Appendix S: Resilience method and analysis

**Background review**

A background review of all previous and prescribed actions within Annual Environmental Monitoring Reports, the Rehabilitation Management Plan, the Bushfire Management Plan and the Conditions of Approval was completed for each of the on-site Rehabilitation Areas, the Regeneration Areas, the ECAs for the original project approval in 2006, and the two new BOAs. Information gaps (i.e. management, monitoring and costing information) were identified necessitating site assessment.

**Collation of GIS data**

Niche utilised GIS data as supplied by WCPL, which included:

1. Recent aerial imagery;
2. Satellite imagery with infra-red spectra (if available);
3. Digital terrain/ elevation model or the like (e.g. Lidar imagery);
4. The digital boundaries of each of the conservation areas (Rehab Areas, ECAs and BOAs);
5. Previously recorded threatened biodiversity within each area;
6. Vegetation mapping from previous site assessments; and
7. Current monitoring locations or data collection sites (such as BioBanking plots).

Field maps were prepared detailing each of the above for use in the field by Niche. The maps were prepared at a scale deemed appropriate for site assessment purposes (say 1:10,000) and on A3.

**Qualitative resilience assessment**

Vegetation condition was assessed using a modified version of Jones and Brodie (1999), *Blue Space, The Method. Assessment of Environmental Condition and Weed Invasion*, which uses qualitative criteria to assign resilience classes to bushland areas. The method is based on biological factors (e.g., vegetation structure, composition and level of exotic invasion) and the health of the soil profile, as distinct from other condition assessment methodologies which are almost always based on the level of weed invasion only.

Table A3-1 Qualitative assessment of bushland condition

|  | **Resilience/Condition Class** | **DESCRIPTION** |
| --- | --- | --- |
| **Resilient Areas*****Soil profile intact. Natural regeneration pathways facilitated.*** | Good | * Minor infestations of weeds or virtually weed free.
* High species richness.
* Low perimeter to core ratio and large adjacent patches.
* All structural layers essentially intact or minor artificial modification has occurred but is not substantially impacting on ecological function.
* Patch in benchmark condition or stable after disturbance.
* Minimal input management required to facilitate regeneration
 |
| Moderate | * Minor infestations of weeds.
* Moderate species richness.
* Moderate perimeter to core ratio, large adjacent patches.
* Structural absence or strong decline in condition of at least one vegetation layer due to previous artificial disturbance (e.g., regrowth from recent clearing event and subsequent loss of hollow-bearing trees).
* Patch approaching benchmark condition.
* Minimal input management required to facilitate regeneration.
 |
| Poor | * Moderate to severe infestations of weeds.
* Low species richness.
* High perimeter to core ratio. Patches isolated or adjacent native vegetation fragmented
* Structural absence or strong decline in at least 2 vegetation layers (e.g., derived native pasture or grassland). Remaining native components under stress.
* Original soil profile intact but patch well outside of benchmark condition.
* Moderate levels of management required to facilitate regeneration.
 |
| **Non-resilient Areas*****Soil profile permanently altered. Natural regeneration pathways unlikely.*** | Disturbed | Rehabilitation or revegetation areas* Moderate level of weed invasion.
* Rehabilitation area – re-vegetation or previous soil translocation.
* Soil profile may exhibit some regenerative potential though structure and composition unlikely to reach benchmark after treatment.
* Limited natural regeneration capacity after treatment and high on-going inputs to achieve sustainable outcome.
 |
| Unmanaged space and degraded bushland* Native vegetation almost totally replaced by weed species and, at best, a single structural layer intact (e.g., large trees in degraded riparian zone)
* Soil profile disturbed and permanently altered resulting in loss of soil seed bank.
* No regeneration capacity, natural regeneration pathways lost.
* Management requires high input reconstruction and commitment to on-going maintenance.
 |
| Not bushland* Potential regeneration suppressed by management practices (e.g., parkland, cropping or exotic pasture).
 |

The method was used to identify areas requiring management and therefore the basis for determining management input and expenditure. The categories for condition as assessed during the site assessment are provided in Table A3.1. Major isolated weed incursions were recorded (e.g., blackberry thickets and other noxious weeds, environmental weeds and also exotic perennial grasses).

#### Quantitative condition assessment – BioBanking site scores

A quantitative assessment of condition was conducted at selected sites considered representative of the varying condition and treatment types observed throughout the conservation areas. This data can be used to align a BioMetric site value score for each vegetation zone. The score can inform, in terms of improve and maintain outcomes for biodiversity, which vegetation zones are likely to be in need of the greatest management input and expenditure. It was assumed that full BioMetric site attribute data (i.e., 20 x 50 metre plots and transects) have been conducted at each of the conservation sites and the data collected by Niche compliments this. BioMetric data was collected by Niche at the 12 sites listed in Table A3.2.

Table A3-2 BioMetric Site Attribute Data (Niche 2014)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Survey point** | **Easting** | **Northing** | **Description** | **Condition** | **Photo and Bearing** | **NSR** | **NOC** | **NMC** | **NGCG** | **NGCS** | **NGCO** | **EC** | **NTH** | **OR** | **FL** |
| 011 | 209217 | 6419577 | Exotic pasture | No resilience | 5614\_180 | 0 | 0 | 0 | 14 | 0 | 2 | 96 | 0 | 0 | 0 |
| 013 | 209073 | 6419862 | Native pasture | Poor | 5616\_082 | 0 | 0 | 0 | 82 | 0 | 0 | 66 | 0 | 0 | 0 |
| 016 | 202743 | 6419230 | Regrowth shrubland - Map unit 8 | Moderate | 5623\_136 | 0 | 0 | 10 | 38 | 0 | 64 | 6 | 0 | 1 | 9.5 |
| 019 | 203065 | 6419622 | Narrow-leaved Iron Bark | Good | 5626\_143 | 0 | 19.5 | 6.5 | 24 | 0 | 20 | 0 | 0 | 0 | 56 |
| 020 | 203039 | 6420196 | Rough-barked Apple | Moderate | 5627\_165 | 0 | 25 | 0.5 | 88 | 0 | 14 | 4 | 1 | 0.5 | 3 |
| 024 | 209207 | 6418836 | Native pasture | Very poor | 5633\_110 | 0 | 0 | 0 | 82 | 0 | 16 | 80 | 0 | 0 | 0 |
| 030 | 207249 | 6419853 | Box Gum Woodland | Poor | 5645\_249 | 0 | 27 | 0 | 24 | 0 | 18 | 42 | 1 | 0 | 18 |
| 045 | 205746 | 6418865 | Tailings dam rehab site - rhodes and smut | Rehab | 5678\_225 | 0 | 0 | 0 | 0 | 2 | 0 | 80 | 0 | 0 | 0 |
| 046 | 205674 | 6418771 | Pit 1 rehab - unknown treatment - sapling eucalypts and wattles | Rehab | 5681\_214 | 0 | 0 | 9 | 0 | 0 | 0 | 82 | 0 | 0 | 0 |
| 048 | 203768 | 6417764 | Translocated topsoil - 50/50 native to weed | Rehab | 5684\_350 | 0 | 0 | 0 | 46 | 0 | 0 | 48 | 0 | 0 | 0 |
| 050 | 204369 | 6418260 | Pit 5 SE Rehab - Acacia shrubland | Rehab | 5689\_135 | 0 | 0 | 6 | 90 | 26 | 6 | 40 | 0 | 0 | 67 |
| 066 | 213785 | 6419216 | Regenerating shrubland in NLIB - Blakelys | Moderate | 5722\_095 | 0 | 0 | 0 | 76 | 52 | 10 | 0 | 0 | 0 | 0 |