Biodiversity Offset Management Plan

BROKEN HILL SOLAR PLANT

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ACRONYMS AND ABBREVIATIONS

BBAM	BioBanking Assessment Methodology
COA	Condition of approval
DECC	Refer to OEH
DP&I	(NSW) Department of Planning and Infrastructure
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
ha	hectares
HBT	Hollow bearing tree
km	kilometres
m	metres
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water (DECC or DECCW)
PV	Photovoltaic
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

1 INTRODUCTION

1.1 BACKGROUND

AGL Energy Limited (AGL) is proposing to construct a solar photovoltaic (PV) plant with a nominal capacity of 50 MW at Broken Hill in western NSW as part of the Commonwealth Solar Flagships Program. The proposed solar plant is to be located on a property to the west of the Broken Hill township. The development site is approximately 200 hectares (ha) in area with additional areas of land required as linear easements for the connection of the project's electrical infrastructure to the electrical grid and for road access from the Barrier Highway. The location of the development site and alignment of the proposed access and transmission easements are shown on (Figure 1-1).

The project was approved by the Department of Planning and Infrastructure (DP&I) on the 27 March 2013. It is a condition of approval (COA) that an Offset Management Package be developed to offset the ecological values lost as a result of the project (COA C5 detailed in Appendix A). AGL have engaged with the existing lessee of the solar plant site to include a suitable area of land for offsetting within the scope of the project. The proposed parcel of land (the offset site) consists of the western portion of Lot 6806 DP 823918. It is located approximately 1.5 km west of the development site and covers approximately 159 ha (refer Appendix B and Figure 1-1).

1.2 PURPOSE AND SCOPE OF THIS REPORT

This report documents how the proponent will meet its obligations under COA C5. Specifically this report provides:

- An overview of the development site and the values that require offsetting.
- Details of the methodologies employed in assessing the values of the offset site.
- A description of the offset site and the biodiversity values it contains.
- Details of the method for securing the offset site and recommendations for its future management and monitoring.
- A discussion of the suitability of the proposed offset.

AGL has consulted with the NSW Office of Environment and Heritage (OEH) throughout the preparation of this report.

1.3 OBJECTIVES AND OUTCOMES

The overarching objectives of this plan and the biodiversity outcomes to be achieved are to:

- Provide a 'like for like' offset with regard to vegetation types and threatened species habitats impacted by the development.
- Ensure offsets are consistent with the *Principles for the use of Biodiversity Offsets in NSW.*
- Achieve a net improvement in the biodiversity values within the offset site and maintain this for the long-term.

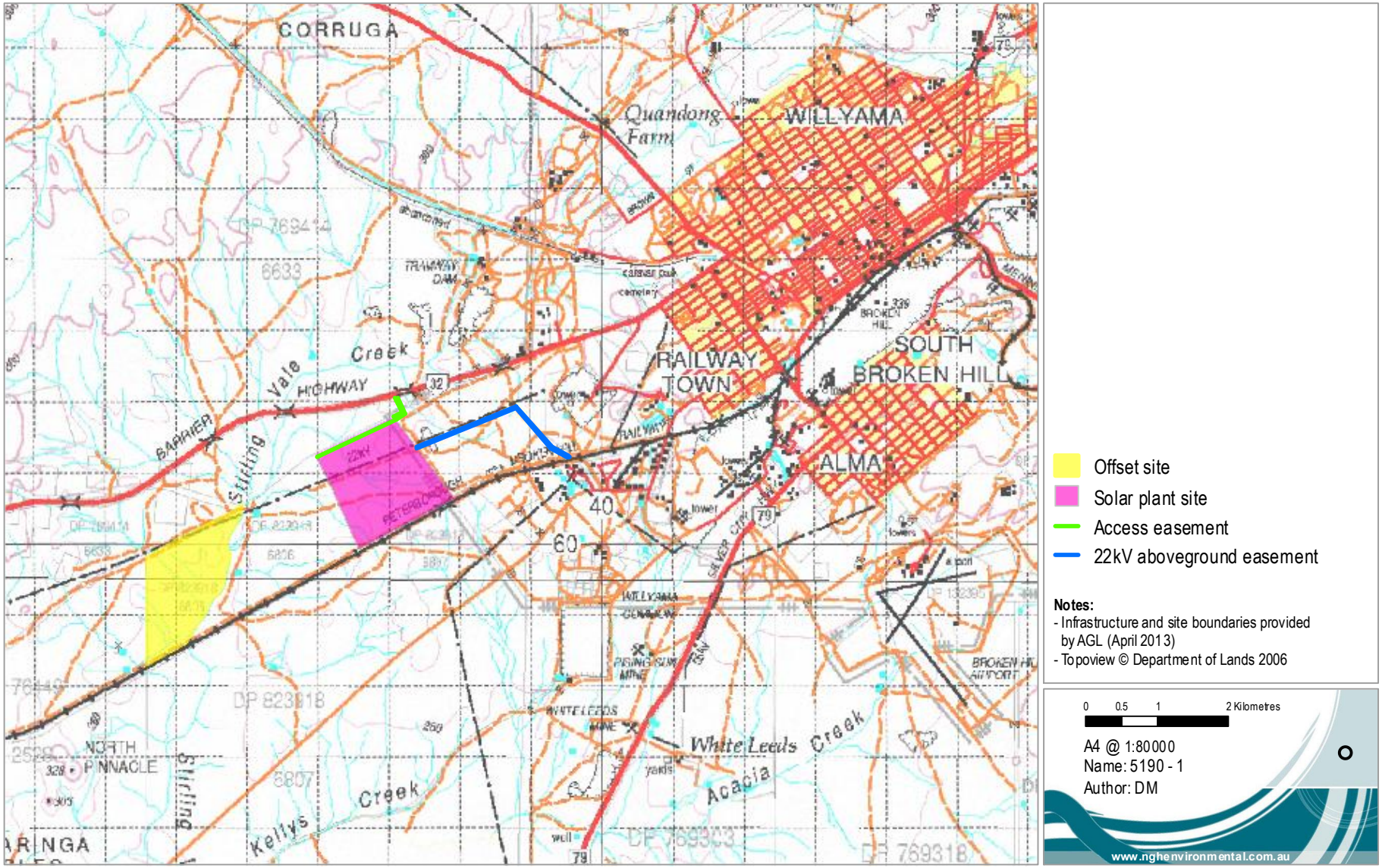

Figure 1-1 Location of the proposed development and offset sites

2 DEVELOPMENT SITE: OVERVIEW

2.1 VEGETATION TYPES

A Flora and Fauna Assessment for the proposed development site was prepared by Sinclair Knight Merz (SKM) in September 2012. Vegetation communities were classified as described in *New South Wales Vegetation Classification and Assessment: Part 1 Plant communities of the NSW Western Plains* by Benson (2006)[1]. Four main vegetation types were recorded on the site comprising:

- Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones.
- Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone.
- Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland of semi-arid and arid sandplains and dunes.
- Mulga - Dead Finish on stony hills mainly of the Channel Country and Broken Hill Complex Bioregions.

The majority of the native vegetation within the development site was considered to be in a near natural state and of high condition. Two additional disturbed areas were also mapped:

- Disturbed Chenopod low open shrubland.
- Cleared residential.

No endangered ecological communities (EECs) or threatened flora species listed under State or Commonwealth legislation were recorded or considered likely to occur on the site. However, Black Bluebush low open shrubland and Mulga – Dead Finish Woodland are considered to be near threatened (Benson 2006).

2.2 FAUNA HABITATS

The report by SKM describes the dominant fauna habitat on the site as low open chenopod shrubland. The density and height of shrubs varies across the site. Tussock grasses were found to be common. Mulga is very sparse and restricted to several small patches and dead standing trees. Due to the lack of tree cover and sparseness of the shrub cover there is very limited shelter or cover for birds, small mammals and reptiles. Logs and cracking clay are virtually absent from the site and while rocks are scattered across the site, these are typically small or embedded in the soil and provide very limited cover for reptiles. There is a central drainage line which exhibits a high cover of bare ground as a result of water erosion, but also contains areas of tall shrubland and mulga and provides cover and nesting opportunities for small birds. A single farm dam is located on the drainage line at the northern boundary and comprises shallow water with grassed edges. This habitat is suited to some water dependent birds.

No threatened fauna species were recorded on the site, however, the site does provide habitat for several threatened fauna species.

[1] This classification has been used to describe vegetation communities throughout this report.

2.3 IMPACTS OF THE DEVELOPMENT

A total of approximately 149.3 ha of vegetation may be required to be cleared for the development (SKM 2012). This includes the assumption that the entire 30 metre wide easement for the power line would be cleared (a total of 8.5 ha). In reality, however, clearing will likely only be required for the power pole footings.

The majority of the cleared vegetation would be comprised of naturally occurring Black Bluebush low open shrubland with smaller areas of the other vegetation types present. The area of each vegetation type to be directly impacted (worst case scenario) is presented in Table 2-1 (adapted from SKM 2012). The proposal was considered unlikely to have a significant impact on any threatened species or communities (SKM 2012).

Table 2-1 Maximum area of each vegetation type to be impacted by the development

Vegetation type	Impacted area (ha)
Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	124.6
Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	13.9
Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland of semi-arid and arid sandplains and dunes	6.3
Mulga - Dead Finish on stony hills mainly of the Channel Country and Broken Hill Complex Bioregions	4
Disturbed Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	0.5
Total	**149.3**

In order to offset the impacts identified above, the proponent has proposed an offset area approximately 1.5 kilometres west of the development site as described in Section 3. The selection of the offset area was conducted in consultation with OEH.

3 OFFSET SITE METHODOLOGY

3.1 DESKTOP ASSESSMENT

Prior to field work, the following database searches were carried out to obtain lists of threatened and migratory flora and fauna species that have the potential to occur at the offset site:

- The OEH threatened species database was searched in relation to the Barrier Ranges sub-region of the Western Catchment Management Authority (May 2013). This search identified species listed as threatened under the NSW *Threatened Species Conservation Act 1995* (TSC Act).
- The DSEWPC protected matters search tool was used to search an area approximately 10 kilometres in radius from the study area (May 2013). This search identified species listed as threatened or migratory under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act)

Habitats for threatened species with the potential to occur at the site were targeted during the field survey to further refine the likelihood of their occurrence.

3.2 FIELD SURVEY

A field survey was undertaken by an ecologist on the 6 – 7 May 2013. A total of 10 person hours was spent on the field survey.

3.2.1 Mapping of vegetation types

The majority of the site was traversed either on foot or by vehicle. Dominant species were recorded sufficient to identify the vegetation types present across the site. Boundaries of vegetation communities were recorded using a Garmin GPSmap 62s hand held GPS to an accuracy of ±3 metres. Vegetation mapping was completed using ArcGIS v10.0. Waypoints recorded in the field were overlayed onto georectified aerial imagery to determine the spatial location of vegetation type boundaries. Where different vegetation types were evident on the aerial imagery, the boundaries between types were further extrapolated from the field data.

3.2.2 Vegetation condition assessment and establishment of monitoring plots

Within the majority of vegetation types at the site, BioBanking plots were conducted according to the BioBanking Assessment Methodology (BBAM, DECC 2009) to collect baseline data on vegetation structure and quality. The location of the plots is shown on Figure 4-1. In the field plots were marked using wooden stakes driven into the ground to facilitate the replication of the plots. The ends of the stakes were painted fluorescent pink to enable easy identification in the field (Figure 3-1). Stakes were placed at the start and end of the 50 metre transect required by the BBAM and their co-ordinates recorded (Table 3-1). To delineate the start point of transects, a silver nail was hammered into the top of the appropriate stake. The 20 x 20 metre quadrat required by the BBAM was conducted within an area bounded by the first 20 metres of the transect and extending 10 metres either side as shown on Figure 3-2.

Photo points were established at each of the start points of the transects, taken looking along the length of the transect.

Table 3-1 Co-ordinates for each of the monitoring plots

	Transect start		Transect end	
Plot name	Easting*	Northing*	Easting*	Northing*
M01	533641.52	6458408.77	533693.98	6458429.85
M02	533599.64	6458791.57	533663.43	6458774.15
M03	533978.53	6459970.07	533992.65	6459922.92
M04	534146.70	6460116.23	534183.12	6460141.86

* Co-ordinates are in MGA zone 54 relative to the GDA94 datum

Figure 3-1 Stakes used to identify the monitoring plots in the field

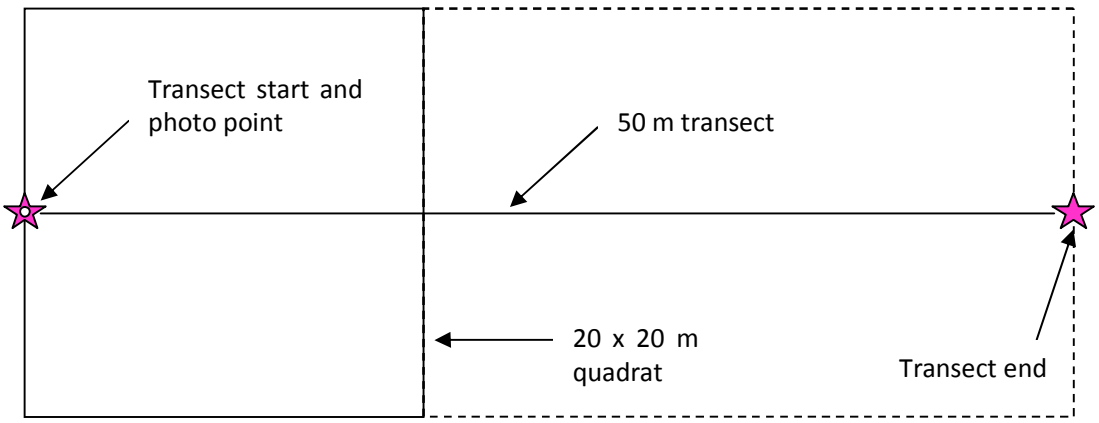

Figure 3-2 Monitoring plot layout

3.2.3 Habitat evaluation

General notes on fauna habitats present were taken across the broader site during the site traverses for the vegetation mapping. At each of the monitoring plot locations, detailed notes were taken with regard to the habitats present. Data recorded was consistent with that recorded at the development site (SKM 2012) and included the percentage cover of the following habitats within the entire 50 x 20 metre plot:

- Tussock grasses
- Chenopod shrubs
- Mulga (or other overstorey species)
- Bare ground
- Cracking clay
- Rocks and logs

Particular attention was paid to areas that may provide habitat for threatened fauna species listed under the *Threatened Species Conservation Act 1995* (NSW) (TSC Act) or the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act).

3.3 LIMITATIONS

3.3.1 Survey timing

The late autumn timing of the survey was considered suitable for identifying the vegetation types and fauna habitats present at the site. However, it was not ideal for accurately determining the quality of the site with regard to species diversity. Many spring and summer flowering species, and species difficult to identify in their vegetative state, may have been overlooked. Prolonged dry weather preceding the survey also meant that many plant individuals had died making them difficult to identify and it is likely that there are species present in the seed bank that were not evident during the survey.

3.3.2 GIS mapping

High resolution georeferenced aerial imagery was not available for mapping. Aerial imagery used for mapping was sourced from Google Earth and then georectified by comparison with georeferenced topographic layers (Topoview 2006) mostly on the basis of the locations of drainage lines, roads and railways. As such, it is possible that there are small discrepancies in the spatial accuracy of the vegetation layer, however this is only relevant if the layer were to be utilised in other GIS environments where georeferenced aerial imagery is available. All mapping as displayed in this document is accurate.

4 OFFSET SITE VALUES

4.1 VEGETATION TYPES

Five vegetation types were identified within the offset site (listed in Table 4-1 and shown on Figure 4-1). In addition, a small area of Sandhill Wattle (*Acacia burkittii*) occurs in the north-west of the site; however, it is typical of this species to form discrete patches within other vegetation types.

The characteristics and condition of each vegetation type along with the results of the monitoring plots where relevant are discussed individually for each community below. The monitoring plot data is presented along with the benchmarks for each vegetation type for comparative purposes. All vegetation within the offset site would be considered to be in moderate to good condition according to the Biometric definitions (DECC 2009).

A composite species list of species recorded during the survey is provided as Appendix C. Vegetation condition classes are as for those described by SKM in their assessment of the development site (SKM 2012).

Table 4-1 Vegetation types within the offset site and their conservation status

Vegetation type	Area on site (ha)	Current extant (ha)	Pre-European extant (ha)	Reservation status	Cleared (OEH 2012)	Threat category
Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	141.8	1,200,000	2,200,000	Inadequate	15%	Near threatened
Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	8.5	4,000	5,000	Inadequate	5%	Least concern
Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland of semi-arid and arid sandplains and dunes	1.9	250,000	100,000	Adequate	0%	Least concern
Mulga - Dead Finish on stony hills mainly of the Channel Country and Broken Hill Complex Bioregions	1.5	500,000	600,000	Inadequate	5%	Near threatened
Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	3.2	40,000	500,000	Inadequate	90%	Critically Endangered *
Total	**157**					

* This category is according to Benson (2006). This community is not listed under State or Commonwealth legislation.

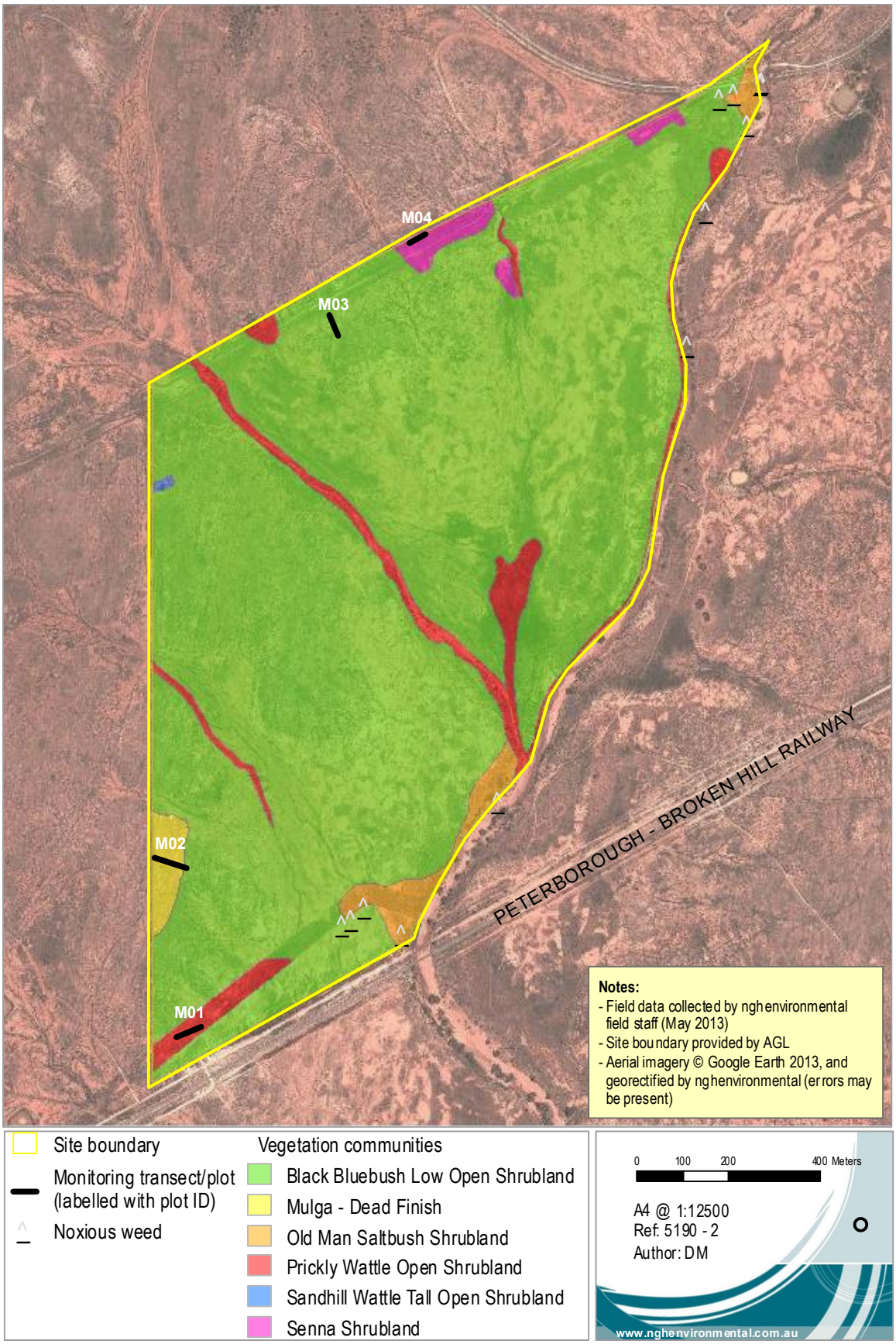

Figure 4-1 Vegetation types, monitoring plots and noxious weeds at the offset site

4.1.1 Black Bluebush low open shrubland

This community is the dominant vegetation type within the offset site. It is dominated by Black Bluebush (*Maireana pyramidata*) with other chenopod shrubs as sub-dominants including Pearl Bluebush (*M. sedifolia*), Low Bluebush (*M. astrotricha*), Saltbushes (*Atriplex* spp.) and Copperburrs (*Sclerolaena* spp.). At the time of the survey forb species were very sparse although it is likely that there would be a range of species evident in more favourable conditions. The ground cover is predominately grassy and ranges from sparse to continuous.

Weed species were generally absent from this community excluding where it bordered existing tracks. It is mostly in a near natural state and is considered to be in high condition.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 4-2. Species richness (which is the number of native species, shown in the table below as 'Native Spp. #') is slightly below the benchmark for this variable, however this is considered likely to be due to unfavourable survey timing. This is also likely to be the reason for the lack of forb cover recorded. No overstorey cover was recorded as the tallest shrubs were all below one metre. Grass and shrub cover within the ground layer exceeds the benchmarks.

Table 4-2 Benchmark and monitoring plot data comparison for Black Bluebush low open shrubland at the site

Benchmark variables: Native Spp. #: number of native species (species richness); HBT: number of hollow bearing trees; Logs: linear length of fallen logs.

	Native	Native cover				Native ground cover						HBTs	Logs
	Spp. #	Overstorey		Midstorey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	13	4%	20%	0%	0%	5%	20%	2%	15%	5%	20%	0	0
Plot M03	10	0%		0%		52%		24%		0%		0	0

Figure 4-2 Black Bluebush low open shrubland at monitoring plot M03

4.1.2 Mulga – Dead Finish on stony hills

This community is restricted to a small area on a rise in the west of the site where the soils are characteristically shallow and stony. Mulga is absent within the offset site however it occurs on the property to the west. Within the offset site, the dominant shrubs include Dead Finish (*Acacia tetragonophylla*) and *Senna phyllodinea*. There are also scattered Black Bluebush and occasional Prickly Wattle (*Acacia victoriae*). The ground cover is predominately grassy.

Weed species were generally absent from this community, however it appears to have been disturbed in the past and has lost some of its natural structure. It is considered to be in moderate condition.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 4-3. Species richness is slightly below the benchmark for this variable however, this is considered likely to be due to unfavourable survey timing. No overstorey cover was recorded as Mulga is generally the overstorey species for this community and was absent from this transect. However, overstorey cover is within the benchmark for this vegetation type. Midstorey and shrub cover within the groundlayer exceeds the benchmarks, with grass cover far exceeding it. No fallen timber was recorded within the plot which is due to the absence of overstorey cover.

Table 4-3 Benchmark and monitoring plot data comparison for Mulga-Dead Finish on stony hills at the site

	Native	Native cover				Native ground cover						HBTs	Logs
	Spp. #	Overstorey		Midstorey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	17	0%	3%	1%	3%	1%	5%	1%	5%	1%	5%	0	3
Plot M02	15	0%		8%		52%		14%		2%		0	0

Figure 4-3 Mulga – Dead Finish on stony hills at monitoring plot M02

4.1.3 Prickly Wattle open shrubland

This community typically occurs in drainage lines and depressions across the site. It is characteristically dominated by an overstorey of Prickly Wattle with a midstorey dominated by Black Bluebush and Bladder Saltbush (*Atriplex vesicaria*). The groundcover is generally sparse however low shrubs are common and dense in some areas.

The declared noxious weed Velvet Mesquite (**Prosopis velutina*) is commonly associated with drainage lines and depressions across the site and was recorded as scattered individuals within this community. Other weeds such as Onion Weed (**Asphodelus fistulosus*) and Saffron Thistle (**Carthamus lanatus*) are locally common. Aside from this, this community is considered to be in a near natural state and is considered to be in high condition.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 4-4. The number of native species recorded is almost equal to the species richness benchmark. Overstorey and midstorey cover and ground cover shrubs exceed the benchmarks however, all other values are comparable.

Table 4-4 Benchmark and monitoring plot data comparison for Prickly Wattle open shrubland at the site

	Native	Native cover				Native ground cover						HBTs	Logs
	Spp. #	Overstorey		Midstorey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	11	0%	0.1%	0%	0%	2%	20%	1%	10%	1%	20%	0	0
Plot M01	12	7%		5%		14%		38%		2%		0	1.5

Figure 4-4 Prickly Wattle low open shrubland at monitoring plot M01

4.1.4 Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland

This vegetation type occurs as discrete patches in the north of the site. It is typically dominated by *Senna phyllodinea* and *Senna artemisioides* subsp. *filifolia* with Umbrella Wattle (*Acacia oswaldii*) in localised patches. Other chenopod species from the surrounding Bluebush Shrubland are also common. The ground layer is predominately grassy along with a range of forbs. Past disturbances have resulted in a number of depressions on the soil surface. Native species diversity appeared to be higher in these areas which may be due to the fact that they retain higher moisture content than the surrounding landscape.

Onion Weed was common within this community particularly adjacent to the existing track. Given the apparent levels of past disturbance, the vegetation is considered to be in mostly moderate condition with more undisturbed areas in high condition.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 4-5. The number of species recorded was considerably higher than the species richness benchmark. As discussed above, this may be due to the presence of depressions. Grass and shrub groundcover exceeds the benchmark. Other values are comparable although no fallen timber was recorded.

Table 4-5 Benchmark and monitoring plot data comparison for Senna shrubland at the site

	Native	Native cover				Native ground cover						HBTs	Logs
	Spp. #	Overstorey		Midstorey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	12	1%	14%	1%	8%	5%	25%	2%	15%	2%	25%	0	2
Plot M04	23	3%		0%		48%		24%		2%		0	0

Figure 4-5 Senna shrubland at monitoring plot M04

4.1.5 Old Man Saltbush shrubland

Areas dominated by Old Man Saltbush (*Atriplex nummularia*) occur adjacent to the drainage line that borders the east of the site. Within this community there are also scattered occurrences of Black Bluebush, Prickly Wattle and Western Boobialla (*Myoporum montanum*). Bladder Saltbush is the dominant species within the lower shrub layer and forms the major component of the groundcover, however it is generally sparse with scattered grasses and other chenopod shrubs forming sub-components.

This community is commonly associated with drainage depressions. Over recent times Old Man Saltbush has been planted in restoration projects for fodder or to combat rising saline water tables (Benson 2006). However, it is considered more likely that this community is naturally occurring along the drainage line that defines the eastern border of the site and that it has spread into the man-made drainage depression in the south of the site following this disturbance. Natural occurrences of this community are rare within the landscape and due to its reduction in extent and poor representation within the reserve system, it is considered to be of conservation concern (Benson 2006).

Due to time constraints a monitoring plot was not established within this vegetation type. Onion Weed is common throughout but given that the vegetation appears to have maintained its structural integrity and composition it is considered to be in high condition.

Figure 4-6 Old Man Saltbush shrubland in the south-east of the site

Within the drainage line that borders this community to the east, River Red Gum (*Eucalyptus camaldulensis*) is dominant in places. However, the border of the site is located on the western bank of the water course and aside from the occasional River Red Gum that may occur high on the bank, the River Red Gum community would not be considered to occur within the offset site.

4.2 WEEDS AND DISTURBANCE

Historically, the site has been utilised for grazing although information from the lease holder suggests that grazing pressure has been relatively low over recent years. This is reflected in the relatively good quality of the vegetation at the site compared to other nearby areas under more intensive management. Feral goats are present at the site, however their numbers do not appear to be high.

Other disturbances include those associated with the excavation of a drainage channel in the south of the offset site to divert water from the Peterborough – Broken Hill Railway which is located adjacent to the site. This area has been successfully colonised by native vegetation communities with Prickly wattle shrubland occupying the western portion, Bluebush shrubland within the central area and Old Man Saltbush shrubland in the east. Within the north-eastern corner of the site there is evidence of an old roadway (the old Barrier Highway) in the form of bridge remnants across the creek line and patches of old bitumen.

Weeds are generally sparse across the site and concentrated on the drainage lines and depressions and areas disturbed by the formation of tracks. Within the drainage lines, two weeds occur that are declared as noxious under the *Noxious Weeds Act 1993* within the Broken Hill control area: Velvet Mesquite (**Prosopis velutina*) and African Boxthorn (**Lycium ferocissimum*). Velvet Mesquite is common within the drainage lines in the east of the site (Figure 4-7). African Boxthorn was detected within the man-made drainage depression in the south of the site. Both of these weeds are also listed as Weeds of National Significance. The locations of these weeds are identified on Figure 4-1.

Figure 4-7 The noxious weed, Velvet Mesquite, in the east of the site

Other more common weeds detected on the site include Onion Weed, Saffron Thistle and Bathurst Burr (**Xanthium spinosum*). All of these weeds were confined to the more disturbed areas of the site, particularly along existing access tracks. It is likely that other weed species also occur in these areas that were not detectable due to the timing of the survey.

Pepper Trees (**Schinus areira*) are common within the drainage line that forms the eastern border of the site, however the majority of these would fall outside of the site boundary.

4.3 FAUNA HABITATS

The dominant fauna habitat at the site is a low open chenopod shrubland with a variable grassy groundcover. Overstorey trees are absent across the majority of the site and restricted to the small patch of Sand Hill Wattle in the west and areas of Prickly Wattle Shrubland in the drainage lines. Generally the site provides limited habitat for birds and small mammals, however the Prickly Wattle Old Man Saltbush shrubland within the man-made drainage depression in the south of the site is relatively dense and would provide cover for a number of bird species including the threatened Redthroat (listed as Vulnerable in NSW). This area also provides connectivity between the creek that borders the east of the site and drainage lines and dams to the south-west.

Rocky habitat for reptiles occurs within the Mulga – Dead Finish vegetation in the west of the site in the form of scattered surface rocks, however there are no outcrops of significance that would provide habitat for threatened reptile species.

Hollow-bearing trees occur within the creek that borders the east of the site, although these are mostly within the creek channel and outside of the offset site boundary.

Habitat data collected within each of the monitoring plots is presented in Table 4-6.

Table 4-6 Fauna habitats within the monitoring plots

	% cover			
Habitat component	M01	M02	M03	M04
Tussock grasses	<5%	70%	50%	60%
Chenopods	40%	5%	20%	20%
Trees/tall shrubs	15%	0%	0%	0%
Bare ground	60%	30%	50%	40%
Cracking clay	0%	0%	0%	0%
Rocks/logs	<5%	10%	0%	0%

4.4 HABITAT FOR THREATENED SPECIES

The results of the database searches field studies at the offset site were considered to determine what habitats may be available for threatened species. One species, the Redthroat (*Pyrrholaemus brunneus*) has been recorded within five kilometres of the site, and there is suitable habitat present within the drainage line in the south of the offset site. It is considered possible that this species may occur in this area, however it was not detected during the field survey. No targeted surveys were undertaken or are considered to be warranted for the development or implementation of this offset plan. Ongoing monitoring surveys are proposed to be limited to BioBanking Methodology plots, which measure vegetation structure and composition as well as a limited number of habitat parameters (hollows-bearing trees and fallen logs).

There is also suitable habitat within the offset site for the species listed in Table 4-7, and these species are known to occur within the Barrier Ranges sub-region of the Western CMA (although recorded more than 5 kilometres from the site). These species also have the potential to occur at the site, although no surveys have been specifically conducted to identify these species and their presence or absence cannot be confirmed.

Table 4-7 Threatened species of the Barrier Ranges sub-region, which have habitat requirements met by the offset site

Common Name	Scientific name	Status
Flora		
Koonamore Daisy	*Erodiophyllum elderi*	Endangered (TSC Act)
Creeping Darling Pea	*Swainsona viridis*	Endangered (TSC Act)
Purple Wood Wattle	*Acacia carneorum*	Vulnerable (TSC & EPBC Acts)
Birds		
Australian Bustard	*Ardeotis australis*	Endangered (TSC Act)
Pied Honeyeater	*Certhionyx variegatus*	Vulnerable (TSC Act)
Rufous Fieldwren	*Calamanthus campestris*	Vulnerable (TSC Act)
White-fronted Chat	*Epthianura albifrons*	Vulnerable (TSC Act)
Mammals		
Bolam's Mouse	*Pseudomys bolami*	Endangered (TSC Act)
Striped-faced Dunnart	*Sminthopsis macroura*	Vulnerable (TSC Act)

4.5 KEY THREATS TO BIODIVERSITY VALUES

As discussed above, the vegetation and habitats at the site are in relatively good condition due to low grazing pressures from domestic stock. Weed invasion and degradation by feral goats are considered to be the two key threatening processes that pose a risk to the biodiversity values at the site. Additionally, indirect impacts such as the exclusion of fire may also be impacting on the structure of vegetation communities at the site. Predation by feral cats and foxes may be impacting on populations of native fauna. These issues form the focus for the management measures recommended in Section 5.2 of this report.

5 SECURITY AND MANAGEMENT OF THE OFFSET SITE

5.1 IN PERPETUITY SECURITY

To secure the offset site in perpetuity, as stated in COA C5, the Proponent shall, in conjunction with the lessee of Western Lands Lease 14240, apply to the Crown Lands Division of the Department of Trade and Investment (Crown Lands) for a Change of Lease Purpose of Western Land Lease 14240 to appropriately record the biodiversity offset on title and within the lease conditions as a conservation area. This would occur within one year from project approval. Relevant approvals from the OEH and DP&I are required to accompany the application.

5.2 PROPOSED MANAGEMENT MEASURES

When the Change of Lease Purpose application is lodged with Crown Lands, standard lease conditions will be applied. Generally, these are as follows:

- The lessee must within 3 months from the date of addition of these conditions to the lease erect and maintain to the satisfaction of the Western Lands Commissioner a stock proof fence around that part of the leased land that is defined as a conservation area.
- The lessee must ensure that during the term of the lease all domestic stock is excluded from that part of the lease defined as a conservation area.
- The lessee must not clear any vegetation or remove any timber, fallen logs or rocks within the land leased unless written approval has been granted by either the Western Lands Commissioner or Minister.

Additional management measures are outlined in Table 5-1. These measures are intended to result in an improvement in the biodiversity values of the site and are designed to be adaptive, informed by the monitoring regime outlined in Section 5.2. These management measures would be incorporated into a detailed management plan for the offset site. The management plan would be prepared and be ready for implementation with the establishment of the offset site.

All management measures would be the responsibility of and financed by AGL. At the end of the operational life of the Solar Plant, the ongoing management would be the responsibility of the lease holder. It is expected that by this time the majority of the required management actions would have been undertaken and ongoing management tasks will largely coincide with routine agricultural activities. Land use restrictions will remain in place on the offset site so that any activities undertaken on the offset site must be compatible with the site's overall function as a conservation area.

Table 5-1 Proposed management measures at the offset site

Management measure	Objective	Justification	Action	Timing
General measures				
Weed control	To minimise the occurrence of weeds within the offset site particularly Weeds of National Significance (WoNS) and listed noxious weeds.	Weeds compete with native species and degrade habitats. The offset site has occurrences of noxious weeds including Mesquite and African Boxthorn.	• Survey to identify target locations for weed control. • Weed control using appropriate methodologies considering target species and landscape context.	• At establishment of the offset site • Ongoing as required
Cat and/or fox control	To minimise the presence of cats and foxes within the offset site.	Predation by cats and foxes can have serious impacts on the populations of native fauna, particularly threatened species.	• Conduct baiting or trapping if cats or foxes are detected within the offset area.	• Consideration given to action on the basis of monitoring results.
Rabbit control	To minimise the risk of the offset site becoming a refuge for rabbits.	Increased rabbit numbers can reduce native regeneration and support higher numbers of pest animals such as cats and foxes.	• Conduct baiting or controlled grazing to reduce the ability of the site to act as a refuge to rabbits.	• Consideration given to action on the basis of monitoring results.
Exclusion of feral goats	To minimise the presence of feral goats.	Feral species can compete for resources with native fauna. Overgrazing by herbivores can prevent the successful ongoing establishment and persistence of native vegetation and lead to degradation.	• Install preventative fencing suitable for the target species. • Remove goats (by trapping or other means) if detected within the offset site.	• At establishment of the offset site • Ongoing as required
Specialised measures (conducted if required)				
Weed control	To minimise the occurrence of weeds in the creek adjacent to the offset site, particularly Weeds of National Significance (WoNS) and listed noxious weeds.	As above, weeds compete with native species and degrade habitats. They can be more easily spread along drainage lines, due to increased water availability.	• The creek line adjacent to the site's eastern boundary would be fenced out of the offset site, however weed survey and control would be undertaken along the creek where it adjoins the offset site to ensure weeds do not become established here. Methods would be appropriate to waterways (i.e. control of spray drift).	• Ongoing as required

Management measure	Objective	Justification	Action	Timing
Implementation of controlled burns	To re-introduce a more natural fire regime and assist in the recovery of degraded areas.	Fire is an integral part of the Australian landscape. Many plant species depend on it for successful germination. Fire can also assist in maintaining the balance of species within an ecosystem.	• If degradation is detected from monitoring, consult with OEH to determine if burning may be appropriate. • Conduct burns as recommended by OEH.	• At establishment of the offset site • Ongoing
Adapt measures to resident native fauna	To ensure that resident native fauna are not adversely impacted by management actions.	While monitoring is restricted to vegetation and habitat parameters and will not include fauna survey, evidence of fauna activity may be detected. Some actions such as weed spraying and controlled burns may adversely affect resident fauna (e.g., ground nesting birds. In these cases, actions should be adapted (postponed or excluded from certain areas) to avoid adverse impacts.	• If resident native fauna may be impacted by management actions, adapt actions as required to address the risk of impact.	• Ongoing as required

5.3 MONITORING AND REPORTING

Monitoring plots have been established at the site as described in Section 3. It is recommended that the methodologies undertaken in this report be repeated at these sites initially on an annual basis. It is also recommended that an additional monitoring plot be established within the Old Man Saltbush shrubland at the site and an additional two monitoring plots be established within Black Bluebush low open shrubland (as this vegetation type occupies the majority of the site). Once surveys have been conducted, a site value score for each plot would be calculated as outlined in Section 3.4 of the BBAM (DECC 2009). This can then be used to demonstrate an improvement or decline in the condition of the vegetation at the site. Monitoring would be undertaken during spring to early summer, which is considered to be optimal timing for vegetation surveys.

As a part of monitoring surveys, the locations and extent of noxious weeds across the entire site would also be recorded. Surveys would be conducted to determine the presence of cats, foxes, rabbits and feral goats. Consideration would be given to control methods, in coordination with broader control programs on adjacent land and in the local area. Fences would be inspected and maintenance carried out if required.

The results of monitoring would be submitted in an annual report to OEH. Management measures may be altered to reflect the results of monitoring.

Following consultation with OEH, it is anticipated that annual monitoring may generally be required for a period of up to five years after which time this period may be extended. This period is flexible and will be dictated by the results of initial monitoring. For example, three years of stable or slight improvement might indicate that monitoring can be reduced, whereas continued degradation might indicate that annual monitoring should continue until improvement is demonstrated. The requirement for specialised management such as an ecological burn may also extend the annual reporting and monitoring period to observe the response to such management. The decision to reduce or continue annual reporting will be made by OEH following submission of each report.

6 SUITABILITY OF THE OFFSET SITE

The proposed offset site provides a 'like for like' offset with respect to the vegetation types and threatened species habitats that are to be impacted by the development. A comparison of the areas of each vegetation type proposed to be impacted by the solar plant with the area of each vegetation type within the proposed offset site is provided in Table 6-1.

Overall the proposed offset presents a 1:1.1 area impacted to area offset ratio. A 1:1.3 ratio is achieved for Black Bluebush low open shrubland which is the main vegetation type to impacted and considered 'near threatened' by Benson, 2006. A 1:1 ratio is not achieved for the other vegetation types to be impacted, however the Prickly Wattle open shrubland and Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland are common vegetation types and considered to be of 'least concern' by Benson (2006). The Mulga-Dead Finish community is considered 'near threatened' by Benson (2006). This community occurs within the proposed power line easement but the 4 ha to be impacted is a worst case scenario assuming that the entire 30 metre easement will be cleared. In reality, clearing will be required only for the footings of power poles which will likely be less than the 1.5 ha contained within the offset site.

The Old Man Saltbush community that occurs within the offset site will not be impacted at the development site. This community is considered to be 'critically endangered' by Benson and the protection of the 3.2 ha area within the offset site is considered to be a net gain in the conservation of this vegetation type.

Table 6-1 Comparison of area by vegetation type within the development and offset sites

Vegetation type	Area to be impacted	Area within the proposed offset	Offset ratio
Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	125.1	141.8	1:1.3
Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	13.9	8.5	1:0.6
Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland of semi-arid and arid sandplains and dunes	6.3	1.9	1:0.3
Mulga - Dead Finish on stony hills mainly of the Channel Country and Broken Hill Complex Bioregions	4	1.5	1:0.4
Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	0	3.2	NA
Total	**149**	**157**	**1:1.1**

Opportunities exist for improvement with appropriate management of the site. Recommended management measures have been outlined in Section 5 along with a monitoring regime to determine whether the objectives are being met. A gain in the biodiversity value of the site is anticipated which would meet the 'maintain or improve' standard. With appropriate management, the proposed offset is considered to meet the *Principles for Biodiversity Offsets in NSW*. A detailed assessment against these principles is provided as Appendix D.

The proposed offset is considered to be suitable on the basis of the vegetation types and habitats it conserves, the potential improvements to be realised and consistency with NSW offset principles. The conservation status of the offset site will be attached to the title of the land and contained within the lease conditions which will ensure that the biodiversity values of the site will be enhanced, maintained and protected for the long-term.

7 REFERENCES

Benson J.S. (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant communities of the NSW Western Plains, *Cunninghamia* 9(3): 383-450, Botanic Gardens Trust, Sydney.

DECC (2008) Vegetation Benchmarks Database. Department of Environment and Climate Change NSW. http://www.environment.nsw.gov.au/biobanking/VegTypeDatabase.htm

DECC (2009) BioBanking Assessment Methodology and Credit Calculator Operational Manual. NSW Department of Environment and Climate Change, Sydney.

OEH (2012) Vegetation types database. Office of Environment and Heritage NSW. http://www.environment.nsw.gov.au/biobanking/VegTypeDatabase.htm

SKM (2012) *AGL Energy Broken Hill Solar Power Plant – Flora and Fauna Assessment*. Report prepared for AGL Energy Limited.

APPENDIX A BIODIVERSITY OFFSET MANAGEMENT PLAN - CONDITION OF APPROVAL C5

C5. Following final design and prior to the commencement of construction, or as otherwise agreed to by the Director-General, the Proponent shall develop and submit a Biodiversity Offset Management Package for the approval of the Director-General. The package shall detail how the ecological values lost as a result of the Project will be offset. The Biodiversity Offset Management Package shall be developed in consultation with the OEH and shall (unless otherwise agreed by the Director-General) include, but not necessarily be limited to:

(a) an assessment of all native vegetation communities, threatened species habitat and Willyama Common land that will either be directly or indirectly impacted by the proposal;

(b) the objectives and biodiversity outcomes to be achieved (including 'improve or maintain' biodiversity values), and the adequacy of the proposed offset considered;

(c) the final suite of the biodiversity offset measures selected and secured including but not necessarily limited to;

> *i) an offset proposal which is supported by a suitable metric method (such as the Biobanking Assessment Methodology);*
>
> *ii) details of the relative condition and values of communities on the offset site in comparison to those to be impacted, including all areas of native shrubland in moderate to good condition;*
>
> *iii) proposed management actions and expected gains;*

(d) the monitoring requirements for compensatory habitat works and other biodiversity offset measures proposed to ensure the outcomes of the package are achieved, including:

> *i) the monitoring of the condition of species and ecological communities at offset locations;*
>
> *ii) the methodology for the monitoring program(s), including the number and location of offset monitoring sites, and the sampling frequency at these sites;*
>
> *iii) provisions for the annual reporting of the monitoring results for a set period of time as determined in consultation with the OEH;*

(e) timing and responsibilities for the implementation of the provisions of the Package.

Land offsets shall be consistent with the Principles for the use of Biodiversity Offsets in NSW (NSW Office of Environment and Heritage, June 2011). Any land offset shall be enduring and be secured by a conservation mechanism which protects and manages the land in perpetuity. Where land offsets cannot solely achieve compensation for the loss of habitat, additional measures shall be provided to collectively deliver an improved or maintained biodiversity outcome for the region.

Where monitoring referred to in condition (d) indicates that biodiversity outcomes are not being achieved, remedial actions shall be undertaken to ensure that the objectives of the Biodiversity Offset Package are achieved.

Within one [year] from approval from the Director-General the Proponent shall, in conjunction with the lessee of Western Lands Lease 14240, apply to the Crown Lands Division of the Department of Trade and Investment for a Change of Lease Purpose of Western Land Lease 14240 to appropriately record the biodiversity offset on title and within the lease conditions as a conservation area.

APPENDIX B SURVEY PLAN OF THE PROPOSED OFFSET SITE

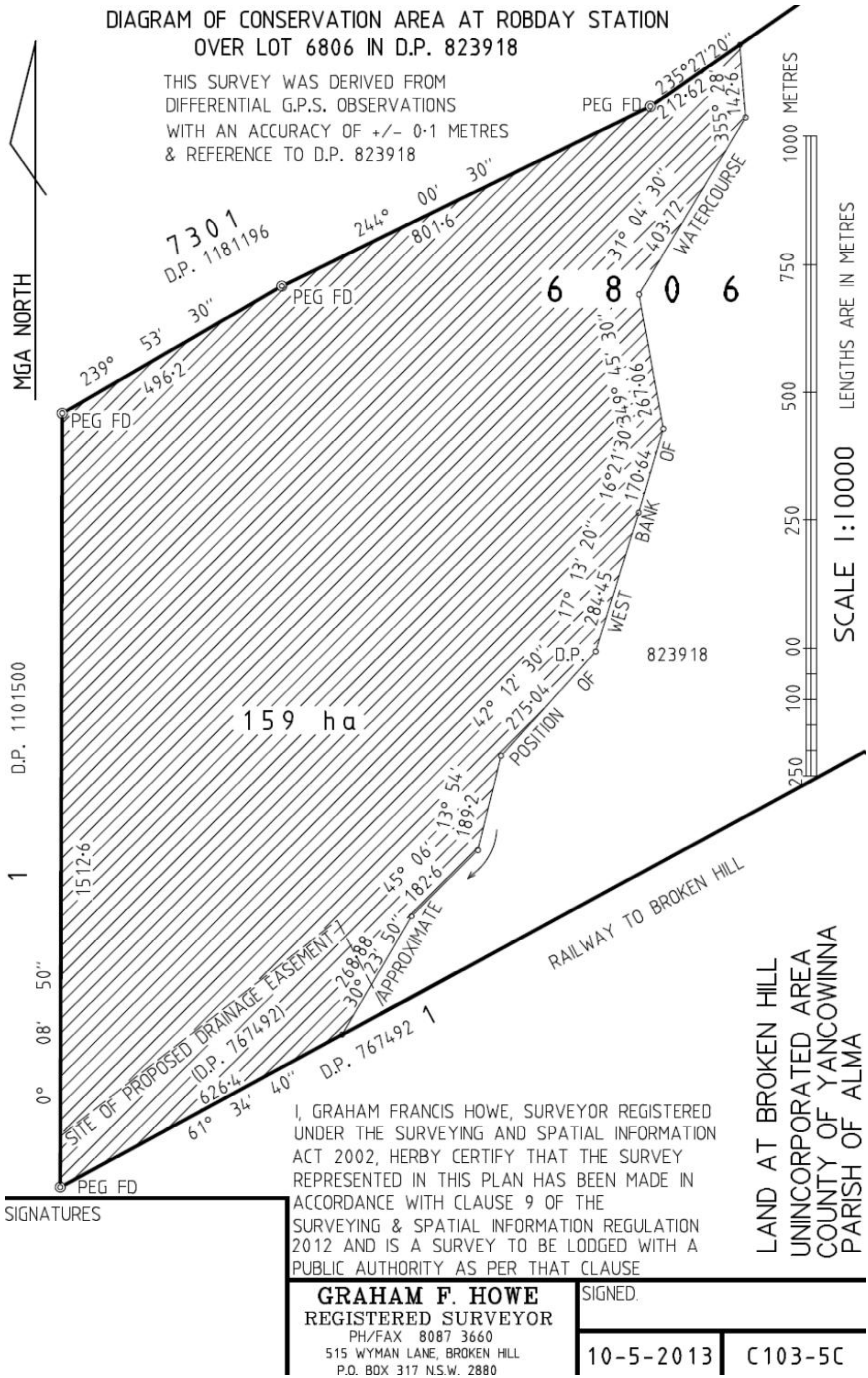
DIAGRAM OF CONSERVATION AREA AT ROBDAY STATION
OVER LOT 6806 IN D.P. 823918
THIS SURVEY WAS DERIVED FROM
DIFFERENTIAL G.P.S. OBSERVATIONS
WITH AN ACCURACY OF +/- 0·1 METRES
& REFERENCE TO D.P. 823918
MGA NORTH
7301
D.P. 1181196
239° 53' 30''
496·2
244° 00' 30''
801·6
235°27'20''
212·62
355° 28'
142·6
PEG FD
6806
31° 04' 30''
403·72
WATERCOURSE
349° 45' 30''
267·06
16°21'30''
170·64
17° 13' 20''
284·45
WEST BANK OF
D.P. 823918
42° 12' 30''
275·04
POSITION OF
13° 54'
189·2
45° 06'
182·6
30° 23' 50''
268·88
APPROXIMATE
SITE OF PROPOSED DRAINAGE EASEMENT
(D.P. 767492)
159 ha
D.P. 1101500
1
0° 08' 50''
1512·6
61° 34' 40''
626·4
D.P. 767492
1
RAILWAY TO BROKEN HILL
1000 METRES
750
500
250
00
100
250
LENGTHS ARE IN METRES
SCALE 1:10000
I, GRAHAM FRANCIS HOWE, SURVEYOR REGISTERED UNDER THE SURVEYING AND SPATIAL INFORMATION ACT 2002, HERBY CERTIFY THAT THE SURVEY REPRESENTED IN THIS PLAN HAS BEEN MADE IN ACCORDANCE WITH CLAUSE 9 OF THE SURVEYING & SPATIAL INFORMATION REGULATION 2012 AND IS A SURVEY TO BE LODGED WITH A PUBLIC AUTHORITY AS PER THAT CLAUSE
LAND AT BROKEN HILL
UNINCORPORATED AREA
COUNTY OF YANCOWINNA
PARISH OF ALMA
SIGNATURES
GRAHAM F. HOWE
REGISTERED SURVEYOR
PH/FAX 8087 3660
515 WYMAN LANE, BROKEN HILL
P.O. BOX 317 N.S.W. 2880
SIGNED.
10-5-2013
C103-5C

APPENDIX C FLORA SPECIES LIST

The following provides a list of flora species that were recorded within the offset site during the survey, mostly within the plot quadrats. Other species opportunistically encountered are also included. Given the difficulties in identifying all species present, particularly grasses, relative abundance of each species has not been provided. Presence or absence by plot or broader site is given.

Species of conservation significance are highlighted. Introduced species are denoted by an asterisk (*). Weeds declared as noxious within the Broken Hill or Unincorporated Area of the Western Division local control area are denoted by a triangle (△). Where uncertainty exists due to the unavailability of mature reproductive material, the taxon is preceded by a question mark, or plants are identified to genus level only. Botanical nomenclature follows G.J. Harden (ed) (1990-2002) Flora of New South Wales, UNSW Press, except where recent changes have occurred.

			Presence/absence				
Scientific name	**Common name**	**Family**	**M01**	**M02**	**M03**	**M04**	**Broader site**
TREES							
Acacia burkittii	Sandhill Wattle	Fabaceae					X
Acacia tetragonophylla	Dead Finish	Fabaceae		X			
Acacia victoriae	Prickly Wattle	Fabaceae	X	X		X	
Eucalyptus camaldulensis	River Red Gum	Myrtaceae					X
Pittosporum angustifolium	Weeping Pittosporum	Pittosporaceae					X
**Schinus areira*	Pepper Tree	Anacardiaceae					X
SHRUBS, SUB-SHRUBS							
Abutilon fraseri	Dwarf Lantern-flower	Malvaceae				X	
Abutilon sp.		Malvaceae		X			
Acacia oswaldii	Umbrella Wattle	Fabaceae					X
Atriplex nummularia	Old Man Saltbush	Chenopodiaceae					X
Atriplex ?pseudocampanulata		Chenopodiaceae	X				
Atriplex stipitata	Mallee Saltbush	Chenopodiaceae		X	X	X	
Atriplex vesicaria	Bladder Saltbush	Chenopodiaceae	X		X		
Enchylaena tomentosa	Ruby Saltbush	Chenopodiaceae		X		X	
Eremophila sturtii	Turpentine	Myoporaceae		X			
Hibiscus krichauffianus	Velvet-leaf Hibiscus	Malvaceae					X
△*Lycium ferocissimum*	African Boxthorn	Solanaceae					X
Lysiana exocarpi		Loranthaceae					X
Maireana astrotricha	Low Bluebush	Chenopodiaceae				X	

			Presence/absence				
Scientific name	**Common name**	**Family**	**M01**	**M02**	**M03**	**M04**	**Broader site**
Maireana pyramidata	Black Bluebush	Chenopodiaceae	X	X	X	X	
Maireana sedifolia	Pearl Bluebush	Chenopodiaceae	X	X	X	X	
Myoporum montanum	Western Boobialla	Myoporaceae					X
△**Prosopis velutina*	Velvet Mesquite	Fabaceae			X		
Ptilotus obovatus	Smoke Bush	Amaranthaceae	X				
Rhagodia spinescens	Spiny Saltbush	Chenopodiaceae		X		X	
Sclerolaena articulata		Chenopodiaceae			X	X	
Sclerolaena divaricata	Tangled Copperburr	Chenopodiaceae			X	X	
Senna artemisioides subsp. *filifolia*		Fabaceae		X		X	
Senna phyllodinea		Fabaceae		X		X	
Solanum sturtianum	Thargomindah Nightshade	Solanaceae					X
**Xanthium spinosum*	Bathurst Burr	Asteraceae					X
FORBS							
**Asphodelus fistulosus*	Onion Weed	Asphodelaceae	X			X	
Brachyscome ciliaris var. *lanuginosa*	Variable Daisy	Asteraceae	X			X	
**Carthamus lanatus*	Saffron Thistle	Asteraceae				X	
Convolvulus microsepalus	Small-flowered Bindweed	Convolvulaceae		X		X	
Disphyma crassifolium subsp. *clavellatum*		Aizoaceae			X		
Leiocarpa tomentosa	Woolly Plover-daisy	Asteraceae					X
**Mesembryanthemum crystallinum*	Common Ice Plant	Aizoaceae					X
Minuria cunninghamii		Asteraceae				X	
Senecio magnificus	Tall yellow-top	Asteraceae					X
Sida corrugata	Corrugated Sida	Malvaceae			X	X	
Wahlenbergia communis	Tufted Bluebell	Campanulaceae					X
**Xanthium spinosum*	Bathurst Burr	Asteraceae					X
GRASSES							
Aristida contorta	Bunched Kerosene Grass	Poaceae					X
Austrostipa nitida	A Speargrass	Poaceae					X
Austrostipa scabra subsp. *scabra*	Rough Speargrass	Poaceae	X	X	X	X	

			Presence/absence				
Scientific name	**Common name**	**Family**	**M01**	**M02**	**M03**	**M04**	**Broader site**
Cymbopogon ambiguus	Lemon Grass	Poaceae					X
Chloris truncata	Windmill Grass	Poaceae					X
Enneapogon avenaceus	Bottle Washers	Poaceae				X	
Eragrostis dielsii	Mallee Lovegrass	Poaceae				X	
Eragrostis eriopoda	Woollybutt Grass	Poaceae	X		X	X	
Panicum decompositum	Native Millet	Poaceae		X			
Rytidosperma sp.	Wallaby Grass	Poaceae				X	
Themeda australis	Kangaroo Grass	Poaceae	X				
Unidentified grass		Poaceae		X	X	X	

APPENDIX D PRINCIPLES FOR BIODIVERSITY OFFSETS IN NSW - CHECKLIST

The following principles, developed by OEH, provide a useful framework for developing offset proposals. They have been considered in developing this Offset Plan, as detailed below.

Impacts must be avoided first by using prevention and mitigation measures.

Offsets are then used to address remaining impacts. This may include modifying the proposal to avoid an area of biodiversity value or putting in place measures to prevent offsite impacts.

The proposal has avoided impacts to the extent that the impacts are the minimum required to meet the objectives of the proposal. Mitigation measures to minimise impacts form part of the conditions of consent for the project. Residual impacts resulting from the clearing of common vegetation types are being offset only.

All regulatory requirements must be met.

Offsets cannot be used to satisfy approvals or assessments under other legislation, e.g. assessment requirements for Aboriginal heritage sites, pollution or other environmental impacts (unless specifically provided for by legislation or additional approvals).

The Offset Plan is required as part of the approval conditions for the project. The proposed offsets will not be used to satisfy approvals or assessments under other legislation.

Offsets must never reward ongoing poor performance.

Offset schemes should not encourage landholders to deliberately degrade or mismanage offset areas in order to increase the value from the offset.

The offset site will be set up in perpetuity – this removes the incentive to degrade the offset site to facilitate development at a later date.

The management measures have clear targets and are set out to push most management to the beginning of the agreement, where successful accomplishment of targets would be rewarded by less intensive management in ongoing years. This suits measures such as weed control which are more easily achieved with intensive efforts to eradicate infestations rather than small ongoing efforts that may allow weeds to re-colonise or spread.

Offsets will complement other government programs.

A range of tools is required to achieve the NSW Government's conservation objectives, including the establishment and management of new national parks, nature reserves, state conservation areas and regional parks and incentives for private landholders.

The offset site will be registered as a conservation area on the title of the land with the Crown Lands Division of the Department of Trade and Investment and its management for conservation will be included within the lease conditions of this land. Privately managed conservation lands complement public reserves and contribute to the protected area system in NSW.

Offsets must be underpinned by sound ecological principles.

They must:

- *include the consideration of structure, function and compositional elements of biodiversity, including threatened species*
- *enhance biodiversity at a range of scales*
- *consider the conservation status of ecological communities*
- *ensure the long-term viability and functionality of biodiversity.*

Biodiversity management actions, such as enhancement of existing habitat and securing and managing land of conservation value for biodiversity, can be suitable offsets. Reconstruction of ecological communities involves high risks and uncertainties for biodiversity outcomes and is generally less preferable than other management strategies, such as enhancing existing habitat.

The biodiversity values contained within the offset site have been described in this report and include consideration for threatened species. The condition of vegetation at the site has been assessed using the Biometrics methodology. The site contains the same communities that are to be impacted by the development and includes an additional community (Old Man Saltbush Shrubland) that is of conservation significance.

The management measures to be implemented on the offset sites focus on the removal of threatening processes which is effective in enhancing threatened species habitats. Additionally, the progress and outcomes of management measures can be monitored and adapted over time to ensure continuing beneficial outcomes.

Offsets should aim to result in a net improvement in biodiversity over time.

Enhancement of biodiversity in offset areas should be equal to or greater than the loss in biodiversity from the impact site.

Setting aside areas for biodiversity conservation without additional management or increased security is generally not sufficient to offset against the loss of biodiversity. Factors to consider include protection of existing biodiversity (removal of threats), time-lag effects, and the uncertainties and risks associated with actions such as revegetation.

Offsets may include enhancing habitat, reconstructing habitat in strategic areas to link areas of conservation value, or increasing buffer zones around areas of conservation value and removal of threats by conservation agreements or reservation.

This offset plan:

- Identifies threats to the offset site's values.
- Sets out suitable management measures that can be undertaken for the long-term.
- Provides security by registering the site as a conservation area on title.

Offsets must be enduring - they must offset the impact of the development for the period that the impact occurs.

As impacts on biodiversity are likely to be permanent, the offset should also be permanent and secured by a conservation agreement or reservation and management for biodiversity. Where land is donated to a public authority or a private conservation organisation and managed as a biodiversity offset, it should be accompanied by resources for its management. Offsetting should only proceed if an appropriate legal mechanism or instrument is used to secure the required actions.

The offset plan for this development is required in perpetuity. The offset will be secured by registering it as a conservation area on the title of the land with the Crown Lands Division of the Department of Trade and Investment. Its management for conservation will be included within the lease conditions of this land and managed for the life of the impact and potentially beyond.

Offsets should be agreed prior to the impact occurring.

Offsets should minimise ecological risks from time-lags. The feasibility and in-principle agreements to the necessary offset actions should be demonstrated prior to the approval of the impact. Legal commitments to the offset actions should be entered into prior to the commencement of works under approval.

It is proposed that all offset arrangements are approved and in order prior to construction although the formal registration of the conservation area on title may occur up to one year after.

Offsets must be quantifiable - the impacts and benefits must be reliably estimated.

Offsets should be based on quantitative assessment of the loss in biodiversity from the clearing or other development and the gain in biodiversity from the offset. The methodology must be based on the best available science, be reliable and used for calculating both the loss from the development and the gain from the offset. The methodology should include:

- *the area of impact*
- *the types of ecological communities and habitat/species affected*
- *connectivity with other areas of habitat/corridors*
- *the condition of habitat*
- *the conservation status and/or scarcity/rarity of ecological communities*
- *management actions*
- *level of security afforded to the offset site.*

These points are addressed and described in this Offset Plan. The methodologies used to assess the offset site are the same as those used to determine the impacts. Vegetation condition has been assessed using the Biometrics methodology. Management actions have been described and a methodology for monitoring the success of these actions has been implemented. The offset will be secured in perpetuity as discussed above.

The best available information/data should be used when assessing impacts of biodiversity loss and gains from offsets. Offsets will be of greater value where:

- *they protect land with high conservation significance*
- *management actions have greater benefits for biodiversity*
- *the offset areas are not isolated or fragmented*
- *the management for biodiversity is in perpetuity (e.g. secured through a conservation agreement).*

These points have been considered in the selection of offset site. The offset site and proposed security and management meet the above objectives.

Management actions must be deliverable and enforceable.

Management actions and their objectives, proposed methods of delivery and monitoring requirements are outlined in Section 5 of this plan. Provisions have been included for the annual reporting of monitoring results to OEH.

Offsets must be targeted.

They must offset impacts on the basis of like-for-like or better conservation outcome. Offsets should be targeted according to biodiversity priorities in the area, based on the conservation status of the ecological community, the presence of threatened species or their habitat, connectivity and the potential to enhance condition by management actions and the removal of threats. Only ecological communities that are equal or greater in conservation status to the type of ecological community lost can be used for offsets. One type of environmental benefit cannot be traded for another: for example, biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity offset requirements.

Offsets have been proposed based on biodiversity values that will be impacted and to achieve a 'like for like' outcome with regard to the vegetation types being impacted. The proposed offset also provides for the conservation of an additional vegetation type which is considered to be rare in the landscape.

Offsets must be located appropriately.

Wherever possible, offsets should be located in areas that have the same or similar ecological characteristics as the area affected by the development.

Locating the offset site in close proximity (approximately 1.5 km west) of the impacts within the same vegetation types achieves this aim.

Offsets must be supplementary.

They must be beyond existing requirements and not already funded under another scheme. Areas that have received incentive funds cannot be used for offsets. Existing protected areas on private land cannot be used for offsets unless additional security or management actions are implemented. Areas already managed by the government, such as national parks, flora reserves and public open space cannot be used as offsets.

The proposed offset is not covered by any existing covenants or agreements. The land is owned by the Crown however, it is not being managed for conservation. The offset is therefore considered supplementary.

Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.

Offsets must be audited to ensure that the actions have been carried out, and monitored to determine that the actions are leading to positive biodiversity outcomes.

Monitoring requirements are outlined in Section 5 of this plan and have been designed to ensure that the actions lead to positive biodiversity outcomes.