in the documents listed in Condition A1 as modified by these conditions will be implemented;</td><td>Section 6</td></tr>
</table>

CoA	Condition Requirements	Reference
	(c) the relevant terms of this approval will be complied with; and	Section 6 Section 7 Appendix A to Appendix J
	(d) issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed.	Issues requiring management and ongoing risk analysis are discussed in Section 5 of this Plan, Section 3.2.1 of the CEMP and Appendix A2 of the CEMP. How issues will be managed is in Sections 6 and 7 of this Plan. Cumulative impacts and how they are identified and managed are addressed in Section 5.2 of this Plan and Sections 2.5 and 3 of the Staging Report.
C10	The **CEMP Sub-plans** must be endorsed by the **ER** and then submitted to the Planning Secretary for approval no later than one (1) month prior to the commencement of the construction activities to which they apply.	CEMP Section 2
C11	Any of the **CEMP Sub-plans** may be submitted to the Planning Secretary along with, or subsequent to, the submission of the **CEMP**.	CEMP Section 2

CoA	Condition Requirements	Reference
C12	Construction must not commence until the **CEMP** and all relevant **CEMP Sub-plans** for such construction activities to which they apply have been approved by the Planning Secretary. The **CEMP** and **CEMP Sub-plans**, as approved by the Planning Secretary, including any minor amendments approved by the **ER,** must be implemented for the duration of construction. Where construction is staged, construction of a stage must not commence until the relevant **CEMP** and **CEMP Sub-plans** for that stage have been endorsed by the **ER** and approved by the Planning Secretary.	CEMP Section 2 Staging Report
E38	Any work associated with the CSSI must limit the clearing of native vegetation to the greatest extent practicable.	Section 2.3 Section 6.1
E39	Impacts to plant community types must not exceed those identified in the documents listed in Condition A1, unless otherwise approved by the Planning Secretary. In requesting the Planning Secretary's approval, the Proponent must provide to the Planning Secretary an assessment of the additional impact(s) to plant community types and an updated ecosystem and/or species credit requirement under Condition E40, if required.	Section 6.11
E40	Prior to any impact on the plant community types or species that are required to be offset, the Proponent must retire the credits specified in and Table 14 and Table 15 in accordance with the offset rules of the Biodiversity Conservation Act 2016, unless alternate credits are approved by the Planning Secretary in accordance with Condition A39. Table 14: Species Credit Requirement	Section 6.11

Species	Impacted individuals	Number of Credits
Magenta Lilly Pilly (*Syzyguim paniculatum*)	5	10

<table>
<tr><th>CoA</th><th>Condition Requirements</th><th>Reference</th></tr>
<tr><td></td><td>Table 15: Ecosystem Credit Requirements
<table>
<tr><th>PCT ID and Name</th><th>Vegetation Formation</th><th>Number of Credits</th></tr>
<tr><td>PCT 1232 – Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion</td><td>Coastal Swamp Forest</td><td>6</td></tr>
<tr><td>PCT 1795 – Swamp Mahogany – Cabbage Tree Palm – Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin</td><td>Coastal Swamp Forest</td><td>27</td></tr>
<tr><td>PCT 1808 – Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coast</td><td>Freshwater Wetlands</td><td>49</td></tr>
</table>
Note: Credits have been calculated using the Biodiversity Assessment Method</td><td></td></tr>
<tr><td>E41</td><td>The Proponent must submit to the Planning Secretary for information a copy of the Credit Retirement Report for the retirement of the biodiversity offsets specified in Table 14 and Table 15 within one month of receiving the report.</td><td>Section 6.11</td></tr>
<tr><td rowspan="2">E42</td><td>Construction must demonstrate how:
(a) noxious weeds are managed; and</td><td>Section 6.6</td></tr>
<tr><td>(b) contamination by pathogens, non-indigenous regenerative plant material and seeds can be prevented by the movement of all tools, vehicles, machinery and personnel.</td><td>Section 6.7</td></tr>
</table>

<table>
<tr><th>CoA</th><th>Condition Requirements</th><th>Reference</th></tr>
<tr><td></td><td>Note: These additional requirements must be addressed in the Flora and Fauna CEMP Sub-plan required under Condition C4.</td><td></td></tr>
<tr><td>E43</td><td>Before the removal or clearing of any vegetation, or the demolition of structures identified as potential roosting sites for microbats commences, pre-clearing/demolition inspections for the threatened species must be undertaken. The inspections, and any subsequent relocation of fauna and associated management/offset measures, must be undertaken under the guidance of a suitably qualified and experienced ecologist. Survey and relocation methodologies and management/offset measures must be included in the Flora and Fauna CEMP Sub-plan required under Condition C4 and the Site Establishment Management Plan required by Condition A17.</td><td>Sections 6.2, 6.3, 6.4, 6.5 and 6.10
Appendix J</td></tr>
<tr><td>E45</td><td>The Proponent must provide bat boxes or build suitable habitat within the replacement box culverts that cross President Avenue at Scarborough Park.</td><td>Section 6.10</td></tr>
<tr><th colspan="3">Monitoring Programs</th></tr>
<tr><td>C13</td><td>The Construction Monitoring Programs set out in Table 5 must be prepared and implemented to enable comparison of the actual construction performance against the predicted performance. The Construction Monitoring Programs must be prepared in consultation with the relevant government agencies and councils as identified for each Construction Monitoring Program.
Table 5: Construction Monitoring and relevant public authorities
<table>
<tr><th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr>
<tr><td>(f)</td><td>Flora and Fauna Monitoring Program</td><td>EES</td></tr>
</table></td><td>(f) Section 6.13 and Appendix J (Flora and Fauna Monitoring Program)
(g) Section 6.8 and Appendix I (Wetland Monitoring Program)
Consultation is addressed in Section 3.4</td></tr>
</table>

CoA	Condition Requirements	Reference
	(g) Wetland Monitoring Program — EES	
C14	**Construction Monitoring Programs** must provide: (a) details of baseline data available; (b) details of baseline data to be obtained and when; (c) details of all monitoring that will be undertaken; (d) the parameters of the Project to be monitored; (e) the frequency of monitoring; (f) the location of monitoring; (g) the reporting of monitoring and analysis results against relevant criteria, including details of the timing and frequency for reporting the results to the Planning Secretary and relevant government agencies; (h) details of the methods that will be used to analyse the monitoring data; (i) procedures to identify and implement additional mitigation measures where results of monitoring indicate adverse impacts or levels above relevant criteria; (j) any consultation to be undertaken in relation to the monitoring programs; and, (k) any specific requirements as required by **Conditions C15** to **C18**, as relevant.	Section 6.8, Section 6.13, Appendix I (Wetland Monitoring Program) and Appendix J (Flora and Fauna Monitoring Program)
C18	The **Wetland Monitoring Program** must include: (a) water quality monitoring sites within Patmore Swamp, Kings Wetland, and upstream and downstream of the creek diversion works in Rockdale Bicentennial Park; (b) monitoring of water levels, electrical conductivity, turbidity, pH, suspended solids, dissolved oxygen and nutrients; (c) standards against which any changes to water quality will be assessed; (d) monitoring of health of aquatic and riparian flora and fauna species in Patmore Swamp, Kings Wetland and Rockdale Bicentennial Park, including species density and diversity; and (e) trigger points for responding to any monitored changes which adversely impact on water quality, surface water levels or aquatic and riparian flora and fauna.	Section 6.8 and Appendix I (Wetland Monitoring Program)

CoA	Condition Requirements	Reference
	Nothing in this condition prevents the Proponent from including these requirements in the **Surface Water Monitoring Program** and **Flora and Fauna Monitoring Program** required under **Condition C13**.	
C19	The **Construction Monitoring Programs** must be developed in consultation with the relevant government agencies as identified in **Condition C13** of this approval, and must identify information, including monitoring parameters, requested by a relevant agency to be included in a monitoring program.	Section 3.4, Appendix I and Appendix J Consultation is addressed in Section 3.4
C20	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month prior to the commencement of construction.	Section 3.4, Appendix I and Appendix J CEMP Section 2
C21	Construction, which is required to be monitored under the Construction Monitoring Programs, must not commence until the Planning Secretary has approved all of the required Construction Monitoring Programs and all relevant baseline data for the specific construction activity has been collected.	Section 3.4, Appendix I and Appendix J CEMP Section 2
C22	The Construction Monitoring Programs, as approved by the Planning Secretary and including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	Section 3.4 Appendix J
C23	The results of the Construction Monitoring Programs must be made publicly available in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program. Note: Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 7.5

3.3 Environmental Management Measures

EMM relevant to this Plan are listed in Table 12 which includes reference to outcomes, timing of when the commitment applies, and relevant documents or sections of the environmental assessment which influence the outcome and implementation.

Table 3: EMM relevant to FFMP

Outcome	EMM	Commitment	Timing	Reference
Removal of native vegetation and habitat, including threatened plants	B1	Detailed design will avoid or minimise the need for native vegetation and habitat removal for the construction of the project, where feasible. A plan for the rehabilitation of all areas directly affected by construction, including water bodies, would be included as part of the CFFMP (refer B4 below).	Detailed design	Section 6.12
Impacts to wetlands and riparian land	B3	A Wetlands Management Plan will be prepared and implemented, in consultation with relevant stakeholders, to manage waterbodies and riparian land within the Project area that may be impacted by the Project during construction. The objectives of the plan will be to: • Maintain and improve the condition of the affected wetlands • Reinstate and rehabilitate any riparian land impacted by the Project • Provide positive ecological and amenity outcomes for the environment and local community. The plan will include: • Consideration of potential water quality, hydrology, amenity and flora and fauna impacts and mitigation	Prior to construction	Appendix I (Wetland Monitoring Program)

Outcome	EMM	Commitment	Timing	Reference
		• A process for dewatering and restoration of the Rockdale Wetland, including measures developed by an ecologist to handle and relocate aquatic fauna • A monitoring program to assess the effectiveness of the mitigation measures and to identify new measures that may be required. The plan will be prepared by a suitably qualified ecologist with experience in wetlands management.		
Impacts to flora and fauna	B4	A Construction Flora and Fauna Management Plan (CFFMP) will be prepared. The CFFMP would outline processes and responsibilities with regard to avoiding, managing and/or mitigating biodiversity impacts during construction. The plan will include: (a) A process for pre-clearance surveys prior to vegetation clearing	Prior to construction	(a) Section 6.2, Appendix A, B, C and D
		(b) A process for vegetation clearing including the establishment of exclusion zones at the limit of clearing to protect sensitive areas. Exclusion zones will be established in accordance with Guide 2 Exclusion Zones of Roads and Maritime's Biodiversity Guidelines[1]		Section 6.1

Outcome	EMM	Commitment	Timing	Reference
		(c) An unexpected finds procedure for both flora and fauna		Section 6.5 and Appendix F Appendix G
		(d) A procedure for managing inadvertent impacts to both flora and fauna		Section 6.4, Section 6.5 and Appendix E, Appendix G
		(e) A process for identifying and managing priority and environmental weeds and other pests prior to, during, and after construction (including within vegetation exclusion zones)		Section 6.2, 6.6 Appendix A Appendix H
		(f) A protocol to minimise the potential for the spread of pathogens such as Chytrid or Phytophthora fungus into and out of the site during construction The processes and procedures will be prepared in accordance with relevant Roads and Maritime guidelines.		Section 6.7
Impacts to Green and Golden Bell Frogs	B5	All construction site inductions will contain a relevant section on identifying and managing potential risks to the Green and Golden Bell Frog. This will include identification of the frog and its habitat, a clear outline of the location of no-go zones for construction	Construction and post construction	Section 6.9 and Appendix F

Outcome	EMM	Commitment	Timing	Reference
		personnel, equipment and materials (including herbicides and pesticides), hygiene protocols and what to do in the event of an unexpected find. Frog exclusion fencing and sediment controls will be installed. Any Green and Golden Bell Frogs encountered within the construction boundary during construction are to be collected by a qualified and experienced herpetologist and relocated within the adjacent golf course by the herpetologist. Impacts to Green and Golden Bell Frog due to light spill will be mitigated with lighting directed to minimise construction night time light spill outside of all construction areas, particularly onto the RTA ponds and Kogarah Golf Course. The ground surface within the Arncliffe construction ancillary facility (excluding the operational footprint) will be reinstated to a condition the same or better than prior to the commencement of construction of the New M5 Motorway Project in consultation with relevant stakeholders.		

3.4 Consultation

The FFMP was prepared in consultation with the Energy, Environment and Science (EES) group and relevant councils in accordance with CoA C4(c). Comment was sought on the draft Plan and feedback was used to update and correct the document. Key matters raised by stakeholders during this process are listed in Table 4.

Table 4: Summary of consultation

Relevant Authority	Comment	Action
EES	EES noted that more detail on the survey methodology is required and that surveys should be undertaken by a suitably trained ecologist of potential roost sites in accordance with "Standard survey methods - Roost Search (microbats)" on page 9 of *'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method,'* in built structures to be impacted. EES also noted that the Environmental Management Measure B4 requires that the sub plan will include a procedure for managing inadvertent impacts to both flora and fauna. Table 2 states that this is addressed in section 6.4 of the sub plan. However, EES considered section 6.4 does not provide a procedure for inadvertent impacts for fauna and does not address flora at all.	More detail on survey methodology has been provided in Section 3.2.3 of the Flora and Fauna Monitoring Program. Section 6.4 and the Procedures in Appendix E and Appendix G were updated in accordance with EES advice.
Bayside Council	Bayside Council requested that it be provided with data relating to fauna found/removed during the construction process and the location and type of nest boxes, microbat habitat installed.	CGU identified an action to send Flora and Fauna Monitoring reports to Bayside Council as they become available. This action has been included in the flora and fauna monitoring program and a response was provided to council.

The FFMP has been updated to address the matters raised during consultation. Community feedback and complaints relating to flora and fauna will be managed in accordance with the Project CEMP and Communications Strategy.

4 Existing environment

The following sections summarise existing flora and fauna within and adjacent to the Project area including species, communities and habitats. The key reference documents are located within Chapter 12 and Appendix H of the M6 Stage 1 EIS. The Project boundary and relevant ecological data is shown on the sensitive area maps included in Appendix A6 of the CEMP.

4.1 Environmental aspects

4.1.1 Plant Community Types and Threatened ecological communities

Three Plant Community Types (PCTs) were identified within Project area, refer Table 5. All three were found to conform to TECs listed under the NSW BC Act. Details of these PCTs are provided in Table 6 and their location in relation to the Project is shown on the Sensitive Area Plans included at Appendix A6 of the CEMP.

All remaining vegetation within the Project area was characterised as “Urban Exotic and Native Cover”. While these areas may contain plant species native to NSW, they do not conform to descriptions of PCT’s and are therefore not assessed as a PCT in the BAM. Native fauna can still utilise these habitats.

No TECs listed under the Commonwealth EPBC Act were identified in the study area.

Table 5: Threatened ecological communities identified in the Project area

Threatened Ecological Community	PCT	BC Act	Occurrence
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Endangered	Approximately 0.47 hectares occurs within the development footprint
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	1808 - Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline	Endangered	Approximately 0.77 hectares occurs within the development footprint
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	1795 - Swamp Mahogany / Cabbage Tree Palm - Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	Endangered	Approximately 0.3 hectares occurs within the development footprint

4.1.2 Threatened flora species

A single threatened flora species has been identified within the Project area, the Magenta Lilly Pilly (*Syzgium paniculatum*). The plants were identified as being landscape planting at Rockdale Bicentennial Park. The location these flora species in relation to the Project is shown on the Sensitive Area Plans included at Appendix A6 of the CEMP and in Figure 2**.**

No additional species credit threatened flora species as listed under the BC Act were identified as occurring on the Project area in the Project EIS.

Species credit threatened fauna species and threatened fauna species listed under the EPBC Act which have potential to occur based on the PCT's identified on the Project area are listed in Table 6. The unexpected finds procedure for these species is described in Section 6.5.

Table 6: Threatened (or otherwise significant) flora species

Common name	Scientific name	EPBC Act	BC Act	Probability of Occurrence
Magenta Lilly Pilly	*Syzygium paniculatum*	Vulnerable	Endangered	Present within Project area. About 20 adult individuals were recorded at Rockdale Bicentennial Park in landscape plantings.
Biconvex Paperbark	*Melaleuca biconvexa*	Vulnerable	Vulnerable	Low
Narrow-leafed Wilsonia	*Wilsonia backhousei*		Vulnerable	Low
Sunshine Wattle	*Acacia terminalis* subsp. *terminalis*	Endangered	Endangered	Low

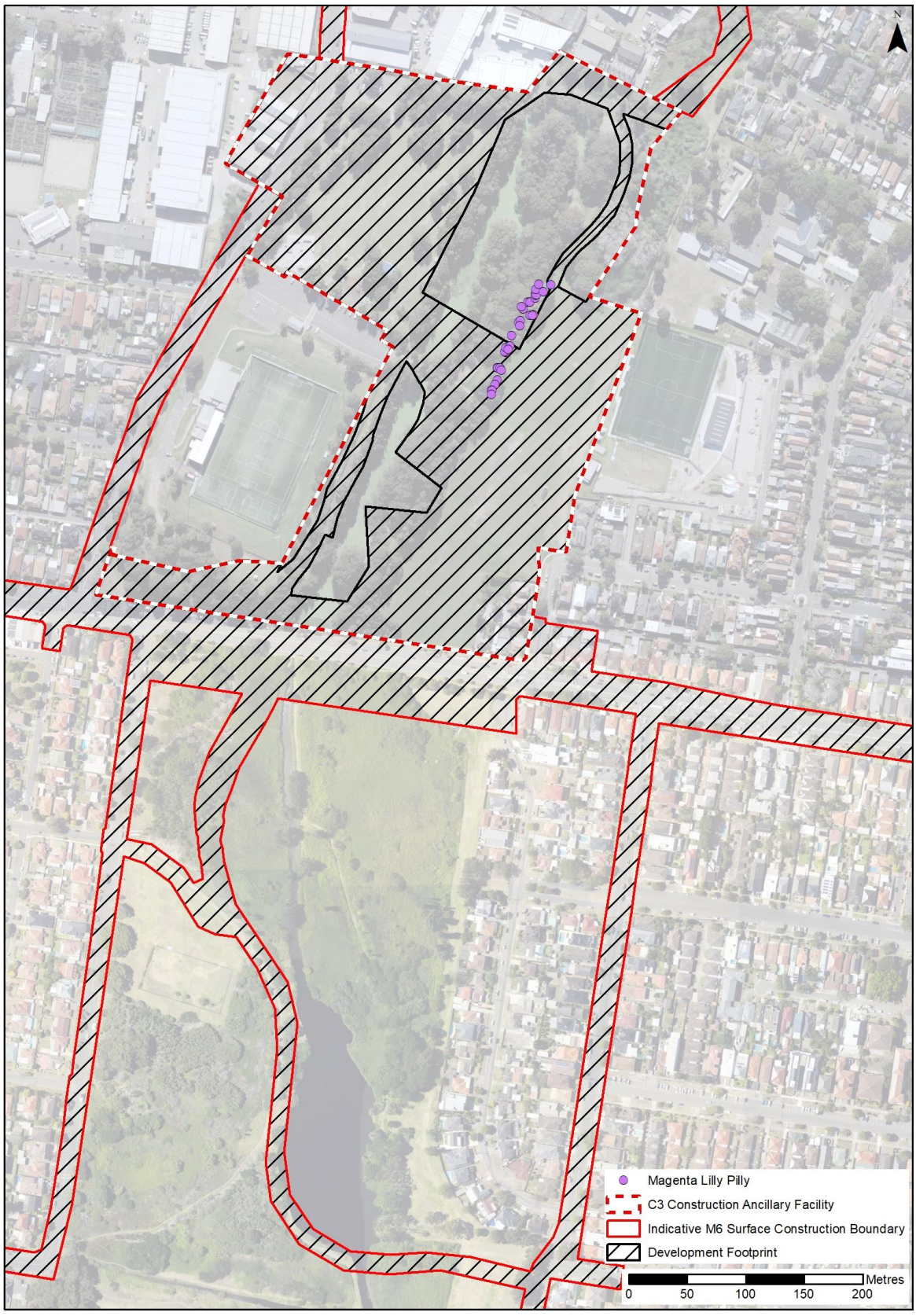


Figure 2: Known locations of Magenta Lilly Pilly

4.1.3 Weeds

Weeds are prevalent throughout vegetated areas of the Project area, particularly the Rockdale Bicentennial Park. Weeds include Weeds of National Significance (WoNS) as listed under the EPBC Act and High Threat Exotic weeds listed on the BAM. All species that are considered to be high threat will outcompete native plants if not controlled. Species identified within the Project area are described in Table 7. Weeds that were identified in the EIS broader study area but not within the finalised Project area, have not been included in Table 7.

Table 7: Weed species identified as occurring within the Project area

Common name	Scientific name	WoNS	High Threat Exotic
Madeira Vine	*Anredera cordifolia*	Yes	Yes
Moth Vine	*Araujia sericifera*		Yes
Cobblers Peg	*Bidens pilosa*		Yes
Green Cestrum	*Cestrum parqui*		Yes
Bitou Bush	*Chrysanthemoides monilifera*	Yes	Yes
Camphor Laurel	*Cinnamomum camphora*		Yes
Panic Veldy Grass	*Ehrharta erecta*		Yes
Cockspur Coral	*Erythrina crista-galli*		Yes
Fennel	*Foeniculum vulgare*		
	Hydrocotyle bonariensis		
Morning Glory	*Ipomoea alba*		Yes
Lantana	*Lantana camara*	Yes	Yes
Mickey Mouse Bush	*Ochna serrulata*		Yes
Asthma Weed	*Parietaria judaica*		
	Paronychia brasiliana		
Kikuyu	*Pennisetum clandestinum*		
Castor Oil Plant	*Ricinus communis*		Yes
Blackberry	*Rubus fruticosus* sp. agg.	Yes	Yes
A Dock	*Rumex crispus*		
Trad	*Tradescantia fluminensis*		Yes

4.1.4 Threatened Fauna and Threatened Fauna Habitat

No threatened fauna species were detected within the Project area during field surveys conducted for the EIS. Species credit threatened fauna species and threatened fauna species listed under the EPBC Act which could potentially occur based on the PCT's identified within the Project area are listed in Table 8. Any records of the species in Table 8 are to be treated as unexpected finds. The unexpected finds procedure for these species is described in Section 6.5.

Table 8: Threatened fauna

Common name	Scientific name	EPBC Act	BC Act	Occurrence likelihood
Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered	Critically Endangered	Low
Bush-stone Curlew	*Burhinus grallarius*		Endangered	Low
Sanderling	*Calidris alba*		Vulnerable	Low
Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	Endangered	Low
Gang-gang Cockatoo	*Callocephalon fimbriatum*		Endangered	Low
Glossy Black-Cockatoo	*Calyptorhynchus lathami*		Vulnerable	Low
Eastern Pygmy-possum	*Cercartetus nanus*		Vulnerable	Low
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	Low
Wallum Froglet	*Crinia tinnula*	Vulnerable		Low
Eastern Bristlebird	*Dasyornis brachypterus* (Eastern)	Endangered	Endangered	Low
White-bellied Sea-eagle	*Haliaeetus leucogaster*		Vulnerable	Moderate – could occasionally forage on wetlands within the Project area
Southern Brown Bandicoot (eastern)	*Isoodon obesulus obesulus*	Endangered	Endangered	Low
Little Eagle	*Hieraaetus morphnoides*		Vulnerable	Low

Common name	Scientific name	EPBC Act	BC Act	Occurrence likelihood
Giant Burrowing Frog	*Heleioporus australiacus*	Vulnerable	Vulnerable	Low
Swift Parrot	*Lathamus discolour*	Critically Endangered	Endangered	Low
Broad-billed Sandpiper	*Limicola falcinellus*		Vulnerable	Low
Black-tailed Godwit	*Limosa limosa*		Vulnerable	Low
Green and Golden Bell Frog	*Litoria aurea*	Vulnerable	Endangered	Moderate Species has re-established a population on Kogarah Golf Course, which borders the Arncliffe construction facility. Incursion into the facility is mitigated by an existing frog exclusion fence.
Green-thighed Frog	*Litoria brevipalmata*		Vulnerable	Low
Square-tailed Kite	*Lophoictinia isura*		Vulnerable	Low
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable	High (Foraging) Potential foraging habitat within the Project area at Rockdale Bicentennial Park. Low (Roosting)
Little Bent-wing Bat	*Miniopterus australis*		Vulnerable	Moderate – could use abandoned buildings and culverts as temporary roosts and could occasionally forage over Project area

Common name	Scientific name	EPBC Act	BC Act	Occurrence likelihood
Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*		Vulnerable	Moderate - could use abandoned buildings and culverts as temporary roosts and could occasionally forage over Project area
Southern Myotis	*Myotis macropus*		Vulnerable	Moderate - could use culverts as temporary roosts and could occasionally forage over Project area
Orange-bellied Parrot	*Neophema chrysogaster*	Critically Endangered	Critically Endangered	Low
Powerful Owl	*Ninox strenua*		Vulnerable	Low – species can use urban vegetation fragments for occasional roosting habitat.
Eastern Osprey	*Pandion cristatus*		Vulnerable	Moderate – could occasionally forage on wetlands within the Project area
Squirrel Glider	*Petaurus norfolcensis*		Vulnerable	Low
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable	Low
Masked Owl	*Tyto novaehollandiae*		Vulnerable	Low
Terek Sandpiper	*Xenus cinereus*		Vulnerable	Low

Four fauna habitat types suitable for threatened fauna were identified by the EIS. These are listed below and shown on the Sensitive Area Maps included at Appendix A6 of the CEMP. Grey-headed Flying-fox roosting habitat has not been shown as is ~3 kilometres north-west of the Project.

Table 9: Fauna habitat types

Name	Habitat features
Grey-headed Flying-fox potential foraging habitat	Grey-headed Flying-fox foraging habitat is located within Rockdale Bicentennial Park where there are numerous planted *Ficus hillii*, *Eucalyptus robusta* and *Eucalyptus botryoides x saligna*, among other potential food sources. No roosting sites or breeding camps occur within the study area, however there is a large camp at Turella, which is ~3 kilometres north-west of the Project.
Green and Golden Bell Frog habitat	Immediately adjacent to the construction ancillary facility at Arncliffe are the two RTA Ponds and existing Green and Golden Bell Frog habitat. The RTA Ponds are purpose-built breeding ponds for the Green and Golden Bell Frog which were constructed along Marsh Street, adjacent to the Southern and Western Sydney Ocean Outfall System (SWSOOS) and the Kogarah Golf Course. Breeding was detected at the RTA ponds in 2020 and foraging frogs have been detected in the RTA Ponds, Enhancement Ponds and Kogarah Golf Course in 2020 and 2021.
Southern Myotis (*Myotis macropus*) roosting habitat	No Southern Myotis were recorded during the field surveys within the Project area. However, President Avenue crosses over a culvert which conveys a waterway running from the north (Rockdale Bicentennial Park) to the south (Scarborough Park North). This culvert may be potential habitat for Southern Myotis. All wetlands that exist within the Project area could provide occasional foraging resources for the species, despite the species not being detected during field survey undertaken for the EIS. Location of Southern Myotis habitat is shown in Appendix A6.
Migratory bird habitat in the Landing Lights wetland	The Landing Lights wetland is known to, or potentially could, provide habitat for threatened and migratory species listed in Table 5 including Sanderling, Curlew Sandpiper, Broad-billed Sandpiper, Black-tailed Godwit and Terek Sandpiper. The Landing Lights wetland is located within 500 metres of the Project area. No direct or indirect impacts are predicted to occur to this wetland from the Project.

4.1.5 Pathogens

The Project EIS identified that the fungal pathogen Chytrid (*Batrachochytrium dendrobatidis*) is likely to be present within waterways and wetlands that located within the Project area. The fungus causes the disease Chytridiomycosis in native amphibians. It is a water borne fungus that is spread through cross contaminations between water bodies. Fungal spores can be spread through contaminated water, soil and vegetation. Some native frog species are natural carriers of the fungus and can also spread it. The Green and Golden Bell Frog is particularly susceptible to this disease.

The EIS identified another two pathogens of concern that were considered unlikely to occur on within the Project area; Myrtle Rust (*Uredo rangelli*) and Phytophthora (*Phytophthora cinnamomi*).

Myrtle Rust is an air-borne plant fungus that attacks the young leaves, shoot tips and stems of Myrtaceous plants eventually causing plant death. It is spread by movement of contaminated material such as clothing, infected plants, vehicles and equipment.

Phytophthora is a soil-borne fungus capable of causing tree death (dieback) by attacking the roots of native plants. Spores can be spread over large areas by water, vehicle and machinery movement as well as human and animal movement.

Management measures to reduce the risk of pathogen spread are discussed in Section 6.7.

4.1.6 Aquatic flora, fauna and habitats

From a candidate list of 108 freshwater, marine and estuarine species listed under the BC Act and/or EPBC Act, no threatened aquatic flora or fauna species were detected in the Project area during field investigations undertaken for the EIS. Other protected flora and fauna listed under the FM Act, including macroalgae, seagrass, mangroves, saltmarsh, fish, sharks, finfish and seahorses were not detected within the Project area during the filed assessments. Aquatic habitat and species recorded in freshwater and estuarine habitats during investigations for the EIS and those predicted to occur are shown in Table 8.

Table 10: Aquatic habitats recorded in Project area

Waterway	Classification #	Description
Wetland within Rockdale Bicentennial Park through Rockdale Wetlands	This habitat is not mapped as Key Fish Habitat (KFH) by DPI Fisheries.	A 30 metre wide artificial pond extended 500 metres north of President Ave within the Rockdale Wetlands The wetland receives stormwater discharge from several large pipe culverts and the water level is regulated by a small weir at President Avenue The banks of the pond are steep with exposed soil, rocky rubble and building waste (e.g. bricks) The presence of piscivorous bird species (fish eaters) suggests fish were present though none were observed during field investigations Anecdotal evidence suggests that the wetland provides habitat for Eastern Long-necked Turtle (*Chelodina longicollis*).
Wetland entering Scarborough Park North	The southern portion of the system (from about 800 metres south of President Avenue) is mapped as Key Fish Habitat by DPI Fisheries.	A narrow wetland directly downstream of President Avenue located within the Scarborough Park North Wetland, which receives water which has spilled over the Bicentennial Park weir. The wetland extends south for around 2 kilometres before entering a stormwater culvert beneath Ramsgate. Aquatic plant species Typha (*Typha orientalis*) and Common Reed (*Phragmites australis*) were observed along the western bank of the wetland. Dissolved oxygen concentration was observed to be poor and unlikely to support native fish life.

Waterway	Classification #	Description
Muddy Creek upstream of Bestic Street	The tidal portion of this concrete channel is mapped as Key Fish Habitat by DPI Fisheries, starting around 250 metres south of Bestic Street.	A 14 metre wide concrete-lined channel. The northern portion is tidal and the southern half towards West Botany Street is freshwater, with occasional tidal influence The channel is concrete lined for two kilometres upstream of West Botany Street and natural downstream of Bestic Street. The downstream portion was observed to have a narrow band of Grey Mangrove (*Avicennia marina*) and modified embankments A school of juvenile *Mugil cephalus* (Sea Mullet) was observed in the freshwater reach during the EIS surveys.
Cooks River near Kogarah Golf Course	This river is mapped as Key Fish Habitat by DPI Fisheries.	The Cooks River at this location is approximately 145metres wide with built seawalls as both banks Four small stormwater culverts flow into the river within the study area A sewage outfall is located near a utility bridge (over the M5 East tunnel), which was flowing at the time of survey. With the exception of material released from the outfall, the river had reasonable water clarity, indicating good tidal flushing. Common marine molluscs inhabited the sloping stone seawall. An underwater survey found rock rubble, oysters, coarse sand/gravel and fine woody debris in the subtidal zone. A large number of *Girella tricuspidata* (Luderick) were active near the sewer outlet during the survey

#Classification in accordance with NSW DPI Fisheries Guidelines

4.1.7 Groundwater Dependent Ecosystems (GDEs)

No GDEs that are highly reliant on groundwater were identified within the study area. However, parts of Rockdale Bicentennial Park Ponds are identified as potential GDEs in the Bureau of Meteorology (BoM) GDE Atlas (Appendix H, Biodiversity development assessment report).

All waterbodies within the Project area are the subject of monitoring under the Wetland Monitoring Program. A separate Groundwater Monitoring Plan is required under the Project CoA. Information collected by the Groundwater Monitoring Plan will be used to help interpret any changes detected

within the study area by the Wetland Monitoring Program that could be attributed to changes in groundwater level or quality.

5 Environmental aspects and impacts

5.1 Construction activities

The proposed construction activities for the Project that could potentially impact native flora and fauna include:

- Preparatory investigations;
- Site establishment and enabling work;
- Tunnelling;
- Surface earthworks and structures;
- Construction of motorway operations complexes;
- Drainage and construction of operational water management infrastructure;
- Construction of the permanent power supply connection;
- Road pavement works; and,
- Finishing works.

These activities would be undertaken within the Project area (**Figure 1**). The Project area includes the following six construction ancillary facilities:

- Arncliffe construction ancillary facility at Arncliffe, within the Kogarah Golf Course currently being used for construction of the New M5 Motorway;
- Rockdale construction ancillary facility at Rockdale, within an existing TfNSW depot at West Botany Street;
- President Avenue construction ancillary facility at Rockdale, north and south of President Avenue within Rockdale Bicentennial Park and part of Scarborough Park North, and a site west of West Botany Street;
- Two shared cycle and pedestrian pathways construction ancillary facilities at Brighton-le-Sands, within the recreation area between West Botany Street and Francis Avenue, near Muddy Creek; and,
- Princes Highway construction ancillary facility, on the north-east corner of the President Avenue and Princes Highway intersection.

5.2 Ecological impacts

Potential and likely impacts associated with the Project are identified in Chapter 12.3 of the EIS and include:

- Removal of native vegetation including two TECs listed under the BC Act;
- Direct and indirect impacts to fauna, including injury and mortality;
- Potential impacts on threatened species not previously detected within the Project area but known to occur close to the Project area;
- Loss of aquatic biodiversity;
- Loss of habitat for threatened species;

- Spread of weeds;
- Introduction of pathogens;
- Edge effects; and,
- Acidification from the displacement of acid sulfate soils.

These potential impacts are described in more detail in Sections 5.2.1 to 5.2.8. Cumulative impacts to flora and fauna are not anticipated to occur from staging of the Project or during construction of the Project. Where unexpected cumulative impacts are identified during works, they will be managed through compliance with relevant CoAs, coordination with external stakeholders including utility providers, and implementation of EMM related to key environmental impacts. The mechanism for identifying any potential unexpected cumulative impacts will be through monitoring, inspections, reporting and auditing

5.2.1 Removal of vegetation and threatened flora species

Construction of the Project will result in the removal of approximately 2.15 hectares of native PCT's. All PCT's within the Project area correspond to TEC's listed under the BC Act. A further 2.3 hectares of "Urban Exotic and Native Cover" would be removed, refer Table 11.

Table 11: Direct impacts to native vegetation

PCT ID	PCT Names	Threatened ecological community	BC Act listing	EPBC Act	Extent of vegetation removal for the Project (ha)
1232	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	Endangered	Not listed	0.37 hectares
1808	Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline			Not listed	0.97 hectares
1795	Swamp Mahogany / Cabbage Tree Palm - Cheese Tree ¬Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	Endangered	Not listed	0.81 hectares

There are 20 mature Magenta Lilly Pilly's planted in lines within landscape plantings at the Rockdale Bicentennial Park. Some (up to 5) of these plants would be cleared for the Project and will be offset in accordance with CoA E40.

The Project EIS identified that 237 native trees (or small groups of trees) would require removal to facilitate the Project. Based on the current concept design for the Project, it is unlikely these trees could be retained. Of these trees, around 41 have been identified as having a high retention value in accordance with the Institute of Australian Consulting Arboriculturists Significance of a Tree, Assessment Rating System.

5.2.2 Loss of habitat for threatened species

The PCTs and areas of "Urban Exotic and Native Cover" located in the Project area provide foraging habitat for the Grey-headed Flying Fox. In total, 4.45 hectares of potential foraging habitat for the species will be removed during construction of the Project.

President Avenue crosses over a culvert which conveys a waterway running from north (Rockdale Bicentennial Park) to the south (Scarborough Park North). The culvert and surrounding habitat at the Rockdale Bicentennial Park offer potential roosting and foraging habitat for threatened species including the Southern Myotis. Buildings that have been abandoned and require demolition can also provide roosting habitat for the Southern Myotis as well as other threatened microbat species.

5.2.3 Direct and indirect impacts to fauna, including injury and mortality

Fauna injury or mortality could occur during construction of the Project as a result of direct collision with vehicles and equipment within the construction boundary. Additional mortality could occur as a result of the clearing of native and non-native vegetation and the dewatering of wetlands. Mobile species (such as birds) may be able to move away quickly and easily, but other less mobile and smaller species may be slower to move away potentially resulting in injury or mortality of the individual.

5.2.4 Impacts to aquatic biodiversity

Potential impacts to wetlands are limited and comprise temporary loss of shading, riparian vegetation and disturbance to aquatic fauna due to construction activities. As described in the Project EIS, Potential impacts to aquatic biodiversity associated with discharges of surface and construction wastewater and disturbances to waterways are considered to be manageable, and would be confined to the construction boundary with application of the proposed management measures outlined Table 12.

5.2.5 Spread of weeds

Some weeds would be removed during the vegetation clearing required for the Project. Given the presence of weeds in the study area there is potential for disturbance of vegetation to lead to the spread and/or intensification of weeds. If not appropriately managed, this may indirectly affect native flora and fauna in adjoining areas by further reducing habitat quality, altering the structure and composition of vegetation and increasing competition for resources. The spread of weeds could also hamper successful post-construction landscaping and revegetation programs.

5.2.6 Introduction of pathogens

Activities that involve movement of equipment, people, landscaping materials and other construction materials over large areas present potential vectors for the spread of pathogens. While presence of pathogens was not confirmed during the Project EIS, Chytrid has previously been detected in wetland habitats close to the Arncliffe construction facility. Given the highly urban context and lack of existing remnant native vegetation within the study area, it is unlikely that Phytophthora is present. Myrtle rust, if present, would be limited to any landscaped or planted Eucalypts. All three pathogens can cause disease and death of certain plant and animal species.

5.2.7 Edge effects

Edge effects on native vegetation are considered likely to occur as a result of the Project. At Scarborough Park Wetlands there would be native vegetation remaining south of President Avenue in an area dominated by Common Reedlands (PCT1808). The reedlands retained would be potentially subject to increased light and weed invasion because of the Project.

5.2.8 Acidification from the displacement of acid sulfate soils

The Project has the potential to result in impacts on biodiversity from acid sulfate soils during construction. It is assumed that a large portion of the excavation for the cut and cover and trough structures within C3 would be through acid sulfate soils.

6 Environmental mitigation and management measures

6.1 Exclusion Zones and Project Boundaries

Prior to the planned vegetation clearing or wetland dewatering and pre-clearing surveys, the Project area boundaries and Environmentally Sensitive Areas must be identified and marked. All Project Boundaries and Exclusion Zones will be marked with an appropriate fence or series of boundary markers to limit clearing of native vegetation to the greatest extent practicable. In addition, all environmentally sensitive areas will have indicative signage installed every 50 metres around the boundary (or at the feature for particularly sensitive areas) (Plate 1).

The Project area boundaries are shown on maps which include the Environmentally Sensitive Areas in Appendix A6 of the Project CEMP.

Plate 1: Example of Environmentally Sensitive Area exclusion fencing and signage (Source: TR&T 2010)

6.2 Pre-clearing surveys

Pre-clearing/construction surveys will be undertaken by the Project Ecologist, ideally at least 7 days prior to the clearing of vegetation. The Project Pre-clearing Checklist is provided in Appendix A and relevant hold points are detailed in the Clearing and Grubbing Procedure (Appendix C). The key objectives of the pre-clearing survey are to:

- Confirm the clearing boundary has been identified and clearly marked;
- Confirm any environmentally sensitive areas have been clearly marked and signed;
- Confirm area to be cleared conforms with Project PCT mapping;
- Identify and mark fauna roosting features such as birds' nests and possum dreys;

- Identify and mark habitat features such as hollow bearing trees, stags, hollow logs or rockpiles;
- Confirm no roosts of Grey-headed Flying Fox are present;
- Identify and demarcate areas or individual weeds that are considered high risk or Weeds of National Significance;
- Determine if any hollow logs can be salvaged for habitat restoration;
- Determine if vegetation within the clearing boundary is suitable for mulching and re-use or if it is required to be treated as green waste, and,
- Identify potential release sites if fauna require capture and relocation during clearing.

Initially, areas requiring a pre-clearing/construction survey will be identified by the Environmental Manager, or Environmental Advisor, in consultation with the Project Engineer or Site Supervisor.

Prior to any vegetation clearing, the Environmental Manager or Environmental Advisor, will accompany the Project Ecologist to site to identify the area of vegetation that requires removal. The Project Ecologist will undertake a meandering walk survey throughout the vegetation to identify the required parameters on the pre-clearing checklist.

Habitat features or habitat trees (trees containing nests, dreys or hollows) will be marked with the code “HBT” using pink spray-paint at chest height. Red and white tape will then be tied around the tree or structure that has the habitat feature. A GPS co-ordinate will be taken for each feature.

All weeds will be identified. Weeds that require to be treated as contaminated waste will be marked with red and white tape and the GPS Co-ordinate will be recorded. Areas of vegetation pre-dominantly comprised of weeds will be treated as contaminated (i.e. not every weed will be marked with tape)

The surveys will also include pre-clearing inspections of any nominated structures, bridges and culverts for roosting microbats prior to the planned disturbance. Microbat surveys will be undertaken during favourable weather conditions (where possible) to increase chances of detection.

6.3 Clearing Supervision and Post Clearing Checklist

A clearing permit is required for the removal of any area of vegetation for the Project. This includes areas mapped as “Urban Exotic and Native Cover” and limb removal on trees that are to be retained. The Clearing Permit template is provided in Appendix B.

Prior to the commencement of clearing, the Project Ecologist will complete a brief survey to ensure no fauna have moved into the area since the Pre-clearing Survey. The results of this survey will be communicated to the clearing contractors prior to the commencement of clearing.

Clearing will be undertaken using the 2-stage clearing process described in Transport Roads and Traffic Authority Biodiversity Guidelines. Stage 1 of the clearing process will be designed to remove shrub and ground cover and most non-habitat trees. All habitat trees must be retained. Stage 1 clearing is designed to protect habitat features that could support fauna and while encouraging them to naturally disperse after the disturbance. Some non-habitat features could be retained during this process to allow fauna to leave the Project area more easily. These decisions can be made on a case by case basis in consultation with the Project Ecologist.

Stage 2 clearing will involve the removal of remaining habitat trees and features. If the feature is a hollow, nest or drey, the machine that is clearing the vegetation will gently tap the feature, to see if any fauna are disturbed. If fauna are disturbed, the Project Ecologist will attempt to capture the animal or corral it off the Project area into an area of suitable habitat.

After this, the habitat tree will be pushed (or cut) down. The Project Ecologist will then inspect the feature to determine if any fauna are using the structure. Any fauna present will be captured by the Project Ecologist and have its health assessed. If veterinarian care is required, the Project Ecologist will organise delivery of the animal. If care is not required, the Project Ecologist will relocate the animal to a suitable release area close to the clearing site. Stage 2 will occur no earlier than 24 hours after Stage 1.

All clearing will be Supervised by the Project Ecologist. The Project Ecologist will be in communication with clearing teams during the process to discuss the best way clear vegetation in a way the reduces risk to any fauna that may be present. At the conclusion of clearing, the Post-clearing Checklist will be filled and signed off by the Project Ecologist and Environmental Representative.

6.4 Fauna Rescue and Release Procedure

Fauna inadvertently encountered during everyday construction activities (i.e not during clearing) will be managed using the Fauna Handling Procedure (Appendix E). The key components of the procedure are described below.

If an animal is identified within an area where it is likely to be impacted by current construction activity, work must stop immediately, and the Environmental Advisor will be contacted. If the animal is a snake, the Project snake handler will also be contacted. If the animal is a bat, the Project Ecologist will be contacted.

If the animal appears injured or unwell (and is not a bat or snake) the Environmental Advisor will organise to have the animal captured and placed in a cool dark holding container and they will be immediately taken to the nearest veterinarian, WIRES representative or Sydney Wildlife for treatment in accordance with the fauna handling procedure (Appendix E).

If the animal appears uninjured, the Environmental Advisor will co-ordinate with the Project ecologist to identify a suitable release point for the animal. If the species is nocturnal, it will be released after dark. In such cases, the animal will be kept in a cool dark and quite area prior to release. Water is not necessary when kept in these conditions.

No attempt will be made to touch or confine Microbats or Flying-foxes identified on the Project area. Injured and or unwell bats could be experiencing symptoms of Australian Bat Lyssavirus (ABL), which can cause fatalities in humans if transmitted through bites or scratches. ABL has been detected in Grey-headed Flying foxes roosting in the Sydney Metropolitan Area. Microbats and Flying-foxes must only be handled by the Project Ecologist who has had a vaccination for Rabies within the last 2 years or has had their titre levels tested.

The relocation of venomous snakes, if required, is hazardous and will be carried out by an experienced and appropriately licenced fauna handler.

6.5 Unexpected Threatened Species Finds

If flora, fauna or a TEC are encountered or inadvertently impacted and have not been previously identified, this will trigger the Unexpected Finds Procedure (Appendix G). The key components of the procedure are described below.

Unexpected threatened flora and fauna are usually inadvertently encountered during the pre-clearing surveys. If threatened species are encountered work must stop, the Project Ecologist will undertake an assessment of potential impacts and identify any required mitigation measures for implementation in consultation with DPIE and EES, as required.

Unexpected fauna can also be occasionally inadvertently encountered on the construction site after pre-clearing surveys have been completed or during general construction activities. If fauna

are encountered during construction activities, the fauna handling procedure (Appendix E) will be activated. Work will stop and the Environmental Advisor will capture and assess the animal. If the animal is identified as a threatened species, all works will stop until the Project Ecologist, in co-ordination with the Environmental Advisor and DPIE have evaluated the potential impacts of the Project and developed suitable mitigation and management measures.

A species-specific unexpected finds procedure exists for Green and Golden Bell Frogs recorded within the Arncliffe Construction Compound (Appendix F).

6.6 Weed Management

In addition to the CoA's for the Project, CGU has a general biosecurity duty under the *Biosecurity Act 2015* to manage and minimise the spread of species listed in Table 5. Weeds will be managed in accordance with the Weed Management Procedure (Appendix H). The key components of the procedure are described below.

The objective of weed management on the Project area is to minimise the risk of weed spread from the Project area to areas outside the corridor. A secondary objective is to manage weeds within areas of retained vegetation located in or adjacent to the Project area.

Weeds identified during Pre-clearing Surveys will be managed in accordance with the Weed Management Procedure. Given the scope of weed infestations identified in the Project EIS, weed management prior to clearing, including spraying and removal, is unlikely to be feasible at most sites. Instead, cleared vegetation that includes weeds, including High Threat weeds and WNoS will be treated as green waste. It will be either encapsulated on site and transported to a licensed green waste facility or all vegetation from a weed invested area will be loaded into a suitable truck and taken to a green waste facility.

Ongoing weed management will occur throughout the construction phase, where required. The focus of this management will be retained vegetation within Environmentally Sensitive Areas and vegetation directly adjacent to the Project area. Three options are available for weed control:

- Cut and remove the foliage of the weeds and spray the stem;
- Spray foliage with an appropriate herbicide
- Physical removal

Any use of herbicides will be strictly in accordance with the Pesticides Act 1999, the product label, and the relevant Safe Work Method Statement developed in accordance with the Project's Work Health & Safety Management Plan. In addition, where approved herbicides are required to be used to control weed species near water, i.e. creeks, drainage depressions, and stormwater drains, extra care is to be taken to limit overspray. All herbicides will only be used during suitable meteorological conditions.

Herbicides are not to be used without the prior approval of the Project Environmental and Sustainability Manager. If a non-glyphosate herbicide is to be used, approvals from the Safety Director and the Environment and Sustainability Manager are required. This 'hold point' is clearly stated in the Weed Management Procedure.

6.7 Pathogen Management

One pathogen is considered likely to occur on or adjacent to the Project area; Chytrid fungus. Chytrid fungus has previously been recorded in the Arncliffe population of GGBF and as the Kogarah Golf Course is frequently traversed by golfers, the presence of the Arncliffe construction compound is not in itself likely to significantly increase the existing risk of transmission. However, the RTA ponds have been managed to reduce chytrid and are fenced off from pedestrians. The

area between the RTA ponds and the compound is not used for golfing and is rarely traversed. It is important that the potential for transmission of chytrid fungus to these areas is minimised as much as possible.

Personnel required to work in these areas will be required to clean and disinfect boots and equipment before entering the area, consistent with the Hygiene Protocol for the Control of Disease in Frogs (DECC 2008) and the Hygiene protocols for the control of diseases in Australian frogs (Murray et al. 2011). Hygiene stations will be set up at all entrance points to the RTA Ponds and Enhancement Areas. A log book will be maintained at all entrance locations to record that personnel using the entrance points have followed the appropriate hygiene procedure.

If the presence of Myrtle Rust and Phytophthora are suspected after undertaking pre-clearing surveys, or from any other source, the site will be treated as contaminated. In response, the following procedures will be enacted:

- All vegetation and soil (if Phytophthora is suspected) from the contaminated areas will be stockpiled within the boundaries of the clearing footprint. It will be removed to an appropriate green waste facility.
- All vehicles and plant that have entered the site will require wash down and inspection prior to leaving entering other areas of the Project area. The wash down area must be closed, with all water and soil prevented from entering the surrounding environment.
- All staff that have entered the contaminated area will be required to wash down footwear and equipment in accordance with National best practice guidelines for management of Phytophthora for biodiversity conservation in Australia (O'Gara *et al*. 2005).

6.8 Wetland Management Strategies

Wetlands management within the Project area is primarily described in the Wetland Monitoring Plan (**Appendix I**). The Wetland Monitoring Plan includes:

- Boundaries and habitats of wetlands potentially impacted by the Project;
- Potential and likely impacts to wetlands within the Project area;
- Mitigation and Management actions for wetlands to be impacted in the Project area;
- Monitoring requirements for wetlands in the Project area including monitoring parameters and performance indicators.

6.9 Green and Golden Bell Frog Management

CGU has developed the M6 Stage 1 Green and Golden Bell Frog Plan of Management (GGBF PoM) to describe the management, mitigation and monitoring measures that are to be implemented by CGU and its contractors at the Arncliffe construction compound during the construction of the M6 Stage 1.

The GGBF PoM is a stand-alone plan developed to comply with CoA E44 (M6S1-CGU-NWW-EO-PLN-000426). It also provides guidelines for the post-construction re-instatement of habitat at the site of the Arncliffe construction compound. The GGBF PoM for the M6 Stage 1 includes:

- On-site management and mitigation measures to limit impacts from the Arncliffe construction compound on GGBF;
- Monitoring of those on-site management and mitigation measures;
- Monitoring of the Enhancement Area;

- Monitoring of the Eastern Frog Corridor; and
- measures to re-instate habitat affected by the Arncliffe construction compound within the returned open space post construction.

The main impact on the Arncliffe GGBF population that will result from the continued utilisation of the Arncliffe construction compound is the ongoing loss of the terrestrial habitat and water features that were within the Arncliffe construction compound, for a number of years. The key mitigation measures for this loss of habitat are the establishment of the M8 Marsh Street habitat area and the implementation of the captive breeding program. These measures are described in ELA (2018) and ELA (2017) respectively and are currently being implemented by TfNSW in accordance with the M8 Project Approval (SSI 6788).

The continued use of the compound also means there is a higher risk of frog incursion resulting in injury or death. To reduce this risk, the existing frog exclusion zone will be maintained and will be enhanced by the installation of a solid barrier along the side of the compound facing the RTA ponds. This will comprise a “hoarding” that is 2.4 metres high, with a horizontal lip (refer to GGBF PoM for further detail). This will extend eastwards along the southern side of the compound from Marsh Street. The existing compound wall around the remainder of the site currently comprises a solid barrier at least 1 metre high with a horizontal lip at the top and this barrier will be maintained during the construction of the M6 Stage 1

In the event that any frogs are found within the Arncliffe construction compound, the “GGBF Stop Work Procedure” set out in Appendix F will be implemented. If GGBFs are found on any of the other M6 Stage 1 worksites apart from Arncliffe, it will be treated as an Unexpected Find and will be trated in accordance with Section 6.5 and Appendix G. GGBF sites are outside of the construction footprint and, therefore, the management measures and monitoring processes from the GGBFPoM are implemented independent of the FFMP (with the exception of Appendix F).

The following information is also included in the site induction for the Arncliffe site:

- Arncliffe compound is within a Green and Golden Bell Frog habitat (Kogarah Golf Course), a species of frog which is endangered in NSW
- GGBF Breeding ponds exist at the Eve Street Ponds and the RTA Ponds
- If developing Work Packs for activities within the site, refer to the Environmental Work Method Statement for list of controls and management mechanisms
- Area outside the site boundary is a No-Go Zone and to enter this area, you must sign onto the Permit to Enter Protected or No-Go Area
    - Boots must be washed down prior to entering this area to reduce the risk of spreading Chytrid Fungus, a deadly disease which is killing frogs across Australia (and the world)
- Monitoring is undertaken on the GGBF population every month by the Project Herpetologist
    - Ensure lights are directed down into site and away from the Kogarah Golf Course
    - Avoid placing noisy equipment and plant in areas adjacent to the RTA Frog Ponds
- If you identify a frog on site, stop works in the vicinity and notify Environmental Coordinator so frog can be identified

Potential indirect impacts on the Arncliffe GGBF population resulting from the M6 Stage 1 are disturbance due to lights, noise and vibration, dust and spills or runoff. The mitigations proposed in the GGBF PoM for these impacts include:

- The use of directional lighting will be used within the Arncliffe construction compound with the objective of minimising light spillage to surrounding properties. In particular, lighting will

be directed so as to avoid light spill into the RTA ponds as much as possible and to minimise light spill to the Enhancement Area and other parts of the Golf Course
- Management of construction noise and vibration in accordance with the Project Approval and EMMs. GGBF populations showed no detectable response to noise originating from the compound during construction of the M8 Motorway.
- Management of dust using bulk water carriers and sprayers to apply rainwater and/or tunnel water / potable water to reduce dust. Slurry run-off will will be managed in accordance with the sediment and erosion control measures.
- Establishment of sediment and erosion controls to prevent runoff, spills and contaminants, silt etc. from the construction compound from entering adjacent habitats, including the RTA ponds, the area between the RTA ponds and the compound, the Enhancement Area and waterbodies on the Golf Course. Controls will be maintained in good condition by CGU and inspected regularly and after heavy rain.
- Induction program for all personnel, including employees, contractors and sub-contractors, containing relevant environmental information before they are authorised to work at the Arncliffe construction compound.

Monitoring will be undertaken for the period that the Arncliffe construction compound is in use for the construction of the M6 Stage 1 and will continue until such time as the re-instatement of the compound area is complete. Details of the monitoring design and schedule are provided in the GGBF PoM.

6.10 Nest Boxes or Artificial Roosting Structures

Nest boxes will be installed as mitigation measures for loss of fauna roosting habitat, primarily hollows in trees and bat roosting sites in culverts or abandoned buildings. Survey methodologies are discussed in more detail in the Flora and Fauna Monitoring Program (Appendix J to this Plan).

No hollow bearing trees were identified in the Project EIS. In the event that a hollow is identified during pre-clearing surveys, the dimensions of the hollow and any signs of occupancy (animal, feathers, scats, fur etc) will be recorded. A nest box with an entrance and depth of similar depth will be installed in adjacent habitat for each hollow identified in the Project area.

If microbats are found utilising abandoned buildings as habitat, next boxes will be installed in adjacent foraging habitat prior to demolition of the building. The number of nest boxes will be determined upon evaluation of the number of microbats using the structure, in consultation with the Project Ecologist.

The culvert at Presidents Avenue has been identified as a potential roosting site for microbats. Microbats that use culverts usually utilise holes and joins in the structure that are formed during the fabrication of the concrete components. As such, numerous cavities can be available for microbats to use.

TfNSW have previously designed and installed certain pre-cast concrete culvert structures that have in-built cavities for microbats. CGU will explore the opportunity to utilise this option during the detailed design phase. If incorporated into detailed design, external artificial nest boxes (that is nest boxes installed outside of the culvert) will not be required as a mitigation measure.

Alternately, CGU will install one nest box designed to support roosting bats per removed section of culvert under Presidents Avenue. In this case, a “section” describes each portion of the concrete culvert, defined by the joints between each portion. It is currently estimated that approximately 10 nest boxes will be installed.

Nest boxes will be installed within trees adjacent to waterbodies as close as possible to the culvert. The boxes will face the waterbody. The nest boxes will be made out sturdy material, preferably hard wood. They will be installed using the Habisure © (**Plate 2**).

During clearing and construction works, installation of nest boxes will also be investigated as an adaptive response to the detection of hollow dwelling fauna on the construction footprint. CGU will hold discussions with the Project Ecologist over the number of nest boxes installed in response to the detection of hollow dwelling fauna. Where feasible, one nest box will be installed for each rescue of a hollow dependent fauna species. Nest boxes will be installed in an appropriate area of vegetation as close as possible to the rescue site.

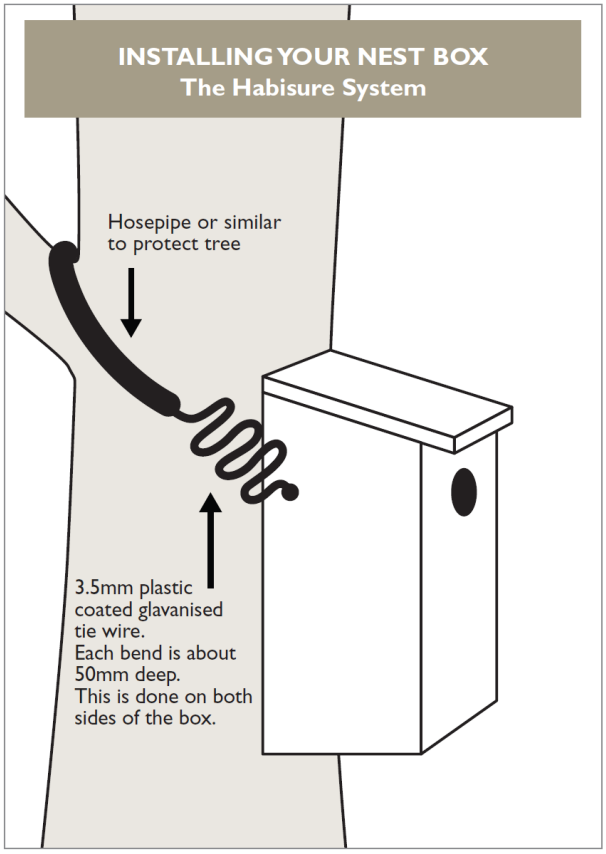


Plate 2: Habisure © method for installing nest boxes (Source: Franks and Franks 2006)

6.11 Biodiversity offsets

The BDAR concluded that three PCTs would be directly affected by the Project. Using the BCC, the BDAR concluded that clearing of the PCTs for the Project would require biodiversity offsets using the BOS. During review and approval of the Project, the credits requiring offset were increased in response to additional mapping undertaken by the DPIE and identification of additional Project area areas in the PIR. The final credit requirements are described in Condition E40 of the Planning Approval:

- Six ecosystem credits for PCT1232 Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion
- Twenty-seven ecosystem credits for PCT1795 Swamp Mahogany / Cabbage Tree Palm - Cheese Tree -Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin
- Forty-nine ecosystem credits PCT1808 Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline.

In addition, species credits would be required by the Project to offset the impact of removing up to 5 Magenta Lilly Pillies. The CoA identified that the retirement of 10 species credits would be required to offset the impact prior to disturbance.

No disturbance of the PCTs or Magenta Lilly Pilly will occur during Stage 1: preliminary construction. Impacts to the above PCTs and Magenta Lilly Pilly will occur during Stage 2: construction works commencing 2022. All offsets must be retired prior to disturbance. Impacts to plant community types will not exceed those identified in the documents listed in Condition A1, unless otherwise approved by the Planning Secretary. In requesting the Planning Secretary's approval, CGU will provide to the Planning Secretary an assessment of the additional impact(s) to plant community types and an updated ecosystem and/or species credit requirement under Condition E40, if required.

Areas of Green and Golden Bell Frog habitat would be affected indirectly. However numerous mitigation measures would be implemented to minimise these impacts. In accordance with CoA E41, CGU will submit to the Planning Secretary, for information, a copy of the Credit Retirement Report for the retirement of the biodiversity offsets specified in Table 14 and Table 15 of the Infrastructure Approval within one month of receiving the report.

6.12 Rehabilitation

Areas affected by construction, including waterbodies, will be rehabilitated and reinstated following completion of construction. Rehabilitation forms part of urban design and landscaping for the Project, which Is developed in consultation with relevant council(s), the community, affected landowners and businesses as part of the Urban Design and Landscape Plan in accordance with CoA E154 – E159 and SWF3. The FFMP will be reviewed and updated with the relevant details on the rehabilitation process (if required) once design and consultation are complete.

6.13 Fauna Monitoring Program

Fauna monitoring for the Project is divided into two distinct programs in addition to the monitoring required under the stand-alone GGBF PoM. Each Monitoring Program includes:

- details of baseline data available and details of how additional baseline data might be collected;
- details of all monitoring that will be undertaken;
- the parameters of the Project to be monitored;
- the frequency and location of monitoring; the reporting of monitoring and analysis results against relevant criteria,
- including details of the timing and frequency for reporting the results to the Planning Secretary and relevant government agencies;
- procedures to identify and implement additional mitigation measures where results of monitoring indicate adverse impacts or levels above relevant criteria; and,
- any consultation to be undertaken in relation to the monitoring programs.

The Monitoring Programs are:

- Wetland Monitoring (**Appendix I**)
- Flora and fauna monitoring including nest box monitoring (**Appendix J**).

Monitoring requirements for the Green and Golden Bell Frog are included in the stand-alone GGBF PoM.

6.14 Roles and Responsibilities

The CGU Project Team organisational structure and roles and responsibilities are outlined in Section 3.4 of the CEMP.

Table 12: Environmental control measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
General						
FF1	Training will be provided to relevant Project personnel, including relevant sub-contractors on flora and fauna requirements from this plan through the induction.	Training materials	Prior to construction	Environmental and Sustainability Manager	Best practice	Training resources
FF2	Ensure all risks to flora and fauna are considered as part of the development of Construction Area Plans. Any works required outside the construction footprint will be referred to the Environmental Manager for advice on further assessment and approval requirements.	Construction Area Plans Site Environmental Plans	Pre-construction Construction	Environmental and Sustainability Manager	Best practice	Construction Area Plans
FF3	Ensure work packs include relevant environmental control information including a Site Environment Plan where required.	Work Packs	Pre-construction Construction	Environmental and Sustainability Manager	Best practice	Work Packs
Vegetation clearing, protection and management						
FF4	A pre-clearing flora and fauna management procedure to be developed and implemented.	Flora and Fauna CEMP Sub-plan	Pre-construction Construction	Environmental and Sustainability Manager	G36 Cl 4.8(b); EMM B4	Appendix C

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
FF5	Project boundary is demarcated with fencing that clearly indicates what areas are to be cleared and not to be cleared	Site Environmental Plans	Pre-construction Construction	Environmental and Sustainability Manager Project Ecologist	EMM B4	Pre-clearing Checklist
FF6	Environmentally sensitive areas are clearly demarcated with fencing that clearly indicates what areas are to be cleared and not to be cleared. Signs indicating that the fenced area is sensitive and to be retained are installed every 50 metres	Site Environmental Plans	Pre-construction Construction	Environmental and Sustainability Manager Project Ecologist	EMM B4	Pre-clearing Checklist
FF7	Pre-clearing surveys are completed by the Project ecologist and Pre-clearing checklists have been filled in	Construction Area Plan and Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	EMM B4	Pre-clearing Checklist
FF8	Clearing Permits have been filled and signed	Construction Area Plan and Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C4	Clearing Permit

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
FF9	2 Stage clearing protocols are implemented and supervised by the Project Ecologist	Construction Area Plans and Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C14	Clearing Permit, Post clearing check list
FF10	Post-clearing checklists are completed at the conclusion of clearing supervision	Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C14	Post clearing check list
Threatened flora and fauna						
FF11	Unexpected threatened species finds procedure to be developed and implemented	Flora and Fauna CEMP Sub-plan	Pre-construction	Construction environment manager and superintendent	G36 Cl 4.8(f); EMM B4	Procedure (Appendix G)
FF12	Undertake pre-clearing surveys and complete Pre-clearing checklists	Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C14	Pre-clearing Checklist

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
FF13	Preclearing surveys of culverts and abandoned buildings to be completed	Site Environmental Plans Construction Area Plans and Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C14	Pre-clearing Checklist
FF14	Microbat nest boxes to be installed	This Plan	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C14	Monitoring Report
FF15	Green and Golden Bell Frog Monitoring to be undertaken in accordance with the Green and Golden Bell Frog Plan of Management	Green and Golden Bell Frog Plan of Management	Construction	Environmental and Sustainability Manager Project Herpetologist	CoA E44	Monitoring Report
FF16	Nest box monitoring to be undertaken in six monthly intervals after installation	Flora and Fauna Monitoring Program	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C14	Monitoring Report

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
Wildlife protection						
FF17	A fauna rescue and release procedure is to be developed and implemented	Fauna handling procedure	Pre construction	Environmental and Sustainability Manager Project Ecologist Superintendent	G36 Cl 4.8(c); EMM B4	Fauna handling procedure (Appendix E)
Aquatic habitats						
FF20	A Wetland Monitoring Plan is to be developed and implemented	Wetland Monitoring Program	Pre construction	Environmental and Sustainability Manager		Appendix I
FF21	Environmentally sensitive areas are clearly demarcated with fencing that clearly indicates what areas are to be cleared and not to be cleared. Signs indicating that the fenced area is sensitive and to be retained are installed every 50 metres	Sensitive Area Plans	Pre construction	Environmental and Sustainability Manager Project Ecologist	EMM B4	Pre-clearing Checklist

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
FF22	All wetland dewatering is undertaken in accordance with the requirements of the Project Ecologist and must be documented in a EWMS prior to any dewatering works.	Site Environment Plans Construction Area Plans and Work Packs	Construction	Environmental and Sustainability Manager Project Ecologist	EMM B3	EWMS
FF23	Pest Aquatic species are euthanized in accordance with Animal Ethics guidelines	Flora and Fauna CEMP Sub-plan	Construction	Environmental and Sustainability Manager Project Ecologist	CoA E42	Post-clearing Checklist
FF24	Rescued native aquatic fauna are relocated to suitable habitats	Flora and Fauna CEMP Sub-plan	Construction	Environmental and Sustainability Manager Project Ecologist	CoA C4	Post-clearing Checklist
FF25	Sediment and water quality control structures are installed and monitored	Soil conservationist	Construction	Environmental and Sustainability Manager Project Ecologist	CoA B5	Surface Water Monitoring Program

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
FF26	Wetland monitoring is undertaken in accordance with the M6 Stage 1 Wetland Monitoring Program	Wetland Monitoring Program	Construction	Environmental and Sustainability Manager Project Ecologist	C13	Monitoring Report
Pests and diseases						
FF27	A procedure for controlling the introduction and spreading of weeds, diseases and pests to be developed and implemented	Weed Management Procedure	Pre construction	Construction environment manager and superintendent	G36 Cl 4.8(d), EMM B4	Appendix H
FF28	A protocol to minimise the potential for the spread of pathogens such as Chytrid or *Phytophthora* fungus into and out of the site during construction to be developed and implemented	Weed Management Procedure	Pre construction	Environmental and Sustainability Manager Project Ecologist	EMM B4	Section 6.7
FF29	Hygiene stations are provided at access points to areas with known GGBF populations	Site Environment Plans	Construction	Environmental and Sustainability Manager Project Herpetologist	EMM B5	GGBF PoM Monitoring Reports

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference	Evidence
FF30	Soil and vegetation contaminated with weeds and weed seed are collected and transported at an appropriate green waste facility	Weed Management Procedure	Construction	Environmental and Sustainability Manager Project Ecologist	CoA E42	Appendix H (Weed Management Procedure)

7 Compliance management

7.1 Roles and responsibilities

The CGU Project Team organisational structure and overall roles and responsibilities are outlined in Section 3.4 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Table 12 of this Plan.

7.2 Training

The key objectives of the FFMP and the management and mitigation measures used to achieve the key objectives will be presented to all staff and sub-contractors as a component of the Project Induction. Specific management actions focusing on wetland management and GGBF management will be incorporated into site specific inductions were required.

All employees, contractors and utility staff working onsite will undergo site induction training relating to soil and surface water management. Induction training will address elements related to soil and water management including:

- Requirements of this Plan;
- Relevant legislation;
- Roles and responsibilities flora and fauna management;
- Procedures to be implemented in the event of an unexpected finds;
- Biodiversity management and protection measures;
- Emergency response procedures (spills).

Targeted training in the form of toolbox talks and specific onsite training will also be provided to personnel. Further details regarding staff induction and training are outlined in Section 3.6 of the CEMP.

7.3 Monitoring and inspections

Monitoring and inspection requirements are outlined in the Flora and Fauna Monitoring Program (Appendix J) and Wetland Monitoring Program (Appendix I). Additional requirements and responsibilities in relation to inspections are documented in Section 3.9.1 and Section 3.9.2 of the CEMP.

7.4 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this CEMP Sub-plan, CoA and other relevant approvals, licences and guidelines. Audit requirements are detailed in Section 3.9.3 of the CEMP.

7.5 Reporting

Reporting requirements and responsibilities are documented in Section 3.9.4 and 3.9.5 of the CEMP. Additional reporting will also be generated in accordance with the Flora and Fauna Monitoring Program (Appendix J) and Wetland Monitoring Program (Appendix I). These reports will be made publicly available for review

8 Review and improvement

8.1 Continual improvement

Section 3.2.2 of the CEMP describes the process for the continual improvement of Project documents.

Continual improvement of this Plan will be achieved by ongoing evaluation of environmental management performance against environmental policies, objectives and targets, for the purpose of identifying opportunities for improvement.

The continual improvement process is designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies, and develop and implement a plan of corrective and preventative actions (refer to Section 3.12 of the CEMP);
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

8.2 FFMP update and amendment

Section 3.13 of the CEMP describes the process for revising and updating the CEMP and its Sub-plans. This will occur as needed. Only the Environmental and Sustainability Manager, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure - refer to Section 2 of the CEMP.

Appendix A – Pre Clearing Checklist

Pre-Clearing Inspection Checklist

Project:	**Project No:**
Requested By:	**Lease / Lot Number:**
Planned Clearing Start Date:	**Expected Completion Date:**

VEGETATION CLEARING LOCATIONS – ATTACH DRAWINGS / SKETCHES IF NECESSARY

GPS Coordinates		Location	Comments

Has the vegetation to be cleared been clearly delineated?		Yes		No		
All trees / vegetation to be retained identified and No-Go Areas fenced off?		Yes		No		
State how identified:_____						
Have habitat trees been identified and appropriately marked?		Yes		No		N/A
State how identified:_____						
Is there risk of weed infestation or spread?		Yes		No		
Were any animals observed? (If *Yes*, relocation required)		Yes		No		
Are any active nests present? (If *Yes*, relocation required)		Yes		No		
If soil disturbance is to occur, have ERSED controls been installed?		Yes		No		
Are the proposed works covered by an existing Approval?		Yes		No		

If yes, note permit number;		**expiry date**		**and attach a copy**	
Have relevant workers been shown limit of clearing, advised of fauna handling procedures and any other SHE controls?		☐	Yes	☐	No
Comments					
Inspection completed by:		**Date:**			
Signature/Role					
Approval by Environmental Representative/Advisor:		**Date:**			
Signature/Role					

Appendix B – Clearing Permit

Permit to Clear Land or Vegetation

SECTION 1 – REQUEST DETAILS					
Site			**Date**		
Area Supervisor			**Position**		
Purpose of Ground Disturbance					
Total disturbance area (ha)			**Date disturbance to commence**		
Estimated Topsoil Depth (mm)			**Date disturbance to be completed**		
Estimated Topsoil volume (m^3)			**Machinery to be used**		
Map (attached)	☐Yes	☐No	**Comments:**		
Has a risk Work Pack been completed for this task?	☐Yes	☐No	**Comments:**		
GPS Coordinates of planned area to be disturbed					
Once the above is completed please forward to Environmental Representative/Advisor for processing					
OFFICE USE ONLY:	Permit #_____ Status Received by Environmental Representative/Advisor: DD/MM/YY Submitted to Client for Approval: DD/MM/YY Followed up: DD/MM/YY Approval Received: DD/MM/YY				
SECTION 2 – PERMIT CONDITIONS					

Condition		Area Supervisor to Complete		
		Date	Initial	Comments
2.0	No clearing to be undertaken until this Permit to Clear Land or Vegetation is received, signed, completed and all permit conditions understood and in place			
2.1	Disturbance area delineated with flagging tape			
2.2	Pre Clearing Inspection Checklist completed			
2.3	Exclusion areas identified and boundaries marked and clearly visible.			
2.4	Appropriate Cultural Heritage permit/s are in place where applicable (check with Client)			
2.5	Ground engaging equipment confirmed as weed free (use Tool: Plant and Equipment Cleandown Declaration).			
2.6	Operators working in the area have been shown the clearing limits by Area Supervisor. Personnel undertaking works are appropriately trained and aware of environmental risks.			
2.7	Large, woody vegetation to be stockpiled separately in approved location or used for Erosion Sediment control or fauna habitat.			
2.8	Disturbance area inspected for fauna and habitat trees and relocated, where applicable			
2.9	Topsoil to be removed to a ___ mm depth Subsoil to be removed to a ____mm depth			
2.10	Topsoil to be stockpiled in approved areas. Subsoil to be stockpiled separately in approved areas			
2.11	Topsoil and subsoil stockpiles are to be less than 2m high			
2.12	Topsoil stockpiles to be signposted and mapped.			
2.13	Area to be surveyed post disturbance to ensure no unauthorised disturbance.			
2.14	Post Clearing Inspection Checklist to be completed at completion of clearing			

2.15	<Insert Other Conditions as required>			

SECTION 3 – PERMIT ISSUE (Completed by Permit Issuer)

I confirm the work area is controlled and authorise work to proceed in strict accordance with the conditions stated in this Work Permit and associated Work Pack and Site Environmental Plans.

Permit Issuer		**Signature**		**Date & Time**	

SECTION 4 – PERMIT ACCEPTANCE (Completed by Permit Holder)

I confirm and accept the conditions stated in this Work Permit and associated work activity documents. I will ensure strict adherence to these conditions and all persons under my control will be advised accordingly.

Permit Holder		**Signature**		**Date & Time**	

SECTION 5 – SIGN OFF

Site Environmental Representative OR Project Manager Sign Off

Name		**Signature**		**Date**	

Client Representative Sign Off (if needed)

Name		**Signature**		**Date**	

Area Supervisor Sign Off

Name		**Signature**		**Date**	

Equipment Operators Involved in Clearing

- **have been advised of Land Disturbance Permit conditions and understand requirements/clearing boundary**

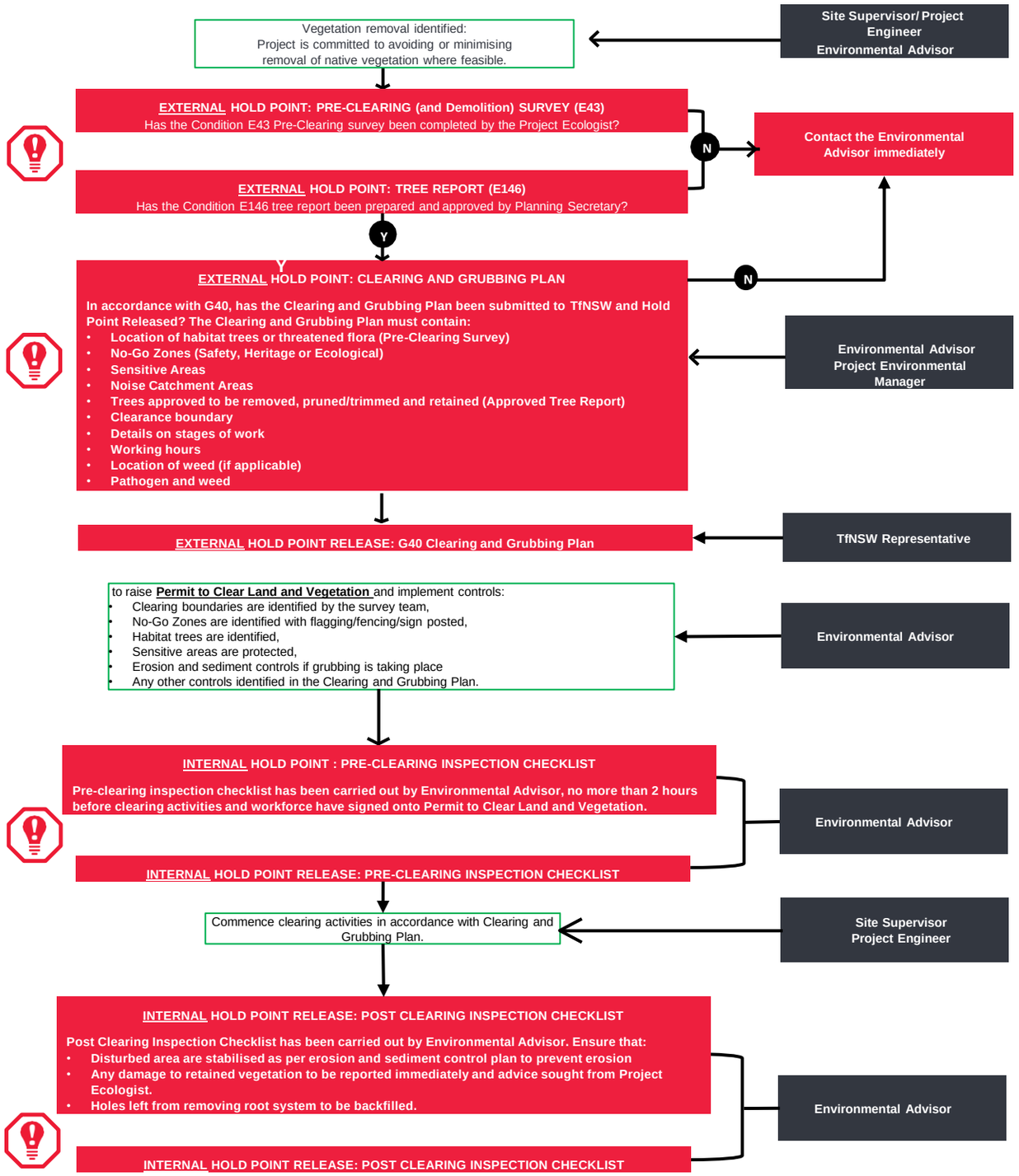
Name		**Signature**		**Date**	

Name		**Signature**		**Date**	
Name		**Signature**		**Date**	
Name		**Signature**		**Date**	

Appendix C – Clearing Procedure

TREE CLEARING AND GRUBBING MANAGEMENT PROCEDURE

MANAGEMENT AND RESPONSIBILITY



PROTOCOL

NOTE: No clearing works are to commence until the applicable Clearing and Grubbing Plan TfNSW Hold Point has been released and the Pre-Clearing Inspection Checklist has been completed. Clearing is to be undertaken as per Guide 2 Exclusion Zones of Roads and Maritime's Biodiversity Guidelines.

Delineate Vegetation to be Cleared or Trimmed

Environmental Advisor and Site Supervisor to delineate the area of vegetation to be cleared or trimmed based on a survey, by the use of fencing or flagging. Delineate area of vegetation to be retained and install "No-Go Zone – Protected Vegetation" signage.
Different coloured flagging can be used to differentiate clearing boundary, exclusions zones and protected species. This is to be documented in the Cleaning and Grubbing Plan and communicated to work crews by the Supervisor.

Pre-clearing Survey and Inspection of Vegetation

- Before the removal or clearing of any vegetation, or the demolition of structures identified as potential roosting sites for microbats commences, pre-clearing/demolition inspections for the threatened species must be undertaken. The inspections, and any subsequent relocation of fauna and associated management/offset measures, must be undertaken under the guidance of a suitably qualified and experienced ecologist.
- Pre-clearing Survey to be completed by Project Ecologist and habitat trees marked.
- A Clearing and Grubbing Plan with reference to the CGU Weed Management Procedure needs to be compiled in accordance with **TfNSW G40 Clearing and Grubbing** and submitted at least seven days prior to clearing activities.
    - Once Hold Point has been released by TfNSW, clearing activities can proceed in accordance with Clearing and Grubbing Plan.
- Project Ecologist and/ or Environmental Advisor to inspect for presence of fauna prior to any work commencing and manage any native fauna.
- Project Ecologist and/ or Environmental Advisor to inspect for presence/absence of Myrtle rust or Phytophthora.
- The Project Ecologist is to determine a suitable relocation area if fauna is encountered.
- Toolbox talk or Pre-start Meeting to be undertaken to discuss limit of clearing, clearing procedures, fauna handling and any weed identification and control measures.

Implement Environmental Controls

- If grubbing is to be undertaken then erosion and sediment controls will be installed, where required, prior to grubbing to ensure that soil laden with seed does not run off site.
- Equipment storage areas and stockpile areas are to be located in cleared areas.
- Prior to entry onsite plant and equipment need to be free of soil, foliage/leaves and mud. Declare if plant and equipment had previously worked in areas where Myrtle Rusk and Phytophthora is present, and provide evidence that all plant, equipment and vehicles have been washed down, where required
- Top soil is to be separated from sub soil and green waste and stockpiled for reuse onsite or offsite. Stockpiles must be appropriately delineated and not be compacted.

Remove Vegetation

- Only clear within delineated area. **ANY CLEARING OR TRIMMING NEEDED OUTSIDE THE PROJECT FOOTPRINT MUST BE APPROVED BY THE PROJECT Environmental Manager BEFORE THE ACTIVITY IS STARTED.**

Procedure for initial site clearing is as follows:

1. All non-marked trees and features will be removed first. Groundcover habitat features that are not too large to be moved will be removed and searched by the Environmental Advisor and/or Project Ecologist. All remaining marked habitat trees will be left intact.

2. Groundcover features such as logs will be gently rolled and searched for the presence of animals at the end of the shift.
3. At least 24 hours* after the clearance of non-marked vegetation, each habitat tree will be carefully removed in the presence of a suitably qualified ecologist and/or fauna rescue personnel, and thoroughly searched for the presence of animals:
    - Marked trees will be shaken prior to felling using a excavator or similar equipment to allow any fauna using the hollows to be observed.
    - Hollow-bearing trees will be slowly pushed over, with care taken to avoid damage to hollows.
    - Fauna rescue personnel (Environmental Advisor or qualified ecologist) will instruct the equipment operators regarding how and which side to fell the trees so that hollows can be quickly checked. In some circumstances sections of a tree containing a hollow or habitat may be individually removed prior to felling. For example, a hollow branch could be individually removed and placed gently on the ground for checking by fauna rescue personnel, prior to felling the tree.
4. Habitat features to be used for habitat enhancement or in rehabilitation works will be relocated to adjacent habitat (subject to landowner consent).

- Any tree clearing will require presence of the Environmental Advisor:
    - Ensure all environmental controls (where required) are in place before removal of vegetation occurs.
    - Report any injured native fauna to the Environmental Advisor immediately.
    - Native fauna should be relocated to the specified relocation area.
- If personnel are unsure where clearing may or may not be undertaken, contact the Environmental Advisor or Project Environmental Manager prior to carrying out works.
- Mulch may be reused on-site for erosion and sediment control, if practicable. Residual mulch is to be taken to a recycling facility. Records of mulch/ green waste sent off site will be recorded.

5. Impacts to plant community types must not exceed approved locations, unless otherwise approved by the Planning Secretary. In requesting the Planning Secretary's approval, CGU must provide to the Planning Secretary an assessment of the additional impact(s) to plant community types and an updated ecosystem and/or species credit requirement under Condition E40, if required.

*as referenced in *Transport Roads and Traffic Authority Biodiversity Guidelines: Protection and managing biodiversity on RTA projects.*

Project: M6S1 Approved By: SBeitel	Revision: 00 Date:12/11/2021 Printed copies are uncontrolled

CPB CONTRACTORS | Ghella | UGL

Appendix D – Post Clearing Checklist

Post-Clearing Inspection Checklist

Project: **Project No:**

Completed By:

Vegetation Clearing Start Date: **Completion Date:**

Note: in some regions there may be additional requirements for clearing (check with the Environmental Representative for your project).

VEGETATION CLEARING LOCATIONS – ATTACH DRAWINGS / SKETCHES IF NECESSARY

GPS Coordinates		Location	Comments

Was all clearing within the vegetation clearing limits?		Yes		No		
Were any trees marked as 'to be retained' impacted by the works?		Yes		No		
Were any habitat trees impacted by the clearing works?		Yes		No		N/A
Were non-habitat trees removed before habitat trees?		Yes		No		N/A
Were any fauna, nests or other fauna features impacted by the clearing works?		Yes		No		N/A
Were any animals shocked, injured or killed as a result of the clearing works? If *Yes*, what action was taken?		Yes		No		
Area Cleared, Topsoil Volumes and Locations Surveyed		Yes		No		
Was the *Process: Fauna Management* followed for any fauna impacted by the works?		Yes		No		N/A

Comments:

Inspection completed by: **Date:**
Signature/Role

Approval by Environmental Representative/Advisor: **Date:**
Signature/Role

Appendix E – Fauna Handling Procedure

FAUNA HANDLING PROCEDURE

MANAGEMENT AND RESPONSIBILITY

INDUCTIONS/TOOLBOX TALKS
All personnel are to receive Inductions and ongoing training via Toolbox Talks.

Site Supervisor
Environmental Advisor
Project Environmental Manager

FAUNA ENCOUNTERED

If any native fauna is encountered, stop work in the immediate area and contact the Environmental Advisor.

In the event of encountering fauna that is likely to be affected, the Site Supervisor/Site Engineer is to:

1. Immediately cease all work likely to affect the fauna.
2. Notify the Environmental Advisor.

The Environmental Advisor is to:

1. In the case of a snake, contact the snake handler (where required). The snake handler will relocate all snakes to a suitable location.
2. In the case of a bat, will contact a suitable qualified ecologist to relocate the bat to a suitable location.

To minimise stress to fauna during relocation the following is to be followed:

1. Ensure appropriate PPE (e.g. leather gloves) prior to attempting to handle fauna.
2. Cover larger animals with a towel or blanket and place in a cardboard box and/or hessian bag.
3. Place smaller animals in a cotton bag, tied at the top; and keep the animal in a quiet, warm, ventilated and dark place.
4. If fauna is not injured relocate to a suitable location. If cats or dogs are found, return to owner or local animal shelter.

Site Supervisor
Site Engineer
Environmental Advisor

INJURED FAUNA

For snakes and bats that are seriously injured and require immediate attention, the appropriate rescue service, ecologist or snake handler will be called immediately. For all other native fauna, agreement will be made with the rescue agency if the animal will be collected or taken to animal hospital.

Site Supervisor
Environmental Advisor
Project Environmental Manager

Rescue Service Contact

WIRES	1300 094 737
RSPCA (Emergency Line)	02 9770 7556
Sydney Snake Catchers	1300 599 938
Kogarah Veterinary Hospital	02 9588 4588
Sydney Wildlife	02 9413 4300

PROTOCOL

HANDLING PROCEDURE

1. If the animal cannot be handled (i.e. venomous reptile or bats), the exact location of the animal is to be recorded and provided to the snake handler or suitable qualified ecologist. All personnel and/or subcontractors are to be excluded from the vicinity.

   Once the snake handler or ecologist arrives on site they are responsible for the fauna. Any decisions regarding the care of the animal will be made by them.

2. If the animal does not require immediate attention, as determined by the Environmental Advisor in consultation with the fauna specialist (where required), a rescue service will be called to collect any animals requiring attention.

3. In the event the rescue service cannot attend, the Environmental Advisor will deliver the injured/captured animal (other than snakes or bats) to the animal service/ shelter as soon as practically possible.

RELEASE PROCEDURE

(native fauna other than snakes or bats)

If the animal is not injured, the Environmental Advisor in consultation with the ecologist (where required) may release the fauna into a suitable area in accordance with the following procedures:

1. The Environmental Advisor in consultation with the ecologist (where required) is to be responsible for undertaking the release

2. If the species is nocturnal, release should be carried out at dusk if practicable.

DOMESTIC ANIMALS

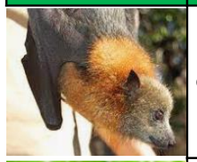
(i.e. dogs & cats)

If the animal is not aggressive, the Environmental Advisor in consultation with the Community and Stakeholder Team to make arrangements for the animal to be returned to its owner (if details are provided on the animals collar). If there are no details, the Environmental Advisor in consultation with the Community and Stakeholder team to make arrangements for the animal to be taken to the local council animal shelter. If the animal is aggressive, the Environment Coordinator is to arrange for the local council animal control officer to collect the animal.

If the animal is injured and not aggressive, the Environment Coordinator in consultation with the Community and Stakeholder team will take the animal to the nearest vet.

REPORTING

Records of any fauna handling will be recorded by the Environmental Coordinator

IMAGE	FAUNA	OEH ACT	EPBC ACT
	Grey-headed Flying Fox	**Vulnerable**	**Vulnerable**
	Green and Golden Bell Frog	**Endangered**	**Vulnerable**

If the above fauna are located within site boundaries, stop works in the vicinity and contact Environmental Coordinator immediately.

Appendix F – Green and Golden Bell Frog Stop Work Procedure

GREEN AND GOLDEN BELL FROG STOP WORK PROCEDURE

MANAGEMENT AND RESPONSIBILITY

INDUCTION/TOOLBOX TALKS

- All personnel are to receive inductions and on-going training via toolbox talks
- Reminder: all Green and Golden Bell Frogs (GGBF) regardless of whether they are healthy, sick or dead must be reported to the Environmental Advisor.

Site Supervisor
Environmental Advisor

HOLD POINT:
GREEN AND GOLDEN BELL FROG ENCOUNTERED
Stop work in the immediate area and contact the Environmental Advisor or if they are not available contact the Environmental Manager.

Site Supervisor
Environmental Advisor

The Environmental Advisor or Environmental Manager is to contact the nominated Project Herpetologist (PH) immediately. The PH will set a pick up time. CGU will not be involved in the relocation of any GGBF.

Environmental Advisor
Environmental Manager

The GGBF will then be removed from the work area by the Environmental Officer or a nominated person. The flowing steps should be undertaken when handling a frog:

- Hands must be cleaned with disinfectant or the handler must wear a pair of new disposable gloves. If you are a smoker, do not handle the frog.
- Frogs are very sensitive to changes in their body temperature, so handle the frog as little as possible (less than 30 sec) and in a gentle manner.
- Place frog in frog pen and cover frog with moist paper towel (soaked in potable water) to keep it wet and secure lid.
- Avoid heat transfer but placing the pen in a safe cool area.
- All frogs will be collected and released by PH.

Environmental Advisor
Environmental Manager
Nominated Handler

HOLD POINT RELEASE
Work activities can recommence in vicinity.

Site Supervisor

The encounter with the GGB will be recorded by the Environmental Advisor and a Pre-start Notice will be issued to inform wider workforce.

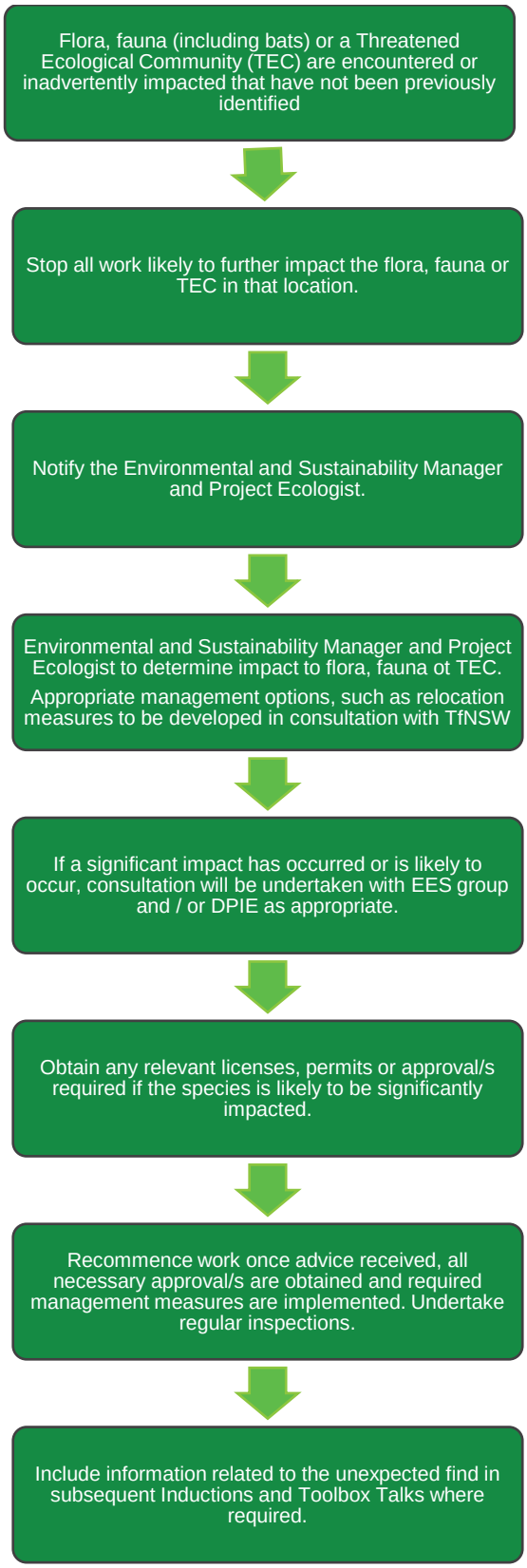
Environmental Advisor

How to identify between a healthy and sick frog

Limit handling frogs to less than 30 sec. Before touching any frogs, hands must be cleaned with disinfectant or the handler must wear a pair of new disposable gloves. If you are a smoker, do not handle the frog.

- Gently touch frog with finger – healthy frogs will blink, sick frogs will not.
- Turn frog on its back – healthy frogs will flip back over, sick frogs will remain on its back.

Appendix G - Unexpected flora or fauna finds procedure



Appendix H - Weed Management Procedure

WEED MANAGEMENT PROCEDURE

MANAGEMENT AND RESPONSIBILITY

Assess Area
Do the weeds occur within or outside the Project boundary?

Site Supervisor
Environmental Advisor

Within Project boundary (onsite)

WEED CONTROL

Use of herbicides requires approval from the Project Environmental Manager

Use of non-glyphosate herbicide requires approval from the Lead Safety Manager and Approvals, Environment and Sustainability Manager

Any use of herbicides will be strictly in accordance with the Pesticides Act 1999, product label, and the Project WHS Management Plan.
Overspray of herbicides to be limited when spraying near water (creeks etc.)
A Pre-clearing and Grubbing Checklist is to be completed. Herbicide application to be administered by authorized and experienced personnel only. Product SDS to be onsite during application and SWMS to be prepared.

Outside Project Boundary

Site Supervisor
Environmental Advisor

Use of herbicides outside of the Project Boundary Works Boundary requires approval from the landowner.

If the works are not in CGU scope of works Environment Team are to be notified.

Construction Manager
Environmental & Sustainability manager
Project Environmental Manager
Site Supervisor
Environmental Advisor
TfNSW (offsite)

STABILISATION OF AREA

Following weed control, any bare soil areas will be assessed and appropriate mitigation measures implemented i.e. stabilisation, erosion & sediment controls etc.

Site Supervisor
Environmental Advisor

DISPOSAL OF WEEDS
Removed weeds must be disposed of to avoid further weed dispersal:

- Encapsulate onsite
- Transport to an appropriate green waste facility.
- Disposal method is to be determined by the Environmental Advisor. It is noted that weeds controlled with herbicide may be left in-situ or mulched (removal and disposal is not required).

Site Supervisor
Environmental Advisor

ONGOING MANAGEMENT

Ongoing weed management is essential to control weed infestations.

Periodic visual assessment of weed re-growth is to be undertaken.

Methods such as hand weeding to be used around retained vegetation (onsite) and in adjacent vegetated areas (offsite), to protect vegetation from potential mechanical or chemical damage.

Site Supervisor
Environmental Advisor

NOXIOUS WEEDS TO BE CONTROLLED

(Identified in EIS)

WEED	SOLUTION	WEED	SOLUTION
Scientific name: Anredera cordifolia Common name: Madeira Vine		Common name: Foeniculum vulgare Scientific name: Fennel	
Scientific name: Araujia sericifera Common name: Moth Vine		Scientific name: Ipomoea alba Common name: A Morning Glory	
Scientific name: Bidens pilosa Common name: Cobbler's Pegs		Scientific name: Lantana camara Common name: Lantana	
Scientific name: Cestrum parqui Common name: Green Cestrum		Scientific name: Ochna serrulata Common name: Mickey Mouse Bush	
Scientific name: Chrysanthemoides monilifera subsp. rotundata Common name: Bitou Bush		Scientific name: Parietaria judaica Common name: Asthma Weed	
Scientific name: Cinnamomum camphora Common name: Camphor Laurel		Scientific name: Paronychia brasiliana	
Scientific name: Conyza bonariensis Common name: Fleabane		Scientific name: Pennisetum clandestinum Common name: Kikuyu	
Scientific name: Ehrharta erecta Common name: Panic Veldt Grass		Scientific name: Ricinus communis Common name: Castor Oil Plan	
Scientific name: Erythrina crista-galli Common name: Cockspur Coral		Scientific name: Rumex crispus Common name: A Dock	
Scientific name: Rubus fruticosus sp. agg. Common name: Blackberry		Scientific name: Tradescantia fluminensis Common name: Trad	

KEY

- Cut and paint herbicide treatment
- Hand weeding
- Spray with herbicide treatment

Pathogen Management

Prior to entry onsite plant and equipment need to be free of soil, foliage/leaves and mud.

Prior to entry onsite declare if plant and equipment had previously worked in areas where Myrtle Rusk and Phytophthora is present, and provide evidence that all plant, equipment and vehicles have been washed down, where required

Prior to entering RTA Ponds area personnel are required to clean and disinfect boots and equipment before entering the area

Appendix I – Wetland Monitoring Program

Wetland Monitoring Program

Project Name: M6 Stage 1

Project number:	M6S1
Document number:	M6S1-CGU-NWW-PE-PLN-000406
Revision date:	06/12/2021
Revision:	01

Document approval

Rev	Date	Prepared by	Reviewed by	Remarks	
A.01	24/08/2021	S.Cummins & K.Duchatel	B. Pellow		
A.02	7/10/2021	S. Cummins	C. Gibson		
00	15/11/2021	K.Duchatel	S. Beitel		
01	06/12/2021	S. Beitel	C Griffiths		

Table of Contents

Table of Tables

Table of Figures

1. Introduction

1.1. Context

This Wetland Monitoring Program (WtMP or Monitoring Program) has been prepared for implementation during construction of the M6 Motorway Stage 1 (the Project). The Project was declared critical State Significant Infrastructure (SSI 8931) for which development consent was granted on 18 December 2019.

The Project entails the construction of:

- A tunnel portal and entry and exit ramps connecting twin motorway tunnels between the New M5 Motorway at Arncliffe and President Avenue, Kogarah to the surface
- Intersection improvements at the President Avenue/Princess Highway intersection
- Shared pedestrian and cycle pathways connecting Bestic Street, Rockdale to Civic Avenue, Kogarah via Rockdale Bicentennial Park (including an on-road cycleway)
- Ancillary infrastructure and operational facilities

The Project is located within Rockdale Wetland Corridor and will directly impact on three wetland areas. From upstream, these include Kings Wetland; Bicentennial Rockdale Wetlands; and Scarborough Pond North. Indirect impacts are also considered for Scarborough Pond South and the downstream aquatic environment of Botany Bay.

The Department of Planning, Industry and Environment (DPIE) has issued an Infrastructure Approval which includes conditions for monitoring of wetland health and development of trigger levels to enable the implementation of management measures should any adverse changes be observed.

1.2. Scope

This Monitoring Program has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Environmental Management Measures (EMM) listed in the M6 Stage 1 Environmental Impact Statement (EIS) and other applicable legislation.

This Monitoring Program forms part of the Construction Environmental Management Plan (CEMP) and further context is provided in the Flora and Fauna CEMP Sub-plan (FFMP) and CEMP. Specifically, this WtMP has been prepared to satisfy Conditions C13 to C15 and C18 of SSI 8931. Table 1 summarises these requirements and where they have been addressed.

Table 1. CoA

<table>
<tr><th>CoA</th><th>Requirement</th><th>Reference</th></tr>
<tr><td>C13(g)</td><td>The Construction Monitoring Programs set out in Table 5 must be prepared and implemented to enable comparison of the actual construction performance against the predicted performance. The Construction Monitoring Programs must be prepared in consultation with the relevant government agencies and councils as identified for each Construction Monitoring Program.

Table 5: Construction Monitoring and relevant public authorities
<table><tr><th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr><tr><td>(g)</td><td>Wetland Monitoring Program</td><td>EES</td></tr></table></td><td>This Monitoring Program.

Consultation is addressed in Section 2.3</td></tr>
<tr><td rowspan="13">C14</td><td>Construction Monitoring Programs must include:</td><td></td></tr>
<tr><td>a) details of baseline data available</td><td>Section 4.2</td></tr>
<tr><td>b) details of baseline data to be obtained and when</td><td>Section 4.3 and Table 3 and Table 4</td></tr>
<tr><td>c) details of all monitoring that will be undertaken</td><td>Section 4.3 and Section 4.4</td></tr>
<tr><td>d) the parameters of the project to be monitored</td><td>Section 4.3 and Section 4.4</td></tr>
<tr><td>e) the frequency of monitoring</td><td>Table 4</td></tr>
<tr><td>f) the location of monitoring</td><td>Figure 3</td></tr>
<tr><td>g) the reporting of monitoring and analysis results against relevant criteria, including details of the timing and frequency for reporting the results to the Planning Secretary and relevant government agencies</td><td>Section 4.6.1</td></tr>
<tr><td>h) details of the methods that will be used to analyse the monitoring data</td><td>Section 4.6.2</td></tr>
<tr><td>i) procedures to identify and implement additional mitigation measures where results of monitoring indicate adverse impacts or levels above relevant criteria</td><td>Section 4.6.3</td></tr>
<tr><td></td><td>4.6.3</td></tr>
<tr><td>k) any consultation to be undertaken in relation to the monitoring programs</td><td>Section 2.3</td></tr>
<tr><td>l) any specific requirements as required by Conditions C15 to C18, as relevant</td><td>Refer C18</td></tr>
<tr><td rowspan="4">C18</td><td>The Wetland Monitoring Program must include:</td><td></td></tr>
<tr><td>(a) water quality monitoring sites within Patmore Swamp, Kings Wetland, and upstream and downstream of the creek diversion works in Rockdale Bicentennial Park</td><td>Section 4.3, Table 4.3 and Figure 3</td></tr>
<tr><td>(b) monitoring of water levels, electrical conductivity, turbidity, pH, suspended solids, dissolved oxygen and nutrients</td><td>Section 4.3
Table 3</td></tr>
<tr><td>(c) standards against which any changes to water quality will be assessed</td><td>Section 4.6.1
Table 3</td></tr>
</table>

CoA	Requirement	Reference
		Table 5
	(d) monitoring of health of aquatic and riparian flora and fauna species in Patmore Swamp, Kings Wetland and Rockdale Bicentennial Park, including species density and diversity; and	Section 4.3.6 Figure 3
	(e) trigger points for responding to any monitored changes which adversely impact on water quality, surface water levels or aquatic and riparian flora and fauna.	Section 4.6.1 Section 4.6.3
C19	The Construction Monitoring Programs must be developed in consultation with the relevant government agencies as identified in Condition C13 of this approval, and must identify information, including monitoring parameters, requested by a relevant agency to be included in a monitoring program.	Section 2.3
C20	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month prior to the commencement of construction.	Section 2 of CEMP
C21	Construction, which is required to be monitored under the Construction Monitoring Programs, must not commence until the Planning Secretary has approved all of the required Construction Monitoring Programs and all relevant baseline data for the specific construction activity has been collected.	Section 2 of CEMP
C22	The Construction Monitoring Programs, as approved by the Planning Secretary and including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	Section 4.1
C23	The results of the Construction Monitoring Programs must be made publicly available in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program. Note: Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 4.6
EMM B3	A Wetlands Management Plan is to be prepared and implemented, in consultation with relevant stakeholders, to manage waterbodies and riparian land within the project footprint that may be impacted by the project during construction. The objectives of the plan will be to: ▪ Maintain and improve the condition of the affected wetlands ▪ Reinstate and rehabilitate any riparian land impacted by the project ▪ Provide positive ecological and amenity outcomes for the environment and local community.	Section 2.2 Section 2.3 Section 4.7
	The plan will include: ▪ Consideration of potential water quality, hydrology, amenity and flora and fauna impacts and mitigation	Section 3 Section 4
	▪ A process for dewatering and restoration of the Rockdale Wetland, including measures developed by an ecologist to handle and relocate aquatic fauna	Section 4.7
	▪ A monitoring program to assess the effectiveness of the mitigation measures and to identify new measures that may be required.	Section 4.6.1
	▪ The plan is to be prepared by a suitably qualified ecologist with experience in wetlands management.	Section 4.7

CoA	Requirement	Reference
EMM SWF3	Treatment measures will be implemented within the waterbodies of Scarborough Park North and Rockdale Bicentennial Park disturbed by the project during construction, to reduce algal bloom conditions and contribute to achieving the NSW Water Quality Objectives over time. Treatments will be considered in consultation with Bayside Council and will include the establishment of macrophyte zones, bank reshaping of the wetland zones; and the use of solar powered devices to aerate the water column.	Section 4.7

2. Purpose and objectives

2.1. Purpose

CoA C4 of the CEMP requires the preparation of the FFMP to outline processes and responsibilities to avoid, manage and mitigate impacts to flora and fauna during construction. The FFMP includes Monitoring Programs to assess the effectiveness of the mitigation measures and to identify new measures that may be required – the purpose of this WtMP.

The WtMP is one of a series of technical documents that support the Project Construction Environmental Management Plan (CEMP) as the following hierarchy shows:

- CEMP
  - Flora and Fauna CEMP Sub-plan
    - Flora and Fauna Monitoring Program
    - Wetland Monitoring Program

2.2. Objectives

Key objectives of the WtMP are to ensure that all CoA are met, compliance with relevant legislation, and address agency submissions and the EMM outlined in the Response to Submissions on the Environmental Impact Assessment (EIS) (refer Table 1).

This is achieved through the following:

- Establishing monitoring parameters that enable comparison of the actual construction performance against the predicted performance of mitigation measures
- Identifying thresholds for monitoring parameters that if exceeded will trigger the need for management responses
- Scheduling and assignment of responsibilities of monitoring requirements

Reinstatement, rehabilitation and improvement of any riparian land impacted by the project to Provide positive ecological and amenity outcomes for the environment and local community is managed under the Project Urban Design and Landscape Plan (UDLP).

2.3. Consultation

In accordance with CoA C13(g), the Energy, Environment and Science (EES) group were provided with the WtMP via the DPIE Portal on 8 October 2021. EES raised no issues in their response provided 9 November 2021.

The WtMP was also provided to relevant councils (Bayside Council, Canterbury Bankstown Council and Georges River Council) during consultation on the Flora and Fauna CEMP Sub-plan who raised no issues. Community feedback and complaints relating to flora and fauna will be managed in accordance with the Project CEMP and Communications Strategy.

3. Study Area

3.1. Overview

The Project is located primarily within the Bayside Council Local Government Area (formerly Rockdale City Council). As shown in Figure 1, the WtMP study area extends from Kings Wetland (immediately west of Kings Road) to the southern end of Scarborough Park South (at the boundary of Ramsgate and due west of Emmaline Street). The study area includes the following waterbodies:

- Kings Wetland
- Rockdale Bicentennial Park Ponds
- Scarborough Pond North (within which lies Patmore Swamp)
- Scarborough Pond South

3.1.1. Hydrology

An unnamed, first order watercourse runs in a southerly direction through the study area continuing approximately two kilometres (kms) further before entering a stormwater culvert beneath Rotary Park in Ramsgate, which drains to Botany Bay. The watercourse is naturally ephemeral although it may appear perennial due to on-going discharges from industries and stormwater runoff from its urbanised catchment.

The western and eastern sides of the catchment predominantly comprise medium density residential development with some industrial development situated around the northern edges of the Rockdale Wetland Corridor. Runoff from urbanised areas is conveyed by the stormwater system into a series of piped outlets that discharge into the study area waterbodies.

Scarborough Pond North (between President Avenue and Barton Street) acts principally as a flood storage area for events up to 1 per cent AEP due to the relatively low velocity of the floodwater.

The NSW River Flow Objectives (RFO's) (DECCW, 2006) identify the Rockdale Bicentennial Park Ponds and Scarborough Ponds North and South as 'Waterways affected by urban development.'

3.1.2. Key Fish Habitat

Kings Wetland, Rockdale Bicentennial Park Ponds and Scarborough Pond North are not mapped as Key Fish Habitat (KFH) by the NSW Department of Primary Industries (DPI, 2021). However, the Scarborough Pond South (approximately 800 m south of President Avenue, south of Barton Street) is mapped as KFH (DPI, 2021). These areas of KFH are included in the study area due to their potential sensitivity and hydrological connectivity with the Project area.

3.1.3. Coastal Management SEPP

As shown in Figure 2, the study area is mapped as Coastal Wetland proximity areas and partially mapped as Coastal Wetland areas under the Coastal Management SEPP. The study area generally encompasses mapped Coastal Wetland areas except where mapping includes non-wetland open spaces areas.

3.2. Kings Wetland

Kings Wetland comprises a relatively small wetland area (approximately 200m^2) but is a locally listed heritage item, identified as item 2330162 on the NSW State Heritage Inventory (SHI, 2021a).

The SHI describes Kings Wetland as containing a bushland remnant, which provides a snapshot of the original vegetation present within the area prior to European settlement. The bushland remnant is reported as containing alluvial floodplain and coastal sands vegetation, represented by remnant

Swamp Oak Woodland along the western side of the wetland adjoining Bicentennial Park and Coastal Sands Swamp Forest communities along the eastern and northern sides.

Biodiversity surveys conducted as part of the EIS (Appendix H, Biodiversity development assessment report) confirmed the presence of the Plant Community Type (PCT) Coastal freshwater swamp forest (PCT 1232).

3.2.1. Construction activities

The Project's construction will involve ground disturbances, including the removal of trees to the east of the wetland where it borders Brighton-Le-Sands public school. The proposed tree removal allows for the construction of a haul road for construction purposes. Once the use of the haul road concludes, the active transport corridor (pedestrian and cycle track) will be installed to traverse the same alignment, with the remainder of the area rehabilitated back to its original state.

3.3. Rockdale Bicentennial Park Ponds

The Rockdale Bicentennial Park Ponds (the Bicentennial Ponds) are part of the Rockdale Wetlands Corridor, which was identified in the Rockdale Council Biodiversity Strategy (2014) as containing threatened ecological communities and providing key habitat for biodiversity in the former Rockdale LGA.

Within the study area, the Bicentennial Ponds extend south from Kings Park to President Avenue in the south and cover approximately 2.8 hectares (ha). Water level within the Bicentennial Ponds is regulated by a small weir at President Avenue (DECCW, 2006).

Biodiversity surveys conducted as part of the EIS (Appendix H) confirmed the presence of: Coastal Flats Swamp Mahogany Forest (PCT 1795); Coastal Freshwater Swamp Forest (PCT 1232); and various areas of planted natives and weed and exotic cover.

Around 20 specimens of one threatened plant species, *Syzygium paniculatum* (Magenta Lilly Pilly), are located within a landscaped area in the Bicentennial Ponds riparian zone. The Project EIS indicated that the origins and provenance of the specimens are unknown but were most likely planted. Five of these specimens will be removed during construction. Monitoring of those specimens that will be retained have been included as a component of the WtMP.

Anecdotal advice suggests that the Bicentennial Ponds are receivers of Eastern Long-necked Turtle and other aquatic reptiles as part of fauna relocation in the LGA (Rockdale Council, 2014).

3.3.1. Construction activities

The Project will involve the construction of entry and exit ramps at President Avenue, an ancillary facility, and a new shared cycle and pedestrian pathway. To facilitate construction of the exit ramp, dewatering and temporary realignment of the Ponds will be required.

3.4. Scarborough Ponds

Scarborough Pond North extends from President Avenue to Barton Street and Scarborough Pond South extends from south of Barton Street. Scarborough Park was once part of Pat Moore's Swamp or Patmore Swamp, which is historically associated with Patrick Moore who was granted 240,000 m2 of land in 1812. Patmore Swamp was formerly a tidal swamp that was drained and filled to create artificial lakes with the assistance of the government relief programme during the 1930s depression (SHI,2021b).

Patmore Swamp is a locally listed heritage item (no. 2330166) due to its technical significance, its contribution to the Central Scarborough wetland area corridor, and its historical value due to its role in the depression era program of public works (SHI,2021b).

Biodiversity surveys conducted as part of the Biodiversity development assessment for the EIS (Appendix H**,** Biodiversity development assessment report) confirmed the presence of the PCTs: Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline (PCT 1808), Coastal Freshwater Swamp Forest (PCT 1232); and regenerating shrubs.

3.4.1. Construction activities

Construction works associated with widening President Avenue will directly impact (through reclamation) a 30 m strip of Scarborough Pond North. Surface runoff from the President Avenue intersection and ramps and portals, ancillary facilities at West Botany Street, and water quality basin in Bicentennial Park will discharge to Scarborough Ponds North.

The southern extension of the shared cycle and pedestrian pathway will be located on primarily the western side of, and near Scarborough Pond North. The southern extent of the extended pathway would cross to the eastern side of the waterway via a bridge structure over the channel that links the two ponds that make up Scarborough Pond North. Construction of the pathway will require removal of the existing vegetation.

Figure 1 Extent of WtMP study area

Figure 2 Coastal Management SEPP areas

3.5. Sensitive receptors

Sensitive receptors (i.e. receiving aquatic environments) identified in this WtMP have been based on available studies, investigations undertaken as a component of the Project EIS and available baseline data. However, it should be noted that the following sensitive receptors may require amendment following the collection of pre-construction / baseline data (refer Section 4.3.6):

- Threatened ecological communities
- State Heritage listed wetlands (including Kings Wetland and Patmore Swamp)
- Groundwater dependent ecosystems
- Key Fish Habitat as mapped by DPI-Fisheries
- Botany Bay, which is the ultimate downstream aquatic environmental, which receives flows from the Project

3.5.1. Threatened Ecological Communities

Three threatened ecological communities (TECs) occur within the study area's riparian and aquatic zone:

- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (PCT 1232)
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions (PCT 1795)
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion (PCT 1808)

All areas of TECs within the study area are the subject of monitoring in this WtMP.

3.5.2. State Heritage listed wetlands

Kings Wetland and Patmore Swamp are both State Heritage listed wetlands (no's 2330162 and 2330166, respectively). Both Kings Wetland and Patmore Swamp contain TEC's and are the subject of monitoring in this WtMP.

3.5.3. Groundwater Dependent Ecosystems

No Groundwater Dependent Ecosystems (GDEs) that are highly reliant on groundwater have been identified within the study area. However, parts of Rockdale Bicentennial Park Ponds are identified as potential GDEs in the Bureau of Meteorology (BoM) GDE Atlas (Appendix H, Biodiversity development assessment report).

All waterbodies within the study area are the subject of monitoring in this WtMP. A separate Groundwater Monitoring Plan is required under the Project's CoAs. Information collected by the Groundwater Monitoring Plan will be used to help interpret any changes detected within the study area by the WtMP that could be attributed to changes in groundwater level or quality.

3.5.4. Key Fish Habitat (KFH)

As discussed in Section 3.1.2, mapped KFH occurs within Scarborough Pond South, south of Barton Street and therefore downstream of the Project area. Scarborough Pond South is included in the WtMP monitoring program to enable detection of any adverse effects on downstream KFH.

3.5.5. Botany Bay

Botany Bay is a significant end receiver of flows that originate from the Project area. Monitoring is not proposed within Botany Bay due to multiple direct and diffuse sources of potential pollutants. However, the inclusion of three monitoring sites downstream of the Project area (i.e. one site within Scarborough Pond North and two sites within Scarborough Pond South) will represent a downstream gradient from identified sources to enable an estimation of the geographic extent of

potential water quality exceedances, and provide comparison between discharge water quality and that entering Botany Bay. The design of the WtMP is discussed in detail in Section 4 of this report.

4. Wetland Monitoring Program

4.1. Overview

The primary objective of this WtMP is to monitor impacts of the Project on sensitive aquatic ecological receptors and estimate their geographical scale. During construction of the Project, risks to sensitive receptors such as aquatic macroinvertebrates and fish are likely to include removal and degradation of aquatic habitats, mobilisation of exposed sediments and altered hydrological regimes, among others (refer Table 2).

To assess the effects of the Project on sensitive receptors, the WtMP will monitor aquatic indices such as aquatic macroinvertebrates and fish within areas that are likely to be impacted by the Project (potential 'impact' areas) and areas with similar characteristics to those in the vicinity of the Project but not predicted to be influenced by project activities (i.e. control areas).

The WtMP will be implemented pre-construction and during construction to enable comparison of the actual construction performance against the predicted performance and the effectiveness of proposed mitigation measures.

Table 2. Ecologically sensitive receptors and potential impacts

Ecological receptors	Potential impacts to be monitored for
Sensitive receptors	
Threatened Ecological Communities (TECs) – riparian vegetation to be retained	Weed dispersal & spread Pathogens /disease dispersal & spread Sediment mobilisation from construction zones Dust mobilisation from construction zones Altered community composition Decreased native species diversity
Threatened Ecological Communities (TECs) – aquatic vegetation to be retained	Weed dispersal & spread Decreased native species diversity Pathogens /disease dispersal & spread Impacts to water quality from: ▪ sedimentation ▪ erosion ▪ acidification ▪ eutrophication Impacts to water levels from: ▪ temporary watercourse diversion ▪ changes in groundwater levels ▪ sedimentation
Key Fish Habitat (KFH)	Impacts from: ▪ altered hydrological regimes ▪ removal and degradation of riparian and aquatic habitats ▪ barriers to fish passage

Ecological receptors	Potential impacts to be monitored for
	▪ drained wetlands ▪ removal of large woody debris ▪ dredging ▪ increased sediment, nutrients and pollutants ▪ loss of important fish breeding habitat ▪ introduction of alien fish species and disease
Botany Bay (downstream aquatic environments)	Impacts from: ▪ sedimentation ▪ erosion ▪ acidification ▪ increased sediment, nutrients and pollutants ▪ loss of important fish breeding habitat
Ecological factors likely to be impacted	
Kings Wetland	As per TECs
Rockdale Bicentennial Ponds	As per TECs
Scarborough Pond North	As per TECs
Aquatic fauna	As per KFH Harm or mortality during dewatering

4.2. Available baseline data

4.2.1. Surface water quality monitoring

Continuous surface water level and groundwater level monitoring is required to be undertaken within Rockdale Bicentennial Ponds and surrounding area for at least 12 months prior to the commencement of construction.

A construction surface water monitoring program is required in accordance with CoA C13(a). The data generated from this program will be used to supplement baseline data collected for this WtMP and for comparison against any changes detected during the construction phase of the Project.

Surface water monitoring is being undertaken as part of the Project, including concentrations of ammonia, total nitrogen, total phosphorous and reactive phosphorous). Further information can be found in Appendix L (Surface water technical report) and Appendix M (Flooding technical report) of the EIS.

Water quality monitoring was conducted by GHD between 2016 and 2017 on behalf of Bayside Council, by Equatica between 2012 and 2013 on behalf of the former Rockdale City Council and in 1999 by Rockdale City Council. Key findings in relation to water quality within receiving waters of Rockdale Wetland and Scarborough Pond North are detailed in Appendix M (Surface water technical report) of the EIS. Results are indicative of a highly disturbed urban waterway.

4.2.2. Groundwater monitoring

A construction groundwater monitoring program is required in accordance with CoA C13(b). A detailed groundwater assessment has been undertaken for the Project and is included in Appendix K (Groundwater technical report) of the EIS. Groundwater monitoring has been undertaken across the study area as part of the F6 Extension geotechnical program, initially between October 2014 and March 2015 and later between July 2016 and February 2018 Appendix K (Groundwater

technical report). Groundwater monitoring has been undertaken at 20 monitoring well locations and this monitoring is ongoing. Groundwater data collected includes:

- Hydraulic connectivity (i.e. the rate at which groundwater naturally moves through the rock or sediments
- Groundwater levels (including fluctuations), determined through groundwater gauging (i.e. monitoring levels in groundwater wells) and data loggers
- Groundwater quality, determined through hydrogeochemical sampling and analysis Appendix K (Groundwater technical report).

Groundwater level monitoring and groundwater quality monitoring will be undertaken monthly as per Appendix K (Groundwater technical report). The data generated from this program will be used for comparison against any changes in water levels (refer Table 3 in Section 4.4) and any potential decrease in water quality detected during the implementation of the WtMP. Groundwater modelling predicts that the long-term surface water drawdown resulting from the Project as being in excess of 0.05 meters for the Rockdale Wetlands Appendix K (Groundwater technical report).

4.2.3. Health of aquatic and riparian flora and fauna

Baseline data for aquatic and riparian flora and fauna is sparse with most available literature reporting on qualitative observations and/or anecdotal evidence. Quantitative data was limited to the following:

- Ling, J.E. (2006) Testing aquatic macroinvertebrate and plant techniques for the biological assessment of wetlands: a consideration of the effects of errors and implications for sampling design.
  - Investigation of the robustness and rigour of biological assessment techniques to assess wetlands at various wetland sites including Rockdale Wetlands. Data to be requested from the author.
- AECOM (2018) F6 Extension Stage 1 from New M5 Motorway at Arncliffe to President Avenue at Kogarah - Appendix H: Biodiversity Development Assessment Report.
  - Relevant to the study area was the collection of data from four floristic site integrity plot/transects in accordance with the NSW Biodiversity Assessment Method (OEH 2017).
    - Limitations: The OEH (2017) Biodiversity Assessment Method (BAM) was updated in 2020 and there are some differences. Additionally, two plot/transects were collected from areas of native vegetation that will be cleared and limited data representation of areas of native vegetation to be retained.
- OEH (2016) The Native Vegetation of the Sydney Metropolitan Area - Version 3 VIS_ID 4489 (SydneyMetroArea_v3_2016_E_4489)
  - GIS layer containing digital mapping of the native vegetation communities of the Sydney Metropolitan area.
    - Limitations: Not all native vegetation within the Project area has been ground-truthed and /or the extent of mapped vegetation polygons has either been cleared or increased in extent since this mapping was undertaken.
- Qualitative studies /reports include (but may not be limited to):
  - White, A. and Burgin, S. (2004) Current status and future prospects of reptiles and frogs in Sydney's urban-impacted bushland reserves. In book: Urban Wildlife: More than Meets the Eye. (pp.109-123) Publisher: Royal Zoological Society of New South Wales.
  - Investigation of herpetofaunal assemblages in urban bushland reserves of Greater Sydney, including the Rockdale Wetlands Corridor.

- Rockdale Council (2014) Rockdale Council Biodiversity Strategy
- The strategy identifies ecological values present (flora and fauna and threatened ecological communities) within the LGA. It also identifies potential threats, areas of biodiversity connectivity, and priority biodiversity sites.
- Eco Logical Australia (2018) F6 Extension Stage 1 from New M5 Motorway at Arncliffe to President Avenue at Kogarah – Appendix H (Biodiversity development assessment report) in the EIS.

Eco Logical Australia (2018) verified existing vegetation community mapping (OEH, 2016) within the construction boundary for the Project to confirm the presence or absence of native vegetation communities, including presence of any TECs. Full floristics, vegetation integrity and condition plots were undertaken on 6 December 2017 Appendix H (Biodiversity development assessment report).

Three native vegetation types corresponding with three Plant Community Types (PCTs) were identified within the construction boundary during field surveys:

- Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion (PCT 1231)
- Swamp Mahogany / Cabbage Tree Palm – Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin (PCT 1795)
- Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline (PCT 1808) Appendix H (Biodiversity development assessment report).

The three PCTs are listed as Endangered under the BC Act. Vegetation within the assessment area is shown in Figure 4-1 to Figure 4-5 of Appendix H (Biodiversity development assessment report).

An aquatic assessment that included a desktop review followed by a site visit (23 January 2018) at Rockdale Bicentennial Park found no threatened aquatic species or populations and concluded that none were likely to depend on the habitat for survival Appendix H (Biodiversity development assessment report).

4.3. Baseline data to be obtained and monitoring to be undertaken

Sampling locations, methods and variables measured will be consistent for both pre-construction (baseline data) and during construction (monitoring data). Data that will be collected are detailed in the following sub-sections.

4.3.1. Surface water quality

In accordance with the WtMP, water quality sampling will be undertaken to assist in the interpretation of the aquatic and riparian flora and fauna data. Water quality will be measured at each site from just below the water surface using a multi-probe instrument that has been calibrated prior to sampling. Water quality will be measured prior to undertaking any biological sampling to avoid disturbance to the waterway. The following variables will be recorded:

- pH
- Temperature (ºC)
- Electrical conductivity (µS/cm)/Salinity (ppt)
- Dissolved oxygen (% saturation and mg/L)
- Turbidity (NTU).

Duplicate readings of each variable will be collected in accordance with Australian Guidelines (ANZECC/ARMCANZ 2000). Alkalinity (mg/L CaCO3) will be measured by field titration using an appropriate alkalinity kit. Two replicate samples of water will also to be collected to be analysed for

total suspended solids (mg/L), total nitrogen (mg/L), ammonia (mg/L), nitrates and nitrites (mg/L) and total phosphorous (mg/L). These water quality data are intended to provide information on environmental conditions at the time of sampling for aquatic ecology.

4.3.2. Habitat assessments

Aquatic habitat condition will be assessed at each of the selected sites using a modified version of the Riparian Channel and Environmental (RCE) inventory method (Chessman *et al*., 1997).

The RCE method involves evaluation and scoring of the characteristics of the adjacent land, the condition of riverbanks, channel and bed of the watercourse, and degree of disturbance evident at each site. Information is to be collected on the following features:

- Occurrence of key aquatic habitat (e.g. pools, macrophytes and woody debris)
- Characteristics of the waterway (e.g. flow and stream width)
- Water clarity
- Presence of in-stream and emergent aquatic macrophytes
- Barriers to fish passage
- Presence of algae, exotic plants, bank degradation, flocculent, odour, detergents, oil, rock piles or sedimentation, pipes, rubbish and point sources
- Surrounding land uses.

The maximum score (52) indicates a stream with little or no obvious physical disruption, and the lowest score (13) a heavily channelled stream without any riparian vegetation is considered to be in poor condition. A photo record, recording upstream and downstream views of each monitoring site, will be collected during each monitoring event to provide a record of aquatic habitat present at the time of sampling.

4.3.3. Surface water levels

As per wetland delineation, the bathymetry and ambient water levels within each wetland water body are not known (and which the extent of riparian and aquatic flora can be correlated to). The Project's construction and its longer-term operation has the potential to affect ambient water levels Appendix K (Groundwater technical report).

A graduated staff gauge will be installed in each wetland for recording surface water level measurements. The gauge will start at zero and be levelled back to a fixed, secure benchmark and common datum (e.g., monitoring boreholes or other survey benchmark). However, if there is a group of gauges and monitoring boreholes on the site, the gauges will be levelled to a common datum.

4.3.4. Aquatic macroinvertebrates

In freshwater habitats, aquatic macroinvertebrates will be sampled in accordance with the Australian River Assessment System (AUSRIVAS) protocols (Turak et al., 2004). AUSRIVAS models predict the aquatic macroinvertebrate fauna expected to occur at a site in the absence of environmental stress, such as pollution or habitat degradation, to which the fauna collected at a site can be compared (Turak et al., 2004).

Edge habitats will be sampled for aquatic macroinvertebrates using a 250 µm mesh dip net. At each site (approximately 100 m long), samples will be collected over a total length of 10 m, usually in 1-2 m sections, ensuring all significant edge sub-habitats within a site (i.e. macrophytes, over-hanging bank and vegetation, leaf-litter, logs) are included in the sample (Turak et al., 2004).

The contents of each net sample will be placed into a white sorting tray and animals collected for a minimum period of 30 minutes. Thereafter, removals will be done in 10-minute periods, up to a total of one hour (Turak et al., 2004). If no new taxa are found within a 10-minute period, removals are to cease (Turak et al., 2004).

The animals collected, including any small fish such as Gambusia, will be placed inside a labelled container, preserved with 70% alcohol and taken to the laboratory for identification. Environmental variables required for running the AUSRIVAS predictive model, including model stream width, percentage boulder or cobble cover, latitude and longitude will be recorded at each site.

In the laboratory, taxa will be identified to family level with the exception of Acarina (to order), Chironomidae (to sub-family), Nematoda (to phylum), Nemertea (to phylum), Oligochaeta (to class), Ostracoda (to subclass) and Polychaeta (to class) using a stereo microscope. Families of Anisoptera (dragonfly larvae) that include listed species are required to be identified to species.

All samples will be retained in appropriate containers and preservative to allow further examination at a later date if required. After checks on identifications, numbers of each type of animal will be entered into spreadsheet format and data checked against laboratory data sheets.

Key outputs from data collected using the NSW AUSRIVAS sampling protocol are Signal2 score (see Chessman et al., 1997), number of taxa recorded, AUSRIVAS Band level and Observed to Expected ratio (OE50) scores for each site (Turak et al., 2004).

4.3.5. Benthic infauna

Samples of benthic infauna will be collected in estuarine habitats using a hand-held corer (10 cm diameter and 10 cm deep). Samples will be collected by carefully penetrating any plant material and the sediment with the corer, which is then capped to create sufficient suction to retain the sample. Samples will be sieved through a 1.0 mm mesh, placed into labelled plastic bags and fixed with 7% buffered formalin/seawater (v/v) and later sorted under a binocular microscope. In the laboratory, all organisms, including amphipods, will be counted and identified to family level (where possible) by suitably qualified personnel using a stereo microscope.

All samples will be retained in appropriate containers and preservative to allow further examination at a later date if required. After checks on identifications, numbers of each type of animal will be entered into spreadsheet format and data checked against laboratory data sheets.

4.3.6. Riparian and aquatic flora

Data considered necessary to inform the proposed ‘riparian and aquatic flora’ monitoring component of this WtMP includes the following:

4.3.6.1. Wetland delineation

Delineation of the wetland areas within the Project area undertaken through desktop assessment of available GIS mapping layers (including contour layers) and ground truthing.

4.3.6.2. Vegetation mapping

Mapping of wetland vegetation is to be updated annually through GIS-based interrogation of the latest available aerial photography, amendment of existing vegetation mapping layers and ground truthing to validate GIS-based interrogation. Updated GIS (polygon) shapefiles of the existing extent of vegetation will inform and prioritise the areas of riparian and aquatic vegetation that monitoring should focus on. This includes:

- Remnant riparian native vegetation and aquatic vegetation, particularly that most sensitive to construction and potential longer-term impacts
- Exotic riparian vegetation that will be the subject of control under management actions specified within the WtMP
- Any vegetation identified as potential habitat for threatened species.

4.3.6.3. Vegetation survey

Vegetation indices will be measured along three transects run approximately 15-20 m apart within each of two sites in Kings Wetland, Rockdale Wetland, Scarborough Pond North and Scarborough Pond South and at a minimum of two appropriate control locations.

The size of sampling sites will be determined by the smallest area (length and distance from the landward edge to the stream bank) of the wetland to be surveyed. Because monitoring will be carried out over a period of years, it is important that sites are accurately recorded using DGPS units and pegged at the landward edge to aid their location. The depth of habitat will determine the length of each transect. Indicators such as percent cover will be standardised to the length of each transect.

Spatial scale at control locations will be parallel to those described for the wetland locations within the study area. Data will be recorded from within four 1 m^2 quadrats placed randomly along each transect line. Proposed indicators for monitoring wetland vegetation include:

- Area of wetland plants. This is a broad indicator of the persistence of existing habitats and the success of mitigation strategies to protect them
- Percentage cover of wetland plants. The number of plants in quadrats along replicate transects of varying length is recorded and expressed as a percentage of the length of the transect
- Number of species present. This indicator would provide an estimate of the diversity and composition of plants (native and weed species) present. A significant decline in the number of native species would potentially indicate a reduction in habitat value. Numbers of species present will be recorded at the smallest spatial scale, that is quadrats sampled along randomly placed transects within sites
- Number of individuals or abundance of each wetland species present. This indicator would provide an estimate of the dominance of wetland species. These data will be recorded at the smallest spatial scale, quadrats sampled along randomly placed transects within sites. A significant decline in total cover and/or increase in cover of weed species would potentially indicate a reduction in habitat value
- Height of tallest plant
- Condition of wetland plants. This indicator will provide an estimate of overall condition of the wetland habitat. Plant condition will be categorised on a three-point scale:
    - Good condition – greater than 50% of the plant with growing tips/no evidence of pathogens and disease.
    - Poor condition – less than 50 % of the plant with growing tips/evidence of pathogens and disease.
    - Dead or near dead – no growing tips on plant.

4.3.6.4. Magenta Lilly Pilly (*Syzygium paniculatum*)

Magenta Lilly Pilly will be monitored[1] biannually (in late spring and autumn) via establishment of photographic monitoring locations, physical measurements and qualitative observations as follows:

- GPS and magnetic bearing and time photographs taken to enable consistency in repeat photographs. Timing of photographs is to ensure optimal imagery capture (i.e., when sun at highest point in sky to avoid shadowing)
- Physical measurements of each species: height; diameter at breast height (DBH), canopy extent

[1] If determined necessary.

- Qualitative observations of any foliage die-back, disease or pathogen evidence and encroachment of habitat by weeds, in particular, Lantana (Lantana camara) and Bitou Bush (Chrysanthemoides *monilifera* subsp. *rotundata*)

4.3.7. Fish surveys

Fish surveys are required to be done in accordance with section 37 of the *Fisheries Management Act* using a Scientific Collection Permit and the NSW Agriculture, Animal Research Authority Care and Ethics guidelines (including relevant legislation and the Australian Code for the Care and Use of Animals for Scientific Purposes (National Health and Medical Research Council, 2013).

4.3.7.1. Freshwater habitat

Fish in freshwater habitats will be sampled using a Smith-Root 15C Electrofisher backpack unit (or similar). Sampling is to be done with consideration of the Australian Code of Electrofishing Practice (DPI, 1997), including the presence of an experienced electrofishing operator at all times.

The Electrofisher will be used to stun the fish in open water, around the edge of pools, around snags, aquatic vegetation and overhanging banks using a pulsed DC current with voltage set at a low initial level of 200 V and thereafter increased to 300 V (if necessary), as follows:

- Four replicate electrofishing ‘shots’ will be completed at each site that holds sufficient water.
- All stunned fish will be collected using a dip net and placed into plastic trays filled with aerated stream water to be counted and identified. Incidental observations, such as evidence of disease, will be noted. All captured fish will be handled with care to minimise stress, and native fish released as soon as possible.

Additional sampling of fish is to be done by deploying fyke nets (panels up to 4 m long on either side of a central funnel 2.5 m long, with 5 mm mesh) and bait traps (250 mm wide with an entrance that tapered to 60 mm wide, 450 mm long and 4 mm mesh size throughout).

Fyke nets will be set obliquely to the stream bank for 2 hours. Care is to be taken to ensure an air space is available for any air breathing animals, including turtles that may be caught inadvertently, either by tying the end of the net to a bankside tree or to a stake that is hammered into the stream substratum.

Captured fish will be counted and identified to species. Where possible fish will be measured to provide an indication of age, however for some species this may not be possible (e.g., eels) in which instance length (e.g., 0-30cm, >30cm – 1m, and > 1m) and girth will be visually estimated

Where catch volumes are high subsampling from the total catch will be undertaken to avoid long processing times and possible fish harm or mortality. Bait traps will be set overnight to favour the collection of nocturnal and crepuscular (active at dawn and dusk) species to supplement electrofishing and netting as follows:

- Bait traps will be set overnight and retrieved in the order they were deployed
- Fish captured from bait traps will be placed into a holding container with aerated stream water, counted and identified to species
- Bait type is to be kept consistent throughout study.

4.3.7.2. Estuarine habitat

A 20-metre Seine net will be used to catch fish from shallow estuarine habitats close to the shore while fyke nets will be deployed in deeper water. Captured fish will be counted and enumerated as per freshwater habitat

4.3.7.3. All habitats

For all wetland sampling locations, the following data will be collected:

- Site identification and GPS location
- Trap type and size, bait used
- Habitat type and depth
- Deployment and retrieval time to assist in calculation of effort measures

4.4. Monitoring parameters & frequency

Monitoring parameters and monitoring frequency are outlined in Table 3. Monitoring locations are discussed in Section 4.5.

Table 3. Monitoring parameters and frequency

Monitoring Parameter	Location	Frequency	Requirements
Wetland delineation	Study area	Prior to construction activities	GIS (polygon) shapefiles of wetland boundaries in order to delineate the Study area and waterbodies.
Water level benchmark	Study area & control locations[2]	At least once prior to construction; 6-monthly after commencement of construction	Date, time and water level measurements.
Updated vegetation mapping	Study area	Post clearance, annually	GIS (polygon) shapefiles of riparian and aquatic flora extent of vegetation.
Surface water quality	Study area & control locations[2]	At least once prior to construction activities; 6-monthly (spring and autumn) after commencement of construction	Three replicate measures of pH, turbidity (NTU), conductivity (µs/cm)/salinity (ppt), temperature (ºC) and dissolved oxygen (% saturation) measured *in-situ*. Two replicate water samples collected and sent to a NATA Accredited laboratory for analysis of total nitrogen, ammonia, nitrates and nitrites, total phosphorous and total suspended solids.
Riparian and aquatic flora	Study area Control locations[2]	At least once prior to construction activities; 6-monthly (spring and autumn) after commencement of construction	Vegetation indices (diversity, composition, percentage cover, condition) to be measured along three transects ran approximately 15-20 m apart within each of two sites at each location. Data to be recorded within 4 x 1m^2 quadrats randomly placed along each transect.
Freshwater macroinvertebrates	Kings Wetland Rockdale Wetland Control locations[2]	At least once prior to construction activities; 6-monthly (spring and autumn) after commencement of construction	Collection of stream characteristic and aquatic macroinvertebrates using the AUSRIVAS protocol for water bodies within New South Wales.
Estuarine macroinvertebrates	Scarborough Pond North & South	At least once prior to construction activities; 6-monthly (spring and autumn) after	Collected using benthic cores (10 cm diameter x 10 cm length). Benthic fauna identified to appropriate taxonomic level and enumerated.

Monitoring Parameter	Location	Frequency	Requirements
	Control locations[2]	commencement of construction	
Fish – Freshwater habitats	Kings Wetland Rockdale Wetland Control locations[2]	At least once prior to construction activities; Annually (late spring/summer) and additionally if required[3]	Backpack electrofishing shots, fyke nets and bait traps will be undertaken for a set time. Fish identified to species level, enumerated and measured.
Fish – Estuarine habitats	Scarborough Pond North & South Control location[2]	At least once prior to construction activities; Annually (late spring/summer) and additionally if required[3]	A 20 metre Seine net and fyke nets. Captured fish will be counted, enumerated and measured.

4.5. Monitoring locations

Monitoring locations are proposed to be situated in Kings Wetland, upstream and downstream of creek diversion works in Rockdale Bicentennial Park, in Scarborough Park North and in Scarborough Park South (Table 4 and Figure 3). Monitoring locations, including control locations, will be finalised during on-site assessment and pre-construction data collection.

Table 4. Proposed monitoring locations

Location	System	Site Code	Easting	Northing
Kings Wetland	Freshwater	KW-1	328978	6240747
	Freshwater	KW-2	328936	6240663
Rockdale Bicentennial Ponds	Freshwater	RB-1	328765	6240530
	Freshwater	RB-2	328701	6240406
	Freshwater	RB-3	328693	6240325
	Freshwater	RB-4	328604	6240188
Scarborough Pond North	Estuarine	SN-1	328638	6239762
	Estuarine	SN-2	328602	6239619
	Estuarine	SN-3	328594	6239370
Scarborough Pond South	Estuarine	SS-1	328472	6239120
	Estuarine	SS-2	328345	6238740
Control 1	Freshwater	TBC	TBC	TBC

[2] Control locations are 'monitoring sites that are in another location in the vicinity of the proposed activity but not impacted by the proposed activity. Monitoring control sites is useful for compliance and regulation assessment.
[3] In response to water quality monitoring thresholds being exceeded or external inquiry.

Location	System	Site Code	Easting	Northing
	Freshwater	TBC	TBC	TBC
Control 2	Estuarine	TBC	TBC	TBC
	Estuarine	TBC	TBC	TBC

Figure 3 Proposed monitoring locations

4.6. Reporting

Annual monitoring reports will be submitted to EES and the Planning Secretary via the DPIE compliance portal within 60 days of each monitoring event unless otherwise directed. Annual reporting will include all results against relevant performance criteria recommended in Table 5 to assess the effectiveness of wetland biodiversity mitigation strategies. CGU has committed to sending copies of flora and fauna monitoring reports to Bayside Council as they become available

4.6.1. Performance criteria

The performance criteria recommended in Table 5 will assist identify any changes in wetland habitat and biota resulting from the clearing, construction and operational phases of the Project. Any modifications and/or maintenance of existing mitigation measures would require additional monitoring protocols to be developed to assess their effectiveness in reducing the negative impacts on biodiversity.

Table 5: Performance criteria to assess the effectiveness of wetland biodiversity mitigation measures

Monitoring measure	Performance criteria	Performance target
Surface water quality	Water quality maintained between potential impact sites and control sites	Water quality is maintained at pre-construction data levels,or improves. Any decrease in water quality does not exceed 10% difference when compared to pre-construction data levels
Surface water level	Maintain natural flow variability and wetland inundation Maintain natural rates of change in water levels	Drawdowns of greater than 10% of natural variation will require adaptive management for high priority GDEs (e.g. monitoring and mitigation/remediation during construction). Natural seasonal variation in monitoring data is in the order of one metre, therefore the drawdown threshold for predicted impact reporting has been taken as 0.1m. However, none of the GDEs within the study area are high priority **Appendix H (**Biodiversity development assessment report)
Riparian and aquatic vegetation	No riparian vegetation or macrophyte dieback No evidence of weed invasion or spread to adjacent areas	Native species diversity, composition, cover and condition is maintained or improves when compared to pre-construction levels. Any decrease does not exceed 10% difference when compared to pre-construction data levels Exotic species diversity and cover remains consistent with or lower than pre-construction levels. No new weed species become problematic
Freshwater macroinvertebrates	AUSRIVAS Band of impairment scores maintained	O/E taxa values maintained or improves within the range for its baseline band of impairment score. Any decrease should not exceed two successive monitoring rounds
Estuarine macroinvertebrates	Benthic infauna diversity is maintained	Diversity, composition and abundance maintained or improves when compared to pre-construction levels. Any decrease does not exceed 10% difference when compared to pre-construction data levels
Fish	Native fish species diversity maintained	Fish species diversity is maintained at pre-construction data levels or increases during the life of the program. Any decrease does not exceed 20% difference when compared to pre-construction data levels

4.6.2. Data analysis

Permutational Multivariate Analyses of Variance (PERMANOVA, Anderson 2001; Anderson et al, 2008) (or similar) is to be used to examine spatial differences and temporal changes, and their interaction, in the performance criteria data collected to assess the performance criteria. Any statistically significant differences (i.e. $P < 0.05$) in the levels of factors and interaction terms is to be examined by *Post-hoc* permutational *t*-tests. Significant differences between groups (e.g. impact versus control) may arise due to differences between group means, differences in dispersion (variance) among groups or a combination of both. Each of these outcomes could be indicative of an impact.

Comparison between the results of analyses and the nominated performance targets (as outlined in Table 5) will determine the effectiveness of mitigation strategies in reducing the negative impacts on wetland biodiversity and whether or not any modifications and/or maintenance of the existing mitigation measures is required.

4.6.3. Criteria exceedance management responses

Should performance criteria not be met, the following management responses shall be implemented:

- Where applicable, assess control locations[4] to determine whether exceedances are evident outside of the study area.
- Notify the Contractor's Project Manager who will notify the ER.
- The Contractor's Project Manager is to undertake immediate investigative work to determine the potential cause of the exceedance.
- Where source of exceedance is attributed to construction activities (e.g., failure in sediment and erosion controls, accidental spill or other discharges), causal construction activities[5] are to cease until source of pollution is contained and mitigation measures re-established.
- Monitor additional measures implemented to reverse impacts.

Any modifications and/or maintenance of existing mitigation measures would require additional monitoring protocols to be developed to assess their effectiveness in reducing the negative impacts on biodiversity.

4.7. Wetlands Management Plan

This WtMP has been prepared by suitably qualified ecologists with experience in wetlands management and aquatic ecology in consultation with relevant stakeholders and fulfils the requirements of EMM B3. Dewatering will be addressed further through the development of a specific EWMS for dewatering. The EWMS will include specific detail to manage and minimise the impact of dewatering the isolated section of the wetland required for works. The EWMS will include detail on:

- Methods to sufficiently isolate the proposed work area in the wetland to minimise direct impacts to the broader ponds

[4] Control locations will be sampled prior to study area monitoring locations.
[5] Cessation of construction activities should only be limited to those activities that are potentially indicated as a causal factor. This is to be determined on the basis, and outcomes, of investigations.

- Methods to dewater the work area while preventing the uptake of materials from the area to dewater (include flow, timing stages)
- Access to the partially dewatered area to facilitate capture, release and recovery of fauna including methods targeted to the species identified during preclearance and baseline surveys (specifying methods and timing of netting, electro-fishing etc)
- Manage pest species that may be encountered (e.g. Gambusia, Cyprinus)
- Ecological clearance and supervision of the final dewatering stages.

The EWMS must be developed by a suitably qualified ecologist and nominate the qualification of personnel involved in fauna and wetland clearance.

The performance criteria recommended in Table 5 will assist in identifying any changes in wetland habitat and biota resulting from the clearing and construction phases of the Project, in addition to determining the effectiveness of mitigation measures to improve the condition of wetlands within the study area.

In accordance with EMM SWF3, treatment measures will be implemented within the waterbodies of Scarborough Park North and Rockdale Bicentennial Park disturbed by the project during construction, to reduce algal bloom conditions and contribute to achieving the NSW Water Quality Objectives over time.

Treatments will be considered in consultation with Bayside Council and may include the establishment of macrophyte zones, and the use of solar powered devices to aerate the water column.

Reinstatement, rehabilitation and improvement of affected wetlands and riparian land to provide positive ecological and amenity outcomes for the environment and local community is managed under the UDLP which would include the following recommendations:

- Weed control and revegetation of endemic species (in the first instance) and locally native species to the greatest extent practicable
- Wetland rehabilitation with a landscape aesthetic and with an aim to reduce the edge effect impacts of active areas to the wetland
- Fish passage enhanced into and out of the wetland areas.

CGU will review and update the WtMP with the relevant details on the rehabilitation process (if required) once final design and consultation of the UDLP complete.

4.8. Quality assurance and documentation

All field and laboratory work will be done by suitably qualified staff experienced in the collection and analysis of freshwater and estuarine habitats and biota. Field and laboratory data and other records will be incorporated into appropriate excel data sheets and databases, determined by the Project Manager.

Data verification would immediately follow data entry and would involve a trained staff member who is familiar with the project checking the accuracy of the records entered against field and laboratory data sheets. Once the data had been entered, the Project Manager would validate the data set by checking it against relevant guidelines and past surveys done within the study area. Errors such as missing or duplicated records will be checked. Once the data verification was complete, all field sheets will be scanned and archived electronically (in pdf format) and in hard copy.

4.9. Review and improvement

Monitoring data will be reviewed throughout the construction period to provide potential requirements to increase, or decrease, the number of sampling locations and/or the analytical suites. This Program will be continually reviewed for appropriateness. Any alterations monitoring locations, analytical suites, or frequencies will be reported in Surface Water Monitoring Reports.

Continual improvement of this Program will be achieved through ongoing evaluation of performance against environmental policies, objectives and targets and Project performance outcomes of the EIS for the purposes of identifying opportunities for improvement.

The continual improvement process is designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

4.10. WtMP update and amendment

The processes described in Sections 3.12 and Section 3.13 of the CEMP may result in the need to update or revise the WtMP. Revisions will occur in accordance with the process outlined in Section 3.13 of the CEMP.

A copy of the updated Program and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

5. References

Acid Sulfate Soils Manual (1998). Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW.State Heritage Inventory 2012a. Accessed 20/08/2021, available from: https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2330162

Anderson, M. J. (2001). A new method for non-parametric multivariate analysis of variance. *Austral Ecology.* 26: 32-46.

Anderson, M. J., Gorley, R. N., Clarke, K.R. (2008). PERMANOVA + for PRIMER: Guide to Software and Statistical Methods. PRIMER-E. Plymouth, UK.

Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (2000). National Water Quality Management Strategy: Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality. Canberra, Australia.

Bureau of Meteorology (BoM) (2018). National Atlas of Groundwater Dependent Ecosystems, available online: http://www.bom.gov.au/water/groundwater/gde/

Chessman, B.C. (2003). New sensitivity grades for Australian river macroinvertebrates.

Chessman, B. C., Growns, J. E., Kotlash, A. R. (1997). Objective derivation of macroinvertebrate family sensitivity grade numbers for the SIGNAL biotic index: application to the Hunter River system, New South Wales. *Marine and Freshwater Research* 48: 159-172.

Department of the Environment and Energy (DOE) (2018). Directory of Important Wetlands Australia. Available online at: https://www.environment.gov.au/water/wetlands/australian-wetlandsdatabase/directory-important-wetlands

Department of Primary Industries (2008). Threatened Species Assessment Guidelines: The Assessment of Significance. State of New South Wales through the New South Wales Department of Primary Industries, February 2008.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011a). Survey Guidelines for Australia's Threatened Reptiles.

DSEWPC (2011b). Survey Guidelines for Australia's Threatened Fish. Available on line: https://www.environment.gov.au/system/files/resources/6c9817ee-517b-4c13-9d8c-e66a61514f53/files/survey-guidelines-fish.pdf

Fairfull, S. (2013). Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update). NSW Department of Primary Industries.

National Health and Medical Research Council (2013). Australian code for the care and use of animals for scientific purposes, 8th edition. Commonwealth of Australia, Canberra.

NSW Office of Environment and Heritage (OEH) (2016). Sydney Metropolitan Catchment Management Authority Vegetation Mapping v 3.0. Office of Environment and Heritage, Sydney.

NSW Office of Environment and Heritage (OEH) (2018). Bionet Atlas. Available online at https://www.environment.nsw.gov.au/asmslightprofileapp/account/login?ReturnUrl=%2fAtlasApp%2fD efault.aspx

Rockdale City Council (2014). Rockdale Biodiversity Strategy. Prepared by Eco Logical Australia.

Riches, M., Gilligan, D., Danaher, K. and Pursey, J. (2016). Fish Communities and Threatened Species Distributions of NSW. NSW Department of Primary Industries

Roads and Traffic Authority (RTA) (2011). Roads and Traffic Authority Biodiversity Guidelines – Protecting and managing biodiversity on RTA projects. Roads and Traffic Authority, Sydney

Sydney Metropolitan Catchment Management Authority (SMCMA) (2011). Botany Bay and Catchment Water Quality Improvement Plan.

State Heritage Inventory (2012). Accessed 20/08/2021, available from: https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2330166)

Turak, E., Waddell, N., Johnstone, G. (2004). New South Wales Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual. Department of Environment and Conservation, Sydney, Australia.

Appendix J – Flora and Fauna Monitoring Program

Flora and Fauna Monitoring Program

M6 Motorway Stage 1

December 2021

Document Number: M6S1-CGU-NWW-ENPE-PLN-000405

Revision: 01

THIS PAGE LEFT INTENTIONALLY BLANK

Contents

Glossary/ Abbreviations

Abbreviations	Expanded text
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
CEMP	Construction Environmental Management Plan
CGU	CPB Contractors, Ghella and UGL Joint Venture
CoA	Conditions of Approval
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EES	Energy, Environment and Science (EES) group of DPIE
FFMP	Flora and Fauna Management Plan
PCT	Plant Community Type
TfNSW	Transport for New South Wales
TEC	Threatened Ecological Community

Document control

Revision	Date	Description	Approval
A.01	07/10/21	Draft issued for consultation and review	
00	17/11/2021	Issued for Approval	

Distribution of controlled copies

This Flora and Fauna Monitoring Program as part of the CEMP is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the Monitoring Program as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office.

Copy number	Issued to	Version

1 Introduction

1.1 Background and Project Description

CPB Contractors, Ghella and UGL (CGU) have been engaged by Transport for New South Wales (TfNSW) to complete detailed design and construct the M6 Motorway Stage 1 (the Project). The Project comprises a new twin motorway tunnel (around four kilometres in length) between the M8 Motorway at Arncliffe and President Avenue at Kogarah with a tunnel portal and entry and exit ramps connecting the tunnels to the surface. The Project surface construction boundaries (Project footprint) are shown in Figure 1.

Works will include a connection to the M8 Motorway, line marking of additional travel lanes between the St Peters interchange to the M6 Stage 1 tunnels, an intersection with President Avenue (including widening and raising of President Avenue), and intersection improvements at the President Avenue/Princes Highway intersection. Mainline tunnel stubs would be constructed to allow for connections to future stages of the M6 Extension.

The Project was declared as a Critical State Significant Infrastructure and the M6 Stage 1 Project was approved by the Minister for Planning and Public Spaces on 18 December 2019.

Key features of the Project include:

- Mainline tunnels approximately 3.0km in length, sized for three lanes of traffic and line marked for two lanes on opening of the motorway;
- Entry and exit ramp tunnels approximately 1.5km in length and a tunnel portal connecting the tunnels to a surface intersection with President Avenue;
- Provision of a new intersection at President Avenue including the widening and raising of President Avenue at this location;
- Upgrade of the President Avenue and Princes Highway intersection to improve capacity and network integration;
- Provision of a new shared cycle and pedestrian pathways;
- Mainline tunnel stubs for a future connection to extend the Project to the south;
- Two motorway operation complexes (MOCs) as follows:
    - Arncliffe: including mechanical and electrical fit-out of the ventilation facility built by the New M5 Motorway project, and provision of a new water treatment plant and substation.
    - Rockdale (south): including a ventilation building, Disaster Recover Site (DRS), substation and power supply, deluge tanks.
- A tunnel ventilation system, including ventilation facilities located at Marsh Street, Arncliffe and West Botany Street, Rockdale, and in-tunnel ventilation systems (jet fans and ventilation ducts);
- New Utility Services, and modifications and connections to existing Utility Services;
- A permanent power supply connection to the Rockdale Ventilation Facility Site MOC from Ausgrid's Canterbury Sub-Transmission Substation;
- Emergency access and evacuation facilities, including pedestrian and vehicular cross, long passages, fire and safety life systems;
- Ancillary infrastructure for motorway operations including operations management and control systems, permanent power supply, communications, lighting, electronic toll collection system, toll gantries and traffic control and signage (both fixed and variable signage);
- Drainage infrastructure to collect surface water and groundwater inflows for treatment;

- Reinstatement of Bicentennial Park and recreation facilities;
- Reinstatement and rehabilitation of construction leased areas within the Arncliffe Site;
- Minor adjustments to local roads in the Project area;
- Development and implementation of systems integration and operating procedures with WestConnex Motorways to ensure safe operation of the interfaces between the Project and the WestConnex Motorways; and
- Any other works as required to complete the project within the scope of the Environmental Impact Statement (EIS), Preferred Infrastructure Report (PIR), Submissions report (including EMMs) and CoA requirements.

The following six surface compounds will facilitate construction of the Project:

- Arncliffe construction ancillary facility (C1), an existing construction site which was used for the construction of the M8 Motorway;
- Rockdale construction ancillary facility (C2), within an existing TfNSW depot;
- President Avenue construction ancillary facility (C3) at Rockdale, within Rockdale Bicentennial Park and an industrial area west of West Botany Street;
- Construction ancillary facilities (C4 and C5) near Muddy Creek to support construction of the Active Transport Corridor; and
- Princes Highway construction ancillary facility (C6) on the corner of Princes Highway and President Avenue, Kogarah to support the intersection surface works.

This Flora and Fauna Monitoring Program (the Program or Monitoring Program) has been prepared to address Conditions of Approval (CoA) from SSI 8931 issued under the EP&A Act for the construction of the Project.

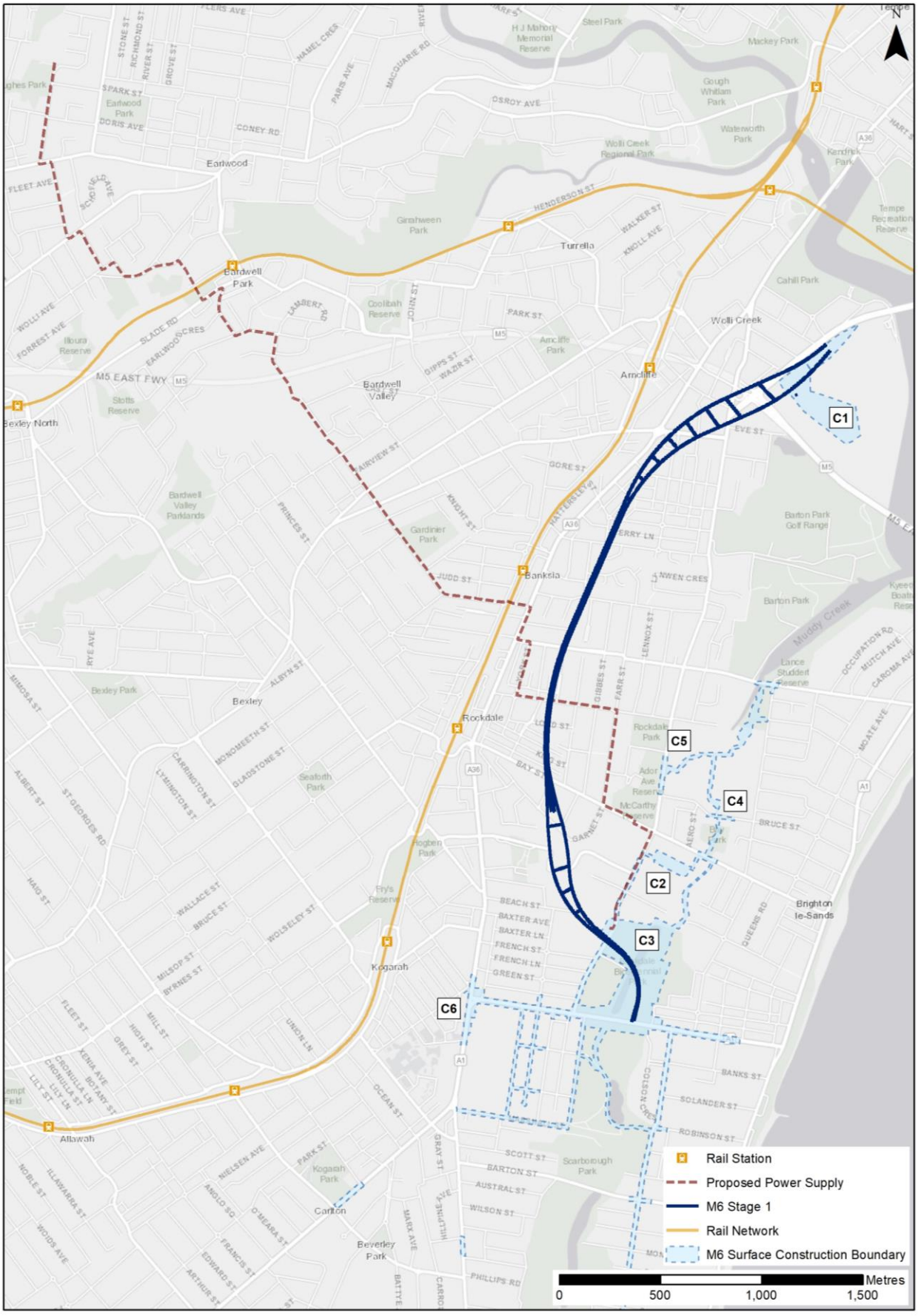


Figure 1: Project overview

1.2 Purpose and Objectives

This plan is one of a series of technical documents that support the Project's Construction Environmental Management Plan (CEMP)

Condition C4 of the CEMP requires the preparation of the Flora and Fauna CEMP Sub-plan (FFMP) to outline processes and responsibilities to avoid, manage and mitigate impacts to flora and fauna during construction.

This Monitoring Program is required to detail specific steps that are required to monitor flora and fauna in accordance with the CoA's and management and mitigation measures outlined in the FFMP. Specifically, the purpose of this Flora and Fauna Monitoring Program is to:

- Ensure the identified impacts in the FFMP are not resulting in unexpected impacts to threatened flora and fauna;
- Ensure all flora and fauna mitigation and management measures are achieving the stated objectives; and,
- Identify if adaptive management responses are required to further manage threatened flora and fauna.

The key objectives of the Monitoring Program are to ensure that all CoA are met , compliance with relevant legislation, and address agency submissions and the Environmental Mitigation Measures outlined in the Environmental Impact Assessment (EIS). This is achieved through the following:

- Identifying baseline data sources that can be used to determine pre-construction threatened flora and fauna abundance and health;
- Identifying thresholds for monitoring parameters that if exceeded will trigger the need for management responses;
- Scheduling and assignment of responsibilities of monitoring requirements; and,
- Consulting relevant stakeholders in the preparation of the Monitoring Program (including Energy, Environment and Science (EES) group of DPIE and relevant councils).

1.3 Scope of Monitoring Program

No significant impacts to flora or fauna were identified during the EIS and monitoring programs for aquatic flora, fauna and habitats have been encapsulated in the M6 Motorway Stage 1 Wetland Monitoring Program (WtMP).

Management and monitoring requirements for Green and Golden Bell Frog (GGBF) have been encapsulated in the M6 Motorway Stage 1 GGBF Plan of Management (PoM) and management actions covering this species are not included in this Program. The GGBF PoM is a standalone plan as it is required under CoA E44 of the Planning Approval.

Therefore, this Monitoring Program focuses only on nest boxes as all other aspects are covered by their own monitoring plans.

Grey-headed Flying-fox foraging habitat is located within Rockdale Bicentennial Park. No roosting sites or breeding camps occur within the study area, however there is a large camp at Turrella, which is approximately 3 kilometres north-west of the Project. Monitoring for Grey-headed Flying-fox has not been included in this Program. If Grey-headed Flying-Fox roosts are identified within or directly adjacent to the Project area, adaptive monitoring options will be assessed, and this Program will be updated.

Table 1: Conditions of Approval

<table>
<tr><th>CoA No.</th><th>Condition Requirements</th><th>Document Reference</th></tr>
<tr><td>C13</td><td>The Construction Monitoring Programs set out in Table 5 must be prepared and implemented to enable comparison of the actual construction performance against the predicted performance. The Construction Monitoring Programs must be prepared in consultation with the relevant government agencies and councils as identified for each Construction Monitoring Program.
Table 5: Construction Monitoring and relevant public authorities
<table><tr><th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr><tr><td>(f)</td><td>Flora and Fauna Monitoring Program</td><td>EES</td></tr><tr><td>(g)</td><td>Wetland Monitoring Program</td><td>EES</td></tr></table></td><td>(f) Section 3
(g) Section 1.3, 3.1

Consultation is addressed in Section 1.4</td></tr>
<tr><td rowspan="8">C14</td><td>Construction Monitoring Programs must provide:
(a) details of baseline data available;</td><td>Section 2
Section 3.2.2</td></tr>
<tr><td>(b) details of baseline data to be obtained and when;</td><td>Section 3.2.3</td></tr>
<tr><td>(c) details of all monitoring that will be undertaken;</td><td>Section 3.2.5</td></tr>
<tr><td>(d) the parameters of the project to be monitored;</td><td>Section 3.2.5
Section 3.2.6</td></tr>
<tr><td>(e) the frequency of monitoring;</td><td>Section 3.2.5</td></tr>
<tr><td>(f) the location of monitoring;</td><td>Section 3.2.5</td></tr>
<tr><td>(g) the reporting of monitoring and analysis results against relevant criteria, including details of the timing and frequency for reporting the results to the Planning Secretary and relevant government agencies;</td><td>Section 3.2.6
Section 4.1</td></tr>
<tr><td>(h) details of the methods that will be used to analyse the monitoring data;</td><td>Table 10</td></tr>
<tr><td></td><td>(i) procedures to identify and implement additional mitigation measures where results of monitoring indicate adverse impacts or levels above relevant criteria;</td><td>Table 10</td></tr>
<tr><td></td><td>(j) any consultation to be undertaken in relation to the monitoring programs; and,</td><td>Section 1.4</td></tr>
<tr><td></td><td>(k) any specific requirements as required by Conditions C15 to C18, as relevant.</td><td>Not applicable</td></tr>
</table>

CoA No.	Condition Requirements	Document Reference
C19	The **Construction Monitoring Programs** must be developed in consultation with the relevant government agencies as identified in **Condition C13** of this approval, and must identify information, including monitoring parameters, requested by a relevant agency to be included in a monitoring program.	Section 1.4
C20	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month prior to the commencement of construction.	CEMP Section 2
C21	Construction, which is required to be monitored under the Construction Monitoring Programs, must not commence until the Planning Secretary has approved all of the required Construction Monitoring Programs and all relevant baseline data for the specific construction activity has been collected.	CEMP Section 2 Staging Report
C22	The Construction Monitoring Programs, as approved by the Planning Secretary and including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	Section 3
C23	The results of the Construction Monitoring Programs must be made publicly available in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program. Note: Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 4.1
E45	The Proponent must provide bat boxes or build suitable habitat within the replacement box culverts that cross President Avenue at Scarborough Park.	Section 3.2

Table 2: Environmental Management Measures relevant to Program

Outcome	Ref #	Commitment	Reference
Impacts to wetlands and riparian land	B3	A Wetlands Management Plan will be prepared and implemented, in consultation with relevant stakeholders, to manage waterbodies and riparian land within the project footprint that may be impacted by the project during construction. The objectives of the plan will be to: • Maintain and improve the condition of the affected wetlands • Reinstate and rehabilitate any riparian land impacted by the project • Provide positive ecological and amenity outcomes for the environment and local community. The plan will include: • Consideration of potential water quality, hydrology, amenity and flora and fauna impacts and mitigation • A process for dewatering and restoration of the Rockdale Wetland, including measures developed by an ecologist to handle and relocate aquatic fauna • A monitoring program to assess the effectiveness of the mitigation measures and to identify new measures that may be required. The plan will be prepared by a suitably qualified ecologist with experience in wetlands management.	Section 1.3 WtMP (M6S1-CGU-NWW-PE-PLN-000406)
Impacts to Green and Golden Bell Frogs	B5	All construction site inductions will contain a relevant section on identifying and managing potential risks to the Green and Golden Bell Frog. This will include identification of the frog and its habitat, a clear outline of the location of no-go zones for construction personnel, equipment and materials (including herbicides and pesticides), hygiene protocols and what to do in the event of an unexpected find. Frog exclusion fencing and sediment controls will be installed. Any Green and Golden Bell Frogs encountered within the construction boundary during construction are to be collected by a qualified and experienced herpetologist and relocated within the adjacent golf course by the herpetologist. Impacts to Green and Golden Bell Frog due to light spill will be mitigated with lighting directed to minimise construction night time light spill outside of all construction areas, particularly onto the RTA ponds and Kogarah Golf Course. The ground surface within the Arncliffe construction ancillary facility (excluding the operational footprint) will be reinstated to a condition the same or better than prior to the commencement of construction of the New M5 Motorway project in consultation with relevant stakeholders.	Section 1.3 GGBF PoM (M6S1-CGU-NWW-EO-PLN-000426)

1.4 Consultation

This Monitoring Program was prepared in consultation with the Energy, Environment and Science (EES) group in accordance with CoA C13(f). Comment was sought on the draft Program and EES feedback was used to update and correct the document.

The Monitoring Program was also provided to relevant councils (Bayside Council, Canterbury Bankstown Council and Georges River Council) during consultation on the Flora and Fauna CEMP Sub-plan. Key matters raised by stakeholders during this process are listed in Table 3.

Table 3: Summary of consultation

Relevant Authority	Comment	Action
EES	EES noted that more detail on the survey methodology is required and that surveys should be undertaken by a suitably trained ecologist of potential roost sites in accordance with "Standard survey methods - Roost Search (microbats)" on page 9 of *'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method,'* in built structures to be impacted. EES also noted that the Environmental Management Measure B4 requires that the sub plan will include a procedure for managing inadvertent impacts to both flora and fauna. Table 2 states that this is addressed in section 6.4 of the sub plan. However, EES considered section 6.4 does not provide a procedure for inadvertent impacts for fauna and does not address flora at all.	More detail on survey methodology has been provided in Section 3.2.3. Section 6.4. The Procedures in Appendix E and G of the FFMP were updated in accordance with EES advice.
Bayside Council	Bayside council raised a number of queries that were general in nature and unrelated to content in the Monitoring Program or Flora and Fauna CEMP Sub-plan.	A response was provided to council which answered their queries.

This Monitoring Program has been updated to address the matters raised during consultation. Community feedback and complaints relating to flora and fauna will be managed in accordance with the Project CEMP and Communications Strategy.

2 Existing Environment

The existing flora and fauna within and adjacent to the Project area including species, communities and habitats is summarised in this section (Section 2) of the Monitoring Program. The key reference documents are located within Chapter 12 and Appendix H of the M6 Stage 1 EIS. The Project boundary and relevant ecological data are displayed on the sensitive area maps included in Appendix A6 of the CEMP.

2.1 Environmental Aspects

2.1.1 Plant Community Types and Threatened Ecological Communities

Three Plant Community Types (PCTs) were identified within the Project area, refer Table 4. All three were found to conform to TECs listed under the NSW BC Act. Details of these are provided in Table 4 and their location shown on the Sensitive Area Plans (SAPs) included at Appendix A6 of the CEMP.

All remaining vegetation within the Project area was characterised as “Urban Exotic and Native Cover”. While these areas may contain plant species native to NSW, they do not conform to descriptions of PCTs and are therefore not assessed as a PCT in the BAM. Native fauna can still utilise these habitats.

No TECs listed under the Commonwealth EPBC Act were identified in the Project area.

Table 4: Threatened ecological communities identified in the Project area

Threatened Ecological Community	PCT	BC Act	Occurrence
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Endangered	Approximately 0.37 hectares occurs within the development footprint
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	1808 - Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline	Endangered	Approximately 0.97 hectares occurs within the development footprint
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions	1795 - Swamp Mahogany / Cabbage Tree Palm - Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	Endangered	Approximately 0.81 hectares occurs within the development footprint

2.1.2 Threatened Flora Species

A single threatened flora species has been identified within the Project Area, the Magenta Lilly Pilly (*Syzgium paniculatum*). The plants were identified as being landscape planting at Rockdale Bicentennial Park. The location these flora species in relation to the project is shown on the Sensitive Area Plans included at Appendix A6 of the CEMP. The plants are located within habitats considered to be associated with the Rockdale Wetland. Given this, the monitoring of the plants is considered closely linked to the monitoring of potential impacts on the Rockdale Wetland.

Monitoring of these individuals has been proposed within the Wetland Monitoring Program (refer to Section 4.3.2.4 of the Wetland Monitoring Program).

Species credit threatened fauna species and threatened fauna species listed under the EPBC Act which have potential to occur based on the PCT's identified on the Project area are listed in Table 5.

Table 5: Threatened of otherwise significant flora species

Common name	Scientific name	EPBC Act	BC Act	Probability of Occurrence
Magenta Lilly Pilly	*Syzygium paniculatum*	Vulnerable	Endangered	Present within Project area. About 20 adult individuals were recorded at Rockdale Bicentennial Park in landscape plantings. Five will be removed during construction with the remainder monitored in accordance with Section 4.3.2.4 of the Wetland Monitoring Program.
Biconvex Paperbark	*Melaleuca biconvexa*	Vulnerable	Vulnerable	Low
Narrow-leafed Wilsonia	*Wilsonia backhousei*		Vulnerable	Low
Sunshine Wattle	*Acacia terminalis* subsp. *terminalis*	Endangered	Endangered	Low

2.1.3 Threatened Fauna and Threatened Fauna Habitat

No threatened fauna species were detected within the Project area during field surveys conducted for the EIS. Species credit threatened fauna species and threatened fauna species listed under the EPBC Act which could potentially occur based on the PCT's identified within the Project area are listed in Table 6. Any records of the species in Table 6 are to be treated as unexpected finds and could trigger additional monitoring requirements.

Table 6: Threatened fauna that could potentially occur on the Project area

Common name	Scientific name	EPBC Act	BC Act	Occurrence likelihood
Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered	Critically Endangered	Low
Bush-stone Curlew	*Burhinus grallarius*		Endangered	Low
Sanderling	*Calidris alba*		Vulnerable	Low
Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	Endangered	Low
Gang-gang Cockatoo	*Callocephalon fimbriatum*		Endangered	Low
Glossy Black-Cockatoo	*Calyptorhynchus lathami*		Vulnerable	Low

Common name	Scientific name	EPBC Act	BC Act	Occurrence likelihood
Eastern Pygmy-possum	*Cercartetus nanus*		Vulnerable	Low
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	Low
Wallum Froglet	*Crinia tinnula*	Vulnerable		Low
Eastern Bristlebird	*Dasyornis brachypterus* (Eastern)	Endangered	Endangered	Low
White-bellied Sea-eagle	*Haliaeetus leucogaster*		Vulnerable	Moderate – could occasionally forage on wetlands within the Project area
Southern Brown Bandicoot (eastern)	*Isoodon obesulus obesulus*	Endangered	Endangered	Low
Little Eagle	*Hieraaetus morphnoides*		Vulnerable	Low
Giant Burrowing Frog	*Heleioporus australiacus*	Vulnerable	Vulnerable	Low
Swift Parrot	*Lathamus discolour*	Critically Endangered	Endangered	Low
Broad-billed Sandpiper	*Limicola falcinellus*		Vulnerable	Low
Black-tailed Godwit	*Limosa limosa*		Vulnerable	Low
Green and Golden Bell Frog	*Litoria aurea*	Vulnerable	Endangered	Moderate Species has re-established a population on Kogarah Golf Course, which borders the Arncliffe construction facility. Incursion into the facility is mitigated by an existing frog exclusion fence.
Green-thighed Frog	*Litoria brevipalmata*		Vulnerable	Low
Square-tailed Kite	*Lophoictinia isura*		Vulnerable	Low
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable	High (Foraging) Potential foraging habitat within the Project area at Rockdale Bicentennial Park. Low (Roosting)

Common name	Scientific name	EPBC Act	BC Act	Occurrence likelihood
Little Bent-wing Bat	*Miniopterus australis*		Vulnerable	Moderate – could use abandoned buildings and culverts as temporary roosts and could occasionally forage over Project area
Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*		Vulnerable	Moderate - could use abandoned buildings and culverts as temporary roosts and could occasionally forage over Project area
Southern Myotis	*Myotis macropus*		Vulnerable	Moderate - could use culverts as temporary roosts and could occasionally forage over Project area
Orange-bellied Parrot	*Neophema chrysogaster*	Critically Endangered	Critically Endangered	Low
Powerful Owl	*Ninox strenua*		Vulnerable	Low – species can use urban vegetation fragments for occasional roosting habitat.
Eastern Osprey	*Pandion cristatus*		Vulnerable	Moderate – could occasionally forage on wetlands within the Project area
Squirrel Glider	*Petaurus norfolcensis*		Vulnerable	Low
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable	Low
Masked Owl	*Tyto novaehollandiae*		Vulnerable	Low
Terek Sandpiper	*Xenus cinereus*		Vulnerable	Low

Four fauna habitat types suitable for threatened fauna were identified by the EIS. These are listed below and shown on the Sensitive Area Maps included at Appendix A6 of the CEMP. It is noted Grey-headed Flying-fox roosts are not within proximity of the Project (located at Turella which is a few kilometres away) and are not included on the SAPs.

Table 7: Fauna habitat types

Name	Habitat features
Grey-headed Flying-fox potential foraging habitat	Grey-headed Flying-fox foraging habitat is located within Rockdale Bicentennial Park where there are numerous planted *Ficus hillii*, *Eucalyptus robusta* and *Eucalyptus botryoides x saligna*, among other potential food sources. No roosting sites or breeding camps occur within the study area, however there is a large camp at Turrella, which is approximately 3 kilometres north-west of the Project. There are no CoA's or commitments within the EIS and/or ancillary documents that require the habitats of the Grey-headed Flying Fox to be monitored. However, if Grey-headed Flying-Fox roost is identified within or directly adjacent to the Project area, adaptive monitoring options will be assessed.
Green and Golden Bell Frog habitat	Immediately adjacent to the construction ancillary facility at Arncliffe are the two RTA Ponds and existing Green and Golden Bell Frog habitat. The RTA Ponds are purpose-built breeding ponds for the Green and Golden Bell Frog which were constructed along Marsh Street, adjacent to the Southern and Western Sydney Ocean Outfall System (SWSOOS) and the Kogarah Golf Course. Breeding was detected at the RTA ponds in 2020 and foraging frogs have been detected in the RTA Ponds, Enhancement Ponds and Kogarah Golf Course in 2020 and 2021. CGU's monitoring requirements in regard to Green and Golden Bell Frog habitat are described in the M6 Motorway Stage 1 GGBF PoM. In the event that an individual is identified utilising habitats outside of those described in the M6 Motorway Stage 1 Green and Golden Bell Frog Management Plan, it will be updated to reflect any additional monitoring requirements in consultation with the EES.
Southern Myotis (*Myotis macropus*) roosting habitat	No Southern Myotis were recorded during the field surveys within the Project area. However, President Avenue crosses over a culvert which conveys a waterway running from the north (Rockdale Bicentennial Park) to the south (Scarborough Park North). This culvert may be potential habitat for Southern Myotis. All wetlands that exist within the Project footprint could provide occasional foraging resources for the species, despite the species not being detected during field survey undertaken for the EIS. Mitigation and monitoring requirements for this habitat feature are described in Table 2.
Migratory bird habitat in the Landing Lights wetland	The Landing Lights wetland is known to, or potentially could, provide habitat for threatened and migratory species listed in Table 5 including the Sanderling, Curlew Sandpiper, Broad-billed Sandpiper, Black-tailed Godwit and Terek Sandpiper. The Landing Lights wetland is located within 500 metres of the Project area. No direct or indirect impacts are predicted to occur to this wetland from the Project and no monitoring requirement have been identified.

2.2 Ecological Impacts

Potential and likely impacts associated with the Project are identified in Chapter 12.3 of the EIS and include:

- The removal of native vegetation including two TECs listed under the BC Act;
- Direct and indirect impacts to fauna, including injury and mortality;
- Potential impacts on threatened species not previously detected within the Project area but known to occur close to the Project area;
- Loss of habitat for threatened species;
- Introduction and spread of pathogens;
- Edge effects; and,
- Acidification from the displacement of acid sulfate soils.

3 Fauna Monitoring Program

3.1 Overview

Fauna monitoring for the Project is divided into three categories:

- Wetland Monitoring;
- Green and Golden Bell Frog Monitoring; and,
- Nest Box Monitoring.

The M6 Wetland Monitoring Program provides details on the monitoring required for wetlands impacted by the Project. Likewise, the M6 Motorway Stage 1 GGBF PoM provides extensive details on the monitoring required for habitats adjacent to the Arncliffe construction compound. These will not be discussed further in this Monitoring Program

3.2 Nest Box Monitoring Program

3.2.1 Background and Objectives

This aspect of the monitoring program covers the monitoring of the use of artificial nest boxes installed to mitigate the loss of roosting habitat, primarily for microbat species. Nest boxes will be installed as mitigation for loss of fauna roosting habitat, primarily hollows in trees and bat roosting sites in culverts or abandoned buildings.

No hollow bearing trees were identified in the Project EIS. In the event a hollow is identified during pre-clearing surveys, the dimensions of the hollow and any signs of occupancy (animal, feathers, scats, fur etc) will be recorded. A nest box with an entrance and depth of similar depth will be installed in adjacent habitat for each hollow identified in the Project footprint.

The culvert at Presidents Avenue has been identified as a potential roosting site for microbats. Microbats that use culverts usually utilise holes and joins in the structure that are formed during the fabrication of the concrete components. As such, numerous cavities can be available for microbats to use for roosting. As of the writing of this Monitoring Program, no microbat species have been detected utilising potential roosting features on the Project footprint, however their presence over longer temporal periods cannot be ruled out.

TfNSW has previously designed and installed pre-cast concrete culvert structures which have in-built cavities for microbats. CGU will explore the opportunity to utilise this option during the detailed design phase. If incorporated into detailed design, external artificial nest boxes (that is nest boxes installed outside of the culvert) will not be required as a mitigation measure.

Alternately, CGU will install one nest box designed to support roosting bats per section of culvert under Presidents Avenue. In this context, a “section” describes each portion of the concrete culvert, defined by the joints between each portion. It is currently proposed that a maximum of 10 nest boxes be installed. Nest box installation methods are covered in the Flora and Fauna CEMP Sub-plan.

3.2.2 Existing Bat Baseline Data

Targeted surveys for species credit species were undertaken at the Project footprint on the dates outlined in Table 8 and no individuals were detected. Table 9 presents a summary of the EIS survey effort for bats.

Table 8: Targeted bat surveys

Date	Target Species
19 January 2018	Hollow bearing tree search for microchiropteran bat and large forest owl habitat
14 February 2018	Microchiropteran bats (habitat search), Green and Golden Bell Frog (habitat search)
27 March 2018	Microchiropteran bat survey
28 March 2018	Microchiropteran bat survey

Table 9: Summary of bat survey effort

Method	Habitat (ha)	Total survey effort (hrs)	Target species
Hollow bearing tree survey	7.49	13	Bats, large forest owls
Culvert inspection	2	2	Bats
Culvert watching	<1	8	Bats
Echolocation detection	<1	8	Bats

A review of Bionet indicates that seven species of microbat have been detected within one kilometre of the Presidents Avenue culvert. All seven of these species could utilise the Presidents Avenue culvert habitat feature occasionally for roosting. The species are:

- White-striped Freetail-bat (*Tadarida australis*)*;*
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)*;*
- Gould's Wattled Bat (*Chalinolobus gouldii*)*;*
- Chocolate Wattled Bat (*Chalinolobus morio*)*;*
- Southern Myotis (*Myotis marcopus*)*;*
- Lesser Long-eared Bat (*Nyctophilus geoffroyi*)*; and*
- Gould's Long-eared Bat (*Nyctophilus gouldii*)*.*

3.2.3 Collection of Additional Data

The President Avenue Culvert is a single tunnel culvert with two openings. Prior to removal or demolition of the Presidents Avenue culvert, a single ANABAT Express will be placed at each opening into the culvert. Echolocation units will also be placed at areas of potentially suitable habitat to identify what local habitats are being utilised by microbat species. This data will be used to determine if microbats are currently using the culvert and if they are preferentially utilising adjacent habitats.

The potential use of the culvert by microbats including Southern Myotis will be evaluated using a combination of ANABATS and Flyout Surveys. Roost surveys will be initiated if these two survey methods determine microbats are using the culvert as a roost, assuming it is safe to do so.

The unit will be set to record from 60 minutes prior to sunset to 60 minutes after final light. Units will survey for 4 successive nights in accordance with OEH 2018 guidelines. In conjunction with this survey effort, two ecologists will observe each opening to determine if microbats fly out at dusk. Notes will be made on flyout observations, including time, so that any fly outs detected can be correlated with calls on the ANABAT unit. If bats are detected, ANABAT recordings will be analysed to determine what species are calling during the fly out.

If the ANBAT surveys and Flyout Surveys confirm the presence of roosting microbats in the culvert, a more detailed culvert investigation will be undertaken. The President Avenue culvert is a challenging survey target, given its length and regular high water levels. Its length means there are potential safety hazards in regard to confined spaces. The water level means access can often be hindered. However, if these hazards are controlled, the culvert will be inspected for bats or signs of bats (guano etc). The survey will be undertaken by two ecologists. A red-light torch will be used to inspect cracks or seams in the roof while a handheld bat detector will be carried to alert to the ecologists for cryptic calling bats. If bats are observed, their species, location, number and reproductive condition will be recorded.

3.2.4 Monitoring Objectives

The objectives of the nest box monitoring program are to:

- Confirm presence or absence of microbats utilising artificial nest boxes;
- Assess the structural integrity and functionality of the nest box; and,
- Ensure the nest box is not being used by an introduced species including the European Honeybee.

3.2.5 Monitoring Program

Nest box monitoring will be initiated upon installation of the nest boxes. They will be installed one month prior to the removal or destruction of the Presidents Avenue culvert. The location of nest box installations will be guided by the results of baseline monitoring. However, it is likely that they will be placed adjacent to waterways not impacted by the Project at King Wetland, Rockdale Bicentennial Ponds, Scarborough Ponds North and South.

Nest boxes will also be installed prior to removal of any hollow bearing trees that may be identified during pre-clearing surveys which will be monitored throughout construction. All other installed nest boxes will also be monitored.

Following installation, the following monitoring schedule will be maintained:

- Inspection of all boxes in the morning on the day prior to decommissioning of the Presidents Avenue Culvert
- Inspection of the boxes in the morning one week after the decommissioning of the Presidents Avenue Culvert
- Inspection of the boxes in the morning every 3 months after the decommissioning of the Presidents Avenue Culvert for one year
- Annual inspection of the nest boxes in the morning after the first year, for 3 years.

Most currently used microbat nest box designs can be inspected for fauna using ground-based monitoring techniques. This can be done using binoculars for open nest box designs or pole and arm cameras for closed nest box designs. While such methods will unlikely indicate what species is using the nest box, they will be effective for determining if the nest box is or has been utilised. Species will be identified where possible and practicable using the methods stated.

If microbat occupancy is suspected or confirmed, but species level identification could not be confirmed, an ecologist will undertake a dusk fly out survey with a hand-held echolocation recording device. Species level identification could be made from the echolocation recordings.

3.2.6 Performance Criteria and Corrective Actions

Performance criteria for the nest box monitoring program are dependent on whether microbats or other species are found utilising roosting features on within the Project footprint. Corrective actions will be implemented where target bats are not utilising nest boxes. Performance criteria and corrective actions are described in Table 10.

Table 10: Performance criteria and corrective actions for nest box monitoring program

Name	Target	Trigger	Corrective action
Nest box occupancy	Microbat species detected utilising the culvert or other features in the Project area are recorded utilising nest boxes	No target microbat species are utilising nest boxes within 12 months of installation	Investigate use of alternate nest box designs and install if identified Investigate other reasons for potential low nest box uptake and implement recommended findings from investigations
Nest box condition	Nest box condition is good with few signs of damage or decay	During construction, nest box condition degrades with signs of wear, aging or construction failure that might impede use of the box.	Replace the box Investigate use of alternate nest box designs and install if identified
Nest Box Condition	No pest animal species are utilising nest boxes	Pest animal species are identified utilising nest boxes	Engage suitably trained expert to remove pest species Investigate alternate nest box designs that could discourage colonisation by pest species and install if identified

4 Reporting and Review

4.1 Reporting

From the first instance of bat habitat removal (culverts or hollow bearing trees) 3 monthly monitoring reports will be submitted to EES and the Planning Secretary via the DPIE compliance portal within 60 days of the reporting period for the first year and then annually after, unless otherwise agreed. Reporting will include all results against the relevant criteria described in Table 10. It will include an analysis of nest box occupancy and provide recommendations if required. CGU will send flora and fauna monitoring reports to Bayside Council as they become available.

4.2 Continual Improvement

Section 3.2.2 of the CEMP describes the process for the continual improvement of Project documents.

Continual improvement of this Program will be achieved by ongoing evaluation of environmental management performance against environmental policies, objectives and targets, for the purpose of identifying opportunities for improvement.

The continual improvement process is designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies, and develop and implement a plan of corrective and preventative actions (refer to Section 3.12 of the CEMP);
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

4.3 Monitoring Program Updates and Amendments

Section 3.13 of the CEMP describes the process for revising and updating the CEMP and its Sub-plans. This will occur as needed. Only the Environmental and Sustainability Manager, or delegate, has the authority to change any of the environmental management documentation. A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure - refer to Section 2 of the CEMP.