BIODIVERSITY OFFSET STRATEGY

Executive Summary

EXECUTIVE SUMMARY

This is the Biodiversity Offset Strategy for the proposed Emu Swamp Dam (the Project).

The residual impacts (impacts that remain following avoidance and implementation of mitigation measures) of the Project Commonwealth and State ecological values have been determined in the Supplementary Report. Southern Downs Regional Council (SDRC) are committed to avoidance and mitigation measures to reduce the residual impacts where possible. The primary avoidance and mitigation measures for the Project include:

- realignment of the pipelines to avoid populations of threatened plants
- rehabilitation of pipeline construction corridors with native ground covers and shrubs
- revegetation and management of a 200 m wide (322 ha) buffer area around the inundation areas of the dam to reconnect patches of vegetation and improve connectivity between the areas of vegetation and habitat
- pest animal control throughout the buffer area
- weed control throughout the buffer area and along the pipeline corridor.

The Biodiversity Offset Strategy has examined the potential offset availability in the Stanthorpe region and presents a preferred offset solution.

Commonwealth Biodiversity Offset

SDRC is committed to provide an offset for residual impacts on Matters of National Environmental Significance (MNES) in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy.

The Project has residual impacts on the following MNES:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Grassy Woodland);
- Callistemon pungens; and
- Granite Belt Thick-tailed Gecko.

The Project's potential offset availability for residual impacts on MNES and the calculated offset potential are presented in Table ES-1.

Table ES-1 Potential offset availability for residual impacts on MNES

MNES	Residual impact	Offset Availability	Calculated Offset Potential (>100% is fully offset)
Box-Gum Grassy Woodland	72.3 ha	1,096 ha (ground-truthed)	391%
Callistemon pungens	45 plants	Propagation of plants	152%
Granite Belt Thick-tailed Gecko	18.1 ha	370 ha of habitat	995%

At least 1,089 ha of ground-truthed offsets for Box-Gum Grassy Woodland are available in the region. A further 439 ha of potential offsets have also been identified from spatial analysis. This is sufficient to meet the offset obligations for Box-Gum Grassy Woodland under the EPBC Act EOP.

Propagation and planting will be undertaken to offset the loss of 56 plants of *Callistemon pungens* from within the inundation area. These plants will be replanted adjacent to areas of vegetation within the buffer area.

There is abundant availability of primary habitat for the Granite Belt Thick-tailed Gecko adjacent to the buffer area.

SDRC proposes to meet the Project's offset requirements by securing and managing direct, land-based offsets. SDRC will legally secure the final offset areas using a legally binding mechanism. The final offset package will be agreed with the Department of the Environment (DotE) and offsets will be secured prior to the commencement of any clearing activities for the Project.

The required offset areas depend on the quality of the offset sites but the indicative offset for residual impacts on MNES is presented in Table ES-2. The indicative offset areas are currently subject to threatening processes including grazing, weed and pest infestation. The final offset package may be revised in consultation with the DotE based on landholder negotiations and additional field surveys.

Table ES-2 Indicative offset areas for residual impacts on MNES

Offset value	Residual impact	Indicative Offset Proposal
Box-Gum Grassy Woodland	72.3 ha	260-280 ha
Callistemon pungens	45 plants	100 plants
Granite Belt Thick-tailed Gecko	18.1 ha	84 ha

State Offset

The Project is exempt from the requirements to provide an offset under the *Vegetation Management Act 1999.* 'Significant projects' under the *State Development and Public Works Organisation Act 1971* are generally exempt from the Queensland Biodiversity Offset Policy (QBOP). The Coordinator-General may give weight to the QBOP during assessment of the Project.

Enhancing the Value of the Buffer Area

The buffer area contains cleared areas and areas that are presently cropped. Within the buffer area there is currently 200 ha of native vegetation and 121 ha of cleared/non-remnant areas. SDRC propose to manage the buffer area for conservation purposes and in the long term it will provide flora and fauna habitat and movement corridors. With effective management of the buffer area, the cleared and degraded areas (121 ha) will regrow to achieve native vegetation. The eventual mix of vegetation communities is likely to reflect the communities that are currently present in the buffer area. The enhancement of the buffer area will mitigate the impacts

SDRC will seek to provide a direct land-based offset for residual impacts on MSES. Should offset areas not achieve ecological equivalence, then an offset payment may be considered for any residual requirements (other than protected animals).

1. INTRODUCTION

The Southern Downs Regional Council (SDRC) is seeking environmental approvals for the proposed Emu Swamp Dam (the Project). The Project includes a proposed dam and associated urban and irrigation pipelines.

This is the Biodiversity Offset Strategy for the Project. This Biodiversity Offset Strategy outlines SDRC's approach to offset unavoidable, residual impacts on matters of national environmental significance (MNES) protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and matters of state environmental significance (MSES).

The Biodiversity Offset Strategy is primarily intended to satisfy both the Commonwealth Department of the Environment (DotE) and the Queensland Government in relation to the offset requirements of the Project. It intends to provide reasonable evidence of offsets being available which meets policy requirements, and sets out the proposed delivery of offset requirements (including potential offset areas) and the activities and timeframes to deliver the offset requirements post approval.

The scope of the Biodiversity Offset Strategy is to:

- describe the Project and environmental approval process;
- quantify the residual impacts on MNES and MSES that cannot be avoided or mitigated by the Project;
- summarise the offset obligations for the Project;
- assess the MNES offset requirements under the EPBC Act Offsets Assessment Guide;
- assess the potential suite of MSES which may be offset via protection and active management of proposed buffer areas around the dam;
- desktop GIS analysis to identify and describe the offsets available that meet the policy requirements, including identification of potential offset areas;
- develop an approach to deliver the offsets that will meet the policy requirements (i.e. when and how the offsets will be provided); and
- outline future offset commitments and the process and timelines for legally securing the offsets.

2. BACKGROUND

2.1. Emu Swamp Dam Project

The proposed Emu Swamp dam site is located on the Severn River between Fletcher Road and Emu Swamp Road. The proposed dam site is 15 km southwest of Stanthorpe and 5 km north of Ballandean.

The Emu Swamp Dam Project has five major components:

- Emu Swamp Dam;
- Urban Pipeline;
- Irrigation Pipeline;
- Stalling Lane Access; and
- Recreational Area

2.1.1. Emu Swamp Dam

The proposed Emu Swamp Dam has a storage capacity of 10,500 ML. The Full Supply Level (FSL) is 738 m Australian Height Datum (AHD) with an associated inundation area of 196 ha. The proposed annual extraction for urban water supply is 750 ML/year. The proposed water allocation for the irrigation component is 1,740 ML/year.

The proposed inundation area for Emu Swamp Dam is presented in Figure 2-1. A buffer area of 200 m (322 ha) is proposed surrounding the dam to protect the water quality within the dam and to maintain ecological connectivity within the region.

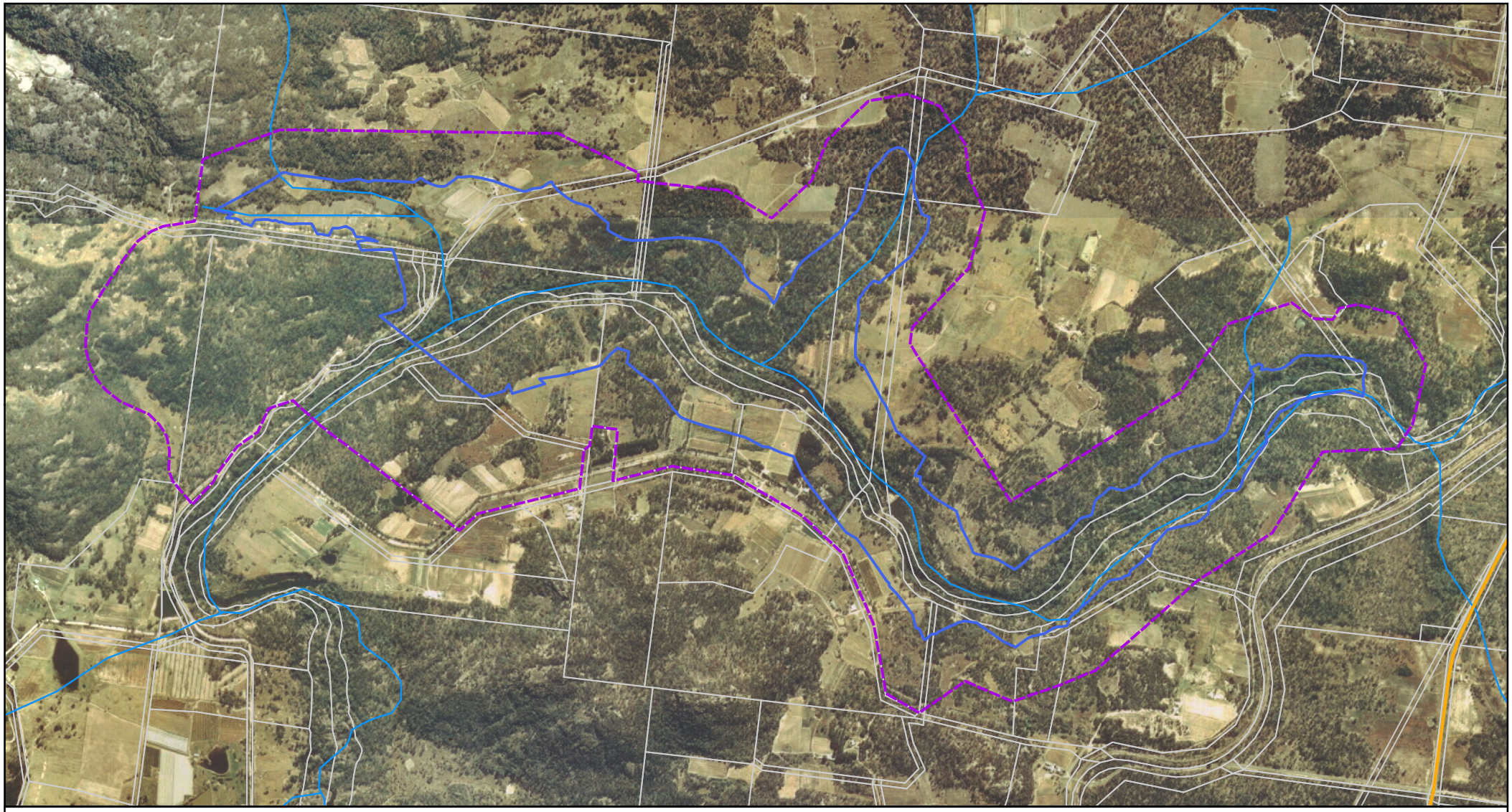
2.1.2. Urban Pipeline

The urban pipeline is 23.2 km long and is largely located in road reserves. The route follows Fletcher Road, the New England Highway, Wiskey Gully Road, Brunckhorst Avenue, Hale Haven Drive, Rifle Range Road, Eukey Road/Sugar Loaf Road, Kingston Road, across private property, Greenup Street/Diamondvale Road and across SDRC land to the Mt Marlay water treatment plant. The urban pipeline route is presented in Figure 2-2.

2.1.3. Irrigation Pipeline

The irrigation pipeline route largely follows road reserves although there are some short sections crossing private lands. The irrigation pipelines are supplied from the urban pipeline. The total length of irrigation pipeline (excluding the urban pipeline section) is 102 km.

The Irrigation Pipeline route follows Eukey Road, the New England Highway, Horans Gorge Road, Mt Stirling Road, Winkler Road, Back Creek Road, Stabiles Road, Amiens Road, Cannon Creek Road, Bapaume Road, Swans Lane, Spring Creek Road, Barracks Road, Aerodrome Road, Applethorpe Road, Ellwood Road, Rogers Road, Church Road, Teale Road, Goodwin Road, Gangemi Road, Poziers Road, Newlands Road, Pfrunder Road, Pradella Road and Scotts Camp Road. The irrigation pipeline route is presented in Figure 2-2.



LEGEND

- Watercourse
- Highway
- Cadastral Boundaries
- Buffer Area
- Full Supply Level (738m AHD)

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0 0.15 0.3 0.45 0.6

Kilometres

Scale - 1:20,000

Projection: GDA94 MGA56

EMU SWAMP DAM - BIODIVERSITY OFFSET STRATEGY

Figure 2-1

Inundation Area and Buffer Area

SINCLAIR KNIGHT MERZ
SKM

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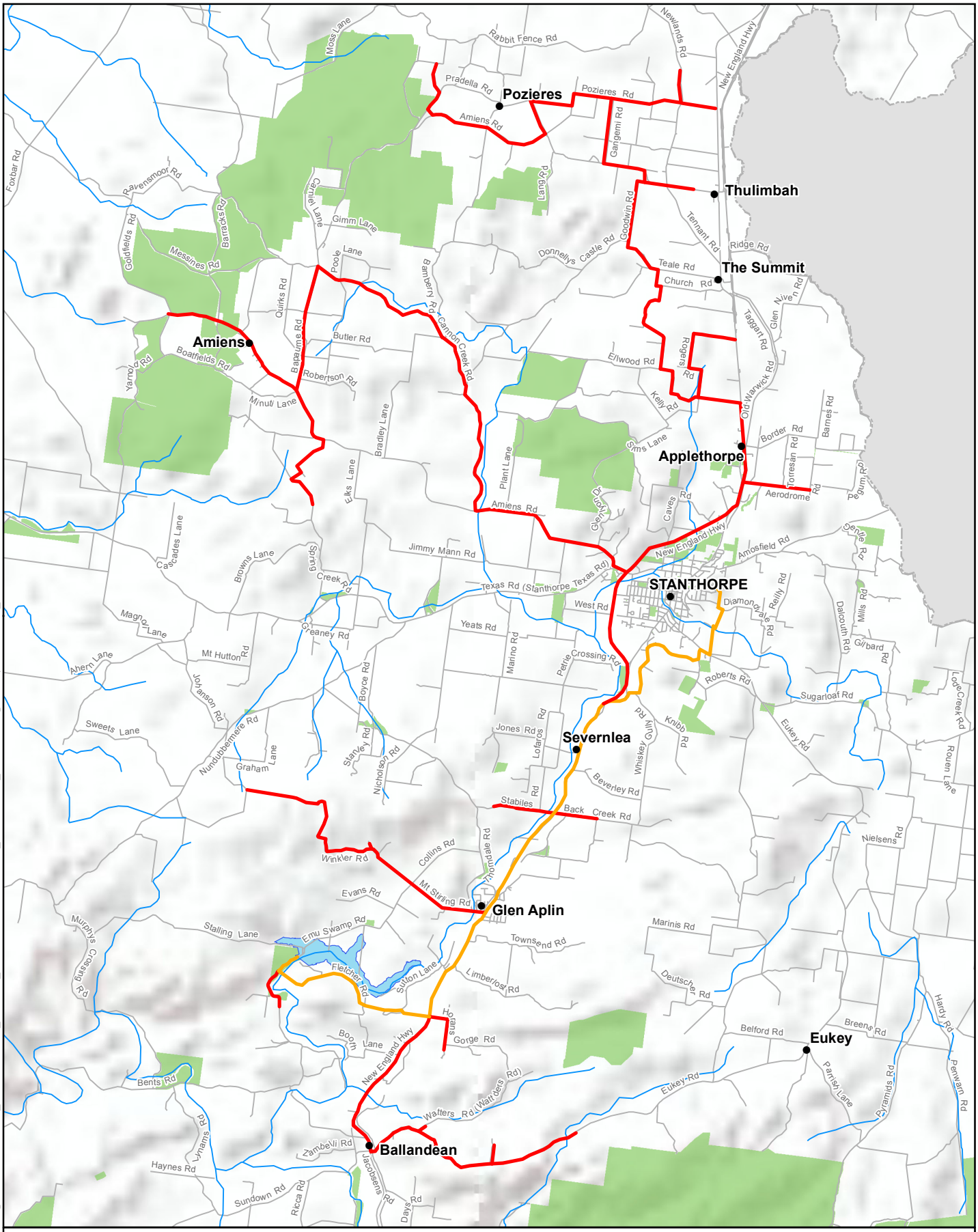

LEGEND

- Town Names
- Watercourse
- Road
- Urban Pipeline
- Irrigation Pipeline
- Park, Forests and Reserves
- New South Wales
- Full Supply Level (738m AHD)

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Kilometres

Scale - 1:150,000

Projection: GDA94 MGA56

EMU SWAMP DAM - BIODIVERSITY OFFSET STRATEGY

Figure 2-2

Urban and Irrigation Pipeline Routes

SINCLAIR KNIGHT MERZ
SKM

I:\QENV2\Projects\QE06732\SpatialArcGIS\Figures\ECOLOGY\02_BIODIVERSITY_OFFSET_STRATEGY\FIGURE02-2_BIOOFFSET_UrbanAndIrrigationPipelineRoutes_140203.mxd Produced: 4/02/2014

2.1.4. Stalling Lane Access

The inundation area for the proposed dam will result in the closure of Emu Swamp Road. As a result of this closure Stalling Lane will no longer be accessible from Emu Swamp Road. Stalling Lane currently provides access to two properties. To maintain this access, the Stalling Lane Access is proposed to be constructed from Fletcher Road to the western end of Stalling Lane. The location of the Stalling Lane Access is presented in Figure 2-1. The alignment of the proposed Stalling Lane Access will be modified as necessary to avoid areas of ecological value.

2.1.5. Recreation Area

Public recreation facilities will be provided on the left abutment of the dam after construction is completed. The expected facilities include:

- picnic area shelters with rainwater tanks, uncovered picnic tables, wood fired BBQs;
- playground equipment;
- toilet facilities with water tank, on-site septic tank treatment and pump out capability;
- boat ramp (5 m wide concrete extending to 3 m below FSL);
- gravel access from Fletcher Road; and
- gravel surfaced car park and boat trailer park.

2.2. Project environmental approval process

On 5 February 2007, the Coordinator-General (CoG) declared the Project a 'significant project' for which an EIS is required, in accordance with the *State Development and Public Works Organisation Act 1971* (SDPWO Act). On 3 January 2007, the Australian Minister for the DotE, formerly Department of the Environment, Water, Heritage and the Arts (DEWHA), determined the Project a 'controlled action' due to potential impacts on listed threatened species and ecological communities.

The Australian Government has accredited the EIS process under the SDPWO Act under a Bilateral Agreement between the Australian and Queensland governments to ensure that its interests are represented in the EIS process. This will enable the EIS to meet the environmental impact assessment requirements under both the Australian and Queensland legislation.

Sinclair Knight Merz (SKM) on behalf of the proponent, SDRC, prepared an EIS in accordance with the Terms of Reference (ToR) prepared by the CoG under the SDPWO Act and in accordance with the Bilateral Agreement. A Supplementary Report was prepared in response to submissions received by the Coordinator-General following the public notification period of the EIS.

The Supplementary Report will be provided to the CoG for consideration in preparing the EIS evaluation report.

3. OFFSET REQUIREMENTS OF THE PROJECT

The Project has federal offset requirements under the EPBC Act EOP due to significant, residual impacts on MNES.

The Project is exempt from the requirements to provide an offset under the *Vegetation Management Act 1999* (VM Act). 'Significant projects' under the SDPWO Act are generally exempt from the Queensland Biodiversity Offset Policy (QBOP). The Coordinator-General may give weight to the QBOP during assessment of the Project.

The focus of the Biodiversity Offset Strategy is to apply the EPBC Act EOP first to offset residual impacts on MNES.

3.1. Federal offset requirements

3.1.1. Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy

The EPBC Act Environmental Offsets Policy (EOP) (DSEWPaC, 2012) sets out the Australian Government's approach to the use of environmental offsets under the EPBC Act to compensate residual impacts on MNES. For assessments under the EPBC Act, offsets are only required for significant, residual impacts defined under the EPBC Act Significant Impact Guidelines 1.1.

The EPBC Act EOP generally requires that offsets be a direct land based offset and if using a combination of direct and compensatory measures. A minimum of 90% of the offset requirements for any given impact must be met through direct offsets.

The EPBC Act EOP does not specify ratios for calculating offset areas. The Offsets Assessment Guide, accompanies the EPBC Act EOP, and provides a tool for the DotE to assess the suitability of offset proposals, and can also be used by proponents to assist with planning for development proposals and assessing the adequacy of proposed offsets.

3.1.2. Matters of National Environmental Significance offset requirements

The residual impacts to MNES were determined in the Assessment of Matters of National Environmental Significance (refer to Appendix K of the Supplementary Report. The extent of residual impacts to MNES requiring offsets are listed in Table 3-1.

Table 3-1 Matters of national environmental significance (MNES) residual impacts requiring offsets

MNES	Residual impacts*			
	FSL	Stalling Lane	Urban and Irrigation Pipeline	Total
Threatened ecological communities				
Box-Gum Grassy Woodland	71.55 ha	0.74 ha	None (11.47 ha)	72.3 ha
Threatened flora				
Acacia pubifolia	None	None (15 plants)	None	None
Boronia repanda	None	None	None (50-100 plants)	None
Callistemon pungens	45 plants	None (4 plants)	None (7 plants)	45 plants
Grevillia scortechinii subsp. *scortechinii*	None	None	None (50 plants)	None
Threatened fauna				
Spotted-tail Quoll	None (9.2 ha primary, 75.1 ha secondary)	None	None (20 ha)	None
Large-eared Pied Bat	None (18.1 ha primary, 70.4 ha secondary)	None	None (20 ha)	None
Granite Belt Thick-tailed Gecko	18.1 ha primary habitat (18.1 ha primary, 70.4 ha secondary)	None	None (20 ha)	10 ha
Bell's Turtle	None (1 individual)	None	None	None

* impact before mitigation in brackets

3.1.3. Offsets assessment guide

The Offsets Assessment Guide has been applied to assess the suitability of proposed offset areas for the residual impacts on MNES. The Project has residual impacts on the following MNES:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Grassy Woodland);
- Callistemon pungens; and
- Granite Belt Thick-tailed Gecko.

Each MNES impacted by the Project has been assessed separately using the offsets assessment guide, however it is recognised that some MNES offsets can be co-located. For example, Granite Belt Thick-tailed Gecko can inhabit Box-Gum Grassy Woodland on granite outcrops (REs 13.12.8 and 13.12.9), although it is not its primary habitat, and *Callistemon pungens* can inhabit Box-Gum Grassy Woodland along watercourses (REs 13.3.1 and 13.12.8). Each proposed offset area has been assessed for each impacted MNES to demonstrate the value of the area as an offset, to determine the proportion of residual impact acquitted by each offset area, and to assist prioritisation for acquisition of third party properties.

The outputs for each MNES (offsets calculator) are provided in Appendix A. The rationale for each of the inputs used in the offsets calculator for each MNES is provided in Appendix B (Table B-1 to Table B-3). A list of reference documents used to provide technical information is provided in each table.

3.2. State offset requirements

The Project is exempt from the requirements to provide an offset under the *Vegetation Management Act 1999.* 'Significant projects' under the *State Development and Public Works Organisation Act 1971* are generally exempt from the Queensland Biodiversity Offset Policy (QBOP). As such there are no specific offsets policies which strictly apply to the Project.

3.2.1. Matters of state environmental significance offset requirements

SDRC propose to manage the buffer area for conservation purposes and in the long term it will provide flora and fauna habitat and movement corridors. The Biodiversity Offset Strategy assesses the potential for the management and regeneration within buffer area to offset the following residual impacts on MSES that are not being covered under MNES offsets:

- Endangered and of concern regional ecosystems;
- Protected plant species; and
- Protected animal species.

Essential Habitat values

Offsets for essential habitat are not proposed, as they are covered under protected plants and animals. Note there are no residual impacts in the pipeline corridors following rehabilitation of the pipeline construction corridors.

Native vegetation in the inundation area supports potential habitat for protected animals including Large-eared Pied Bat (*Chalinolobus dwyeri*), Spotted-tail Quoll (*Dasyurus maculatus*), Square-tailed Kite (*Lophoictinia isura*), Turquoise Parrott (*Neophema pulchella*) Short-beaked Echidna (*Tachyglossus aculeatus*) and Koala (*Phascolarctos cinereus*).

The following MSES have been omitted as they are covered under MNES residual impacts:

- Protected plants – *Acacia pubifolia*, *Boronia repanda*, *Callistemon pungens* and *Grevillia scortechinii* subsp. *scortechinii*);
- Protected animals – Granite Belt Thick-tailed Gecko, Large-eared Pied Bat and Spotted-tail Quoll.

Connectivity and Watercourse and Values

SDRC will revegetate and manage the buffer area around the inundation area of the dam to reconnect patches of vegetation to mitigate potential impacts on local connectivity. The size of the buffer area is approximately 200 m in width, approximately 5 km in length with a total area of 322 ha. Rehabilitation and management of the buffer will create a movement corridor of similar width to the current riparian habitat in the inundation area. Cleared and degraded areas in the buffer area will regrow to achieve native vegetation. The proposed buffer area will ultimately provide a contiguous corridor around the inundation area maintaining connectivity with existing remnant vegetation. The vegetation in buffer area is of sufficient size and configured in a way that a functional ecosystem is maintained. The current extent of vegetation will be maintained in the landscape. The Project is not expected to have residual impacts on local connectivity.

Clearing of watercourse REs has been minimised through locating construction activities within the inundation area and reducing the disturbance corridor along the urban and irrigation pipelines. SDRC propose to mitigate the impacts on watercourse vegetation communities through enhancing watercourse REs within the buffer area.

Table 3-2 Matters of state environmental significance residual impacts

MSES	Impacts before mitigation in buffer area [1]			
	FSL	Stalling Lane	Urban and Irrigation Pipeline	Total
Endangered regional ecosystems	Area (ha)			
RE 13.3.1	26.01	0.34	None (0.21)	26.35
13.3.1x1	20.52	None	None (0.30)	20.52
RE 13.12.8	None	None	None (3.83)	None
RE 13.12.9	52.74	None	None (2.87)	52.74
RE 13.12.9/13.12.8	None	None	None (0.12)	None
TOTAL				99.61
MSES not overlapping with residual impacts on Box-gum grassland (72.29 ha)				27.32
Of concern regional ecosystems	Area (ha)			
RE 13.12.6	4.66	None	None (0.30)	4.66
Watercourses	Area (ha)			
RE 13.3.1 (including 13.3.1x1)	46.5	0.34	None (0.5)	46.8
Connectivity	Area (ha)			
REs included within state and/or regional ecological corridor	138.45	0.62	None	139.07
Protected plant species	Number of plants			
Acacia latisepala	3	None	None	3
Homoranthus montanus	1 (HERBRECS)	None	None	1
Melaleuca flavovirens	7	None	None	7
Mirbelia confertiflora	None	None	None	None
Rulingia hermaniifolia	1 (HERBRECS)	None	None	1
Thelionema grande	5	None	None	5
Protected animal species	Area (ha) of habitat			
Short-beaked Echidna	153.98	1.40	None (22.36)	155.38
Koala	78.75	None (0.34)	None (7.03)	78.75
Platypus	None	None	None	None
Square-tailed Kite	109.89	1.41	None (10.62)	111
Turquoise Parrot	109.89	1.41	None (10.62)	111

[1] Impact before mitigation in brackets (does not include enhancements from the buffer area)

Enhancing the Buffer Area

The buffer area contains cleared areas and areas that are presently cropped. The crops will be removed and areas that have been degraded by grazing, weed growth etc. The cleared areas and degraded areas will be protected and managed to foster regrowth of vegetation communities, including endangered and of concern regional ecosystems.

Within the buffer area there is currently 200 ha of native vegetation and 121 ha of cleared/non-remnant areas. Almost half of the native vegetation (98 ha) is considered endangered under the VM Act. Endangered and of concern REs and advanced regrowth within the buffer area are presented in Table 3-3.

Table 3-3 Endangered and of concern regional ecosystems in the buffer area

MSES	Status	Remnant (ha)	HVR (ha)	Non-remnant (FPC>11%)	Total (ha)
RE 13.3.1	Endangered	9.6	None	None	9.6
RE 13.3.1x1	Endangered	3.3	None	None	3.3
RE 13.12.8	Endangered	55	0	8	63
RE 13.12.9	Endangered	30	0	5.3	35.3
RE 13.12.6	Of Concern	13	0	0.9	13.9

With effective management of the buffer area, the cleared/non-remnant areas (121 ha) vegetation will regrow to increase the area of vegetation and habitat in the buffer area. The eventual mix of vegetation communities is likely to reflect the communities that are currently present in the buffer area.

Land within the buffer area would be acquired by the SDRC for the Project. It is intended that regeneration of the buffer area would be secured using an appropriate legally binding mechanism.

Potential offset areas for Koala have been identified in the Buffer Area are presented in Table 3-4Error! Reference source not found..

Table 3-4 Potential offset areas for Koala in the Buffer Area

Offset Area	Remnant (ha)	HVR (ha)	FPC>11%	Total (ha)	Meets minimum size of impact area?
Buffer Area	209.64	0	21.89	231.53	Yes

Final Residual Impacts after Enhancing the Buffer Area

The final residual impacts after enhancing the buffer area are presented in Table 3-5.

Table 3-5 Final residual impacts on MSES after enhancing the buffer area

MSES	Residual impacts after mitigation in buffer area [1]		
	Impacts before mitigation in Buffer Area	Mitigation in Buffer Area	Residual impact on MSES
Endangered regional ecosystems	Area (ha)		
Endangered regional ecosystems	27.32	111	None
Of concern regional ecosystems	4.66	13.9	None
Watercourses	Area (ha)		
RE 13.3.1 (including 13.3.1x1)	46.5	12.9	33.6
Connectivity	Area (ha)		
REs included within state and/or regional ecological corridor	139.07	Functional ecosystem maintained	None
Protected plant species	Area (ha)		
Acacia latisepala	3	None	3
Homoranthus montanus	1	None	1
Melaleuca flavovirens	7	None	7
Mirbelia confertiflora	None	-	None
Rulingia hermaniifolia	1	None	1
Thelionema grande	5	None	5
Protected animal species	Area (ha)		
Short-beaked Echidna	155.38	322	None
Koala	78.75	231	None
Platypus	None	-	None
Square-tailed Kite	111	322	None
Turquoise Parrot	111	322	None

[1] Impact before mitigation in brackets

4. OFFSET AVAILABILITY

4.1. Methodology

4.1.1. Overview

A desktop GIS assessment was undertaken to determine potential offset areas for MNES (Box-Gum Grassy Woodland, *Callistemon pungens*, Granite Belt Thick-tailed Gecko) and some additional MSES which are not being covered under Commonwealth offset requirements (endangered and of concern REs, and protected plants and animals). Field verification of the potential offset areas for Box-Gum Grassy Woodland were undertaken to provide evidence that these offsets exist. The following selected properties were assessed for their offset availability:

- Regeneration buffer area - 200 m wide, 322 ha buffer area around the FSL
- Connolly Dam – SDRC owned land surrounding Connolly Dam
- Additional 'third party' properties (grouped according to geographical location A-H)

All these properties are freehold and are located in the same bioregion. The buffer area has been considered for translocation sites for EPBC Act listed flora species, protected plants, and other MSES. It has not been considered as an offset for MNES as it is considered mitigation under the current policy framework.

4.1.2. Desktop assessment

A desktop assessment of mapping was conducted to identify the suitability of these properties for potential use as offsets. The following mapping was utilised:

- DEHP Regional Ecosystems (RE) (Version 6.1);
- DEHP Essential Habitat (Version 3);
- DEHP high value regrowth (HVR) (Version 2.1);
- DEHP Biodiversity Planning Assessment (BPA) (Version 1.3);
- DEHP pre-clearing RE; and
- 3D Environmental vegetation mapping (2007).

4.1.3. Identification of potential offset areas – MNES

The criteria used for the identification of potential offset areas for MNES included:

- remnant REs; and
- HVR.

DEHP pre-clearing RE data was used to identify potential RE descriptions for HVR.

To identify potential offset areas for each MNES, the representative, dominant REs for that matter where queried on Connolly Dam and third party properties as follows.

- Box-Gum Grassy Woodland: remnant or HVR vegetation which are a primary component of the listed ecological community (REs 13.3.1, 13.11.8, 13.12.8 and 13.12.9) where they comprise more than 50% of the community (i.e. RE1).
- Habitat for Granite Belt Thick-tailed Gecko: remnant or HVR vegetation providing potential primary habitat (REs 13.12.2 and 13.12.6) where they comprise more than 50% of the community (i.e. RE1).

To identify translocation sites for threatened flora, the representative, dominant REs providing habitat for that species were queried on the buffer area as follows:

- Callistemon pungens: remnant or HVR vegetation providing potential habitat (13.3.1, 13.3.1x1, 13.12.2, 13.12.6, 13.12.8.

4.1.4. Field surveys

Potential offset areas for Box-Gum Grassy Woodland were ground-truthed during a field survey conducted by two SKM ecologists in October 2013 for Connolly Dam and January 2014 for third party properties. The purposes of the survey were to:

- confirm the RE of the potential offset areas
- check whether it meets the EPBC Act listing advice for Box-Gum Grassy Woodland.

The following survey methodology was employed:

- Formalised quaternary level sampling to confirm the RE type following Queensland Herbarium procedures identified in Neldner *et al*. (2012). REs were classified according to the bioregion, land zone and vegetation type, in accordance with the system of Neldner *et al*. (2012) for remnant / non-remnant vegetation.
- Use of a check-list proforma developed by SKM to determine whether the community meets the condition criteria of Box-Gum Grassy Woodland as stipulated in the EPBC Act listing advice (TSSC, 2006a).

Groups A, B, C, D, G, H and I were surveyed. Groups E, F were not surveyed as access was not permitted. Potential offset sites with Box-Gum Grassy Woodland were observed at Groups A, B, D and I.

Potential offset areas for Box-Gum Grassy Woodland identified in the desktop spatial analysis have been revised based on the results of this field survey.

4.1.5. Potential offsets in buffer area – matters of state environmental significance

The spatial data used to assess the potential for the buffer area to offset residual impacts on MSES included:

- remnant REs;
- HVR: and
- FPC >11%.

DEHP pre-clearing RE data was used to identify potential RE descriptions for HVR and FPC>11% sites.

To identify potential offset areas for each MSES, the representative, dominant REs for that matter where queried on the buffer area as follows.

- RE 13.3.1: remnant, HVR or FPC>11% vegetation that is a dominant (i.e. RE1), endangered RE in BVG1M: 15b.
- RE 13.3.1x1: remnant, HVR or FPC>11% vegetation that is a dominant (i.e. RE1), endangered RE (according to pre-clear mapping) in BVG1M: 16d.
- RE 13.12.8 and 13.12.9: remnant, HVR or FPC>11% vegetation that is a dominant (i.e. RE1), endangered RE in BVG1M: 15a.
- RE 13.12.6: remnant, HVR or FPC>11% vegetation that is a dominant (i.e. RE1), of concern RE in BVG1M: 29b.
- Habitat for Koala: remnant, HVR or FPC>11% vegetation providing potential critical habitat (REs 13.3.1, 13.12.8, 13.12.9, 13.12.2, 13.12.5) as defined in the Interim koala referral advice (SEWPAC, 2012).

To identify translocation sites for protected plants, the representative, dominant REs providing habitat for that species were queried on the buffer area as follows:

- *Acacia latisepala*: remnant or HVR vegetation providing potential habitat (13.3.1, 13.12.2, 13.12.5, 13.12.6, 13.12.8 and 13.12.9).
- *Melaleuca flavovirens*: remnant or HVR vegetation providing potential habitat (13.3.1, 13.3.1x1, 13.12.2 and 13.12.6).
- *Thelionema grande*: remnant or HVR vegetation providing potential habitat (13.3.1, 13.3.1x1 and 13.12.6).

4.2. Potential offset areas - matters of national environmental significance

4.2.1. Box-Gum Grassy Woodland

Appropriate offset areas and locations for Box-Gum Grassy Woodland have been determined by spatial analysis, field verification and application of the EPBC Act offsets assessment guide (Appendix A includes details of the values used as inputs to the calculator and discussed key assumptions in relation to timeframes, current condition and likely future condition of offset areas). The results for each property group are summarised in Table 4-1. Locations of the potential offset areas are considered commercial-in-confidence and are not presented in the report.

Table 4-1 Potential offset areas for Box-Gum Grassy Woodland

Offset Area	Lots	Total (ha)	Ground-truthed?	% of impact offset	Minimum 90% direct offset requirement met?
Connolly Dam	1RP47924 1RP47928	27.73	Yes, confirmed as the TEC	10.61	No
Group A1	Confidential	103.03	Yes, confirmed as the TEC	37.97	No
Group A2	Confidential	415.26	Yes, confirmed as the TEC	153.05	Yes
Group A3	Confidential	42.54	Yes, confirmed as the TEC	15.68	No
Group B1	Confidential	23.67	Yes, confirmed as the TEC	8.72	No
Group B2	Confidential	134.43	Yes, confirmed as the TEC	49.55	No
Group B3	Confidential	250.78	Yes, confirmed as the TEC	92.43	Yes
Group C	Confidential	None	Yes, not the TEC	-	-
Group D1	Confidential	64.50	Yes, confirmed as the TEC	23.77	No
Group D2	Confidential	27.14	Yes, confirmed as the TEC	10	No
Group E	Confidential	275.14	No, access not permitted	71.57	No
Group F	Confidential	164.35	No, access not permitted	42.75	No
Group G	Confidential	None	Yes, not the TEC	-	-
Group H	Confidential	None	Yes, not the TEC	-	-
Group I	Confidential	6.98	Yes, confirmed as the TEC	2.57	No

Use of the offsets assessment guide indicated that the residual impact on Box-Gum Grassy Woodland can be partially offset within the SDRC owned land surrounding Connolly Dam. This area provides around 10% of the direct offset requirement. The remaining offset requirement can be met by acquisition of third party properties from Groups A, B, D and/or I (combined they provide around 394% of the direct offset requirement), and potentially Groups E and F subject to ground-truthing.

It is recognised that risk and uncertainty exist in relation to the success of biodiversity offsets. Consideration of risk and uncertainty is built in to the calculation of offsets under the EPBC Act EOP. The EPBC offsets assessment guide incorporates quantification of risk into the calculation of an appropriately sized offset.

In conclusion, a total of 1,096 ha of confirmed offsets for Box-Gum Grassy Woodland are available in the region, and a further 439 ha of potential offsets. This is more than enough to meet the offset obligations for Box-Gum Grassy Woodland under the EPBC Act EOP, given that a hypothetical offset of 300 ha was sufficient to acquit obligations for this MNES.

4.2.2. Callistemon pungens

As part of the offset strategy, threatened plants that cannot be avoided by the Project will be translocated to suitable habitat in offset areas as detailed in Section 4.3.2 and under the guidance of an Offset Area Management Plan (OAMP).

To offset the loss of 45 plants of *Callistemon pungens* from within the inundation area, seeds and cuttings will be collected and propagated prior to clearing of the FSL. At least 300 individuals will be propagated to ensure there is a sufficient store in case of plant failures. Planting of 100 individuals into suitable habitat within the buffer area, including REs 13.3.1, 13.3.1x1 and 13.12.6, is proposed. At least four separate translocation sites will be used to reduce the risk of loss due to stochastic events. There are 116.39 ha of suitable habitat available in the buffer area, which is likely suitable for translocation. The buffer area upstream of the FSL contains a population of *C. pungens* but none have been identified in the 500 m downstream of the FSL. The areas of suitable habitat within the buffer area (particularly along Severn River) will be assessed for suitability as a translocation site.

No documentation relating to previous translocation projects of this species was found during preparation of this report, however local nurseries have propagated this species from seed successfully, and there have been successful translocations of *Melaleuca biconvexa* on the NSW Central Coast.

Callistemon pungens grows in the cracks between granite slabs and boulders along waterways. As such, attempts to relocate of whole plants would likely result in damage to the root system and plant death. Propagation from seed collected from impact areas is more suitable, as plants in this genus generally produce large amounts of seed annually and seed germinates readily.

An appropriate offset value for *C. pungens* has been determined by application of the EPBC Act offsets assessment guide (refer Appendix A). The results are summarised in Table 4-2.

Table 4-2 Potential offset value for *Callistemon pungens*

Offset Area	No. of individuals	Ground-truthed?	% of impact offset	Minimum 90% direct offset requirement met?
Buffer area	100	Potential habitat has been ground-truthed, however further surveys required to confirm translocation sites	152.48	Yes

Use of the offsets assessment guide indicated that the residual impact on *C. pungens* can be offset by translocation of 100 individuals at four separate locations into a suitable offset area. This will achieve 152% of the direct offset requirement. With 116.39 ha of suitable habitat for *C. pungens* available in the buffer area

(Res 13.3.1, 13.3.1x1 and 13.12.6), it is likely that four separate translocation sites can be found. There are also several sites on third party properties in the locality where *C. pungens* has been recorded which may be suitable as translocation sites (i.e. off Booth Lane, Happy Valley or along Quart Pot Creek).

4.2.3. Granite Belt thick-tailed gecko

Appropriate offset areas and locations for Granite Belt thick-tailed gecko have been determined by spatial analysis of potential habitat and application of the EPBC Act offsets assessment guide (refer Appendix A). The results for each of the selected properties are summarised in Table 4-3. Locations of the potential offset areas are considered commercial-in-confidence and are not presented in the report.

Table 4-3 Potential offset areas for Granite Belt Thick-tailed Gecko

Offset Area	Total (ha)	Ground-truthed?	% of impact offset	Minimum 90% direct offset requirement met?
South - Confidential	84.29	No	226.46	Yes
North - Confidential	285.90	No	768.13	Yes

Use of the offsets assessment guide indicated that the residual impact on Granite Belt thick-tailed gecko can be offset on adjacent third party properties. Either properties assessed contain primary habitat and would greatly exceed the direct offset requirement.

4.3. Potential offsets for matters of state environmental significance

4.3.1. Watercourse REs

SDRC propose to mitigate impacts on watercourse REs through enhancing watercourse RE's within the buffer area. Any residual impacts on watercourse RE's will be offset by either securing and managing a suitable direct land-based offset or an offset payment.

4.3.2. Protected plants

The offset rules under the draft QBOP asked for a 1:3.5 offset of the carrying capacity of the clearing area for protected plants. It is understood that these ratios are still applied. The Biodiversity Offset Strategy proposes translocation based on the number of impacted plants.

Translocation is the transfer of plants or plant material to an alternative location, away from an area of impact. As part of the offset strategy, threatened plants that cannot be avoided by the Project will be translocated to suitable habitat in offset areas. Translocation can be undertaken via a range of methods including seed collection and propagation, propagation from cuttings, direct seeding, transplantation of whole plants and transfer of soil, leaf litter or branches. The most appropriate method for translocation will depend on individual species characteristics, ease of propagation and features of the translocation site. As such, each species to be translocated will need a tailored approach based on the species habitat requirements, reproductive ecology, growth characteristics and sensitivity to disturbance.

Translocation of threatened plants will be in accordance with principles described in Vallee *et al*. (2004) and under the guidance of the OAMP. Principles described in Vallee *et al*. (2004) are summarised below.

1) Translocation should only occur if:
   - All possible measures have been taken to avoid and minimise impacts
   - It can be demonstrated that there will be no irreparable harm to the species as a whole
   - The translocation is implemented, managed, monitored and evaluated following procedures outlined below
   - Adequate time and funding have been provided for project development, monitoring, management and evaluation

Impacts of the Project on the species population should not to occur until either the translocation program has been deemed successful, or until a sufficient number of plants/seed is stored safely in an ex situ collection.

1) A pre-translocation assessment should be undertaken to collect biological, ecological, environmental and logistical information to allow detailed plans to be developed and to enhance the probability of the translocation program being successful.

2) Translocation planting should only commence after all the following points have been addressed:
   - An assessment of the most appropriate time to plant has been undertaken
   - Sufficient personnel are available
   - The condition of the plants is ideal
   - A disease hygiene plan has been prepared
   - A data sheet has been prepared to track each plant during the planting process
   - The translocation sites landowners/managers have been contacted and notified
   - Appropriate transport has been arranged to get the plants to the site with minimal damage
   - A suitable planting layout design has been prepared
   - After-planting care has been arranged

3) A peer reviewed program of ongoing care, management, monitoring and evaluation should be prepared prior to the translocation. Specific criteria for identifying success should be clearly defined, and the program should include details of funding and responsibilities.

The OAMP will cover all aspects of seed collection, cutting collection, propagation, retrieval of whole plants from clearing areas, transport, hygiene, storage, planting, timing, maintenance and monitoring. All collection of seed, vegetative material and cuttings will be undertaken in accordance with specifications outlined in the Flora Bank Guidelines (1998-2000). Clearing of impact areas will not occur until all threatened plants species have been collected and propagated in sufficient numbers to enable re-establishment in offset areas, and suitable offset areas have been secured. Sufficient plants and propagative material must be collected, propagated and retained to allow for the possibility of translocation failures.

A discussion of the suitability of translocation for each of the species impacted by the Project is provided in Section 4.2.2 for *Callistemon pungens* and below for others, with reference to any previous relocation outcomes reported for these species. Only species that will be residually impacted by the Project have been considered for translocation at this stage. In the event additional species are identified prior to construction (for example, during pre-clearance surveys) they will be included in the OAMP.

Acacia latisepala

Translocation of *Acacia* species has been successful in some previous projects in South East Queensland and Western Australia. Translocation of a population of *Acacia attenuata* (closely related to *A. latisepala*) at Bundilla (Sunshine Coast, Queensland) involved translocation of large intact sods containing roots, soil and whole plants. This was to retain the soil seed bank and thus assist in retaining genetic diversity. Preliminary observations of the translocated sods noted some seedling recruitment in the translocated population. It was noted that a program of fire management would be required to maintain active regeneration of this population. A fire frequency of between 6–10 years was considered favourable for the long-term persistence of the species (Brownlie *et al*. 2009).

Translocation of two *Acacia spp.* was found to be successful in Western Australia for *Acacia aprica* and *Acacia cochlocarpa* subsp*. cochlocarpa* (Monks and Coates 2002). Seed was collected from 30 *A. cochlocarpa* subsp. *cochlocarpa* plants and 60 *A. aprica* plants. Seeds were pre-treated and germinated on agar plates, then transferred to a nursery. Plants were planted into the transfer site at 9 months old, and 18 months old. Short term survival of both species seedlings planted in 1999 was high over the two following years, ranging from 87% to 100%. The long term success of these translocated populations is unknown. Fencing of seedlings to exclude herbivores form the translocation sites was found to be the most important factor in survival rates (Monks and Coates 2002).

For the three individual *A. latisepala* in the FSL, seed will be collected and propagated prior to clearing of the FSL. The three whole plants will also be retrieved prior to clearing of the FSL. The alignment of the irrigation pipeline and urban pipeline will be adjusted where possible to avoid *A. latisepala* plants. Where this is not possible, seed will be collected and whole plants retrieved where feasible. Translocation sites for this species will be within suitable habitat containing REs 13.3.1, 13.12.2, 13.12.5, 13.12.6, 13.12.8 and/or 13.12.9. There is 225.67 ha of suitable habitat within the buffer area. For plants impacted in the FSL, translocation sites will be established in the buffer area. In the event the pipeline alignments cannot be adjusted, plants will be translocated into suitable habitat adjacent to the pipeline construction corridors.

Acacia pubifolia

There is a HERBRECS record of 15 individuals near the proposed Stalling Road Access. In the event the road alignment cannot be altered to avoid these plants, seed and cuttings will be collected from the impacted plants prior to clearing, and whole plants retrieved.

As discussed for *A. latisepala*, translocation of Acacia species has been successful in some previous projects. Translocation sites for this species will be established within suitable habitat adjacent to the road alignment containing REs 13.12.2, 13.12.5 and/or 13.12.6.

Boronia repanda

Boronia repanda is known from a number of HERBRECS records on Pfunders Road and Poziers Road within proposed irrigation pipeline corridor. A translocation project involving *Boronia rivularis* on the Sunshine Coast, Qld was resulted in proliferation of the species at the translocation receiving site. The method of translocation was to lift large intact turves of soil (to 30 cm depth) with the associated plant material, place these onto palettes and transport to a receiver site. However this method may not be suitable for shallow soil depths.

Where *Boronia repanda* occurs along the pipeline corridor, the alignment will be altered to avoid the plants where possible. In the event that plants cannot be avoided, seed and cuttings will be collected from the impacted plants prior to clearing, and whole plants retrieved. Boronia species propagation is generally found to be more successful using stem cuttings rather than seed. Translocation sites for this species will be established within suitable habitat adjacent to the pipeline construction corridor containing REs 13.12.2, 13.12.5 and/or 13.12.6.

Grevillea scortechinii *subsp.* scortechinii

This species is known from HERBRECS records on Pfunders Road and Poziers Road within the proposed irrigation pipeline corridor. Numerous translocation projects have previously been undertaken involving Grevillea species. Translocation trials of *G. scapigera* near Corrigin in Western Australia undertaken from 1993 were found to have increasing levels of success (from 5% up to 80% survival rates, one year after planting). The main factors in success rates were found to be appropriate hardening off periods prior to planting, irrigation and control of insect seed predation. Natural recruitment was observed in 2003, ten years after the start of the program.

Where Black Grevillea plants occur along the irrigation pipeline corridor, the alignment will be altered to avoid the plants where possible. If plants cannot be avoided, seed and cuttings will be collected from the impacted plants prior to clearing, and whole plants retrieved. Propagation of grevilleas from cuttings is generally a reliable method and is preferred over seed propagation because of both the scarcity of seed and problems in germination (Australian Native Plants Society 2009). Translocation sites for this species will be established within suitable habitat adjacent to the pipeline construction corridor containing REs 13.3.1, 13.12.2, 13.12.6, 13.12.8 and/or 13.12.9.

Melaleuca flavovirens

No documentation relating to previous translocation projects of this *Melaleuca flavovirens* was found during preparation of this report. There have been successful translocations of *Melaleuca biconvexa* on the NSW Central Coast. Plants in this genus generally produce large amounts of seed annually and the seed germinates readily with no treatment.

For the seven individual *M. flavovirens* plants in the FSL, seed and cuttings will be collected and propagated prior to clearing of the FSL. Whole plants will also be retrieved prior to clearing of the FSL.

Translocation sites for this species will be within suitable habitat in the buffer area containing REs 13.3.1, 13.3.1x1, 13.12.2 and 13.12.6. There are 116.39 ha of suitable habitat available within the buffer area.

Mirbelia confertiflora

No documentation relating to previous translocation projects of *Mirbelia confertiflora* was found during preparation of this report. Other Mirbelia species are known to strike readily from tip cuttings and seed germinates well if pre-treated in hot water overnight (ANBG 2012). One plant was identified along the urbane pipeline corridor. If possible the pipeline alignment will be altered to avoid this plant. If avoidance is no possible, seed and cuttings will be collected and the whole plant retrieved prior to clearing. Translocation sites for this species will be established within suitable habitat adjacent to the pipeline construction corridor containing RE 13.12.6 and/or 13.12.8.

Thelionema grande

No information relating to previous translocation projects of this species was found during preparation of this report. This species produces ample seed, but the seed have a low germination rate and are difficult to propagate. The best method of propagation is by the division of plants, best done in winter when growth has slowed (ANBG 2013).

Five individual plants are located in the FSL. Seed will be collected and whole plants retrieved prior to clearing. Translocation sites for this species will be within suitable habitat in the buffer area containing REs 13.3.1, 13.3.1x1 and 13.12.6. There are 26.18 ha of suitable habitat (remnant and HVR) available within the buffer area.

5. OFFSET DELIVERY

5.1. Direct land-based offsets

SDRC proposes to meet the Project's offset requirements by securing and managing direct, land-based offsets. For MNES offsets, including those that are also MSES (i.e. *Callistemon pungens* and Granite Belt Thick-tailed Gecko) these are proposed to meet the requirements of the EPBC Act EOP.

All offset areas are proposed to be legally secured by a legally binding mechanism (i.e. covenant) and managed by SDRC, rather than through a third party. The buffer area and SDRC owned property surrounding Connolly Dam provide a unique opportunity for delivering the offsets. The land already is, or will be, owned by SDRC, and can be easily managed by the proponent for weeds, pests and fire management purposes, to ensure that the areas achieve the desired outcomes.

The buffer area is already utilised by the species/communities impacted and is a local solution. SDRC propose to secure the outstanding offset balance by the acquisition of one or more of the identified third party properties, subject to confirmation of their suitability.

A conservation gain will be achieved by implementing a direct offset which improves or maintains the viability of the protected matter, or reduces any threats of damage, destruction or extinction. This conservation gain will be achieved by:

- improving existing habitat for the protected matter (i.e. through replacement of bushrock and fallen timber from the impact areas)
- creating new habitat for the protected matter through revegetation and assisted regeneration
- reducing threats to the protected matter through weed, pest animal, fire and grazing management
- enhancing biodiversity value by improving connectivity
- averting the loss of a protected matter or its habitat that is under threat by legally securing the offset area for conservation purposes.

A combination of the above four approaches will be used in formulating the final offset.

5.2. Compensatory measures

SDRC is not currently proposing the use of other compensatory measures as part of the offset strategy. It is considered that protecting and enhancing vegetation communities and habitat at the site of impact will provide the greatest biodiversity benefits to the species/communities impacted.

5.3. Offset payment

SDRC will seek to provide a direct land-based offset for residual impacts on MSES. Should offset areas not achieve ecological equivalence, then an offset payment may be considered for any residual requirements (other than protected animals).

6. FUTURE OFFSET COMMITMENTS AND TIMING

6.1.1. Agreements

For MNES offsets, the proponent will consult with the DotE until an acceptable offset has been agreed upon. It is anticipated that the offset requirements will be a condition of approval under Section 34 of the EPBC Act. For MSES offsets, the proponent will enter into a Deed of Agreement with the DEHP prior to the issue of the development approval for the Project, to secure the offset within 12 months of approval.

6.1.2. Landholder engagement

SDRC expect to commence landholder engagement once the Biodiversity Offset Strategy has been endorsed by the DotE and the DEHP, and the Project has been approved. Landholder engagement will be focussed on those properties that can satisfy the remaining offset requirements as a whole (rather than piecemeal) and provide maximum potential to co-locate offset requirements.

6.1.3. Ecological equivalence

The QBOP does not specify ratios for calculating offset areas, rather, offsets are determined on a case-by-case basis, with application of Ecological Equivalence assessments (DERM 2011b).

An ecological equivalence assessment of the impact areas has already been undertaken (refer Appendix C). Ecological equivalence assessment of remaining offset areas will be undertaken after endorsement of the Biodiversity Offset Strategy, and once landholder negotiations have been undertaken.

6.1.4. EPBC Act offsets assessment

Once ground-truthing has confirmed the proposed offset areas meet the MNES offset requirements, an updated offsets assessment will be carried out using the EPBC Act Offsets Assessment Guide. This will determine the final offset area required for each MNES.

6.1.5. Offset area management plan

Each final offset area will be supported by an Offset Area Management Plan (OAMP) that outlines practical measures to enhance the site's vegetation and habitat values as well as reduce threatening processes to achieve the habitat quality scores.

Active management of the offset areas is expected to continue for up to 20 years depending on the condition of the vegetation. The OAMP will include:

- map of the final offset area;
- ecological equivalence assessment and/or EPBC Act offsets assessment to confirm the suitability of the final offset area;
- offset area management objectives and conservation outcomes;
- management and monitoring actions, i.e. revegetation, assisted regeneration, weed and pest management, fire management, grazing practices;
- performance criteria that determine when active management will be complete, such as the regrowth vegetation achieving remnant status, or if the area is remnant status vegetation or habitat reaching a certain ecological condition, or threatening processes being removed or reduced;
- persons responsibility for the actions identified; and
- corrective actions.

The OAMP will be developed through consultation with landholders, government agencies, specialists, qualified ecologists and on-ground providers. It will be the responsibility of SDRC to ensure offset areas are managed by appropriately experienced and qualified personnel.

6.1.6. Legally secure the offset

SDRC will legally secure the final offset areas using a legally binding mechanism, such as:

- gazettal as a protected area under the Queensland *Nature Conservation Act 1992*
- declaration as an areas of high nature conservation value under the VM Act, or
- covenant under the Queensland *Land Title Act 1994* or *Land Act 1994*.

6.1.7. Timing

The timeframes for the future offset commitments are detailed in Table 6-1.

Table 6-1 Offset strategy timeframes

Commitment	Offset timeframes
Deed of Agreement	Prior to issue of Project approval
Landholder engagement	Commence after Project approval
Field surveys, ecological equivalence assessment and update of EPBC Act offsets assessment	Within 4 months of approval
Final Biodiversity Offset Strategy	Within 8 months of approval
Offset Area Management Plans	Within 10 months of approval
Legally secure the offset	Within 12 months of approval

7. REFERENCES

3D Environmental (2007). *Terrestrial Flora Baseline Study – Emu Swamp Dam Project*. Severn River, Queensland. prepared for Stanthorpe Shire Council

Australian National Botanic Gardens (ANBG) (2012). *Information about Australia's Flora – Growing Native Plants – Mirbelia speciosa.* Australian National Botanic Gardens and Centre for Australian National Biodiversity Research, Canberra. Accessed online on 3/9/2013 at http://www.anbg.gov.au/gnp/interns-2005/mirbelia-speciosa.html

Australian National Botanic Gardens (ANBG) (2013). *Information about Australia's Flora – Growing Native Plants – Thelionema grande.* Australian National Botanic Gardens and Centre for Australian National Biodiversity Research, Canberra. Accessed online on 3/9/2013 at http://www.anbg.gov.au/gnp/interns-2004/thelionema-grande.html

Biodiversity Assessment and Management (BAAM) (2007) *Terrestrial Vertebrate Impact Assessment Emu Swamp Dam and Associated Infrastructure Stanthorpe Shire.* Report prepared for Stanthorpe Shire Council.

Brownlie, H., Playford, J., Wallace, H., and Shapcott, A. (2009). Population ecology and genetics of the vulnerable Acacia attenuata (Mimosaceae) and their significance for its conservation, recovery and translocation, Australian Journal of Botany, vol 57, pp. 675- 687

Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) (2012) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy.* October 2011.

Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) (2012) *Interim koala referral advice for proponents.*

Eyre, T.J., Kelly, A.L., Neldner, V.J., Wilson,B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2011). *Biocondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.1*. Department of Environment and Resource Management (DERM), Biodiversity and Ecosystem Sciences, Brisbane.

Monks and Coates (2002). The translocation of two critically endangered Acacia species. Conservation Science W. Australia 4 (3) pp 54-61

Neldner, V.J., Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (2012). *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.2.* Updated August 2012. Queensland Herbarium, Queensland Department of Science, Information Technology, Innovation and the Arts, Brisbane. 124 pp.

Queensland Environmental Protection Agency (EPA) (2008). *Queensland Government Environmental Offsets Policy*. Queensland Government.

Queensland Department of Environment and Resource Management (DERM) (2011a). *Policy for Vegetation Management Offsets Version 3 30 September 2011.* Queensland Government.

Queensland Department of Environment and Resource Management (DERM) (2011b). *Queensland Biodiversity Offset Policy (version 1) 3 October 2011*. Queensland Government.

Queensland Department of Environment and Resource Management (DERM) (2011c). *Ecological Equivalence Methodology Guideline - Policy for Vegetation Management Offsets and Queensland Biodiversity Offsets Policy, Version 1.* Queensland Government.

Queensland Department of Natural Resources and Mines (2013) *Letter submission on the Preliminary Draft Supplementary Environmental Impact Statement for the Proposed Emu Swamp Dam Project*. Received 18 November 2013. DNRM Reference NM1113NAM0001

Threatened Species Scientific Committee (TSSC) (2006a) *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.*

Appendix A EPBC Act offsets assessment – calculator

- Box-Gum Grassy Woodland – Connolly Dam
- Box-Gum Grassy Woodland – Group A1
- Box-Gum Grassy Woodland – Group A2
- Box-Gum Grassy Woodland – Group A3
- Box-Gum Grassy Woodland – Group B1
- Box-Gum Grassy Woodland – Group B2
- Box-Gum Grassy Woodland – Group B3
- Box-Gum Grassy Woodland – Group D1
- Box-Gum Grassy Woodland – Group D2
- Box-Gum Grassy Woodland – Group E
- Box-Gum Grassy Woodland – Group F
- Box-Gum Grassy Woodland – Group I
- Callistemon pungens
- Granite Belt Thick-tailed Gecko – Connolly Dam
- Granite Belt Thick-tailed Gecko – South
- Granite Belt Thick-tailed Gecko – North

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	27.73 ha of Box-Gum Grassy Woodland at Connolly Dam on SDRC owned land	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	27.73	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	2.77	80%	2.22	0.60	5.37	10.61%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM, 2014)
									Future area without offset (adjusted hectares)	23.6	**Future area with offset (adjusted hectares)**	26.3									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**9**	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	5.37	10.61%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	7	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	103.03 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	103.03	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	25.76	80%	20.61	5.53	19.22	37.97%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	72.1	**Future area with offset (adjusted hectares)**	97.9									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	6	**Future quality without offset (scale of 0-10)**	5	**Future quality with offset (scale of 0-10)**	8	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	19.22	37.97%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	50.60	Adjusted hectares	415.26 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	Start area (hectares)	415.26	Risk of loss (%) without offset	30%	Risk of loss (%) with offset	5%	103.82	80%	83.05	22.28	77.45	153.05%	Yes	Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	290.7	Future area with offset (adjusted hectares)	394.5								
					Time until ecological benefit	5	Start quality (scale of 0-10)	**6**	Future quality without offset (scale of 0-10)	**5**	Future quality with offset (scale of 0-10)	**8**	3.00	95%	2.85	2.05				
Threatened species habitat																				
Area of habitat	No				Time over which loss is averted (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset									
									Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0								
					Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	77.45	153.05%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	42.54 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	42.54	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	10.64	80%	8.51	2.28	7.93	15.68%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	29.8	**Future area with offset (adjusted hectares)**	40.4									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	7.93	15.68%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	23.67 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	23.67	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	5.92	80%	4.73	1.27	4.41	8.72%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	16.6	**Future area with offset (adjusted hectares)**	22.5									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	4.41	8.72%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	134.43ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	134.43	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	33.61	80%	26.89	7.21	25.07	49.55%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	94.1	**Future area with offset (adjusted hectares)**	127.7									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	25.07	49.55%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	7	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	50.60	Adjusted hectares	250.78 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	250.78	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	62.70	80%	50.16	13.46	46.77	92.43%	Yes	Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	175.5	**Future area with offset (adjusted hectares)**	238.2								
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	6	**Future quality without offset (scale of 0-10)**	5	**Future quality with offset (scale of 0-10)**	8	3.00	95%	2.85	2.05				
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	46.77	92.43%	**Yes**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	64.50 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	64.5	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	16.13	80%	12.90	3.46	12.03	23.77%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	45.2	**Future area with offset (adjusted hectares)**	61.3									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	12.03	23.77%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	50.60	Adjusted hectares	27.14 ha of Box-Gum Grassy Woodland on Group A1 properties	**Risk-related time horizon (max. 20 years)**	20	Start area (hectares)	27.14	Risk of loss (%) without offset	30%	Risk of loss (%) with offset	5%	6.79	80%	5.43	1.46	10.00%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	19.0	Future area with offset (adjusted hectares)	25.8								
					Time until ecological benefit	5	Start quality (scale of 0-10)	**6**	Future quality without offset (scale of 0-10)	**5**	Future quality with offset (scale of 0-10)	**8**	3.00	95%	2.85	2.05				
																5.06				
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset									
									Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0								
					Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	5.06	10.00%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	7	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	275.14 ha of Box-Gum Grassy Woodland on Group E properties	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	275.14	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	68.79	80%	55.03	14.76	51.31	101.40%	Yes		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	192.6	**Future area with offset (adjusted hectares)**	261.4									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	6	**Future quality without offset (scale of 0-10)**	5	**Future quality with offset (scale of 0-10)**	8	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	51.31	101.40%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	50.60	Adjusted hectares	164.35 ha of Box-Gum Grassy Woodland on Group F properties	**Risk-related time horizon (max. 20 years)**	20	Start area (hectares)	164.35	Risk of loss (%) without offset	30%	Risk of loss (%) with offset	5%	41.09	80%	32.87	8.82	30.65	60.57%	No	Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	115.0	Future area with offset (adjusted hectares)	156.1								
					Time until ecological benefit	5	Start quality (scale of 0-10)	**6**	Future quality without offset (scale of 0-10)	**5**	Future quality with offset (scale of 0-10)	**8**	3.00	95%	2.85	2.05				
Threatened species habitat																				
Area of habitat	No				Time over which loss is averted (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset									
									Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0								
					Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	30.65	60.57%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Box-Gum Grassy Woodland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Direct clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	**Area**	72.29	Hectares	3D Environmental (2007). Terrestrial Flora Baseline Study – Emu Swamp Dam Project. Severn River, Queensland. Unpublished report prepared for Stanthorpe Shire Council and Emu Swamp SEIS - Terrestrial Ecology Chapter (SKM 2013)
			Quality	**7**	Scale 0-10	
			Total quantum of impact	50.60	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	50.60	Adjusted hectares	6.98 ha of Box-Gum Grassy Woodland on Group I properties (Diamondvale)	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	6.98	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	1.75	80%	1.40	0.37	1.30	2.57%	No		Emu Swamp Dam SEIS - Biodiversty Offset Strategy (SKM 2014)
									Future area without offset (adjusted hectares)	4.9	**Future area with offset (adjusted hectares)**	6.6									
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**	3.00	95%	2.85	2.05					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	50.603	1.30	2.57%	**No**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Callistemon pungens
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality	**0**		
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	Yes	Loss of population of M. williamsii in inundation area	45		Count	Terrestrial flora surveys by 3D Environmental (2007); SKM (2013)

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**								
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes	45	Count	Propagation of 300 individuals from seed and cuttings. Planting of at least 100 individuals into suitable riparian	10		100		0		100		100	70%	70.00	68.62	152.48%	Yes		

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	45	68.62	152.48%	**Yes**	$0.00	N/A	$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Granit Thick Tailed Gecko
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality	**0**		
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Suitable habitat for this species will be lost in the inundation area	**Area**	18.13	Hectares	SEIS Appendix K MNES (SKM 2014)
			Quality	**8**	Scale 0-10	
			Total quantum of impact	14.50	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**								
Threatened species habitat																				
Area of habitat	Yes	14.50	Adjusted hectares	84.29	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	84.29	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	21.07	80%	16.86	16.20	32.85	226.46%	Yes	
									Future area without offset (adjusted hectares)	59.0	**Future area with offset (adjusted hectares)**	80.1								
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**10**	3.00	95%	2.85	2.82				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No								0											

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	14.504	32.85	226.46%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Granit Thick Tailed Gecko
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality	**0**		
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Suitable habitat for this species will be lost in the inundation area	**Area**	18.13	Hectares	SEIS Appendix K MNES (SKM 2014)
			Quality	**8**	Scale 0-10	
			Total quantum of impact	14.50	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**								
Threatened species habitat																				
Area of habitat	Yes	14.50	Adjusted hectares	285.9	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	285.9	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	71.48	80%	57.18	54.94	111.41	768.13%	Yes	
									Future area without offset (adjusted hectares)	200.1	**Future area with offset (adjusted hectares)**	271.6								
					Time until ecological benefit	5	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**10**	3.00	95%	2.85	2.82				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No								0											

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	14.504	111.41	768.13%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Appendix B EPBC Act offsets assessment – inputs

Table B-1 Box-Gum Grassy Woodland

Assessment Guide	Input	Explanation	Reference document/s
Impact description	Clearing of a threatened ecological community for construction of a dam and pipelines near Stanthorpe	Residual impact on Box-Gum Grassy Woodland in inundation area (71.55 ha) and Stalling Lane Access (0.74 ha). Impacts on the community in pipeline corridors (11.47 ha) are expected to be temporary, as progressive rehabilitation will be undertaken in the pipeline construction corridors.	Appendix H MNES Assessment; Section 2.1 Project description (SKM 2014)
Impact area	83.76 ha direct impact (this includes impacts in FSL, urban and irrigation pipelines and Stalling Lane Access, although clearing for pipelines will be a temporary) 72.29 ha residual impact	Field surveys using the minimum condition criteria published by DotE were undertaken in the inundation area to determine how much of the vegetation to be impacted meets the Box-Gum Grassy Woodland listing criteria. Condition of vegetation was recorded by BioCondition surveys (Eyre et al. 2011) and by using the listing advice condition criteria.	Appendix H MNES Assessment; Appendix E Terrestrial Ecology Field Survey Results (SKM 2014) BioCondition – A Condition Assessment Framework for Terrestrial Biodiversity in Queensland – Assessment Manual (Eyre et al. 2011) White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands listing advice and conservation advice (TSSC 2006)
Quality of vegetation impacted (0-10)	7	Components of habitat quality for consideration in the EPBC Act offsets assessment guide include site condition, site context and species stocking rate. Site context takes into account site connectivity as well as the role of the site in relation to the overall population or extent of a species or community. BioCondition surveys were undertaken to assess the condition of the vegetation. Scores for field-based indicators (recruitment of woody perennial species, native plant species richness, tree canopy height, tree canopy cover, shrub canopy cover, native perennial grass cover, organic litter cover, large trees, coarse woody debris and weed cover) and GIS based indicators (size of patch, connectivity and context) were calculated using the Ecological Equivalence Methodology Guideline Version 1 (DERM 2011). Site condition - Condition of the vegetation was found to be impacted by weed infestation, grazing and impacts of fire (resulting in a substantial shrub layer).	Appendix E Terrestrial Ecology Field Survey Results (SKM 2014) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland National Recovery Plan (Department of Environment, Climate Change and Water NSW 2010). Ecological Equivalence Methodology Guideline Version 1 (DERM, 2011)

Assessment Guide	Input	Explanation	Reference document/s
		Results of BioCondition surveys showed the Box-Gum Grassy Woodland REs (13.3.1, 13.12.8 and 13.12.9) had an average score of 80% for field-based attributes. However, due to impacts from weeds, grazing and fire, the score for this component has been reduced to 6/10. Site context –Spatial analysis of GIS based indicators (size of patch, connectivity and context) showed the Box-Gum Grass Woodland REs (13.3.1, 13.12.8 and 13.12.9) had an average score of 87%, which equates to 9/10 for this component. However, the importance of the impacted vegetation in relation to the total remaining extent of Box-Gum Grassy Woodland and also in relation to the local extent is considered to be low. The estimate of the total remaining extent of Box-Gum Grassy Woodland quoted in the National Recovery Plan (NSW DECCW, 2010) was 405,000 ha. Based on this extent the Project will impact on at least 0.02% of the overall extent of the community. Field surveys for Box-Gum Grassy Woodland indicated that within 20 km of the dam there are approximately 5,217 ha containing the threatened ecological community. Based on this figure, the impacted vegetation is 1.6% of the local extent. The impacted area is a low percentage of the local and total extents. Therefore, due to a low relative importance, the score for this component has been reduced to 7/10. Species stocking rate - As the fauna surveys recorded a number of threatened flora and fauna species in the community in the Project area, the species stocking rate is considered to be high. The score for this component is assumed to be 8/10. The average score across the three components is 7/10.	
Proposed offset	Varies depending on quality. Initial analysis indicates the estimated size is 300 ha (remnant and HVR of Box-Gum Grassy Woodland)	GIS analysis and ground truthing of vegetation communities indicate the following areas of Box Gum Grassy Woodland in the locality suitable for an offset: 27.73 ha at Connolly Dam on SDRC owned land 1500.84 ha on the following groups of 'third party' land parcels: Group A1 – 103.03 ha Group A2 – 415.26 ha Group A3 – 42.54 ha	Biodiversity Offset Strategy (SKM 2014) File note to DotE

Assessment Guide	Input	Explanation	Reference document/s
		Group B1 – 23.67 ha Group B2 – 134.43 ha Group B3 – 250.78 Group D1 – 64.50 ha Group D2 – 27.14 ha Group E – 125 ha of remnant; 151 ha of HVR Group F – 164 ha of remnant; 0 ha of HVR Group I – 13.01 ha of remnant; 0 ha of HVR Note Groups E and F have not been ground-truthed due to access restrictions. All other potential offset areas have.	
Risk related time horizon	20 years	Offset will be secured "in perpetuity" so the maximum timeframe has been used.	Biodiversity Offset Strategy (SKM 2014)
Time until ecological benefit	5 years	Ecological benefits will commence in the short term (1-3 years) as a result of weed and pest management, fire management and grazing management. Longer term benefits, such as re-establishment of native ground covers and grasses in areas where weeds have been suppressed, maturation of juvenile trees and gradual decline of early successional species can be expected to occur over a 3-5 year timeframe. The maximum time to ecological benefit is therefore estimated to be 5 years.	
Start area	Proposed offset areas	Connolly Dam – 27.73 ha Group A1 – 103.03 ha Group A2 – 415.26 ha Group A3 – 42.54 ha Group B1 – 23.67 ha Group B2 – 134.43 ha Group B3 – 250.78 Group D1 – 64.50 ha Group D2 – 27.14 ha Group E – 275.14 ha Group F – 164.35 ha Group I – 13.01 ha	
Start quality	Connolly Dam - 7 Group A1 – 6.3 Group A2 – 6.3 Group A3 – 5.7 Group B1 – 6.3 Group B2 – 6.3 Group B3 – 6.3 Group D1 – 6.3 Group D2 – 6.3 Group E – 5.7 Group F – 6.3	Connolly Dam - BioCondition surveys in Connolly Dam indicate that the average vegetation site condition is 80%, with impacts from weeds and grazing (6/10). Site context and species stocking rate is considered to be the same as the impact area (7/10 and 8/10 respectively). Therefore, habitat is considered to have an overall start quality of 7/10. Groups A1 and A2 – Ground-truthing of this vegetation indicates it meets the condition criteria for Box-Gum Grassy	Appendix E Terrestrial Ecology Field Survey Results (SKM 2014) Biodiversity Offset Strategy (SKM 2014) RE and HVR mapping

Assessment Guide	Input	Explanation	Reference document/s
	Group I – 6.3	Woodland and that they are good examples – low shrub cover, mid-sparse canopy cover, but impacts from grazing and ground cover not entirely native (7/10). Spatial analysis indicates moderate connectivity in the landscape. A low relative importance has been assumed (4/10). A high species stocking rate has been assumed (8/10). Therefore, habitat is considered to have an overall start quality of 6.3/10. Group A3 – Ground-truthing of this vegetation indicates it meets the condition criteria for Box-Gum Grassy Woodland, but not a good example - high shrub cover and the ground storey is invaded by African Lovegrass (5/10). Spatial analysis indicates moderate connectivity in the landscape, but a low relative importance has been assumed (4/10). A high species stocking rate has been assumed (8/10). Average score of 5.7/10. Group B1 - Ground-truthing of this vegetation indicates it meets the condition criteria for Box-Gum Grassy Woodland but not a good example - high shrub cover and impacts from grazing (5/10). Spatial analysis indicates high connectivity in the landscape, but a low relative importance has been assumed (6/10). A high species stocking rate has been assumed (8/10). Therefore, habitat is considered to have an overall start quality of 6.3/10. Group D1 - Ground-truthing of this vegetation indicates it meets the condition criteria for Box-Gum Grassy Woodland and is good example – low shrub cover, mid-sparse canopy cover, but ground cover not entirely native and heavy grazing (7/10). Spatial analysis indicates moderate connectivity in the landscape, but a low relative importance has been assumed (4/10). A high species stocking rate has been assumed (8/10). Average score of 6.3/10. Group D2 - Ground-truthing of this vegetation indicates it meets the condition criteria for Box-Gum Grassy Woodland and is a good example – low shrub cover, mid-sparse canopy cover, ground cover predominantly native (7/10). Spatial analysis indicates moderate connectivity in the landscape, but a low relative importance has been assumed (4/10). A high species stocking rate has been assumed (8/10). Average score of 6.3/10. In lieu of ground-truthing for Groups E and	

Assessment Guide	Input	Explanation	Reference document/s
		F, we have assumed habitat is of Group E is of similar quality to Group A3, as it has moderate connectivity in the landscape, and that Group F is of similar quality to Group B1, as it has high connectivity. In lieu of ground-truthing for Groups E and F, we have assumed habitat is of Group E is of similar quality to Group A3, as it has moderate connectivity in the landscape, and that Group F is of similar quality to Group B1, as it has high connectivity. Group I - Ground-truthing of this vegetation indicates it meets the condition criteria for Box-Gum Grassy Woodland and is, in places, a good example – low shrub cover, mid-sparse canopy cover, ground cover predominantly native (7/10). Spatial analysis indicates moderate connectivity in the landscape, but a low relative importance has been assumed (4/10). A high species stocking rate has been assumed (8/10). Average score of 6.3/10.	
Risk of loss (%) without offset	Connolly Dam – 15% Third party properties – 30%	Risk of loss of Box-Gum Grassy Woodland on the Connolly Dam site is low, unless Council has plans for clearing the site for some other purpose. There is a risk of loss of condition of the vegetation to the extent that it no longer meets the minimum condition criteria for Box-Gum Grassy Woodland. This could occur as a result of weed infestation, frequent fires and fragmentation from the numerous tracks through this site. Risk of loss at Connolly Dam is estimated to be approximately 15% over a 20 year period, due to: Clearing by Council (0%) Wildfire (5%) Fragmentation (5%) Weeds, pests, grazing (5%) Risk of loss on the third party properties is generally high due to: - current land management practices on agricultural land are not geared toward conservation of the native ground cover stratum. As such the potential for Box-Gum Grassy Woodland to degrade is high - rural zoning allows for clearing of both remnant and regrowth vegetation for agricultural purposes, no matter what the VM status of the vegetation Risk of loss of the third party properties is estimated to be approximately XX% over a 20 year period, due to: Clearing by landholder (10%) Wildfire (5%)	SDRC zoning maps. RE mapping and VM Act. Mining lease maps

Assessment Guide	Input	Explanation	Reference document/s
		Flood (5%) Weeds, pests, grazing (10%)	
Future quality without offset (scale of 0-10)	Connolly Dam – 6 Group A1 – 5.3 Group A2 – 5.3 Group A3 – 4.7 Group B1 – 5.3 Group B2 – 5.3 Group B3 – 5.3 Group D1 – 5.3 Group D2 – 5.3 Group E – 4.7 Group F – 5.3 Group I – 5.3	Over 8 years the quality can be expected to decline slightly for the Connolly Dam site. This is because threats to Box-Gum Grassy Woodland are not currently specifically being managed on this site. Without the offset, the quality on third party properties is expected to decrease slightly, as these areas are currently managed for agricultural purposes.	
Risk of loss (%) with offset	5%	Risk of loss of Box-Gum Grassy Woodland on the Connolly Dam site with the offset is reduced to 5%, as this area will be protected and managed to improve the quality of the vegetation. Current threats will be mitigated by fire management, weed and pest control, track restoration and restriction of activities that are inconsistent with the management objectives. Risk of loss of Box-Gum Grassy Woodland on private property secured for the offset is reduced to 5%, as these areas will be protected and managed to improve the quality of the vegetation. Current threats will be mitigated by management in accordance with an OAMP. The average risk of loss without the offset is therefore 5%.	
Future quality with offset (scale of 0-10)	Connolly Dam - 9 Group A1 – 8.3 Group A2 – 8.3 Group A3 – 7.7 Group B1 – 8.3 Group B2 – 8.3 Group B3 – 8.3 Group D1 – 8.3 Group D2 – 8.3 Group E – 7.7 Group F – 8.3 Group I – 8.3	The expected outcome of managing the offset areas is a substantial increase in quality over 8 years.	
Confidence in result (quality)	80	Offset areas contain a combination of remnant vegetation and high value regrowth. As such, revegetation will not be required and the risks associated with plant or seed failures will be avoided. All of the offset areas selected have strong potential to self-regenerate with the correct	Specific weed and pest control factsheets (QLD DAFF and NSW DPI). RE database – contains information about fire regimes for Qld REs.

Assessment Guide	Input	Explanation	Reference document/s
		management. Management of will focus on weed and pest control, fencing, fire management and grazing management. There is a substantial amount of information available about - successful control techniques for pests and weeds - suitable fire regimes for woodlands and regional ecosystems - grazing management in grassy ecosystems. The OAMP will incorporate methods that have been trialled and found to be successful. Monitoring will be undertaken as part of the OAMP and evaluation of management methods undertaken with each round of monitoring. Management methods will be adjusted according to the results of monitoring and evaluation.	Rawlings, Kimberlie A guide to managing box gum grassy woodlands/Kimberlie Rawlings, David Freudenberger and David Carr. Canberra, A.C.T.: Department of the Environment, Water, Heritage and the Arts, 2010. SEQ Ecological Restoration Framework (Chenoweth EPLA and Bushland Restoration Services (2012). Prepared on behalf of SEQ Catchments and South East Queensland Local Governments, Brisbane. National Recovery Plan – Box Gum Grassy Woodlands
Confidence in result (risk of loss)	95	Legal securing of offset areas has a high probability of averting loss.	

Table B-2 *Callistemon pungens*

Assessment Guide	Input	Explanation	Reference document/s
Impact description	Loss of part of a population on the Severn River in the inundation area.	The residual impact of the Project on Callistemon pungens within the inundation area will be loss of 45 plants. The impact of the loss of these plants will be significant for section of the Severn River that will be inundated for the dam. Individuals of the species found in the vicinity of the dam will not be affected by the Project and will continue to survive after the Project is completed. The few individuals located along the pipeline corridors will be avoided by adjusting the alignment of the corridor.	Appendix H MNES Assessment; Chapter 10 Terrestrial Ecology (SKM 2014); Flora surveys by 3D Environmental (2007) and SKM (2013)
Quantum of impact	45 individuals	As above	Appendix H MNES Assessment; Appendix E Terrestrial Ecology Field Survey Results (SKM 2014)
Proposed offset	Planting at least 100 individuals into suitable riparian habitat at 4 translocation sites in the buffer area. Ongoing management and monitoring for 8 years.	Propagation of 300 individual plants from seed and cuttings to provide back up for plant failures in offset areas. At least 4 separate translocation sites to be used to reduce the risk of loss due to stochastic events.	Biodiversity Offset Strategy (SKM 2014)
Time horizon	10		
Start value	100 individuals	100 individuals will be planted into suitable riparian habitat at 4 translocation sites in the buffer area. Additional plants will be stored in a nursery as contingency for plant failures.	
Future value without offset	0	The buffer area upstream of the FSL contains a population of C. pungens but none have been identified in the 500m downstream of the FSL. This section of the Severn River is within the buffer area and will be assessed for suitability as location for translocation of this species. There are also potential translocation sites on private properties identified as potential offset areas. The species is not known to occur on these properties as yet.	Appendix E Terrestrial Ecology Field Survey Results (SKM 2014) Flora surveys by 3D Environmental (2007) and SKM (2013)
Future value with offset	100	Translocation of this species into offset areas will result in establishment of 100 additional plants.	
Confidence in result	70%	The species produces plentiful seed which germinates easily. Local nurseries have reported that they have propagated this species from seed successfully, and that they have an existing supply of plants for a revegetation project, however note that they currently collect seed from several locations around Stanthorpe and cross breed so a	ANBG

Assessment Guide	Input	Explanation	Reference document/s
		dedicated propagation for the Project to retain genetic diversity from the impact site would be required. Protection of translocated plants from herbivores, desiccation, disease, fire or other threats will form part of the OAMP, and a reserve of plants from the propagation of 300 individuals will be retained in a nursery as contingency in case of plant failures.	

Table B-3 Granite Belt Thick-tailed Gecko

Assessment Guide	Input	Explanation	Reference document/s
Impact description	Suitable habitat for this species will be lost in the inundation area	One individual was found within the inundation area during field surveys (BAAM 2008) from a small patch of Callitris dominated woodland with substantial areas of bare rock (RE 13.12.6). Notwithstanding the fact that the Project will result in a net increase in habitat for the local population of the Granite Belt Thick-tailed Gecko over the longer term (within the proposed buffer area), there remains a risk associated with the lag time between the commencement of rehabilitation activities and the point at which the habitat becomes suitable for the species. A resident population will be displaced from habitat which is currently suitable and occupied and displaced individuals may not successfully inhabit the buffer area. As such, it is considered likely that there will be a residual impact of the project on 18.13 ha of primary habitat (REs 13.12.2 and 13.12.6) and 70.41 ha of secondary habitat (REs 13.12.5, 13.12.8 and 13.12.9).	Appendix H MNES Assessment (SKM 2014)
Impact area	18.13 primary habitat	As the individual was found in primary habitat (RE 13.12.6) it is only proposed to offset primary habitat. The area of primary habitat impacted was calculated using field-verified vegetation mapping of the inundation area (3D Environmental 2007), and REs providing primary habitat (REs 13.12.2 and 13.12.6).	Appendix H MNES Assessment (SKM 2014)
Quality of vegetation impacted (0-10)	8	Components of habitat quality for consideration in the EPBC assessment guide include site condition, site context and species stocking rate. Based on BioCondition survey results, spatial data and distribution and habitat information on the Granite Belt Thick-tailed Gecko, the following rationale has been used to determine that the overall 'condition' of the impacted habitat is 9. This is based on each criteria providing equal weighting. Site condition - Results of BioCondition surveys showed that primary remnant habitat (REs 13.12.2 and 13.12.6) in the impact area had an average score of 98.75% for field based attributes (98.75%) using the Ecological Equivalence Methodology Guideline Version 1 (DERM, 2011). However, condition of the habitat was found to be impacted by weed infestation, grazing and fire. Due to impacts from weeds, grazing and fire, the score for this component has been reduced to 8/10.	Appendix E Terrestrial Ecology Field Survey Results (SKM 2014)

Assessment Guide	Input	Explanation	Reference document/s
		Site context – Spatial analysis of GIS indicators (patch size, context and connectivity) showed that remnant primary habitat (REs 13.12.2 and 13.12.6) in the impact area had an average score of 82% using the Ecological Equivalence Methodology Guideline Version 1 (DERM, 2011). This equates to a score of 8/10 for this component. Species stocking rate – the species was recorded once in remnant habitat. Therefore, the stocking rate is considered to be high in remnant primary habitat (8/10) The average score of habitat quality is 8/10.	
Proposed offset	1) 84.29 ha 2) 285.90 ha	Suitable primary habitat (REs 13.12.2 and 13.12.6) for Granite Belt Thick-tailed Gecko exists on third party properties adjoining the regeneration buffer area around the FSL. It is proposed to secure these for offsets. There is no primary habitat available at SDRC owned land surrounding Connolly Dam.	Biodiversity Offset Strategy (SKM 2014)
Risk related time horizon	20 years	Offset will be secured "in perpetuity" so the maximum timeframe has been used.	Biodiversity Offset Strategy (SKM 2014)
Time until ecological benefit	5 years	Ecological benefits will commence in the short term (1-3 years) as a result of weed and pest management, fire management, grazing management and replacement of ground habitat (bushrock and fallen timber) from inundation area. Longer term benefits, such as re-establishment of native ground covers and grasses in areas where weeds have been suppressed, maturation of juvenile trees and gradual decline of early successional species can be expected to occur over a 3-5 year timeframe. The maximum time to ecological benefit is therefore estimated to be 5 years.	
Start quality	8	Assume the condition of habitat on the adjoining properties is the same as the impacted vegetation (8).	Appendix H MNES Assessment; Appendix E Terrestrial Ecology Field Survey Results (SKM 2014) Biodiversity Offset Strategy (SKM 2014)
Start area	1) 84.29 ha 2) 285.90 ha	Suitable primary habitat for Granite Belt Thick-tailed Gecko exists on third party properties adjoining the Project buffer area around the FSL. It is proposed to secure these for offsets.	
Risk of loss (%) without offset	30%	Risk of loss of habitat on third party properties is estimated to be approximately 30% over a 20 year period, due to: Clearing by landholder (10%)	RE mapping and VM Act.

Assessment Guide	Input	Explanation	Reference document/s
		Wildfire (5%) Weeds, pests, grazing (15%)	
Future quality without offset (scale of 0-10)	7	Without the offset, the quality on third party properties is expected to decrease slightly, as these areas are currently managed for agricultural purposes.	
Risk of loss (%) with offset	5%	Risk of loss of Box-Gum Grassy Woodland on third party properties secured for the offset is reduced to 5%, as these areas will be protected and managed to improve the quality of the vegetation. Current threats will be mitigated by management in accordance with an OAMP.	Biodiversity Offset Strategy (SKM 2014)
Future quality with offset (scale of 0-10)	10	The expected outcome of managing the offset areas is an increase in quality over 5 years from the removal of threats, re-establishment of ground habitat (bushrock and fallen timber) from inundation area and assisted regeneration of woodland habitat.	
Confidence in result (quality)	80	Offset areas contain a combination of remnant and high value regrowth vegetation. The offset areas have strong potential to self-regenerate with the correct management. Management will focus on weed and pest control, fencing, fire management and grazing management. There is a substantial amount of information available about - successful control techniques for pests and weeds - suitable fire regimes for woodlands and regional ecosystems - grazing management in grassy ecosystems. The OAMP will incorporate methods that have been trialled and found to be successful. Monitoring will be undertaken as part of the OAMP and evaluation of management methods undertaken with each round of monitoring. Management methods will be adjusted according to the results of monitoring and evaluation. In calculating the confidence in result there are several factors contributing to risk of quality of habitat: Wildfire (5% risk) Weeds, pests and grazing (15% risk)	Specific weed and pest control factsheets (QLD DAFF and NSW DPI). RE database – contains information about fire regimes for Qld REs. SEQ Ecological Restoration Framework (Chenoweth EPLA and Bushland Restoration Services (2012). Prepared on behalf of SEQ Catchments and South East Queensland Local Governments, Brisbane.
Confidence in result (risk of loss)	95	Legal securing of offset areas has a high probability of averting loss. In calculating the confidence in result there are several factors contributing to risk of loss on third party properties: Wildfire (5% risk)	

Appendix C Ecological equivalence assessment

- FSL
- Pipeline
- Connolly Dam

Assessment Unit	RE	VM Status	Area (ha)	Patch Size Score	Connectivity Score	Context Score	Site based attributes score	TOTAL	Assessment unit score (sum of scores x area/100)
1	13.3.1	Endangered	0.806	10	2	5	73	90	0.725746634
	13.3.1	Endangered	0.878	10	2	4	73	89	0.781370736
	13.3.1	Endangered	0.014	10	4	4	73	91	0.012650603
	13.3.1	Endangered	0.044	10	4	5	73	92	0.040098358
2	13.12.2	Not of Concern	3.797	10	4	4	80	98	3.720724256
3	13.12.2	Not of Concern	0.343	0	2	4	80	86	0.29464881
4	13.12.2	Not of Concern	3.262	10	4	4	80	98	3.197179675
5	13.3.1	Endangered	3.451	10	2	4	73	89	3.071694588
6	13.3.1x1	Endangered	8.146	10	5	4	73	92	7.494403668
7	13.12.9	Endangered	8.432	10	4	4	61	79	6.661317389
8	13.12.9	Endangered	6.525	10	4	4	61	79	5.154883938
9	13.12.5	Not of Concern	0.601	0	0	4	80	84	0.504562402
10	13.12.5	Not of Concern	6.781	10	4	4	80	98	6.645533594
11	13.12.6	Of Concern	0.094	10	5	4	80	99	0.093401859
12	13.12.9	Endangered	1.059	10	2	4	61	77	0.815203176
13	13.12.2	Not of Concern	1.600	10	4	4	80	98	1.568150702
14	13.12.6	Of Concern	0.410	10	5	4	80	99	0.406198466
15	13.12.2	Not of Concern	2.120	10	4	4	80	98	2.077390072
16	13.12.9	Endangered	0.640	10	4	4	61	79	0.505325929
17	13.12.6	Of Concern	2.920	10	5	4	80	99	2.890935356
18	13.3.1	Endangered	2.409	10	5	4	73	92	2.216492001
19	13.12.9	Endangered	13.787	10	4	4	61	79	10.89135428
20	13.12.5	Not of Concern	3.937	10	5	4	80	99	3.89745522
21	13.3.1x1	Endangered	2.369	10	5	4	73	92	2.179567698
22	13.12.9	Endangered	0.962	10	4	4	61	79	0.759685531
23	13.3.1	Endangered	1.640	10	2	4	73	89	1.459737577
24	13.12.5	Not of Concern	0.952	10	5	4	80	99	0.942858169
25	13.12.9	Endangered	8.628	10	4	4	61	79	6.816288126
26	13.3.1	Endangered	0.928	0	0	4	73	77	0.714350048
27	13.3.1	Endangered	2.254	10	2	4	73	89	2.006417992
28	13.12.6	Of Concern	0.204	0	2	4	80	86	0.175366714
	13.3.1x1	Endangered	0.549	10	5	4	73	92	0.505304256
29	13.3.1x1	Endangered	1.196	10	4	4	73	91	1.088016544
	13.3.1x1	Endangered	3.065	10	2	4	73	89	2.728046083
30	13.3.1	Endangered	0.507	10	5	4	73	92	0.466652723
31	13.12.5	Not of Concern	2.757	10	4	4	80	98	2.702305273
32	13.12.2	Not of Concern	0.228	10	2	4	80	96	0.219104236
33	13.12.2	Not of Concern	2.122	10	4	4	80	98	2.079343257
34	13.12.6	Of Concern	0.272	10	5	4	80	99	0.269366201
35	13.12.5	Not of Concern	0.005	10	5	4	80	99	0.004709206
	13.3.1	Endangered	3.572	10	5	4	73	92	3.286303848
36	13.3.1	Endangered	3.083	10	5	4	73	92	2.836595914
	13.3.1	Endangered	0.886	10	4	4	73	91	0.805844094
37	13.3.1x1	Endangered	0.718	10	5	4	73	92	0.660939509
	13.3.1x1	Endangered	0.803	10	5	4	73	92	0.739153868
38	13.12.5	Not of Concern	2.451	10	2	4	80	96	2.352757685
39	13.12.5	Not of Concern	0.177	10	5	4	80	99	0.175453349
40	13.12.9	Endangered	7.577	10	5	4	61	80	6.06153133
41	13.3.1x1	Endangered	1.705	10	5	4	73	92	1.568610463
42	13.12.9	Endangered	5.134	10	5	4	61	80	4.107032431
43	13.3.1	Endangered	1.558	10	5	4	73	92	1.432944562
44	13.3.1	Endangered	3.344	10	5	4	73	92	3.076689815
45	13.3.1x1	Endangered	0.711	10	5	4	73	92	0.653669349
46	13.12.6	Of Concern	0.394	10	5	4	80	99	0.389725835
47	13.3.1x1	Endangered	1.262	10	5	4	73	92	1.160983197
48	13.3.1	Endangered	0.637	10	5	4	73	92	0.586219157
49	13.12.6	Of Concern	0.362	10	5	4	80	99	0.358402556
50	13.12.5	Not of Concern	0.010	10	5	4	80	99	0.009594086
							SUM OF CONDITION SCORES		119.0462924
							SUM OF SPECIAL FEATURES SCORES		67.9796659

Assessment Unit	RE	VM Status	Area (ha)	Patch Size Score	Connectivity Score	Context Score	Site based attributes score	Sum of scores	Assessment unit score (sum of scores x area/100)
1	13.12.2	Not of Concern	2.055	10	5	4	78	97	1.993617884
2	13.12.8	Endangered	0.425	10	5	4	56.3	75.3	0.320100339
3	13.3.1	Endangered	0.291	10	4	4	74	92	0.267643453
4	13.3.1	Endangered	0.237	10	2	4	74	90	0.213638234
5	13.12.9	Endangered	0.542	10	5	4	60.3	79.3	0.429912394
6	13.3.1	Endangered	0.210	10	5	4	74	93	0.194996355
7	13.12.2	Not of Concern	0.031	0	2	4	78	84	0.026062655
8	13.12.2	Not of Concern	1.319	10	4	4	78	96	1.266336033
9	13.12.9	Endangered	0.734	10	4	4	60.3	78.3	0.574369831
10	13.12.8	Endangered	0.565	10	2	4	56.3	72.3	0.408346513
11	13.12.9	Endangered	0.426	10	4	4	60.3	78.3	0.333816041
12	13.12.8	Endangered	1.546	10	2	4	56.3	72.3	1.117642074
13	13.12.9	Endangered	0.088	10	4	4	60.3	78.3	0.068704899
14	13.12.8	Endangered	0.535	10	5	4	56.3	75.3	0.403027102
15	13.12.8	Endangered	0.529	10	4	4	56.3	74.3	0.393168318
16	13.12.8	Endangered	0.184	10	2	4	56.3	72.3	0.133117899
17	13.12.8	Endangered	0.106	0	2	4	56.3	62.3	0.066234305
18	13.12.8	Endangered	0.172	10	2	4	56.3	72.3	0.12421356
19	13.12.8	Endangered	1.144	10	2	4	56.3	72.3	0.82695532
20	13.12.8	Endangered	0.267	0	2	4	56.3	62.3	0.166481124
21	13.12.6	Of Concern	0.089	0	4	4	75	83	0.074060819
22	13.12.8	Endangered	0.501	10	2	4	56.3	72.3	0.361946783
23	13.12.8	Endangered	0.064	0	2	4	56.3	62.3	0.040125157
24	13.12.8	Endangered	0.078	10	2	4	56.3	72.3	0.056232838
25	13.12.8	Endangered	0.355	10	2	4	56.3	72.3	0.256842406
26	13.12.8	Endangered	0.228	10	2	4	56.3	72.3	0.164611691
27	13.12.8	Endangered	0.073	0	2	4	56.3	62.3	0.04526202
28	13.12.8	Endangered	0.637	10	2	4	56.3	72.3	0.46075853
29	13.12.8	Endangered	0.051	10	2	4	56.3	72.3	0.036646078
30	13.12.8	Endangered	1.290	10	4	5	56.3	75.3	0.97130084
31	13.12.9	Endangered	0.080	10	2	4	60.3	76.3	0.06098365
32	13.12.9	Endangered	0.001	10	2	4	60.3	76.3	0.000556871
33	13.12.2	Not of Concern	0.004	10	2	4	78	94	0.003709991
34	13.12.2	Not of Concern	0.004	10	2	4	78	94	0.003797606
35	13.12.8	Endangered	0.320	10	4	4	56.3	74.3	0.238011987
36	13.12.8	Endangered	0.017	10	4	4	56.3	74.3	0.012768079
37	13.12.8	Endangered	0.033	10	2	4	56.3	72.3	0.024182954
38	13.12.8	Endangered	0.005	10	2	4	56.3	72.3	0.003466529
39	13.12.8	Endangered	0.218	10	2	4	56.3	72.3	0.15785215
40	13.12.8	Endangered	0.211	10	4	4	56.3	74.3	0.156496954
41	13.12.2	Not of Concern	0.003	10	2	4	78	94	0.002969744
42	13.12.2	Not of Concern	1.217	10	2	4	78	94	1.144414705
43	13.12.2	Not of Concern	0.023	10	2	5	78	95	0.021457042
44	13.12.8	Endangered	0.132	10	4	5	56.3	75.3	0.099523736
45	13.12.2	Not of Concern	0.419	10	2	4	78	94	0.394296025
46	13.12.9	Endangered	0.100	10	2	4	60.3	76.3	0.075940035
47	13.12.9	Endangered	0.057	0	2	4	60.3	66.3	0.037891825
48	13.12.9	Endangered	0.775	10	4	4	60.3	78.3	0.607102541
49	13.12.9	Endangered	0.179	10	2	4	60.3	76.3	0.136256009
50	13.12.9	Endangered	0.064	10	2	4	60.3	76.3	0.048798295
51	13.12.6	Of Concern	0.087	10	4	4	75	93	0.080626673
52	13.12.6	Of Concern	0.017	10	5	5	75	95	0.016355874
53	13.12.9	Endangered	0.208	5	2	2	60.3	69.3	0.143986226
54	13.12.9	Endangered	0.027	10	2	2	60.3	74.3	0.020194519
55	13.12.9	Endangered	0.000	0	2	2	60.3	64.3	4.90713E-06
56	13.12.9	Endangered	0.120	0	2	2	60.3	64.3	0.076947853
57	13.12.9	Endangered	0.017	0	2	2	60.3	64.3	0.010992026
58	13.12.8	Endangered	0.117	2	2	0	56.3	60.3	0.070744472
59	13.12.8	Endangered	0.172	0	2	2	56.3	60.3	0.1039745
60	13.12.8	Endangered	0.000	5	2	2	56.3	65.3	0.000254013
61	13.12.8	Endangered	0.063	0	2	2	56.3	60.3	0.037721782
62	13.12.9	Endangered	0.000	0	2	4	60.3	66.3	9.06364E-05
63	13.12.5	Not of Concern	0.221	10	2	4	77.7	93.7	0.207106825
64	13.12.9	Endangered	0.029	10	2	4	60.3	76.3	0.0221291
65	13.3.1	Endangered	0.084	0	2	4	74	80	0.067015579
66	13.12.9	Endangered	0.068	10	4	4	60.3	78.3	0.053604544
67	13.3.1x1	Endangered	0.167	10	2	4	74	90	0.15048396
68	13.12.9	Endangered	0.214	10	2	4	60.3	76.3	0.163531227
69	13.12.5	Not of Concern	0.449	10	4	4	77.7	95.7	0.430151152
70	13.12.5	Not of Concern	0.458	10	4	4	77.7	95.7	0.437887599
71	13.12.5	Not of Concern	0.024	0	2	2	77.7	81.7	0.019768926
72	13.12.5	Not of Concern	0.018	10	2	2	77.7	91.7	0.016676547
73	13.12.5	Not of Concern	0.356	2	2	2	77.7	83.7	0.297581622
74	13.12.5	Not of Concern	0.070	10	4	2	77.7	93.7	0.065654939
75	13.12.9	Endangered	0.077	10	2	2	60.3	74.3	0.057140244
76	13.12.9	Endangered	0.483	10	4	2	60.3	76.3	0.368472719
77	13.3.1x1	Endangered	0.170	10	5	2	74	91	0.154728443
78	13.3.1x1	Endangered	0.229	10	5	2	74	91	0.208769063
79	13.12.9	Endangered	0.618	10	5	2	60.3	77.3	0.477562277
80	13.12.5	Not of Concern	0.149	10	5	2	77.7	94.7	0.140969318
81	13.12.9	Endangered	0.034	10	2	4	60.3	76.3	0.026009518
82	13.12.5	Not of Concern	0.118	10	2	4	77.7	93.7	0.110281616
83	13.12.5	Not of Concern	0.366	10	5	2	77.7	94.7	0.347034553
84	13.12.6	Of Concern	0.461	10	5	2	75	92	0.424545755
85	13.12.5	Not of Concern	0.136	10	5	2	77.7	94.7	0.128552471
86	13.3.1	Endangered	0.114	10	4	4	74	92	0.105112906
87	13.12.9	Endangered	0.003	10	2	4	60.3	76.3	0.002490848
88	13.12.2	Not of Concern	0.157	0	2	4	78	84	0.131561528
89	13.12.2	Not of Concern	0.048	0	2	4	78	84	0.040127756
90	13.12.2	Not of Concern	0.125	10	2	4	78	94	0.117298322
91	13.12.8	Endangered	0.049	0	2	4	56.3	62.3	0.030816025
92	13.12.8	Endangered	0.069	10	2	4	56.3	72.3	0.049967879
93	13.12.8	Endangered	0.859	10	4	2	56.3	72.3	0.621220844
94	13.3.1	Endangered	0.082	10	4	2	74	90	0.074138863
95	13.3.1	Endangered	0.010	10	2	2	74	88	0.008893465

96	13.12.8	Endangered	1.313	10	2	2	56.3	70.3	0.923213259
97	13.12.8	Endangered	2.039	10	4	2	56.3	72.3	1.473981501
98	13.12.8	Endangered	0.163	10	2	4	56.3	72.3	0.11778944
99	13.12.8	Endangered	0.267	0	2	2	56.3	60.3	0.161290592
100	13.12.8	Endangered	0.488	10	4	4	56.3	74.3	0.362557843
101	13.12.8	Endangered	0.031	10	4	4	56.3	74.3	0.022930792
102	13.12.9	Endangered	0.100	2	2	4	60.3	68.3	0.068431716
103	13.12.8	Endangered	0.000	10	2	2	56.3	70.3	2.8893E-06
104	13.12.8	Endangered	0.013	0	2	2	56.3	60.3	0.007915384
105	13.12.6	Of Concern	0.002	10	2	2	75	89	0.001570415
106	13.12.8	Endangered	0.054	2	2	2	56.3	62.3	0.033711758
107	13.12.8	Endangered	1.081	0	5	2	56.3	63.3	0.684117981
108	13.12.8	Endangered	1.053	2	4	2	56.3	64.3	0.677048062
109	13.12.8	Endangered	0.052	2	2	2	56.3	62.3	0.032465594
110	13.12.8	Endangered	0.033	10	2	2	56.3	70.3	0.023058751
111	13.3.1	Endangered	0.281	2	2	4	74	82	0.230667737
112	13.12.8	Endangered	0.039	10	2	4	56.3	72.3	0.027839979
113	13.12.2	Not of Concern	0.014	10	2	4	78	94	0.012820975
114	13.12.8	Endangered	0.307	2	4	4	56.3	66.3	0.203550292
115	13.12.8	Endangered	0.074	10	2	4	56.3	72.3	0.053445163
116	13.12.2	Not of Concern	0.064	10	4	2	78	94	0.05971643
117	13.12.8	Endangered	0.062	10	4	2	56.3	72.3	0.044990546
118	13.12.2	Not of Concern	0.029	10	4	2	78	94	0.027707399
119	13.12.8	Endangered	0.066	10	4	2	56.3	72.3	0.047960594
120	13.12.8	Endangered	0.050	10	2	4	56.3	72.3	0.036240191
121	13.12.8	Endangered	0.094	10	2	4	56.3	72.3	0.067783486
122	13.12.6	Of Concern	0.004	10	2	4	75	91	0.003929678
123	13.12.8	Endangered	0.019	10	2	4	56.3	72.3	0.013833204
124	13.12.8	Endangered	0.138	0	2	4	56.3	62.3	0.085791389
125	13.12.8	Endangered	0.055	0	2	4	56.3	62.3	0.034059927
126	13.12.8	Endangered	0.000	5	2	4	56.3	67.3	6.97078E-05
127	13.12.8	Endangered	0.062	10	2	4	56.3	72.3	0.045176421
128	13.12.8	Endangered	0.054	10	2	2	56.3	70.3	0.037963377
129	13.12.8	Endangered	0.269	0	2	0	56.3	58.3	0.156879344
130	13.12.8	Endangered	0.221	5	2	2	56.3	65.3	0.144257438
131	13.12.8	Endangered	0.406	5	2	2	56.3	65.3	0.26518609
132	13.12.8	Endangered	1.250	5	2	2	56.3	65.3	0.816554005
133	13.12.8	Endangered	0.022	5	5	2	56.3	68.3	0.014753262
134	13.12.5	Not of Concern	0.020	2	2	2	77.7	83.7	0.017063542
135	13.12.5	Not of Concern	0.017	0	2	2	77.7	81.7	0.014199769
136	13.12.5	Not of Concern	0.186	0	2	2	77.7	81.7	0.152025546
137	13.12.5	Not of Concern	0.242	0	2	2	77.7	81.7	0.198046069
138	13.12.2	Not of Concern	0.207	2	2	4	78	86	0.178102333
139	13.12.2	Not of Concern	0.433	10	2	4	78	94	0.406857442
140	13.12.2	Not of Concern	0.023	0	2	4	78	84	0.019143709
141	13.12.2	Not of Concern	0.164	0	2	4	78	84	0.137870145
142	13.12.2	Not of Concern	0.167	10	2	4	78	94	0.156818695
143	13.12.2	Not of Concern	0.073	0	2	2	78	82	0.059784814
144	13.12.8	Endangered	0.169	10	2	0	56.3	68.3	0.115285285
145	13.12.9	Endangered	0.167	0	2	0	60.3	62.3	0.104345011
146	13.12.5	Not of Concern	0.093	0	2	0	77.7	79.7	0.074508463
147	13.12.2	Not of Concern	0.006	0	2	0	78	80	0.005071351
148	13.12.2	Not of Concern	0.060	0	2	0	78	80	0.048203877
149	13.12.8	Endangered	0.320	0	2	0	56.3	58.3	0.186470376
150	13.12.9	Endangered	0.258	5	2	0	60.3	67.3	0.173377069
151	13.12.2	Not of Concern	0.000	5	5	2	78	90	0.000230414
152	13.3.1x1	Endangered	0.202	10	4	4	74	92	0.186050767
153	13.12.9	Endangered	0.452	10	5	4	60.3	79.3	0.358662237
								SUM OF CONDITION SCORES	30.75920766
								SUM OF SPECIAL FEATURES SCORES	13.53356779

Site number: BC1 Connolly Dam	No benchmark for 13.11.8. Used the 13.12.8 benc		BioCondition Plot			
Attribute	**Threshold**	**Weighting (%)**	**Value**		**Sub-score**	**Score**
Large trees		*15*	no. Euc.	35		
Eucalypts	43 cm (DBH)		no. non-Euc.	0		
	43 /hectare					
Non-eucalypts	53 cm (DBH)		% of benchmark	*77.8*	10	**10**
	2 /hectare					
Tree canopy height (m)		*5*				
Canopy	19 m (canopy)		canopy (m)	17.5		
			% of benchmark	*92.1*	5	**5**
Sub-canopy	n/a		subcanopy (m)	n/a		
			% of benchmark	*n/a*		
Recruitment of canopy species (%)	100 %	*5*	% recruitment	100		
			% of benchmark	*100*	5	**5**
Tree canopy cover (%)						
Canopy	50 %	*5*	% canopy cover	51.0		
			% of benchmark	*102.0*	5	**5**
Sub-canopy	n/a		% subcanopy cover	15		
			% of benchmark	*n/a*		
Shrub cover (%)	18 %	*5*	% shrub cover	2		
			% of benchmark	*10.0*	3	**3**
Coarse woody debris (m/ha)	491 m/ha	*5*	m cwd	70		
			% of benchmark	*14.3*	2	**2**
Native plant spp. richness		*20*				
Trees	3 spp.		no. tree spp.	3		
			% of benchmark	*100.0*	5	
Shrubs	4 spp.		no. shrub spp.	6		
			% of benchmark	*150.0*	5	
Grass	12 spp.		no. grass spp.	4		
			% of benchmark	*33.3*	2.5	
Other/forbs	23 spp.		no. other/forb spp.	13		
			% of benchmark	*56.5*	2.5	**15**
Non-native plant cover (%)	0	*10*	% non-native plant cover	1	10	**10**
Native perennial grass cover (%)	15 %	*5*	% native grass cover	62.6		
			% of benchmark	*417.3*	5	**5**
Organic litter cover (%)	83 %	*5*	% organic litter cover	25.6		
			% of benchmark	*30.8*	3	**3**
Landscape context (fragmented)						
Patch size		*10*				
Context		*5*				
Connectivity		*5*				
Total Score		***100***				**63**
BioCondition Class						

Site number:	Benchmark (13.12.9)		BioCondition Plot			
Attribute	**Threshold**	**Weighting (%)**	**Value**		**Sub-score**	**Score**
Large trees		*15*	no. Euc.	6		
Eucalypts	43 cm (DBH)		no. non-Euc.	0		
	45 /hectare					
Non-eucalypts	n/a		% of benchmark	*60.0*	10	**10**
	n/a					
Tree canopy height (m)		*5*				
Canopy	22 m (canopy)		canopy (m)	17.5		
			% of benchmark	*79.5*	5	**5**
Sub-canopy	n/a		canopy (m)	n/a		
			% of benchmark	*n/a*		
Recruitment of canopy species (%)	100 %	*5*	% recruitment	100		
			% of benchmark	*100*	5	**5**
Tree canopy cover (%)						
Canopy	60 %	*5*	% canopy cover	60.5		
			% of benchmark	*100.8*	5	**5**
Sub-canopy	n/a		% subcanopy cover	n/a		
			% of benchmark	*n/a*		
Shrub cover (%)	34 %	*5*	% shrub cover	5		
			% of benchmark	*14.7*	3	**3**
Coarse woody debris (m/ha)	491 m/ha	*5*	m cwd	625		
			% of benchmark	*127.3*	5	**5**
Native plant spp. richness		*20*				
Trees	4 spp.		no. tree spp.	7		
			% of benchmark	*175.0*	5	
Shrubs	8 spp.		no. shrub spp.	7		
			% of benchmark	*87.5*	2.5	
Grass	9 spp.		no. grass spp.	12		
			% of benchmark	*133.3*	5	
Other/forbs	21 spp.		no. other/forb spp.	16		
			% of benchmark	*76.2*	2.5	**15**
Non-native plant cover (%)	0	*10*	% non-native plant cover	1	10	**10**
Native perennial grass cover (%)	15 %	*5*	% native grass cover	30		
			% of benchmark	*200.0*	5	**5**
Organic litter cover (%)	79 %	*5*	% organic litter cover	33		
			% of benchmark	*41.8*	3	**3**
Landscape context (fragmented)						
Patch size		*10*				
Context		*5*				
Connectivity		*5*				
Total Score		***100***				**66**
BioCondition Class						