Googong Township water cycle project: Stage A - Network (east)

Flora and Fauna Management Plan

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Contents

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Revision History

Revision No.	Date issued	Change Summary
1	30-06-2014	Changes to reflect Guideline ACT's environmental system and Bulk Water Connection (BWC) – Early Works
2	21-08-2014	Includes references to complete Stage B
3		
4		
5		

Copy no.	Issued to	Version
1	GTPL	REV 2
2	Project Engineer [Guideline ACT]	REV 2
3	Environmental Representative	REV 2
4	Project Manager [ACTEW]	REV 2
5	Environmental Manager [ACTEW]	REV 2

1 Introduction

1.1 Context

This Flora and Fauna Management Plan (FFMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Googong Township water cycle project Stages A and B – Network (east) (the Project).

Refer to Section 1 and Section 2 of the CEMP for additional detail on the scope of the Project to which this FFMP applies.

This FFMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Statement of Commitments (SoC), the safeguards listed in the Googong Township water cycle project Environmental Assessment (EA), submissions report, and all applicable legislation.

1.2 Background

The Googong Township water cycle project EA assessed the impacts of construction and operation of the Project on flora and fauna.

As part of EA development, a detailed assessment was prepared to address the Director General's Requirements issued by the Department of Planning and Infrastructure (DP&I). The flora and fauna assessment was addressed in Section 11 and Appendix F of the EA.

The EA concluded that there is unlikely to be significant flora and fauna impacts associated with the construction and operation of the Project, following the implementation of the proposed mitigation measures identified in the EA.

The Googong Township water cycle project was referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EBPC Act) due to potential impacts on matters of national environmental significance, including migratory species, threatened species and communities. The Googong Township water cycle project was declared a controlled action under the EPBC Act, and subsequently approved on 19 May 2011, subject to conditions.

1.3 Environmental management systems overview

The overall Environmental Management System and approach to managing environmental impacts for the Project is described throughout the CEMP.

This FFMP forms part of the environmental management framework for the Project, as described in Section 1.5 of the CEMP. In accordance with CoA C20(e), this Plan has been developed in consultation with the Office of Environment and Heritage (OEH), Queanbeyan City Council (QCC) and the Department of the Environment

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how the Principal (ACTEW) and the contractor will manage and protect flora and fauna during construction of the Project.

This Plan also assists in ensuring the Project meets the environmental objectives and targets as defined in Section 3.5 of the CEMP.

2.2 Objectives

The key objective of the FFMP is to ensure that impacts to flora and fauna are minimised. To realise this objectives, the following will be undertaken:

- Ensure appropriate measures are implemented to address the relevant CoA and SoC, and the safeguards detailed in the EA and submissions report (refer to Sections 3.2 and 3.3 respectively).
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 of this Plan.
- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise potential adverse impacts to flora and fauna (refer to Section 5.1).
- Stage B – Bulk water main connection
- Stage B of the Network (east) project consists of the connection of the BWPS directly to the existing DN1800 main.
- This work will be conducted in two stages:
    1. Early works – excavation and placement of the excavated material to form a crane pad (or part thereof) to enable the ultimate work to be completed and vegetation clearing in an area of approximately 0.92 ha where the bulk water connection is to be constructed.
    2. Remainder of the work (including application for extended and 24 hour works where relevant)

A pre-clearing survey has been conducted and has been attached as Appendix F. This includes a description and survey of the additional 0.92 ha that needs to be cleared for Stage B.

3 Environmental requirements

3.1 Relevant legislation and guidelines

Section 3.1 of the CEMP identifies the legal and other requirements applicable to the Project. This section identifies the key legislation and guidelines applicable to managing flora and fauna.

3.1.1 Legislative requirements

Legislation relevant to flora and fauna management includes the following.

Environmental Planning and Assessment Act 1979 (EP&A Act)

As outlined in Section 3.1 of the CEMP, the Project has been assessed and approved by the NSW Department of Planning and Infrastructure (DP&I) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Section 75U of the EP&A Act lists various approval requirements that do not apply to an approved Part 3A project, including a permit under section 201, 205 or 219 of the *Fisheries Management Act 1994 (*FM Act*)*, an authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation or State protected land, a permit under Part 3A of the *Rivers and Foreshores Improvement Act 1948*, a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the *Water Management Act 2000.*

The following directions, orders or notices cannot be made or given so as to prevent or interfere with the carrying out of the Project, an interim protection order (within the meaning of the *National Parks and Wildlife Act 1974* (NPW Act) or the *Threatened Species Conservation Act 1995* (TSC Act)), an order under Division 1 (Stop work orders) of Part 6A of the NPW Act, Division 1 (Stop work orders) of Part 7 of the TSC Act or Division 7 (Stop work orders) of Part 7A of the FM Act.

National Parks and Wildlife Act 1974

While Section 75U of the EP&A Act provides an exemption for some sections of the NPW Act, some provisions of the Act still apply. Accordingly, where required the relevant personnel, such as the Project ecologist, will hold the following.

- Scientific licence under Section 132(c) of NPW Act (including fauna – harm/ trap/ hold/ release/ collect samples from protected fauna, and flora – pick/ study native flora).
- Permit to conduct scientific research, under the Animal Research Act, 1985 (Approval); Scientific Use Registration Certificate under Animal Care and Protection Act, 2001.

Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The Googong Township water cycle project was referred to the DSEWPaC under the EPBC Act due to potential impacts on matters of national environmental significance, including migratory species, threatened species and communities. The Googong Township water cycle project was declared a controlled action under the EPBC Act, and subsequently approved on 19 May 2011, subject to conditions.

This FFMP will comply with the conditions of the EPBC Act approval, where relevant. The relevant conditions of approval, and a reference to where the condition is addressed in this Plan or other management documents is included in Table 3.3.

Other legislation

- TSC Act.
- FM Act.
- *Noxious Weeds Act 1993* (NW Act).
- *Pesticides Act 1999*.

The relevant provisions of legislation are further explained in the register of legal and other requirements included in Appendix M of the CEMP.

3.1.2 Relevant guidelines

The following guidelines and documents have been reviewed in the preparation of this FFMP:

- *Queanbeyan City Council Development Construction Specification C212 – Clearing and grubbing* (QCC, 2011).

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan are listed in Table 3.1. A cross reference is also included to indicate where the condition is addressed in this Plan or other management documents.

Table 3.1 Conditions of approval relevant to flora and fauna management

CoA No.	Condition requirements	Document reference
B11	The Proponent shall limit the clearing of native vegetation to the minimum extent practicable. Details regarding the procedures for clearing vegetation, minimising the extent of clearing and the extent and location of these reductions shall be included in the Flora and Fauna Management Plan prepared in accordance with condition C20.	Section 4.3 Table 5.1 (FF5, FF6) Appendix A
B12	All hollow bearing trees shall be retained to the greatest extent practicable. Where this is not feasible, trees containing hollows shall be inspected by a suitably qualified ecologist prior to disturbance, and where native fauna are located using the tree hollows, procedures shall be developed and implemented under the guidance of the qualified ecologist to minimise impacts on the native fauna. Details of actions to be taken and measures to monitor their effectiveness shall be included in the Flora and Fauna Management Plan.	Table 5.1 (FF8, FF19) Section 7.2 Appendix A
B13	Where possible, the removal of trees which form potential habitat for the Speckled Warbler (*Chthonicola sagittata*) shall occur outside of the August to January period breeding season of the species. If clearing cannot be avoided during this time, the area must be inspected by a qualified ecologist prior to any disturbance to identify potential nesting sites. If a nesting site is observed and it contains young, the area must be retained for at least 3 weeks to allow the young to fledge.	Table 5.1 (FF15, FF16, FF17, FF18) Appendix A

CoA No.	Condition requirements	Document reference
B14	The Proponent shall establish and maintain in perpetuity a dedicated area of land on the project site for the conservation of the Pink-tailed Worm Lizard (*Aprasia parapulchella*) as outlined in the plan prepared in accordance with condition D9 and shown in Appendix 2 (of the Project Approval).	Aprasia Conservation Management Plan Not applicable to Stage A – Network (east)
C20 (e)	A Flora and Fauna Management Plan to outline measures to protect, and minimise the loss of, terrestrial, riparian and aquatic native vegetation and native fauna habitat as a result of construction of the project. The Plan shall be prepared in consultation with OEH, Department of the Environment and Queanbeyan City Council, and include, but not necessarily be limited to:	This Plan
	(i) procedures for pre-construction surveys to identify key flora and fauna features within and adjacent to the construction area;	Table 5.1 (FF4) Appendix A
	(ii) procedures to accurately determine the total area, type and condition of vegetation community to be cleared;	Section 4.3 Section 6.4.1
	(iii) plan/s showing terrestrial vegetation communities, important flora and fauna habitat areas, EECs, threatened species (Hoary Sunray *Leucochrysum albicans var. tricolor*, Speckled Warbler *Chthonicola sagittata* and Pink-tailed Legless Lizard *Aprasia parapulchella*), weeds and areas to be cleared. The plans shall also identify vegetation adjoining the site which contains important habitat areas and/or threatened species, populations or ecological communities;	Table 5.1 (FF3) Appendix E
	(iv) methods to avoid and manage potential impacts on flora and fauna species and their habitat which may be directly or indirectly affected by the project, such as location of fencing to exclude access to sensitive areas, procedures for vegetation clearing or soil removal/stockpiling and procedures for re-locating hollows or installing nesting boxes and managing weeds;	Table 5.1 Appendix A Appendix A Appendix B
	(v) measures for conserving and reusing topsoil;	Table 5.1 (FF11)
	(vi) procedures to be implemented for controlling weeds and feral pests;	Table 5.1 (FF13, FF20) Appendix D
	(vii) rehabilitation details and success criteria;	Table 5.1 (FF12, FF22) Landscape Management Plan
	(viii) a program for reporting on the effectiveness of flora and fauna management measures; and	Section 6.5
	(ix) a procedure to review management methods where they are found to be ineffective.	Section 7 Section 8.3, 8.4 and 8.5 of CEMP

3.3 Statement of commitments

The SoC relevant to this Plan are listed Table 3.2. A cross reference is also included to indicate where the condition is addressed in this Plan or other management documents.

Table 3.2 Statement of commitments relevant to flora and fauna management

Objective	Ref. No.	Commitment	Timing	Document reference
Protect native flora and fauna	F1	A flora and fauna management plan will be prepared prior to construction as part of the CEMP. All feasible and reasonable measures will be undertaken to minimise the impact of construction on native vegetation and fauna including: • Minimising the disturbance of native flora and hollow-bearing trees. • Implementing weed control measures. • Revegetating with endemic species. • Minimising soil disturbance. • Implementing clearing protocols to protect flora and fauna.	Prior to and during construction	This Plan Table 5.1 Appendix A Appendix D
Protect threatened flora and fauna	F2	The Flora and fauna management plan (within the CEMP) will contain specific additional measures for threatened species, including: • Only approved works will be undertaken within 5m of a threatened species and exclusion fencing will be erected around threatened flora species and threatened fauna habitats and maintained in place until such time as construction works are completed, unless otherwise approved by OEH. • Site-specific management measures will be implemented for the protection of the Pink-Tailed Worm Lizard near the site proposed for SPS2 and at Hill 800, and for the Hoary Sunray near the BWPS site, including exclusion zones, signage and pre-construction surveys. These works will be undertaken under the supervision of an appropriately qualified ecologist.	Prior to and during construction	Table 5.1 (FF3, FF6, FF7, FF17) Appendix E Not relevant to construction of Stage A – Network (east)

Objective	Ref. No.	Commitment	Timing	Document reference
Avoid impacts on and monitor changes to aquatic ecology	A1	Aquatic ecology impacts are considered under WQ4. A water quality and aquatic ecology monitoring program will be developed to monitor construction and operation impacts of the Project on waterways (refer to WQ4 for further details). The monitoring program will include siting of the aquatic ecology monitoring location to ensure viable comparison with historical and other recent river ecology data. Riparian vegetation, weeds and invasive scrub will be managed within the Googong township site. This will include surveying, mapping and managing invasive species.	Prior to and during construction, and during operation	Water quality and aquatic ecology monitoring program is not applicable to Stage A – Network (east). Monitoring to commence 12 months prior to commissioning of the WRP. Refer to SoC WQ4. Table 5.1 (FF24)
Minimise impacts on aquatic habitats	A2	Riparian zones within the Googong township site will be revegetated with species of local providence to increase stability. Further measures to ensure minimal impact on aquatic habitats are addressed in Statement of Commitments WQ1-WQ5.	Construction	Not applicable to Stage A – Network (east)

Objective	Ref. No.	Commitment	Timing	Document reference
Monitor impacts on waterways	WQ4	A monitoring program to assess the potential impacts of the Project on the Queanbeyan River (including water quality, flow, fish migration, macrophytes and macro invertebrate communities) will be undertaken. • Details of the monitoring program will be determined in consultation with relevant government authorities/stakeholders (including the OEH, DPI and, potentially, ACTEW Corporation). Such consultation will ensure the sharing of available data for the Queanbeyan River for comparative and impact assessment purposes. • A new monitoring site within the Queanbeyan River is proposed to measure water quality and aquatic ecology impacts over the medium term. This site will be located near the confluence of Googong Creek and Queanbeyan River (and will be sited to enable comparison with data collected from upstream and downstream sites). • Monitoring will commence approximately 12 months prior to commissioning the water recycling plant.	Prior to, during construction and during operation	Table 5.1 Compliance Tracking Program

3.4 EPBC Act conditions of approval

The EPBC Act conditions of approval relevant to this Plan are listed in Table 3.3. A cross reference is also included to indicate where the condition is addressed in this Plan or other management documents.

Table 3.3 EPBC conditions of approval relevant to flora and fauna management (for the Project)

CoA No.	Condition requirements	Document reference
4	To prevent impacts on the Hoary Sunray (*Leucochrysum albicans* var. *tricolor*) during construction, the person taking the action must fence and sign 'no go areas' of Hoary Sunray habitat in the vicinity of the Bulk Water Pumping Station and existing ACTEW Googong Water Treatment Plant.	Table 5.1 (FF14) Appendix E
5	Within 30 days from the commencement of the action, the person taking the action must advise the department in writing of the actual date of commencement.	Table 5.1 (FF4)

4 Environmental aspects and impacts

The following sections summarise existing vegetation communities, threatened flora, fauna and habitat. Identified impacts are then reviewed. The key reference documents are Section 11 and Appendix F of the EA.

4.1 Environmental aspects

4.1.1 Vegetation communities

The Project will pass through five vegetation communities (refer Appendix E). These communities are:

- Native pasture with scattered planted native trees.
- Scribbly Gum/Red Box/Apple Box Dry Forest.
- Blakely's Red Gum/Red Box/Apple Box Grassy Woodland.
- Acacia regrowth.
- Maintained Eucalypt Open Woodland.

4.1.2 Endangered ecological communities

One endangered ecological community (EEC) was identified within the Project area (refer 7.2Appendix E).

- White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grasslands (listed as critically endangered under the EPBC Act and endangered under the TSC Act).

The location of this EEC is identified in the environmental constraints maps included in Appendix I of the CEMP.

4.1.3 Threatened flora species

One threatened flora species was identified adjacent to the Project area.

- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*), listed as endangered under the EPBC Act.

Three populations were identified in the vicinity of the Bulk Water Pumping Station access road.

The location of Hoary Sunray populations are identified in the environmental constraints maps included in Appendix I of the CEMP.

4.1.4 Threatened fauna

The Project provides potential habitat for threatened woodland birds. The Speckled Warbler listed as vulnerable under the TSC Act was recorded just outside the Project area during 2009 field survey for the EA.

During the July 2012 pre-clearing survey, a previously unrecorded threatened woodland bird, the Scarlet Robin was identified within the Project area. The Scarlet Robin is listed as vulnerable under the TSC Act. Listing under the TSC Act occurred in December 2010, after the field survey and ecological assessment was completed for the EA. The Project would impact upon the area of potential habitat for this species (refer to Section 4.3.2).

The mitigation measure proposed in CoA B13 (refer Table 3.1) will be extended to cover the Scarlet Robin so that clearing of this potential habitat occurs outside of the July to January breeding season where possible, or that if clearing cannot be avoided during this period, that the potential habitat area be inspected prior to any disturbance (refer Table 5.1 (FF20, FF21)).

The recording of this unexpected threatened woodland bird and the proposed management measures has been discussed with the OEH as outlined in the Vegetation Clearing Procedure (refer Appendix B). No comment has been received.

The location of threatened woodland bird potential habitat is identified in the environmental constraints maps included in Appendix E to this document.

Two additional threatened fauna species were recorded in the broader study area for the Googong Township water cycle project during field surveys. These are:

- Eastern Bent-wing bat (*Miniopterus schreibersii oceanensis*).
- Pink-tailed Legless Lizard (*Aprasia parapulchella*).

Potential habitat for these two species fall outside the Project area.

4.1.5 Fauna habitats

Woodlands (including Box-Gum Woodland)

Several patches of woodlands are present with varying value to fauna. These are:

- Roadside vegetation: A narrow strip of roadside vegetation that falls adjacent to Googong Dam Road. This includes hollow bearing trees that are likely to provide nesting habitat for parrots, possums and birds. The roadside woodland habitat is considered to be of low value to fauna.
- Disturbed woodlands near the existing Googong Water Treatment Plant: Provides direct and indirect food source for vertebrates, particularly birds. Termite mounds are found at moderate densities and are an important habitat component for goannas.
- Woodland along the BWSP pipeline alignment: Provides moderate and low quality potential habitat for the Speckled Warbler (*Chthonicola sagittata*) and the Scarlet Robin (*Petroica boodang*), both listed as vulnerable under the TSC Act (refer Section 4.1.6). Woodlands fall into two fauna habitat categories: moderate quality threatened woodland bird potential habitat and low quality threatened woodland bird potential habitat. These are identified in Appendix E.

4.1.6 Aquatic habitat

Two tributaries of Googong Creek lie to the west of the Project. Googong Creek is an ephemeral creek that flows through agricultural land and discharges into the Queanbeyan River. The surrounding agricultural land use has altered the creek's natural flow regime and aquatic ecology. The overall ecological health is considered to be somewhat degraded. While there are a small number of native trees, the majority of vegetation in the area is degraded grassland, with moderate weed infestation.

4.2 Construction activities

Key aspects of the project that could result in adverse impacts to flora and fauna include:

- Clearing of native vegetation and fauna habitat, particularly in proximity to the Bulk Water Supply Station and access road.
- Disturbance of soils, consequential erosion and sedimentation, and/or spread of weeds.
- Work adjacent to watercourses.

4.3 Flora and fauna impacts

Likely and potential impacts associated with the Project include:

- Disturbance of habitat for native flora and fauna species or ecological communities, including the removal of hollow bearing trees or rock.
- Disturbance to foraging or breeding resources for threatened species.
- Edge effects (such as weed invasion, pests and disease).
- Disturbance of watercourses resulting from contamination or sedimentation of waterways, degrading water quality and impacts on the quality of aquatic habitats.

The Project trench alignment and layout has been designed to avoid impacts on native vegetation and fauna habitat as far as practical. Clearing will generally be limited to a ten metre offset from the infrastructure (including trenches for pipelines, pumping stations, access roads and reservoirs), to enable construction (refer Appendix A). The clearing limits are identified in the flora and fauna constraints maps (refer Appendix E).

In areas adjacent to native vegetation or fauna habitat, the clearing limits will be reviewed by the Project Engineer, with assistance from the Project ecologist where required, to ensure that the Project results in the least possible impact on native vegetation. Based on the current design and clearing limits presented in Appendix E, the Project is likely to result in the loss of:

4.3.1 Vegetation communities

The area of impact on each vegetation community is outlined below. The area of impact is based on a clearing limit of ten metres offset from the infrastructure (including trenches for pipelines, BWPS and access road), to enable construction.

- Native pasture with scattered planted native trees: 2.3 hectares
- Scribbly Gum/Red Box/Apple Box Dry Forest: 27.9 hectares
- Acacia regrowth: 1.4 hectares
- Maintained Eucalypt Open Woodland: 7.3 hectares
- Blakely's Red Gum/Red Box/Apple Box Grassy Woodland: none. To be protected during construction.

The final area, type and condition of vegetation to be removed will be verified as outlined in Section 6.4.1.

4.3.2 Fauna habitat (threatened fauna habitat):

- 29.3 hectares of moderate quality threatened woodland bird potential habitat
- 7.5 hectares of low quality threatened woodland bird potential habitat.

The CoA B13 provides mitigation measures for the threatened Speckled Warbler habitat (refer Table 3.1). The Project will apply this mitigation to moderate and low quality threatened woodland bird potential habitat, providing potential habitat for two threatened bird species (refer Table 5.1 measures including FF18, FF19, FF20, FF21).

4.3.3 Endangered ecological communities

No area of EEC will be impacted. EEC is to be protected during construction in accordance with mitigation measures FF7 and FF15 (refer Table 5.1).

4.3.4 Hollow bearing trees

The Project would result in the removal of 12 hollow bearing trees consisting of around 23 hollows. A two-stage approach to clearing will be carried out in areas where habitat trees have been identified. Refer to Vegetation Clearing Procedure (Appendix B).

5 Environmental control measures

5.1 Flora and fauna mitigation and management measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the CoA, SoC and the EA. Specific measures and requirements to address impacts on flora and fauna are outlined in Table 5.1.

Table 5.1 Mitigation measures

ID	Measure	When to implement	Reference	Responsibility
FF1	All Project personnel will be provided training on the requirements of this Plan through site inductions, toolbox talks or specific training.	Prior to construction; construction	CoA A8	Project engineer
FF2	A Project ecologist will be appointed prior to the commencement of construction to provide technical advice and assist the Project implement management measures.	Prior to construction		Project engineer
FF3	Flora and fauna constraints maps will be developed that identify plan/s showing vegetation communities, important flora and fauna habitat areas, endangered ecological communities, threatened species (Hoary Sunray and Speckled Warbler), weeds and clearing limits. The plans will also identify vegetation adjoining the site that contains important habitat areas and/or threatened species, populations or ecological communities (7.2Appendix E.	Prior to construction; construction	CoA C20(e)(iii)	Project engineer
Vegetation clearing, protection and management				
FF4	The Project will advise the DSEWPaC within 30 days from the commencement of the action, the person taking the action must advise the department in writing of the actual date of commencement.	Prior to construction	EPBC CoA 5	
FF5	A pre-construction clearing survey will be carried out by a qualified ecologist prior to construction in accordance with the **Pre-construction Clearing Survey Procedure** (Appendix A).	Prior to construction; construction	CoA C20(e)(i)	Project Engineer

ID	Measure	When to implement	Reference	Responsibility
FF6	The limits of clearing will generally limited to a ten metre offset from the footprint of the infrastructure (including trenches for pipelines, pumping stations, access roads and reservoirs), to enable construction. In areas adjacent to native vegetation or fauna habitat, the clearing limits will be reviewed to ensure that the Project results in the least possible impact on native vegetation.	Construction	CoA B11	Construction Manager Project Engineer
FF7	The limits of clearing will be clearly marked on construction work plans and on site prior to clearing. Vegetation to be retained will be protected through exclusion fencing and 'no-go zone' signage, where appropriate. Exclusion fencing is to include the use of fencing or flaggings suitable to indicate a 'no clearing zone'.	Prior to construction; construction	CoA B11	Project engineer
FF8	Erosion and sediment controls will be installed prior to and during clearing, in order to protect adjacent vegetation and watercourses. Refer to Soil and Water Management Plan.	Prior to construction; construction	CoA C20(e)(v) SoC F1	Construction Manager Project Engineer Foreman
FF9	At least half the required nest boxes will be installed prior to the commencement of vegetation clearance. Host trees are to be identified. Where they are located on private land, permission from landowners will be sought to install boxes. Refer to **Hollow Relocation and Nest Box Strategy** (Appendix B).	Construction	CoA C20(e)(iv)	Project engineer
FF10	Clearing will be undertaken in a two-staged process in accordance with the **Vegetation Clearance Procedure** (Appendix A).	Prior to construction; construction	CoA B12 CoA C20(e)(iv) SoC F1	Project Engineer Foreman
FF11	Hollows will be relocated where possible in accordance with the **Hollow Relocation and Nest Box Strategy** (Appendix B). Generally, native vegetation cleared for the Project will be mulched for reuse in rehabilitation works and erosion control.	Construction	CoA C20(e)(iv)	Project engineer
FF12	Topsoil will be stripped and stockpiled for reuse. Topsoil and other soil stockpiles will not be located in 'no-go zones'.	Construction	CoA C20(e)(v) SoC F1	Project Engineer Foreman
FF13	Revegetation/rehabilitation of the site will be conducted progressively during the construction phase to ensure the timely reuse of collected topsoil. Disturbed areas will be rehabilitated to a condition consistent with the pre-construction state, in accordance with the Landscape Management Plan.	Construction	CoA C20(e)(vii) SoC F1	Project Engineer Foreman

ID	Measure	When to implement	Reference	Responsibility
FF14	Weed management measures, such as bush regeneration and weed spraying will be implemented in accordance with the **Weed and Pest Management Strategy** (Appendix D).	Prior to construction; construction	CoA C20(e)(vi) SoC F1	Project Engineer
Threatened flora and endangered ecological communities				
FF15	Hoary Sunray populations and potential habitat adjacent to the Bulk Water Pumping Station, the patch of EEC, and any other threatened flora that may be identified during pre construction clearing surveys, will be identified on the environmental constraints maps (Appendix E). Exclusion fencing and signage of 'no-go zones' will be installed to avoid disturbance, where required. Exclusion fencing will be installed at least five metres from the location of threatened flora.	Prior to construction; construction	CoA C20(e)(iv) SoC F1 EPBC CoA 4	Project engineer
Threatened fauna and fauna protection				
FF16	A suitably qualified ecologist would undertake searches for native fauna in the construction footprint immediately prior to clearing. Searches would include nests and large hollow-bearing trees, and target habitats of hollow dwelling species and threatened fauna (eg the Speckled Warbler). Refer to the **Vegetation Clearance Procedure** (Appendix A).	Prior to construction; construction	CoA B13 SoC F1	Project engineer
FF17	Threatened fauna habitat will be identified on the environmental constraints maps. Exclusion fencing and signage of 'no-go zones' will be installed to avoid disturbance, where required. Exclusion fencing will be installed at least five metres from the location of threatened fauna habitat.	Prior to construction; construction	CoA C20(e)(iv) SoC F1	Project Engineer
FF18	Where possible, clearing of vegetation in potential habitat for the Speckled Warbler will not be undertaken during the August to January breeding season. If clearing cannot be avoided during this period, the area to be cleared should be inspected by a qualified ecologist prior to any disturbance in accordance with the **Vegetation Clearance Procedure** (Appendix A).	Construction	CoA B13	Project Engineer
FF19	Should the pre-clearing survey identify a Speckled Warbler nesting site that contains young, exclusion fencing and signage of 'no-go zones' will be installed to avoid disturbance, where required. Clearing will be postponed for at least three weeks to allow the young to fledge. Clearing will continue only upon advice from the Project ecologist.	Prior to construction; construction	CoA B13	Project Engineer

ID	Measure	When to implement	Reference	Responsibility
FF20	Where possible, clearing of vegetation in potential habitat for the Scarlet Robin will not be undertaken during the July to January breeding season. If clearing cannot be avoided during this period, the area to be cleared should be inspected by a qualified ecologist prior to any disturbance in accordance with the **Vegetation Clearance Procedure** (Appendix A).	Construction		Project Engineer
FF21	Should the pre-clearing survey identify a Scarlet Robin nesting site that contains young, exclusion fencing and signage of 'no-go zones' will be installed to avoid disturbance, where required. Clearing will be postponed for at least three weeks to allow the young to fledge. Clearing will continue only upon advice from the Project ecologist.	Prior to construction; construction		Project Engineer
FF22	Hollows will be relocated or nest boxes will be installed to offset the loss of hollow bearing trees where feasible and reasonable, as per the **Hollow Relocation and Nest Box Strategy** (Appendix B). Hollow relocation or nest box installation would be undertaken so as to limit damage to existing vegetation.	Construction	CoA C20(e)(iv) SoC F1	Project Engineer
FF23	Pest management measures, such as construction equipment washing procedures will be implemented in accordance with the **Weed and Pest Management Strategy** (Appendix D).	Prior to construction; construction	CoA C20(e)(iv) CoA C20 (e)(vi) SoC F1	Project Engineer
Watercourses and aquatic ecology				
FF24	Creek banks or waterways disturbed during the laying of pipes will be stabilised through rehabilitation and revegetation in accordance with the **Landscape Management Plan**.	Construction	SoC A2	Project Engineer
Revegetation				
FF25	The top 50 – 100 mm of topsoil will be stripped, scalped for weeds and stockpiled separately. Weed infested topsoil will be reused as fill where possible, and will not be reused for landscaping.	Construction		Project Engineer Foreman
FF26	Weed free topsoil will be respread for landscaping purposes. Where possible, topsoil will be stripped and reinstated by soil horizon (B horizon reinstated first and finishing with A horizon).	Construction		Project Engineer Foreman

ID	Measure	When to implement	Reference	Responsibility
	Weed and pest management. Refer to **Weed and Pest Management Strategy** (Appendix D).			
FF27	Prior to vegetation clearance, woody weeds will be removed. This will include the physical removal and stump poisoning (ie cut-and-daub technique) for Sweet Briar, Blackberry and Hawthorn located in 'high weed infestation' area. Spot removal of the patch of Serrated Tussock, located just outside the Proejct, will also be removed. Refer to Appendix E for the location of weeds within the Project.	Construction	SoC A2	Project Engineer
FF28	Earth moving vehicles will, as far as possible, be cleaned of dirt before entering the Project site and when leaving areas of 'high weed infestation'. Construction personnel will, as far as possible, clean their boots and clothing of all seed laden material prior to leaving high weed infested areas.	Construction	SoC A2	Project Engineer Foreman
FF29	• Any topsoil that is imported from offsite for use in landscaping will be weed free. • Topsoil will be stripped from areas of 'high weed infestation' and buried as fill or disposed of off site. • Topsoil from moderate and low weed infestation categories will be stripped and stockpiled separately. Topsoil will only be reused in an area of the same weed category.	Construction	SoC A2	Project Engineer Foreman
FF30	No domestic pets will be brought on site.	Construction	SoC A2	Construction Manager Foreman
FF31	Vegetation will not be left in piles to create potential habitat for rabbits and other vermin.	Construction	SoC A2	Project Engineer Foreman

6 Compliance management

6.1 Roles and responsibilities

The Project team's roles and responsibilities are outlined in Section 4.1 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 5 of this Plan.

6.2 Training

All personnel working on site will undergo site induction training relating to flora and fauna issues. The induction training will address elements related to flora and fauna management including:

- The objectives and requirements of this Plan.
- Relevant legislation.
- Pre-clearing and clearing protocols.
- Environmental exclusion fencing and 'no-go zones'.
- General flora and fauna management measures.
- Weed control measures.

Targeted training for personnel directly involved in vegetation clearing would be provided as required. Training would be developed and delivered through environmental work method statements and toolbox talks.

Further details regarding induction and training are outlined in Section 5 of the CEMP.

6.3 Inspections

Inspection of actual or potential impacts to flora and fauna will occur as required for the duration of the Project. Daily visual inspections of the construction site will be undertaken by the Project engineer and construction personnel to identify actual or potential flora and fauna management concern.

Weekly environmental inspections including of flora and fauna management and mitigation measures will be undertaken by the Project engineer This will include auditing of construction activities to ensure there is no impact on threatened species, endangered ecological communities or habitats in addition to that already permitted. It will also include inspection of retained vegetation and environmental exclusion fencing. These inspections will be documented on the weekly checklist.

The Environmental Representative will inspect the site regularly.

Requirements and responsibilities in relation to inspections are documented in Section 8.1 of the CEMP.

6.4 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Plan, CoA, SoC and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 8.4 of the CEMP.

6.4.1 Auditing native vegetation impacts

Section 4.3 outlines the extent of impacts on native vegetation. The contractor will verify the impacts on native vegetation after significant clearing events, and at least every six months. The auditing of native vegetation impacts will generally include the following key steps:

- Map the survey the data collected on the limits to clearing on site (refer to the **Vegetation Clearing Procedure (**Appendix A)).
- Quantify the actual impacts on site on the following (with assistance from the Project ecologist as required):
  - Threatened flora.
  - Native vegetation communities, including endangered ecological communities.
  - Threatened fauna habitat.
  - Ensure any information collected during the **Pre-construction Clearing Survey** (Appendix A) is considered.
- Compare the actual impacts against those predicted (refer Section 4.3). Where the Project has resulted in significant additional impacts to native vegetation, manage the event as a non-conformance. Refer to Section 8.3 of the CEMP for managing non-conformances.
- The outcome of native vegetation audits will be reported through six-monthly construction compliance reports. Refer to Section 8.4 of the CEMP.

6.5 Reporting

Results and outcomes of inspections, monitoring and auditing will be reported internally on a monthly basis. Monthly reporting will include reporting on the effectiveness of the flora and fauna mitigation and management measures outlined in Table 5.1. Section 1.10 of the Monthly Report (Appendix O to the CEMP) includes a section for this reporting requirement.

Six-monthly construction compliance reports will be prepared to report on compliance with the Project Approval. Reporting requirements and responsibilities are documented in Section 8.5 of the CEMP.

7 Review and improvement

7.1 Non-conformity, corrective and preventative actions

A non-conformance is an action or omission that does not conform with the requirements of this Plan or any legal and other requirements.

Where inspections, auditing or reporting (as outlined in Section 6.3, Section 6.4 and Section 6.5 above) identify that the flora and fauna mitigation and management measures identified in this Plan are ineffective, a non-conformance or opportunity for improvement will be raised.

Any member of the Project team or the Environmental Representative can identify a non-conformance or opportunity for improvement. Section 8.3 of the CEMP identifies the process for identifying, reporting, recording and reviewing non-conformances. This will ensure continual improvement.

7.2 Management plan update and amendment

The processes described in Section 7 and Section 8 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Appendix A Pre-construction clearing survey procedure

A.1 Distribution

There are no restrictions on the distribution or circulation of this procedure within the Googong Integrated Water Cycle Stages A and B – Network (east) project (the Project).

A.2 Purpose

This procedure details the requirements for conducting a flora and fauna survey on site prior to the commencement of construction.

The procedure will assist to identify any additional mitigation measures required to manage impacts on flora and fauna.

A.3 Induction/training

Where required, Project personnel will be made aware of this procedure as required through toolbox talks.

A.4 Scope

This procedure is applicable to all activities conducted by the Project contractor or subcontractors that have the potential to impact on vegetation or fauna habitat. This procedure includes the following key elements:

- Confirm location of biodiversity features.
- Identify habitat trees.
- Locate suitable habitat for fauna that may require relocation.
- Update management measures.

A.5 Procedure

Identify biodiversity features

- Review the environmental assessment and submissions report and any other ecological investigations carried out on site to identify the known and potential locations of threatened flora (eg

Hoary Sunray (*Leucochrysum albicans* var. *tricolor*)), threatened fauna (eg Speckled Warbler (*Chthonicola sagittate*)) and endangered ecological communities (eg White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grasslands).

Conduct pre-clearing survey

- Prior to the commencement of clearing, the Project ecologist is to conduct an on site survey to check for the presence of threatened flora and fauna species identified in the assessment as likely to occur.
- Record the location of hollow-bearing trees, threatened flora and trees containing threatened fauna, including (where relevant):
  - GPS location.
  - Species.
  - Type of habitat.
  - Size of hollow.
  - Type of hollow.
- Mark identified hollow-bearing trees, threatened flora and trees containing threatened fauna on site with suitable materials, eg flagging tape or paint.

Locate suitable habitat for fauna relocation

- In consultation with the Project ecologist, identify (including GPS location) of nearby habitat that would be suitable for the release of fauna that may require relocation.

Update management measures

- The Project engineer is to incorporate the results of the pre-construction clearing survey into the Construction Environmental Management Plan or Flora and Fauna Management Plan and constraints maps as required. This may include:
  - The location of threatened flora and fauna identified.
  - The location of nearby habitat that would be suitable for the release of fauna.
  - Any additional biodiversity management measures, eg an update to identified 'no-go zones'.

Appendix B Vegetation clearance procedure

B.1 Distribution

There are no restrictions on the distribution or circulation of this procedure within the Googong Integrated Water Cycle Stages A and B – Network (east) project (the Project).

B.2 Purpose

This procedure details the requirements for clearing and grubbing of vegetation on site. It will be used to identify the limits to clearing.

This procedure relates to the measures to be put in place prior to, during and following clearing of vegetation.

B.3 Induction/training

Where required, Project personnel will be made aware of this procedure through toolbox talks or targeted training.

B.4 Scope

This procedure is applicable to all activities conducted by the Project contractor or subcontractors that have the potential to impact on vegetation or fauna habitat. This procedure includes the following key elements:

- Inspect vegetation prior to commencement of clearing.
- Implement environmental controls.
- Remove vegetation.
- Inspect site after felling.
- Manage cleared vegetation.

B.5 Procedure

Mark out clearing limits

- In consultation with the Project engineer, identify the limits of clearing. The limits of clearing will generally be limited to a 10 metre offset from the infrastructure (including trenches for pipelines, pumping stations, access roads and reservoirs). In areas adjacent to native vegetation or fauna

habitat, clearing limits will be reviewed to ensure the least possible impact on native vegetation. Where working in proximity to identified 'no go' areas, the limits of clearing should be identified in consultation with the Project ecologist.

- Install fencing of flagging to identify the clearing limits.
- Record the limits to clearing using accurate survey technology. This will enable the recording and auditing of the area of native vegetation cleared by the Project.

Pre-clearing activities

- At least two days prior to clearing, the Project ecologist is to check for the presence of threatened flora and fauna, and fauna habitat.
- If not already done, record details of all hollow-bearing trees, including:
  - GPS location.
  - Species.
  - Size of hollow.
  - Type of hollow.
- Within the clearing limits, mark all habitat trees. A habitat tree includes hollow bearing trees and any trees that contain nests or cavities that may act as a hollow.
- Within the clearing limits, mark any trees found to contain threatened fauna, or the location of any threatened flora. Should any threatened flora or fauna species be unexpectantly encountered, the Project engineer and Project ecologist would determine the significance, assess impacts and identify management measures, approvals/licences or permits required, in consultation with the Office of Environment and Heritage (OEH), Department of Primary Industries – Fisheries Conservation and Aquaculture and Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), as appropriate.
- Should the Project ecologist identify a Speckled Warbler (*Chthonicola sagittata*) nesting site that contains young, the area must be retained for at least three weeks to allow the young to fledge. Clearing will continue upon advice from the Project ecologist.
- The Project ecologist should capture or removed fauna that have potential to be disturbed, injured or killed as a result of clearing. Fauna should be relocated in to suitable nearby habitat, identified by the Project ecologist.
- If grubbing is to take place, erosion and sediment controls are to be in place prior to grubbing.

Obtain approval to clear

- The Project engineer should issue the approval to clear, indicating that clearing limits and environmental controls are adequate.

Non-woody vegetation

- Where the Project ecologist has not identified the presence of habitat features, non-woody vegetation (grasses and groundcover species) can be removed.
- Grasses and groundcover species should be incorporated into the stripping of topsoil to retain any organic material and stockpiled according the Soil and Water Management Plan (CEMP Appendix A).

Implement a two-stage clearing process

- A two-stage approach to clearing will be carried out in areas where habitat trees have been identified.
- Stage 1 of clearing will include the felling of all non-habitat trees, ensuring that there is minimal disturbance to the habitat trees.
- Habitat trees will be left standing for a minimum of 24 hours. This will ensure fauna have an opportunity to relocate of their own accord.
- The Project ecologist is to be on site for felling of all habitat trees.
- Fell habitat trees carefully, allowing trees to be lowered to the ground.
- The Project ecologist is to inspect the felled habitat trees for fauna. Fauna identified should be captured, inspected for injury and relocated to suitable habitat (as identified by the Project ecologist).

Management of cleared vegetation

- Where advised by the Project engineer, hollows are to be relocated, in accordance with the Hollow Relocation and Nest Box Strategy (Appendix C to the FFMP).
- Mulch remaining native vegetation and stockpile for reuse in rehabilitation works and erosion control.

Reporting

- The Project engineer should record the outcomes of the clearing process, including:
  - Clearing dates, areas cleared, surveyed limits to clearing etc.
  - Details of habitat trees, the number of trees, nests etc.
  - Fauna species present, captured and located.
  - Fauna injured or killed.
  - Discussion on the effectiveness of methods.
  - Recommendations, if any, to review and improve the vegetation clearing procedure.

Verify impacts of vegetation clearing

- After each significant clearing event, the Environment Manger is to incorporate the outcomes of the clearing process, including an audit of native vegetation impacts, as per the process outlined in Section 6.4.1 of the FFMP.

Appendix C Hollow relocation and nest box strategy

C.1 Distribution

There are no restrictions on the distribution or circulation of this procedure within the Googong Integrated Water Cycle Stages A and B – Network (east) project (the Project).

C.2 Purpose

This procedure details the requirements to mitigate the impacts of vegetation clearance on hollow-dependent fauna. It outlines the procedures for relocating hollows and/or installing nest boxes.

C.3 Induction/training

All Project personnel will be provided with a general site induction including an outline of their responsibilities relating to reducing impacts on flora and fauna. Personnel involved in vegetation clearance and nest box installation will be inducted into this procedure. If required, additional training will be provided through toolbox talks.

C.4 Scope

This procedure is applicable to all activities conducted by the Project contractor or subcontractors that are involved in the removal of hollow bearing trees.

C.5 Hollow bearing trees

Around 12 hollow bearing trees supporting 23 hollows were recorded within the Project site. For each hollow bearing tree the following data were collected:

- Location of tree (GPS).
- Species of tree.
- Size of entrance/s (estimated in centimetres).
- Estimation of hollow volume (small, medium or large).
- Location of hollow (branch or trunk).
- Height of tree (metres).
- Tree diameter at breast height.

Table 7.2 details this information. The locations of hollowing bearing trees are provided in Appendix E of the Flora and Fauna Management Plan (Flora and fauna constraints maps).

Note that five hollow bearing trees were identified in the pre-clearing survey for the connection works. Please refer to the Permanent Connection Pre-clearing Survey in Appendix F

Table 7.2 Hollow data set

GPS Point	Hollow ID	Tree Species	Comments	Diameter of Entrance (cm)	Estimate of volume	Location	Hollow Height (m)	Tree Height (m)	DBH (cm)
T5	T5H1	Brittle Gum		5	Small		6.5	14	80
T5	T5H2	Brittle Gum		8	Small		5	14	80
T5	T5H3	Brittle Gum		15	Med		4	14	80
T6	T6H1	Brittle Gum	Stag	10	Small	Trunk	7	14	70
T6	T6H2	Brittle Gum	Stag	8	Small	Branch	4	14	70
T8	T8H1	Blakely's Red Gum		40	Med	Trunk	3	17	90
T9	T9H1	Scribbly Gum		10	Small	Branch	9	12	90
T9	T9H2	Scribbly Gum		8(x2)	Med	Trunk	9	12	90
T9	T9H3	Scribbly Gum		8	Small	Trunk	7.5	12	90
T9	T9H4	Scribbly Gum		12	Med	Branch	2.5	12	90
T10	T10H1	Scribbly Gum		20	Large	Trunk	1.5	12	70
T11	T11H1	Bundy	Dying	20	Large	Trunk	3.5	8	80
T11	T11H2	Bundy	Dying	20	Large	Trunk	2	8	80
T12	T12H1	Scribbly Gum	Stag	7	Small	Branch	4	9	40
T12	T12H2	Scribbly Gum	Stag	10	Med	Trunk	2.5	9	40
T13	T13H1	Scribbly Gum	Stag	12	Med	Branch	12	17	70
T13	T13H2	Scribbly Gum	Stag	8	Med	Branch	10	17	70
T14	T14H1	Scribbly Gum	Half dead	8	Small	Branch	6	18	80

GPS Point	Hollow ID	Tree Species	Comments	Diameter of Entrance (cm)	Estimate of volume	Location	Hollow Height (m)	Tree Height (m)	DBH (cm)
T15	T15H1	Red Box		10	Small	Branch	5.5	10	35
T15	T15H2	Red Box		13	Med	Branch	4.5	10	35
T15	T15H3	Red Box		12	Large	Branch	3	10	35
T16	T16H1	Red Box	Exposed but deep	50	Large	Trunk	2	5	60
T17	T17H1	Scribbly Gum	Occupied by Brush-tail Possum	15	Small	Trunk	4	5	40

C.6 Nest boxes

- For every hollow that is removed during vegetation clearance, up to two nest boxes will be installed. If the hollow can be relocated, one nest box will be installed. While the relocation of hollows is preferred, it may not always be feasible, particularly where hollows are located within the tree trunk.
- Up to 46 nest boxes will be required to offset the loss of 23 hollows to be removed for the Project.
- A range of boxes will be installed. Based on the types/ sizes of hollows recorded during survey and the fauna species known and likely to occur, they will comprise of:
  - Four insectivorous bat roots, with a three centimetre entrance over three metres in height.
  - Twelve small glider boxes.
  - Eight possum boxes.
  - Twelve medium nest boxes suitable for parrots and Brown Treecreepers, with a six centimetre entrance over three metres in height.
  - Ten cockatoo boxes.

C.7 Procedure

Confirm loss of hollows and nest box requirements

- Carry out Pre-construction Clearing Survey in accordance with Appendix A to the FFMP. Confirm the number of hollows to be removed, and the quantity and size of nest boxes required to replace hollows lost at a 2:1 ratio.

Identity host trees prior to vegetation clearing

- Potential host trees are to be identified prior to clearing. Host trees are be located in adjacent/nearby habitat which will not be subject to planned future development or other vegetation clearance.
- T the specific host trees within these patches will be chosen by the Project Ecologist, in consultation with the Project engineer.
- Order nest boxes.

Install nest boxes prior to vegetation clearing

- At least half the required nest boxes will be installed prior to the commencement of vegetation clearance, including:
  - Two insectivorous bat roots, with a three centimetre entrance over three metres in height.
  - Six small glider boxes.
  - Four possum boxes.
  - Six medium nest boxes suitable for parrots and Brown Treecreepers, with a six centimetre entrance over three metres in height.
  - Five cockatoo boxes.
- Nest boxes will be mounted between two and eight metres above the ground, depending on target fauna group, subject to advice from the Project Ecologist.
- A maximum of two relocated hollows or replacement nest boxes will be placed in each chosen host tree.

Implement the Vegetation Clearing Procedure

The Vegetation Clearing Procedure (Appendix B of the Flora and Fauna Management Plan) outlines the steps to be taken during vegetation clearing. This includes:

- Pre-clearing activities including the need to check hollows for the presence of threatened fauna, recording of hollow bearing trees, trapping and relocation of fauna.
- Implementation of a two-stage clearing process for clearing in areas where habitat trees have been identified.

Install nest boxes or hollows after vegetation clearing

- Hollows that can be cut from the felled trees will be installed in adjacent host trees.
- Where hollows cannot be relocated, additional nest boxes will be ordered and installed. Based on the fauna identified during the clearing process, the Project Ecologist will confirm the type of nest boxes that will be required. Section C.6 details the types of nest boxes that will likely be required.
- Landowner permission will be required for the installation of relocated hollows or nest boxes as outlined above.

Monitoring

- Monitoring will be undertaken in the Spring or Summer following the clearance of vegetation (ie Spring or Summer 2013).
- All nest boxes/relocated hollows will be inspected for fauna occupation.
- Monitoring will be conducted by the Project Ecologist.

Appendix D Weed and pest management strategy

D.1 Distribution

There are no restrictions on the distribution or circulation of this procedure within the Googong Integrated Water Cycle Stages A and B– Network (east) project (the Project).

D.2 Purpose

This procedure details the requirements for managing weeds and feral pests.

D.3 Induction/training

All Project personnel will be provided with a general site induction including an outline of their responsibilities relating to weed management. Personnel involved in weed management will be inducted into this procedure. If required, additional training will be provided through toolbox talks.

D.4 Scope

This procedure is applicable to all activities conducted by the Project contractor or subcontractors that have the potential to introduce or spread weeds/feral pests within the Project site.

D.5 Weed species present

Weed Species

Numerous weeds species common to pastoral lands occur at varying levels of infestation throughout the study area. The weed species recorded during the field survey are listed in Table 7.3.

Two species are considered to be of higher threat within the study area than the remainder of the weed species present in the site. These are two Weeds of National Significance, African Lovegrass and Serrated Tussock.

African Lovegrass (*Eragrostis curvula*) is considered to be of the highest immediate concern. A dense stand of this species was recorded in the western part of the Project, at the corner of Old Cooma Road and Googong Dam Road. In addition, scattered individuals and small clumps of plants were observed along the Googong Dam Road reserve. African Lovegrass is currently present at high density.

Table 7.3 Weed species recorded during the field survey (July 2012)

Scientific name	Common Name	Weed of National Significance
Trees and Shrubs		
Crataegus monogyna	Hawthorn	
Rosa rubiginosa	Sweet Briar	
Rubus fruticosis	Blackberry	x
Groundcover (grasses)		
Eragrostis curvula	African Lovegrass	x
Dactylis glomerata	Cocksfoot	
Holcus lanatus	Yorkshire Fog	
Nasella trichotoma	Serrated Tussock	x
Paspalum dilatatum	Paspalum	
Phalaris aquatica	Phalaris	
Groundcover (non-grassy weeds)		
Acetosella vulgaris	Sheep Sorrel	
Arctotheca calendula	Capeweed	
Conyza bonariensis	Flaxleaf Fleabane	
Echium plantagineum	Paterson's Curse	
Hirschfeldia incana	Hairy Mustard	
Hypericum perforatum	St John's Wort	
Hypochaeris radicata	Flatweed	
Onopordum acanthium	Scotch Thistle	
Plantago lancolata	Ribwort Plantain	
Sonchus oleraceus	Common Sowthistle	

Scientific name	Common Name	Weed of National Significance
Verbascum thapsus	Great Mullein	

Scattered tussocks may be found along the remainder of the road reserve. African lovegrass is of considerable concern to the ecological values of the Project area and surrounds as it thrives in low fertility soils, forms dense swards, produces large quantities of seed which may be viable for up to 17 years, and is unfavourable as grazing fodder for native fauna and livestock.

Serrated Tussock (*Nasella trichotoma*), another Weed of National Significance, is considered a less immediate (although still considerable) threat which will likely require future management. This species is another extremely unpalatable and low fodder-value weed, which can form dense monocultures, particularly in degraded or disturbed areas. Serrated Tussock was not recorded within the Project site at the time of survey, however a number (>50) plants were located approximately 300 metres east of the Project. In addition to the above, the three species of woody weeds (Sweet Briar, Blackberry and Hawthorn) have the potential to form dense stands and once formed, these stands can be difficult and costly to remove.

Exotic pasture grasses such as Phalaris (*Phalaris aquatica*) and Cocksfoot (*Dactylis glomerata*) are generally considered to be 'naturalised' in the locality however in this instance they are considered to be weeds wherever they are threatening the integrity of otherwise high value native vegetation communities or where they have extended beyond the agricultural areas in which they may have been previously sown or otherwise encouraged.

Weed infestation classification

Three weed infestation categories were identified within (and in the vicinity of) the Project. Areas of high, medium and low weed infestation), as outlined below.

- High weed infestation: Includes areas where the groundstorey is dominated by exotic weed species, and a proportion of the biomass is usually comprised of at least one Weed of National Significance (namely African Lovegrass). These areas required targeted control and care must be taken to minimise spread of seed into surrounding areas.
- Moderate/scattered weed infestation: Includes areas with a predominantly native groundstorey or a groundstorey dominated by naturalised exotic pasture species of low-moderate concern (such as Phalaris) and moderate weed infestation. Weeds present in these areas are mostly common agricultural land weed species although there may be scattered plants or small clumps of one Weeds of National Significance which will require targeted control to prevent them becoming a more significant problem.
- Low or no weed infestation: This category support no weeds or the weeds that are present are common, mostly considered 'naturalised' and occur at low density. Native grasses and shrubs dominate the understorey and there are currently no weeds within that present a significant threat.

Weed categories are mapped in Appendix E of the Flora and Fauna Management Plan (Flora and fauna constraints maps).

D.6 Procedure

The following measures will be adopted during all clearing and construction works. Construction personnel will be informed of the importance of these measures during toolbox talks.

These measures are also included in Table 5.1 of the Flora and Fauna Management Plan, where appropriate.

Management measures during construction

- Earth moving vehicles will, as far as possible, be cleaned of dirt before entering the Project site and when leaving areas of 'high weed infestation'. This is particularly important if vehicles are moving between the Project and Stage A – Network (west) (where weeds are more prevalent).
- Construction personnel will, as far as possible, clean their boots and clothing of all seed laden material prior to leaving high weed infested areas.
- Any topsoil that is imported from offsite for use in landscaping will be weed free.
- Topsoil will be stripped from areas of 'high weed infestation' and buried as fill or disposed of off site.
- Topsoil from moderate and low weed infestation categories will be stripped and stockpiled separately. Topsoil will only be reused in an area of the same weed category.
- No domestic pets will be brought on site.

Targeted weed control

- A targeted weed removal program (spot spraying) of the patch of serrated tussock will be implemented as soon as possible in order to prevent the spread of this weed in the locality.
- Prior to vegetation clearance, woody weeds will be removed. This will include the physical removal and stump poisoning (ie cut-and-daub technique) for Sweet Briar, Blackberry and Hawthorn located in 'high weed infestation' area. Woody weed removal will be limited to the weeds present within the Project corridor.
- Targeted weed control will be carried out for two consecutive years following construction and the species targeted will be informed by subsequent monitoring. Details will be included in the operational environment management plan.

Pest control

- To avoid the creation of additional areas of rabbit harbour, felled vegetation will be distributed throughout the surrounding woodland (where possible) and/or mulched for use in erosion and sedimentation control or landscaping.
- Vegetation will not be left in piles to create potential habitat for rabbits and other vermin.

Rehabilitation

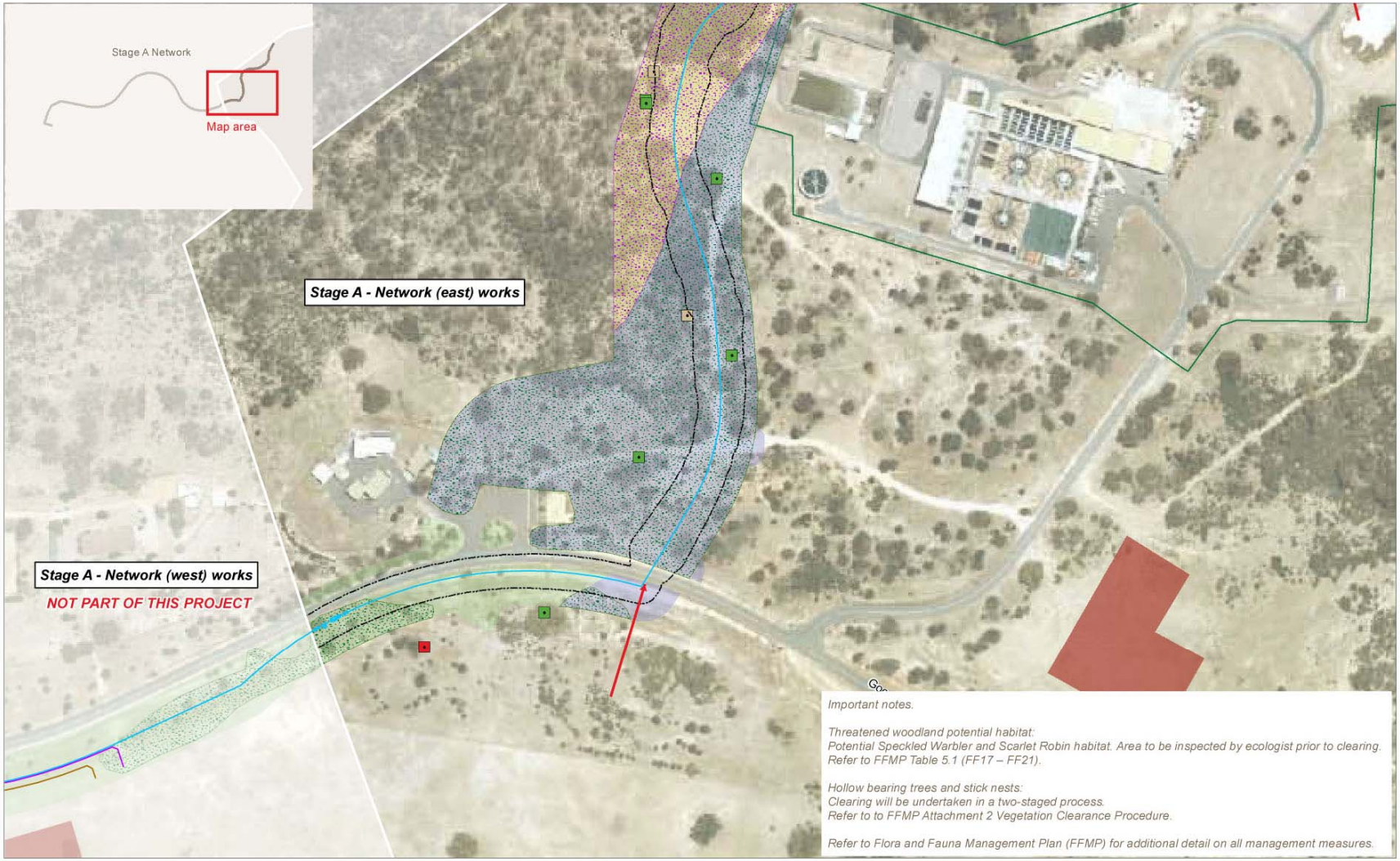
- Seeding of areas for rehabilitation will be involve either:
  - an exotic crop of mixed infertile grasses and clovers etc;
  - native grasses (refer to Landscape Management Plan for detail on species to be seeded).
- Sowing is to occur immediately after the completion of construction.
- The sowing rate will aim to deliver a minimum 200 germinable seeds per square metre. This is to prevent significant weed establishment.

Monitoring and rehabilitation

Landscaping and rehabilitation will be carried out as per the Stage A – Network Landscape Management Plan (LMP). Upon completion of the landscaping works (including areas of native grass seeding) annual monitoring will be undertaken to monitor the success of the revegetation works and to identify areas where additional weed management is required.

Species which may require future management include Chilean Needle Grass (*Nassella neesiana*) (not currently present within the Project area, however a Weed of National Significance of considerable threat, should it establish), Horehound (*Marrubium vulgare*), Patterson's Curse (*Echium plantagineum*) and Great Mullein (*Verbascum thapsus*).

Appendix E Flora and fauna constraints maps



Source Brown Consulting, Biosis
Drawing no. 11122g_FFMPb_east01

Indicative only, subject to detailed design

Construction features
- Potable water mains
- Construction access point
- Extent of clearing
- Existing ACTEW Googong water treatment plant site
- Site construction compound

Ecological features
- Scarlet Robin
- Hollow-bearing Tree
- Termite Mound

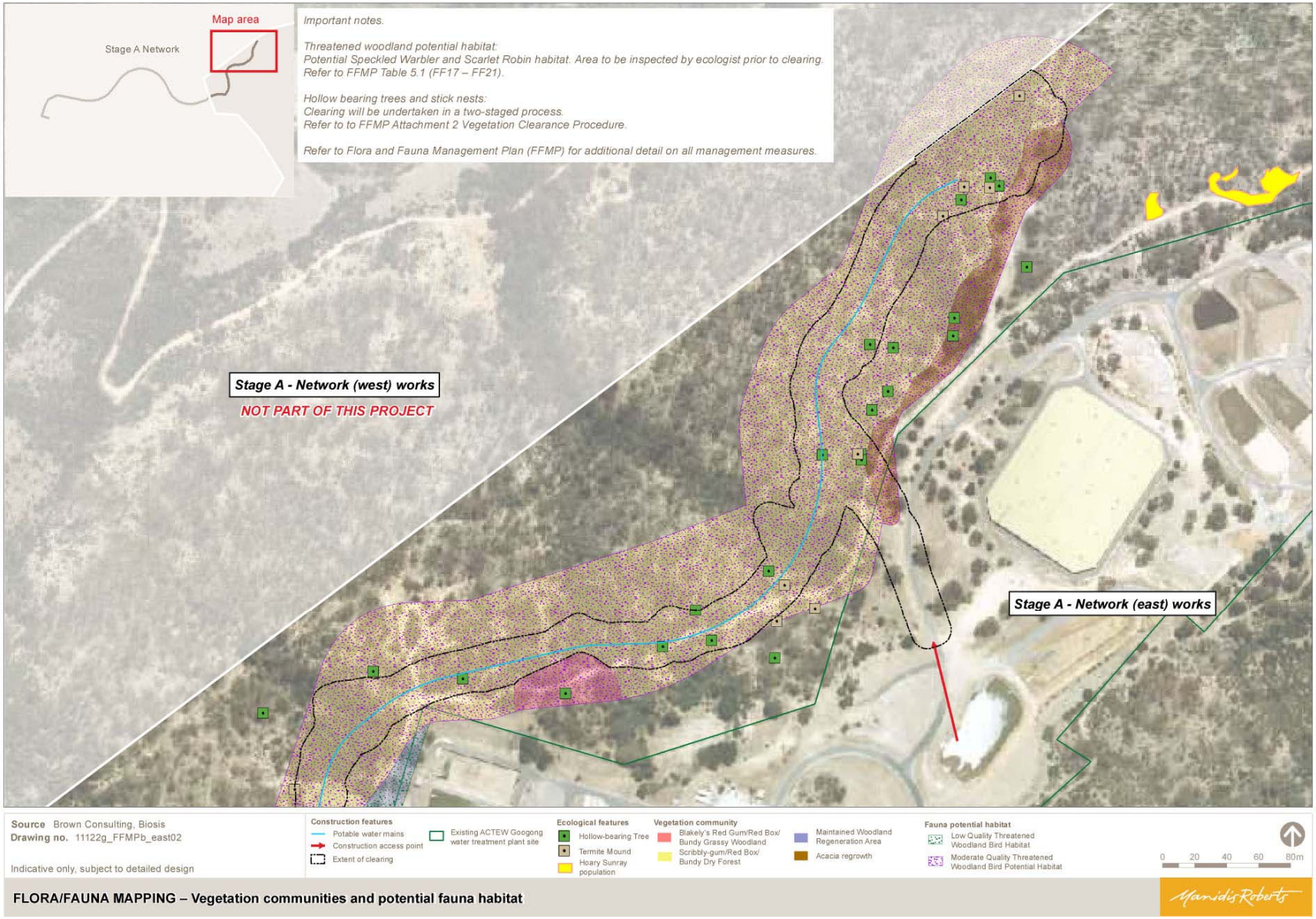
Vegetation community
- Maintained Woodland Regeneration Area
- Native Pasture with scattered planted native trees
- Scribbly-gum / Red Box / Bundy Dry Forest

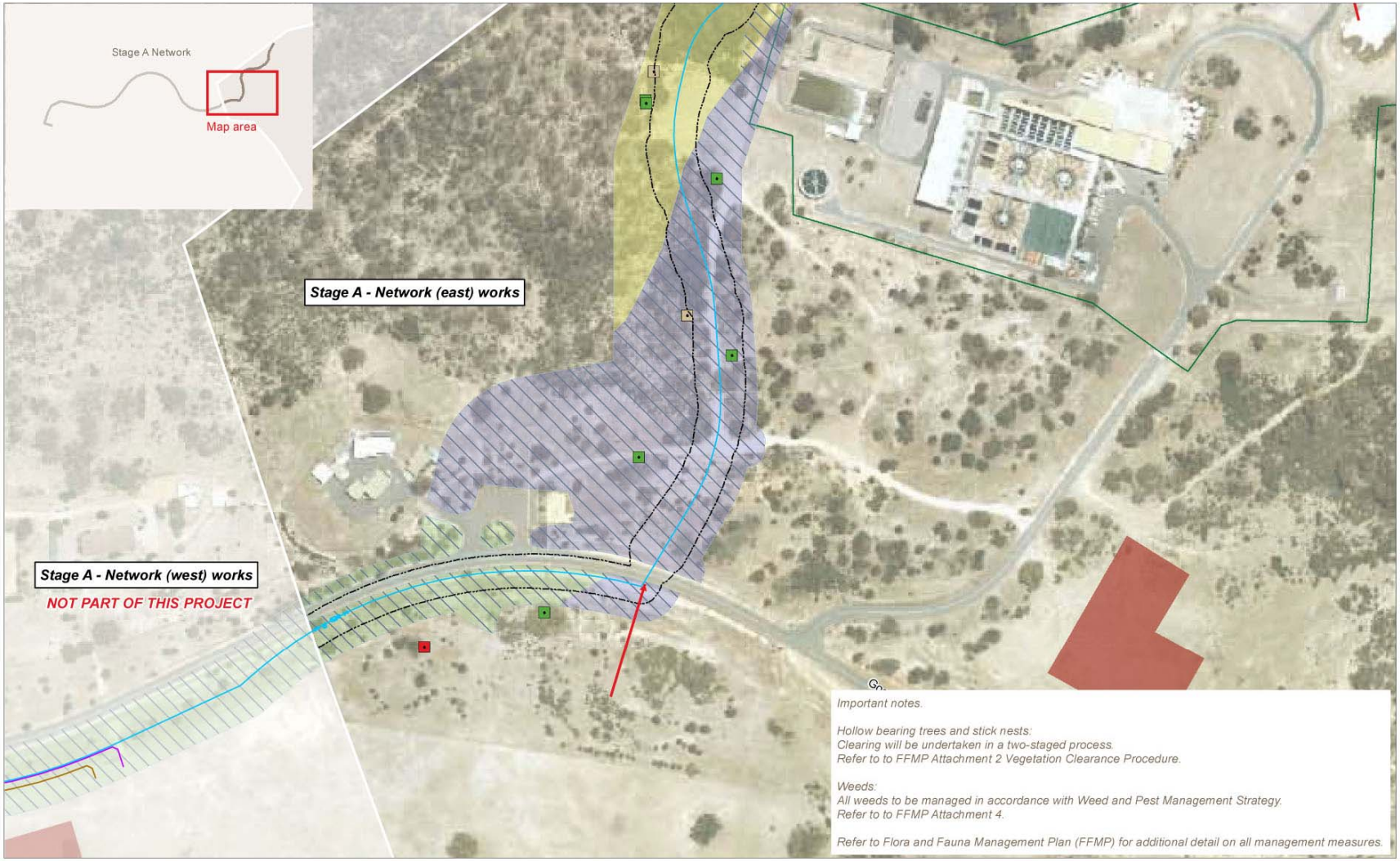
Fauna potential habitat
- Low Quality Threatened Woodland Bird Habitat
- Moderate Quality Threatened Woodland Bird Potential Habitat

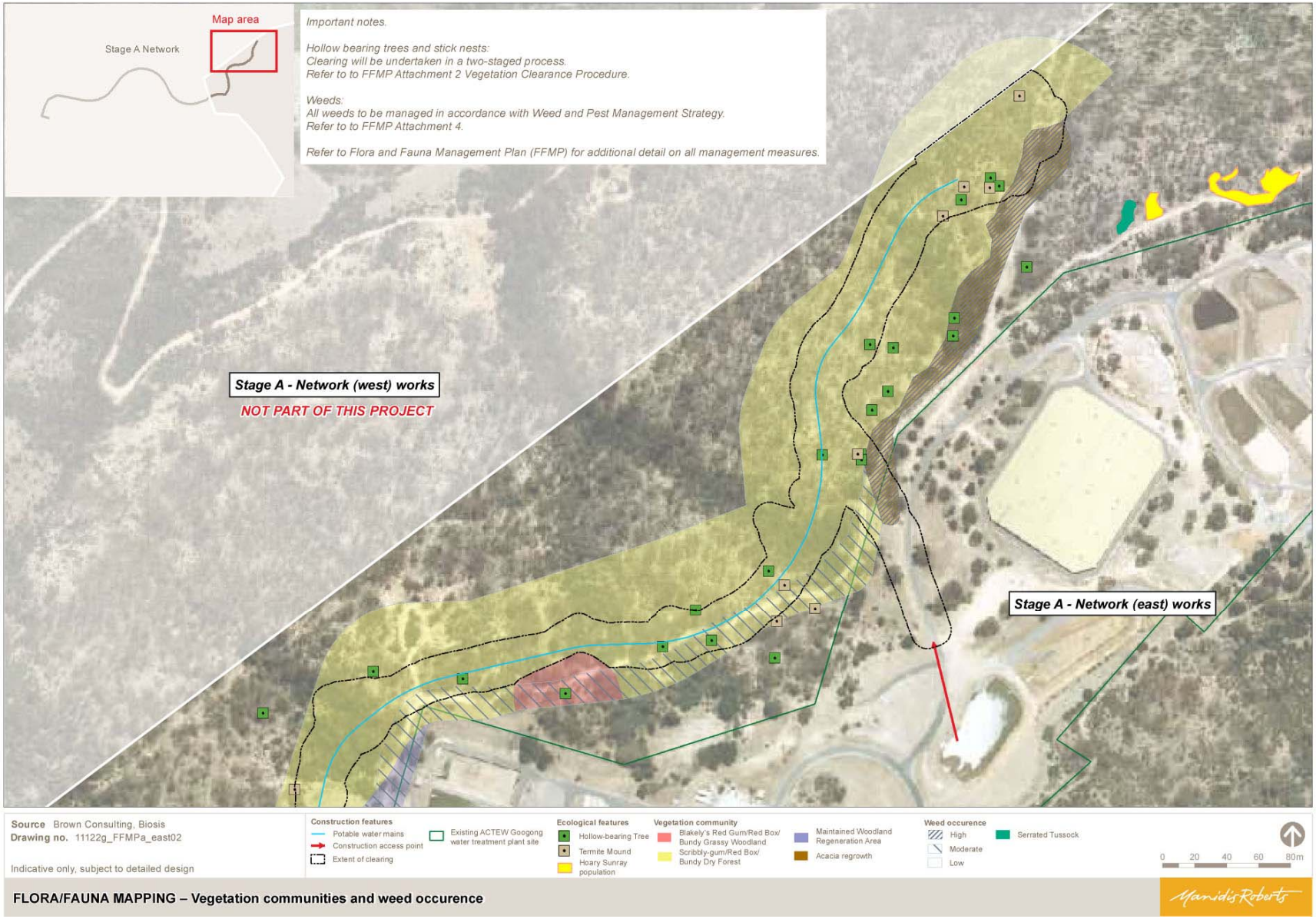
0 20 40 60 80m

FLORA/FAUNA MAPPING – Vegetation communities and potential fauna habitat

Mandis Roberts


Map area
Stage A Network
Important notes.
Threatened woodland potential habitat:
Potential Speckled Warbler and Scarlet Robin habitat. Area to be inspected by ecologist prior to clearing.
Refer to FFMP Table 5.1 (FF17 – FF21).
Hollow bearing trees and stick nests:
Clearing will be undertaken in a two-staged process.
Refer to to FFMP Attachment 2 Vegetation Clearance Procedure.
Refer to Flora and Fauna Management Plan (FFMP) for additional detail on all management measures.
Stage A - Network (west) works
NOT PART OF THIS PROJECT
Stage A - Network (east) works
Source Brown Consulting, Biosis
Drawing no. 11122g_FFMPb_east02
Indicative only, subject to detailed design
Construction features
Potable water mains
Construction access point
Extent of clearing
Existing ACTEW Googong water treatment plant site
Ecological features
Hollow-bearing Tree
Termite Mound
Hoary Sunray population
Vegetation community
Blakely's Red Gum/Red Box/ Bundy Grassy Woodland
Scribbly-gum/Red Box/ Bundy Dry Forest
Maintained Woodland Regeneration Area
Acacia regrowth
Fauna potential habitat
Low Quality Threatened Woodland Bird Habitat
Moderate Quality Threatened Woodland Bird Potential Habitat
0 20 40 60 80m
FLORA/FAUNA MAPPING – Vegetation communities and potential fauna habitat
Marshall Roberts


Stage A Network
Map area
Stage A - Network (east) works
Stage A - Network (west) works
NOT PART OF THIS PROJECT
Important notes.
Hollow bearing trees and stick nests:
Clearing will be undertaken in a two-staged process.
Refer to to FFMP Attachment 2 Vegetation Clearance Procedure.
Weeds:
All weeds to be managed in accordance with Weed and Pest Management Strategy.
Refer to to FFMP Attachment 4.
Refer to Flora and Fauna Management Plan (FFMP) for additional detail on all management measures.
Source Brown Consulting, Biosis
Drawing no. 11122g_FFMPa_east01
Indicative only, subject to detailed design
Construction features
Potable water mains
Construction access point
Extent of clearing
Existing ACTEW Googong water treatment plant site
Site construction compound
Ecological features
Scarlet Robin
Hollow-bearing Tree
Termite Mound
Vegetation community
Maintained Woodland Regeneration Area
Native Pasture with scattered planted native trees
Scribbly-gum / Red Box / Bundy Dry Forest
Weed occurence
Moderate
Low
0 20 40 60 80m
FLORA/FAUNA MAPPING – Vegetation communities and weed occurence
Marshall Roberts


Map area
Stage A Network
Important notes.
Hollow bearing trees and stick nests:
Clearing will be undertaken in a two-staged process.
Refer to to FFMP Attachment 2 Vegetation Clearance Procedure.
Weeds:
All weeds to be managed in accordance with Weed and Pest Management Strategy.
Refer to to FFMP Attachment 4.
Refer to Flora and Fauna Management Plan (FFMP) for additional detail on all management measures.
Stage A - Network (west) works
NOT PART OF THIS PROJECT
Stage A - Network (east) works
Source Brown Consulting, Biosis
Drawing no. 11122g_FFMPa_east02
Indicative only, subject to detailed design
Construction features
Potable water mains
Construction access point
Extent of clearing
Existing ACTEW Googong water treatment plant site
Ecological features
Hollow-bearing Tree
Termite Mound
Hoary Sunray population
Vegetation community
Blakely's Red Gum/Red Box/ Bundy Grassy Woodland
Scribbly-gum/Red Box/ Bundy Dry Forest
Maintained Woodland Regeneration Area
Acacia regrowth
Weed occurence
High
Moderate
Low
Serrated Tussock
0 20 40 60 80m
FLORA/FAUNA MAPPING – Vegetation communities and weed occurence
Mandis Roberts

Appendix F

Stage B – Bulk Water Pump Station Permanent Connection – Pre-clearing Survey