Offset memorandum

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To Kate Gowland
From Cassandra Thompson

Subject Cobbora Coal Project: Offset information

Dear Kate,

1 Introduction

A meeting was held with representatives from the Department of Planning and Infrastructure (DP&I), Office of Environment and Heritage (OEH) and Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) and EMGA Mitchell McLennan Pty Ltd (EMM) on the 8 August 2013 to discuss the Cobbora Coal Project Biodiversity Offset Package (BOP) (EMM 2013).

SEWPaC has requested additional justification for the calculations used for two threatened flora species, Ingram's Zieria (*Zieria ingramii)* and *Homoranthus darwinioides*. This will allow SEWPaC to determine if the proposed offsets meet the EPBC Act Environmental Offset Policy requirements.

This includes providing as much information as possible to back up the offset calculations (noting that most of this had already been supplied). This will form the basis for further discussions on supplementary measures such as propagation trials and the translocation program and how these measures could be reflected in the offset calculator.

This memorandum provides a summary of the condition, threats and likely response to management actions for the two threatened flora species in the Project study area and offset sites.

2 Ingram's Zieria

2.1 Project study area

Sub-populations of Ingram's Zieria that will be impacted by the Project range from poor to good condition. Some areas appear to be subject to intense grazing pressure from stock and invasive species, but also from native species. In Blue-leaved Ironbark Woodland, Ingram's Zieria sometimes occurred at disturbed track edges close to fallen timber.

Ingram's Zieria has a restricted distribution within the Project study area at the known eastern extent of the species in the region (DEWHA 2007). Less than half of the 15 sub-populations in the locality will be impacted by the Project and this impact will not influence this distribution as sub-populations will remain to the east (Table 2.1).

A number of the sub-populations are a few isolated individuals. Generally, the Project avoids impacting on large sub-populations of the species, which will be more viable in the long-term (Figure 1). Sub-populations 2, 8 and 9 and part of sub-population 10 will not be impacted by the Project but are outside the offset areas (Figure 1).

Table 2.1 Ingram's Zieria to be impacted in the Project study area

Population	Number of Individuals to be impacted	Description of sub-population	Vegetation community
1	48	On a gentle south-west facing slope in an area of open woodland.	Boundary between Red Stringybark Woodland and Cypress Pine Woodland
4	179	A large percentage of bare ground with young plants and a large number of seedlings. The plants occurred in an area of low foilage cover dominated by Sifton Bush with scattered fallen timber and surrounded by open Blue-leaved Ironbark Woodland. The sub-population was on a gentle north-facing slope and was a mixture of older plants and seedlings.	Blue-leaved Ironbark Woodland
5	63	On top of a north-facing slope in red earth with large and smaller rocks. Ingram's Zieria occurred within areas where there was a high percentage of fallen timber and bare ground.	Blue-leaved Ironbark Woodland
6	1	On a ridge top in open ironbark forest. This area was recorded during the baseline surveys but the individual was not able to be located during the 2011 – 2012 surveys despite targeted searches in the area.	Blue-leaved Ironbark Woodland
7	2	On a ridge top in open ironbark forest. This area was recorded during the baseline surveys but the plants were not able to be located during the 2011 – 2012 surveys despite targeted searches in the area.	Blue-leaved Ironbark Woodland
10	179	Sub-population in Red Gum Woodland gradeing into Ironbark Woodland. Made up of very young plants with many seedlings present. Plants occurred in an area of low shrubs and open canopy. Some plants were flowering and setting seed in January and August 2012.	Dwyer's Red Gum Woodland and Regrowth
15	8	On a rocky rise in an open area adjacent to a track. This sub-population contained mainly smaller individuals in open forest and where there was some fallen timber.	Blue-leaved Ironbark Woodland
Total	**480**		

2.2 Offset areas

Eight sub-populations of Ingram's Zieria were identified in the offset areas (Figure 1). A total of 1,435 plants have been recorded in these areas (Table 2.2). Other populations may occur in the offset areas which have not been surveyed in detail.

Table 2.2 Ingram's Zieria populations in the offset areas

Sub-population number	Number of Individuals	Offset area	Description of sub-population	Vegetation community
3	340	Zieria patch	Located on a small grassy hill surrounded by native and exotic pasture. Small rock outcrops occur throughout with the plants generally below these areas on flatter ground. The sub-population ranges from north-facing slopes to south-east-facing slopes and flat ground. Open woodland with a high percentage of bare ground. Individuals had set seed in November 2011 in this area.	Blue-leaved Ironbark Woodland and Dwyer's Red Gum Woodland
11	28	Eastern link area	On an eastern-facing slope in open woodland.	Blue-leaved Ironbark Woodland, Dwyer's Red Gum Woodland and Cypress Pine Woodland
12	70	Eastern link area	On a flat to north-facing gentle slope. Adjacent to a population of *Homoranthus darwinioides*. The sub-population occurs in a rocky area where there is a low foliage cover and a high proportion of open ground. The sub-population contained seedlings and some older plants.	Blue-leaved Ironbark Woodland and Cypress Pine Woodland
13	25	Eastern link area	Plants were predominantly located on the midslope with fewer plants recorded at the base of gentle slopes.	Blue-leaved Ironbark Woodland
14	23	Eastern link area	Plants recorded on the upper parts of south to south-east-facing slopes. The sub-population contained seedlings and some older plants in open woodland with a low sparse shrub layer and scattered grass tussocks.	Blue-leaved Ironbark Woodland
16	216	Cobbora additions	Plants were recorded on a number of rocky knolls.	Dwyer's Red Gum amongst Blue-leaved Ironbark and near patches of Red Stringybark Woodland
17	5	Goonoo addition	Plants were recorded in two areas on a slight slope.	Dwyer's Red Gum amongst Blue-leaved Ironbark and near patches of Red Stringybark Woodland
18	728	Goonoo addition	Plants were recorded on a cleared track and in adjacent bushland on a hillslope.	Dwyer's Red Gum amongst Blue-leaved Ironbark
Total	**1,435**			

The offset sites, particularly in the north, contain large areas of suitable habitat for Ingram's Zieria. This includes large areas of Blue-leaved Ironbark Woodland adjacent to Dwyer's Red Gum Woodland which is where this species was most commonly observed in the Project study area and offsets.

As with the Project study area, sub-populations of Ingram's Zieria in the offsets are isolated and fragmented as a result of habitat preferences and past agriculture. Sub-populations occur in three distinct areas in the offset areas, one south-east of and extending into the Project study area, one to the north associated with the Cobbora SCA additions and another further to the north associated with the Goonoo SCA additions. The south-eastern area is at the eastern extent of the known distribution of the species and therefore is essential to preserving the species distribution. The other areas in the Project study area are within the known range of the species, however new sub-populations have been identified in previously unsurveyed habitat of the Project study area and offsets.

Some sub-populations occur outside the offsets and outside the mining footprint. These will be monitored and managed in accordance with the Integrated Landscape Management Plan. These sub-populations have not been included in the offset calculations.

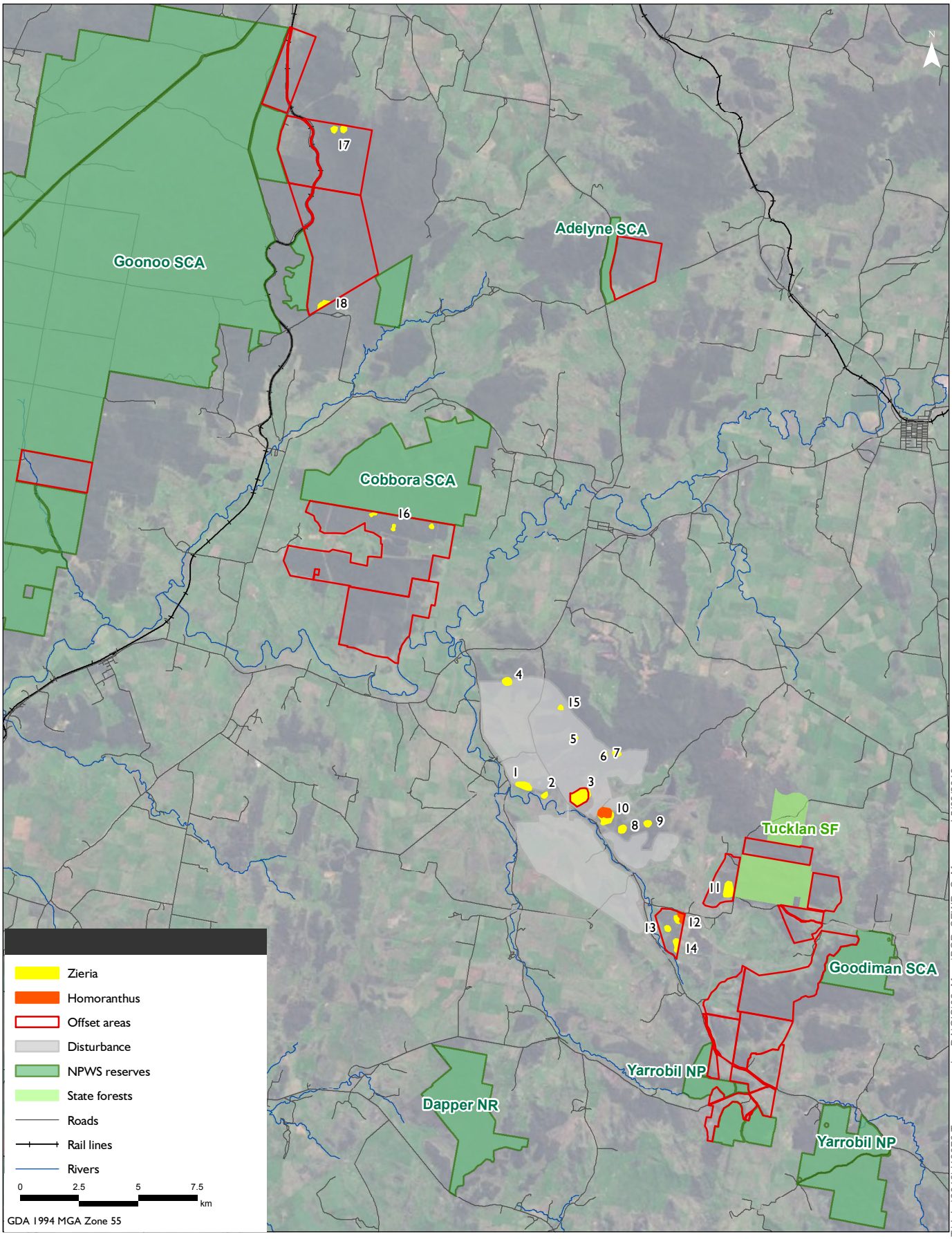
A total of 480 individuals will be impacted by the Project and 1,435 individuals have been identified in the offset areas, an impact:offset ratio of approximately 1:3.

2.3 Condition

Ingram's Zieria is relatively common where suitable habitat occurs in the Project study area. In some parts of the Project study area, Ingram's Zieria occurs as large, multi-stemmed shrubs and appear to be in good condition. The current sub-populations appear to be stable, with new individuals only observed in four sub-populations (eg sub-population 4). In other parts of the Project study area, the sub-populations are being 'shaded out' by other shrub species which have regenerated as a result of good seasons and recent ground disturbance for fence installation or by grazing. Such areas are in lower condition.

As with the Project study area, some of the offset sub-populations in the offsets are in good condition and others are lower in condition. A number of the larger populations in the offsets contain significant regeneration, with a number of new individuals less than 10 cm tall (see Photograph 1). Where large sub-populations of plants occurred and regeneration was evident, the sub-populations were considered to be in good condition. Other sub-populations appeared to be affected by grazing, with a number of individuals having few remaining leaves. The populations in the northern offset sites did not appear to have been affected by grazing as much as those in the Project study area and southern offset areas. Overall, the condition of Ingram's Zieria in the s similar to the Project study area.

Photograph 1 Area with new growth of Zieria ingramii following clearing works for the installation of a fence in the northern offsets sites (Goonoo SCA additions)



Location of *Zieria ingramii* and *Homoranthus darwinioides* in the Project area and offset sites

EMM
EMGA Mitchell McLennan

Figure 1

2.4 Likely improvements through offsets

Germination mechanisms of Ingram's Zieria are not known. DEC (2007) suggests that fire could play a role in germination. However, the authors of this study note that a high density of seedlings was recorded within parts of the study area that had not recently experienced fire. From observations of the species in the field, there is no evidence that fire is needed for germination (pers obs) and high frequency fire is listed as a threat to this species (DEC 2007).

Species in the Rutaceae family, of which Ingram's Zieria is a member, in the Sydney region were observed to have limited seed dispersal ability, having a short range initial ballistic dispersal of seeds from fruits followed by secondary seed dispersal primarily by ants. Seeds are generally dispersed less than a few metres. There was also a high level of seed dormancy at release (Auld 2001). Seeds were observed on many plants within the local population when the Project study area was surveyed in January 2012 and collected in December 2012.

Additional populations may occur in the offset areas and additional plants are likely to establish as a result of the proposed management and propagation trials. Soil disturbance has been shown to be a trigger to recruitment in a number of the offset areas (see Phorograph 1). Management would encompass trials to determine if this is the most suitable method for stimulating natural regeneration.

Propagation of Ingram's Zieria cuttings was attempted by the Australian National Botanic Gardens in Canberra on numerous occasions with up to 81% strike rate, however difficulties were encountered in growing plants on after propagation (DEWHA 2007). Ingram's Zieria individuals have been successfully propagated from seed as part of the propagation trials for the Project by Bilby Blooms near Coonabarabran NSW. The propagation trials are planned to include the use of cuttings for this species.

Seeds were divided into 4 parts, soaked, scarified, and a gibberellic acid solution was used on some seeds. Smoke water has also been used in the propagation trials. Bilby have had slow sporadic germination with about 5 or 6 individuals so far. However, it has been a very mild and damp autumn and winter. Propagation from cuttings is planned for future trials, and is considered likely to be much more effective for this species.

No information is available on the success of translocation of this species. However, the threatened *Zieria obcordata* has been successfully translocated from Canberra to Wellington and it is likely that Ingram's Zieria will respond to translocation from the Project study area to suitable areas of the offset sites.

Plants in the offset sites are currently at risk without any management of key threatening processes and threats known to impact the species. Grazing impacts appear to be a threat to this species, with evidence of grazing and impacts to Ingram's Zieria identified at locations throughout the Project study area and offset sites. Plants were often observed within and surrounded by fallen timber, which appeared to be affording them some protection from grazing (see Photograph 2). In several areas, plants were often also observed with signs of heavy grazing and plants in poor health as a result.

Photograph 2 Areas of Zieria ingramii being afforded protection by fallen timber

It is not clear if this species is being grazed by native herbivores, feral species or stock, as all were present in most areas where grazing was identified as an issue. However, grazing impacts appeared to be most significant in areas adjacent to agricultural areas where stock had been or were present and where feral animals were often observed.

Grazing and habitat degradation by the European Rabbit, feral pigs and feral goats are key threatening processes currently operating in the offset areas and potentially impacting on Ingram's Zieria. A large mob of feral goats was recorded on numerous occasions during the ecological surveys to the south-east of the Project study area, in proximity to the Eastern Link Area and Southern NPWS additions. Feral pigs were also frequently encountered in the offset areas, with large areas impacted by pigs, particularly in the southern offset areas.

In the Project and offset areas, Ingram's Zieria individuals identified in the baseline studies and subsequent ecological surveys, have not been able to be identified again in recent surveys. It is likely that these have been lost as a result of these threats. This includes the loss of sub-populations 6 and 7 and individuals from sub-populations 3, 12, 14 and 11 (Figure 1).

It is considered that without active management of the offset sites – including controlled grazing by stock, and controlling feral animals and weeds, only 50% of the current offset population will remain within 10 years. Criteria have been developed to determine the confidence values in the future value of the offset sites for both the predicted loss of the current population and the predicted gain in population numbers (see Figure 2). A 40% confidence has been placed on the loss of 50% of the current population in the offsets. This result has been identified as known threats are currently operating at the offset sites and appear to be affecting population numbers, such impacts would continue to operate without offset management, but using a conservative approach, the predicted loss of 50% of the population may not occur.

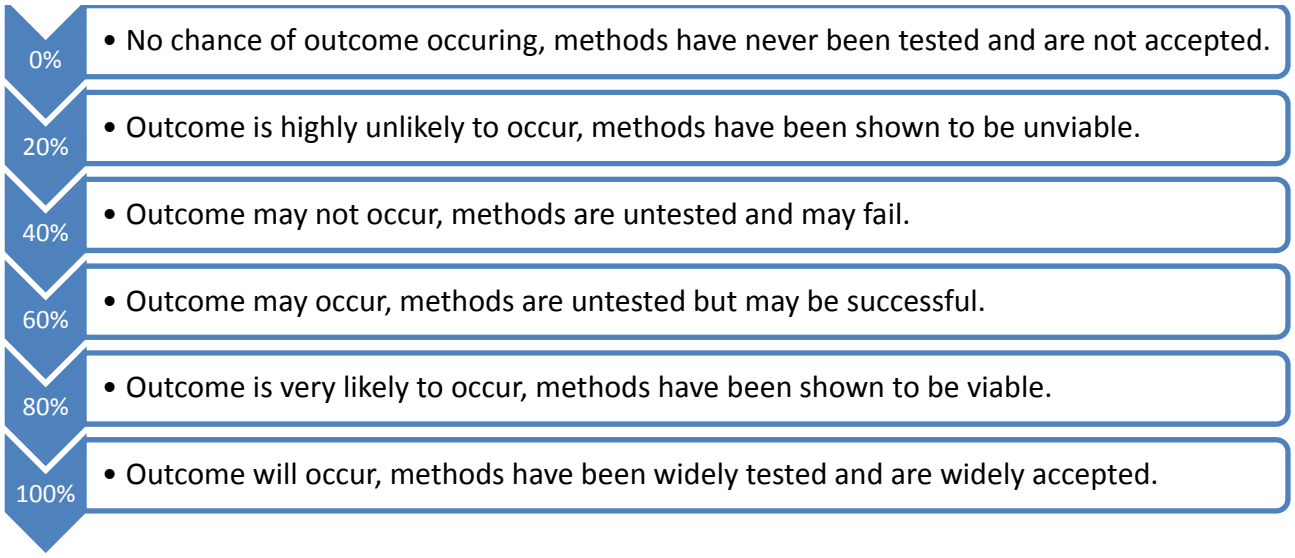


Figure 2 Criteria used for the confidence in result (%) for the future value with and without offset

Management will include repairing and/or installing fencing, excluding grazing in identified sensitive areas, and weed and pest control that will continue while CHC owns these properties. A detailed Biodiversity Offset Management Plan describing how each of the offset properties will be managed will be prepared. The plan will describe the management of offset properties to ensure that their biodiversity value is maintained prior to the Project physically commencing. This plan will be implemented after receiving Project Approvals.

The offset calculations assume that the number of Ingram's Zieria can increase by 50% in the offset sites (to a total of 2,135 from 1,435 individuals) within 10 years of management. This will be accomplished with active and adaptive management including feral animal control (preventing grazing), weed control, habitat protection and improvement resulting in increased recruitment at the offset sites (assumes approximately 200 new individuals), and replanting of propagated individuals (from seeds and cuttings and assumes approximately 320 new individuals) and introduction of translocated individuals (up to 400 individuals to be translocated, assuming 180 survive). Some of these actions are already underway, including feral animal control and weed control in the Project study area and its surrounds, and seed collection and propagation trials.

A 40% confidence in the outcome has again been used for the assumption that there will be a 50% increase in the number of Ingram's Zieria in the offset sites within 10 years (see Figure 2). This confidence level is appropriate as, while seed and cutting propagation has been completed on a number of occasions for this species, the outcome of reinstatement of individuals and translocation is untested and may fail. No evidence is available to determine the efficacy of the proposed management actions to result in the predicted increase in population numbers (the outcome may not occur).

3 *Homoranthus darwinioides*

3.1 Project study area

One of the identified sub-populations of *Homoranthus darwinioides* will be impacted by the Project (Figure 1). Approximately 55% of the sub-population (127 individuals) and 30% of the overall local population will be impacted. The impacted sub-population is in an area of Dwyer's Red Gum Woodland, Blue-leaved Ironbark Woodland and surrounding regrowth. *H. darwinioides* is most abundant where the canopy is sparse, but also in areas where significant shrub regrowth has occurred since grazing has been discontinued. In the regrowth areas, it occurs as large solitary plants on open ground amongst dense patches of Sifton Bush. The sub-population to be impacted occurs on a light brown sandy loam with loose sandstone rocks at the surface.

Two distinct meta-populations of *H. darwinioides* occur in the region, with one to the north-west of the Project study area in and surrounding Goonoo SCA and another to the east associated with the Goulburn River National Park. The Project study area is between these and forms a new meta-population area.

3.2 Offsets

A sub-population of approximately 200 individuals occurs in the offsets (Figure 1). This sub-population is located in Blue-leaved Ironbark Woodland. The dominant shrub species was Common Fringe-myrtle. Other species recorded included Silver-leaved Ironbark (*E. melanophloia*), Black Cypress Pine, *Allocasuarina gymanthera,* Spurwing Wattle *(Acacia triptera), Philotheca ciliata,* Wattle Mat-rush *(Lomandra filiformis* subsp. *filiformis)* and *Platysace linearifolia*.

In addition to this sub-population, but excluded from the offset calculations, an additional sub-population of 100 individuals (adjacent to the impacted sub-population) will be managed on CHC property outside the Project study area (Figure 1). Further, the offsets adjacent to Goonoo SCA contain potential habitat for this species, however it has not yet been identified in these areas.

3.3 Condition

The populations in both the Project study area and offsets are considered to be in good condition with mature individuals present in both areas. However, minimal recruitment was observed in either area during the surveys and minimal evidence of grazing was observed. The populations are therefore considered stable, but potentially at risk of a stochastic event (including fire), particularly given the highly restricted nature of its known distribution in the Project and offset areas.

Homoranthus spp have been identified as being susceptible to the key threatening process description for competition and habitat degradation by feral goats (OEH 2013). While little evidence of grazing was identified in the locality, the displacement of feral animals from the Project into the surrounding areas, particularly the offset areas to the south-east which contain the offset population of *H. darwinioides*, may pose a substantial risk to this population should pest species not be controlled through the integrated land management plan. Without the protection of the offset, this area may also be subject to grazing and trampling by stock which has also been identified as a threat to this species (TSSC 2008).

Photograph 3 Large Homoranthus darwinioides plant

3.4 Likely improvements through offsets

Limited recruitment of *H. darwinioides* was observed in the impact or offset areas, however management trials with soil disturbance will be undertaken in the offset areas to determine if this will increase regeneration. Little is known about this species reproduction, however seed was collected from the impact population in 2013 and germination and propagation trials are underway.

Additional plants may establish as a result of the proposed management of the offset areas, propagation trials and proposed translocation program. The offset calculations assume that an additional 200 individuals made up of approximately 100 individuals from translocation and 100 from the propagation of cuttings will be established. The proposed propagation trials will add to the available data for this species and aid in its long-term recovery in the region which will assist in the shortfall in the calculations.

Propagation trials from seeds are currently underway for this species and trails with cuttings are also planned. *H. darwinioides* is able to be propagated from seeds, but is grown fairly easily from cuttings of new growth (Australian Native Plant Society 2009). The species has been cultivated in Sydney from Rylstone cuttings and at Burrendong Arboretum near Wellington (OEH 2012) but the results from the project trials to date have been poor. Further germination trials will be undertaken with the collected seed in the coming months. Propagation from cuttings is planned after Project approval and is considered likely to be much more effective for this species. No information is available on the success of translocation of this species.

The proposed management measures in the offset areas will reduce the risk of current threats to the local population of *H. darwinioides*. The population outside the offsets on CHC-owned land, will also be managed under the Integrated Land Management Plan, to reduce such threats. This will assist in the long-term survival of the local population.

It is considered that without active management of the offset sites, including allowing grazing by stock, and not controlling feral animals and weeds resulting in degradation of habitat, only 50% of the current offset population will remain within 10 years. A 40% confidence has been placed on the loss of 50% of the current population in the offsets (see Figure 2). This result has been identified as known threats (feral animals and stock grazing) are currently operating at the offset sites and would continue to operate without offset management, but using a conservative approach, the predicted loss of 50% of the population may not occur. While this species does not appear to be currently impacted by the identified threats in the offset areas, the isolated nature of the sub-population (particularly when considering the loss of a proportion of the other sub-population), increases its susceptibility to stochastic events such as fire. This risk is considered to be a significant threat which has the ability to remove the entire sub-population.

Management will include repairing and/or installing fencing, excluding grazing in identified sensitive areas, and weed and pest control that will continue while CHC owns these properties. A detailed Biodiversity Offset Management Plan describing how each of the offset properties will be managed. The plan will describe the management of offset properties to ensure that their biodiversity value is maintained prior to the Project physically commencing. It will be important that bushfire planning is included in this plan, with suitable protection of the sub-population from bushfire threat. This plan will be implemented after receiving Project Approvals.

The offset calculations assume that the number of *H.darwinioides* will increase by 100% in the offset sites (with a total of 400 from 200 individuals) within 10 years of management. This will be accomplished with active and adaptive management including feral animal control, weed control, habitat protection and improvement resulting in increased recruitment at the offset sites (assumes approximately 20 new individuals), and replanting of propagated individuals (from seeds and cuttings and assumes approximately 80 new individuals) and introduction of translocated individuals (approximately 120 individuals to be translocated, assuming 100 survive). Some of these actions are already underway, including feral animal control and weed control in the Project study area and its surrounds, and seed collection and propagation trials.

A 40% confidence in the outcome has again been used for the assumption that there will be a 50% increase in the number of *H.darwinioides* in the offset sites within 10 years. This result has been identified as while seed and cutting propagation has been completed on a number of occasions for this species, the outcome of reinstatement of individuals and translocation is untested and may fail, and no evidence is available to determine the efficacy of the proposed management actions to result in the predicted increase in population numbers (the outcome may not occur).

4 Conclusion

The calculations used in the assessment of the suitability of the proposed offsets for threatened flora under the EPBC Act Environmental Offset Policy are considered to be conservative and that the values used in the offset calculations presented in the offset package report are justified by the information provided in this memorandum.

5 References

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