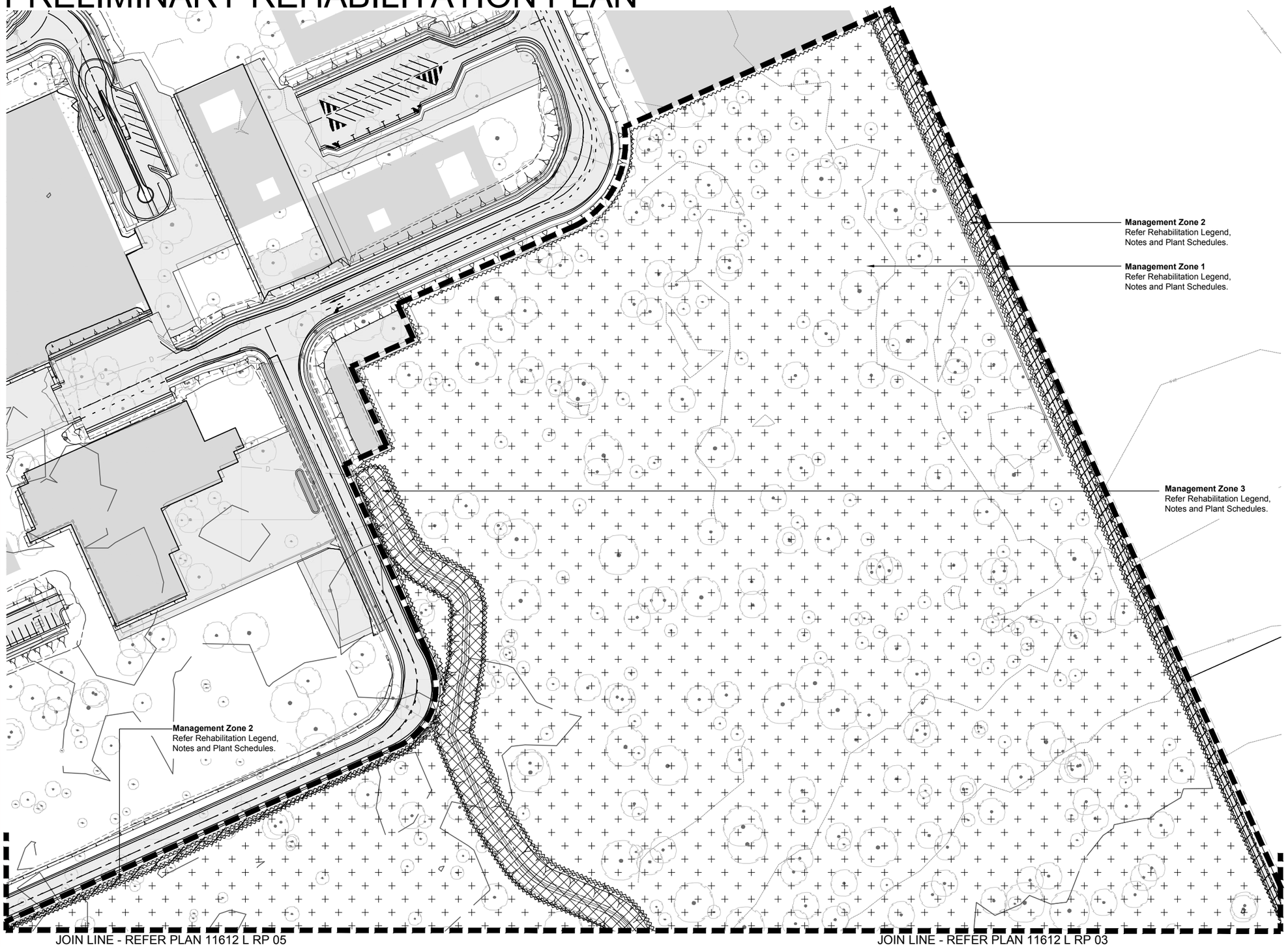
BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

PRELIMINARY REHABILITATION PLAN



LEGEND

Management Zone 1 - Existing Vegetation (Natural Regeneration)

Existing native trees, shrubs and groundcovers to be protected and retained. Weed management to entire zone to encourage natural regeneration by reducing competition. Appropriate (sensitive) weed management methodology within this zone to minimize any native vegetation damage / losses.
Refer to Rehabilitation Notes for additional details, plant species and densities.

Management Zone 2 - General Rehabilitation (Reconstruction)

Weed management to entire zone to encourage natural regeneration by reducing competition. Any existing/ occuring regrowth of native trees, shrubs and groundcovers to be protected and retained.
All bare / denuded areas to be appropriately cultivated, topsoiled and blanket mulched (100mm depth) or tecmatting (1:3 batters and locations prone to erosion) as required. All jutenetting to be installed to manufacturer's recommendations. Reconstruction of natural environment to be undertaken via tubestock installation including a diversity of tree, shrub and groundcover species to match regional ecosystem mapping for site.
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Management Zone 3 - Swale Rehabilitation (Reconstruction)

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Refer to Rehabilitation Notes for additional details, plant species and densities.

Management Zone 4 - Detention Revegetation (Reconstruction)

Weed management to entire zone to encourage natural regeneration by reducing competition. Any existing/ occuring regrowth of native trees, shrubs and groundcovers to be protected and retained.
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Management Zone 5 - Basin/Wetland Revegetation (Reconstruction)

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AMENDMENTS:

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A	06.10.2023	CLIENT ISSUE	RM
B	01.11.2023	PRELIMINARY ISSUE	RM

CLIENT: QUEENSLAND GOVERNMENT

PROJECT: BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

DRAWING: **REHABILITATION PLAN LAYOUT PLAN SHEET 1**

DRAWN: FW CHECKED: RM

DRAWING #: **11612 L RP 02 B**

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BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

PRELIMINARY REHABILITATION PLAN

LEGEND

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DRAWING: **REHABILITATION PLAN LAYOUT PLAN SHEET 2**

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DRAWING #: **11612 L RP 03 B**

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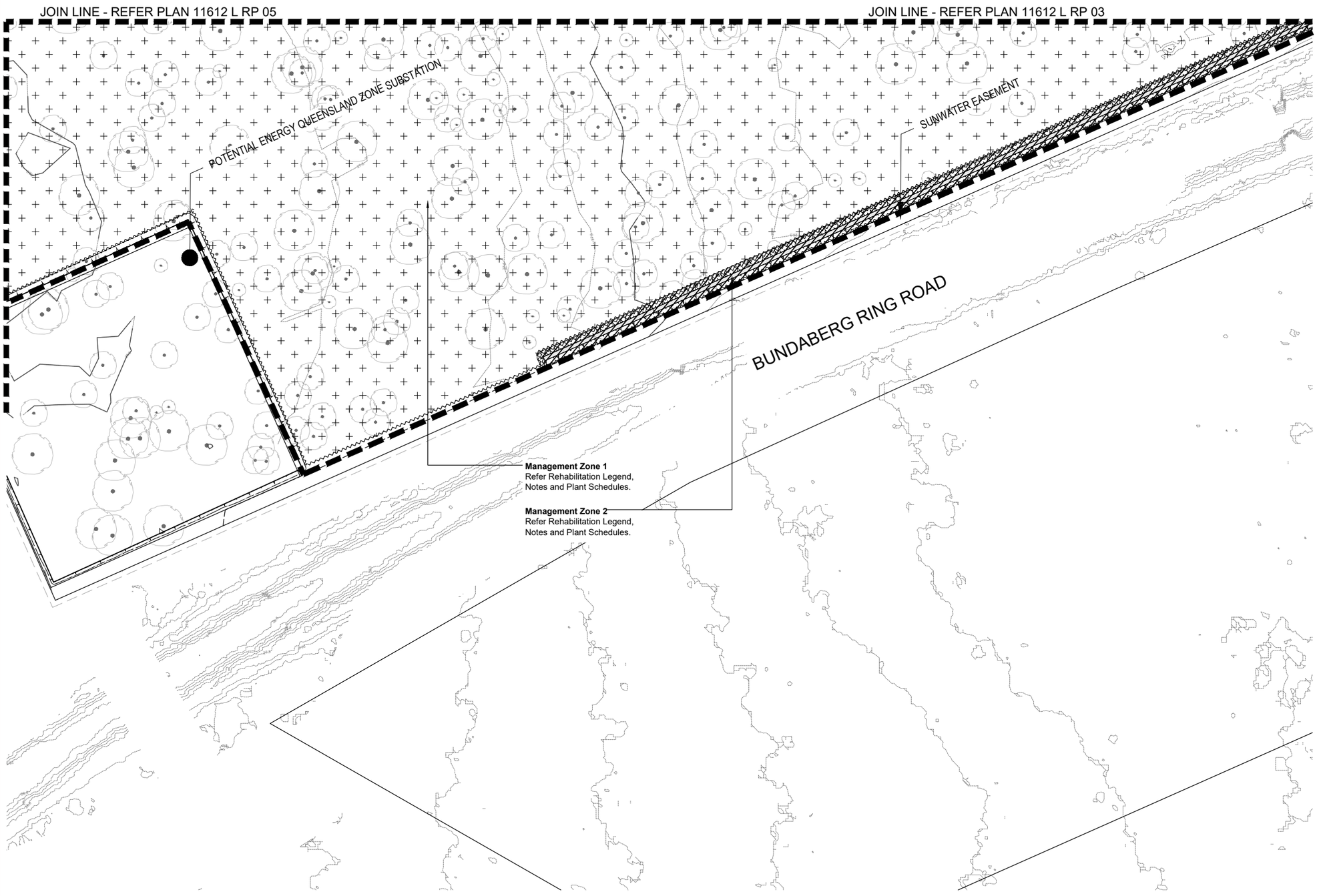
PRELIMINARY REHABILITATION PLAN



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DRAWING: **REHABILITATION PLAN LAYOUT PLAN SHEET 3**

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DRAWING #: **11612 L RP 04 B**

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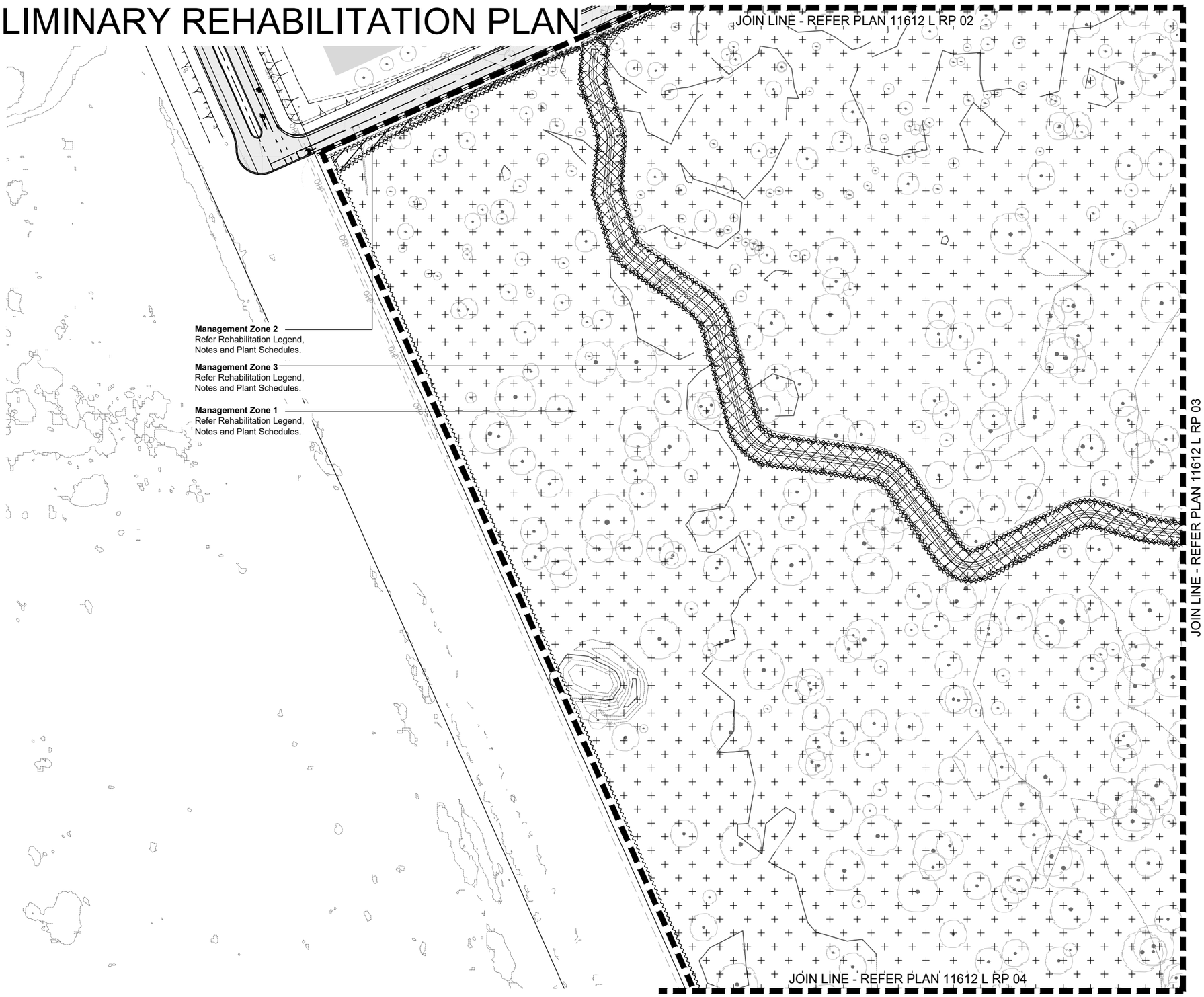
PRELIMINARY REHABILITATION PLAN



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DRAWING: **REHABILITATION PLAN LAYOUT PLAN SHEET 4**

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PRELIMINARY REHABILITATION NOTES

REHABILITATION INTRODUCTION

A substantial amount of rehabilitation research has been conducted and compiled as part of the "South East Queensland Ecological Restoration Framework (SEQERF)" and subsequently endorsed by the majority of South East Queensland councils. Given this, information provided within this Rehabilitation document will largely utilize information derived from this framework.

Rehabilitation or "Ecological Restoration" can be described as "the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed" (source: Society for Ecological Restoration International).

A key aspect of ecological restoration is that structure and function are returned to site, improving site stability, and improved habitat for fauna and flora. Structure includes vegetation height and density, canopy cover and appropriate species, as well as habitat features such as fallen logs and site rock. Function refers to the natural and self-sustaining processes occurring within the site including regeneration capacity, succession and cycling of nutrients. Activities required to achieve these objectives may include controlling environmental weeds, re-establishment of wildlife corridors and/ or stabilisation of creek banks or stormwater devices.

In accordance with the South East Queensland Ecological Restoration Framework, four ecological restoration approaches are generally applicable to rehabilitation works:

- Natural Regeneration
- Assisted Natural Regeneration
- Reconstruction
- Fabrication

It is worth noting as restoration work progresses on a site, ongoing changes to the structure and diversity of the vegetation will become apparent. These changes tend to occur in a cyclical manner, with the initial disturbance to the vegetation (either natural or man-made) being the trigger for changes. It is important to recognise that the vegetation will have to pass through a variety of stages of succession first, often over a period of years.

Disturbance as part of restoration works often has a negative connotation, however can often be useful for site restoration. Regeneration of native plant species is stimulated by mimicking natural disturbances. The techniques used will depend on the individual species and vegetation community, as they have evolved to respond to disturbances in different ways. Some examples of these techniques are:

- Control of competing vegetation, especially environmental weeds;
- Controlled burns or burn piles in vegetation communities adapted to fire;
- Soil disturbances such as ripping or raking; and/or
- Alterations to hydrology in wetlands to reinstate natural movement.

The SEQERF also highlights that consistent follow up is critical for success of ecological restoration. This ensures that beneficial, permanent changes can occur within the vegetation community benefiting both fauna and flora. In order to be able to confirm these changes are occurring, ongoing site monitoring may also be required.

Ecological restoration is a complicated and evolving field. It requires careful consideration for all ecosystem aspects to try in minimize any unexpected interactions, although is generally accepted that not all can be fully known about each complex ecosystem. Given this, it is necessary to remain flexible throughout this process to adapt to site and natural changes.

REHABILITATION APPROACHES

ECOLOGICAL RESTORATION APPROACHES	
NATURAL REGENERATION	
Applies:	To relatively large, intact and weed-free areas of native vegetation. Where native plants are healthy and capable of regenerating without human intervention. When native plant seed is stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water. Where the plant community has a high potential for recovery after any short-live disturbance such as a fire or cyclonic winds. When preventative action is all that is required to avert on-going disturbances e.g. erection of fencing to prevent instruction by cattle.
Role of planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration.
Goal vegetation community:	The re-establishing plant community will be similar in structure, composition and diversity to the original vegetation.
ASSISTED NATURAL REGENERATION	
Applies:	To natural areas where the native plant community is largely healthy and functioning. When native plant seed is still stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water. Where the natural regeneration processes (seedling germination, root suckering, etc.) are being inhibited by external factors, such as weed invasion, soil compaction, cattle grazing, mechanical slashing, etc. When limited human intervention, such as weed control, minor amelioration of soil conditions, erection of fencing, cessation of slashing, etc. will be enough to trigger the recovery processes through natural regeneration. When the main management issue is weed infestation and/or current land use practices.
Role of planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration except where species cannot return to site without direct intervention.
Goal vegetation community:	The re-establishing plant community will be substantially similar in structure, composition and diversity to the original vegetation.
RECONSTRUCTION	
Applies:	Where the site is highly degraded or altered. When the degree of disturbance has been so great and long-standing that the pre-existing native plant community cannot recover by natural means. To sites such as areas of fill, sites affected by stormwater flow, areas that have been drastically cleared, even though there may be a few remaining native trees or shrubs. When a greater degree of human intervention is required, such as weed control, cessation of grazing and/or slashing, amelioration of soil conditions such as importation of soils, drainage works or re-shaping of the landscape.
Role of planting:	Importation of native species to the area is required, either through planting or direct seeding (in some situations). natural regeneration and recruitment is insufficient to initially re-establish the original vegetation. Depending on the prevailing circumstances, the planting of a broad diversity of species from the target ecosystem may be unnecessary and the use of pioneers may be sufficient to re-establish ecological processes.
Goal vegetation community:	The re-establishing planted community should be similar to the original vegetation in structure, composition and diversity.
FABRICATION (TYPE CONVERSION)	
Applies:	Where site conditions have been irreversibly changed. When it is not possible to restore the original native plant community. Where a better-adapted local plant community can be planted that will function within the changed conditions. In situations such as the construction of a wetland plant community to mitigate increased urban storm-water run-off.
Role of planting:	Revegetation (planting) is the major component in a fabrication program.
Goal vegetation community:	The re-establishing planted community should be similar to a naturally occurring plant community of the same type (e.g. a constructed freshwater wetland should resemble a natural system in terms of structure, composition and diversity).

Note: Table adapted from a table in the Gold Coast City Council's "Guideline for the preparation of a Rehabilitation Plan"

REHABILITATION METHODOLOGY

As part of most rehabilitation scopes, it is worth considering an appropriate methodology for both compiling documentation and site works. This can be broken down into the following items:

- Site assessment
- Rehabilitation Design / Documentation (this plan)
- Site Works
- Maintenance and monitoring

REHABILITATION METHODOLOGY - SITE ASSESSMENT

Detailed assessment of site conditions prior to commencement of documentation is essential in the establishment of a site specific ecological restoration methodology. In accordance with the SEQERF the following checklist will form part of the site assessment process:

- Describe the history and background of the site;
- Describe the soil, drainage, topography and aspect;
- Describe the native vegetation on the site and along site boundaries;
- Describe the weeds on site;
- Describe the vegetation dispersal and structure;
- Describe the fauna use on site; and
- Describe estimated native regeneration response.

The responses to the above check list will provide the basis of the proposed restoration approach from Natural Regeneration to Fabrication for each treatment area within this Rehabilitation Plan.

Consideration should be made in the importance of integrating site specific measures for fauna habitat and movement. With many fauna species having specific habitat requirements, foraging patterns and movement patterns. During the site assessment process the following provisions should be taken into consideration:

- Fauna movement opportunities via easements, tracks, utility corridors and / or infrastructure pathways;
- Diversity and type of fauna and distribution on site;
- Habitat opportunities eg. dense foliage, roosting areas, log hollows and potential nesting boxes;
- Fauna disturbance and vicinity of works to significant nesting areas and / or fauna movement;
- Distribution of significant specialised food resources eg. Koala trees; and
- Stage weed removal and / or altering of weed control technique if the weeds are currently forming a significant fauna habitat.

For the sake of keeping this Rehabilitation document concise, site analysis results are compiled under a separate template and may or may not be included in this set, however the analysis outcomes derive the Rehabiltiation design methodology.

REHABILITATION METHODOLOGY - REHABILITATION DESIGN

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Note: Source for information contained on this page from SEQERF.

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CLIENT: QUEENSLAND GOVERNMENT

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DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW CHECKED: RM

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PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS

Following resolution of the site analysis and management areas as part of rehabilitation design, prioritising site works should be considered. Prior to site works commencing, the site should be secured from degrading impacts such as grazing by stock, unauthorised access and rubbish. Some factors that may require immediate attention include;

- The presence of highly invasive weed species which may disperse further prior to substantial site works commencing.
- The presence of weed species which may have a long term impact on ecological communities such as exotic and weed varieties of vines.
- Flammable materials (including weed thickets, grasses and vines).
- Damaging and easy access by 4WD, motorbikes and pedestrians into core retained vegetation and ecological restoration areas. This may require installation of temporary fencing if deemed appropriate.

Site works can be typically broken down into the following categories:

- Primary Works
- Follow-up Works
- Maintenance Works

Primary Works

Primary works or initial works within the site or a section of the site involves a sequence of activities such as the control of all groundcover weeds, woody weeds in the understorey and exotic vines prior to the control of weed trees. Primary work has the effect of creating a large degree of disturbance which will stimulate the germination of native and exotic species. Therefore, continuing works should be scheduled shortly after the initial visit to allow for timely control of the newly regenerating weeds. Highly invasive weeds should be treated as a priority during primary work in order to avoid invasion of newly disturbed areas. Some weeds will need to be treated in steps e.g. where areas of weed is being used by nesting birds or where the staged removal of canopy weed trees is required. Techniques used during primary work commonly involve spot spray, cut-scrape-paint, cut-paint, scrape-paint, roll-hang and over spraying (source: SEQERF). Refer to Weed Management notes for additional details.

Following completion of weed management, rehabilitation (such as assisted natural regeneration, construction and fabrication planting) to occur in areas unaffected by weed management activities or areas that primary weed management activities have concluded. Refer to Rehabilitation Works notes for additional details.

At the end of primary work, the zone will have been comprehensively and systematically worked, ready for follow up works.

Follow-up Works

At intervals, which will vary according to the type of weed impacting the site and growing conditions, follow-up work will be necessary. This generally involves the spot-spraying of newly germinating weeds and resprouting sections of woody weeds and vines. It is at this stage that observational visits should be made to the site to determine what progress the vegetation is making, and decide when to implement further follow-up work. A site that receives badly-timed, too frequent or too little follow-up will rapidly experience setbacks, as weed propagules will quickly become established in the newly disturbed areas. Germinating native seedlings may be swamped by weeds or damaged by inexperienced operators thereby exhausting the seedbank. Unless adequate follow-up can be ensured when planning restoration works, there is little point in commencing primary work, as time and resources are consumed with no substantial gain achieved (source: SEQERF).

Maintenance Works

By the maintenance stage, the vegetation community is at a point where native plant species are germinating and establishing, and canopy formation is occurring. Weed density is starting to decrease as the native plants which have been encouraged during the previous restoration works are able to out-compete the weeds. One of the fundamental principles of ecological restoration is that it attempts to create or re-establish an ecosystem that is self-sustaining. Therefore, it is the underlying goal that maintenance will eventually be decreased to a minimum. While this is not always possible, due to factors such as the continual reintroduction of weed propagules to the site from nearby residential areas; unfavourable seasons or weather event; persistent weed species; or global influences such as the enhanced greenhouse effect, it should always be strived for (source: SEQERF).

Maintenance works may include minor ongoing weed management and infill planting depending on site conditions.

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

Weed management typically comprises a major part of rehabilitation site works. Weed management provides the basis of aiding natural regeneration and assisted natural regeneration. It also forms part of the preliminary work required for reconstruction and fabrication scopes. Weed Management to be undertaken in accordance with SEQERF Primary, Follow-up and Maintenance works notes (adjacent).

Critical skills for Weed Management include:

- Identification Skills
- Knowledge of different techniques
- Knowledge of relevant legislation

Identification Skills

Both native and weed species should be identified prior to primary weed removal works and ongoing throughout the follow-up and maintenance periods. This is to maximise natural regeneration and reducing likelihood of accidental weed spraying to native vegetation. Regenerating species to be treated and maintained in a similar manner to newly planted revegetation tubestock. If contractor is unsure of species, advice should be sought by botanist, specialist contractor or confirmed with Queensland Herbarium. Refer to indicative Weed Treatment schedules derived from Queensland Herbarium for an indication of weed species and treatments.

Knowledge of Different Techniques

A range of weed management techniques are available to combat varying weed species and scenarios. Refer to adjacent schedules for an indication of weed management techniques.

Knowledge of Relevant Legislation

It is expected contractors have a depth of knowledge of relevant legislation to complete site rehabilitation works.

This may include occupational Health and Safety laws as well as environmental and heritage protection legislation. Bush regenerators must comply with the requirements of the Workplace Health and Safety Act 2011 or, when working on Commonwealth lands, the Commonwealth's Occupational Health and Safety (Commonwealth Employment) Act 1991. Contractors should also obtain all relevant permits required under State and Commonwealth legislation (e.g. Nature Conservation Act 1992, Fisheries Act 1994, Vegetation Management Act 1999, Biosecurity Act 2014- including Fire Ant Movement Controls). Contractors must also be aware of and adhere to cultural heritage protection obligations under the Aboriginal Cultural Heritage Act 2003 and where chemicals are in use, the Agricultural Chemicals Distribution Control Act 1966.

In addition to the above, contractors should also be familiar with local government body requirements (e.g. Pest Management Plans, Local Codes, Policies and Guidelines) and Classifications of weeds. Refer to adjacent schedules for classification of weeds under the Land Protection Act (superseded by the Biosecurity Act 2014).

Under the Biosecurity Act 2014, landowners are responsible for taking all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is known as the general biosecurity obligation (GBO). The act categorises restricted matter (restricted plants and animals) into the following:

- Category 1: must be reported to an inspector within 24 hours (includes Red Imported Fire Ants, amongst others).
- Category 2: must be reported within 24 hours to Biosecurity Queensland on 13 25 23.
- Category 3: must not be distributed either by sale or first, or released into the environment.
- Category 4: must not be moved.
- Category 5: must not be kept.

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

WEED MANAGEMENT TECHNIQUES	
METHOD	**DESCRIPTION**
Herbicide	**The herbicide weed control techniques described below provide a range of proven methods that can be used on a restoration site.**
Cut - Scrape-Paint	Cut the stem of the plant close to the ground (approximately 1-2cm) ensuring that soil does not come in contact with the cut surface. The cut can be made at a slight angle in order to increase the surface area that is exposed to the chemical. Apply herbicide immediately to the cut stump using poison pot and brush or dripper bottle. Using a knife, scrape the sides of the stump thoroughly to expose the green tissue. Apply herbicide to the scraped stump. The chemical must be applied within 10 seconds of the cut or scrape being made in order for it to be fully effective.
Cut - Paint	Cut the stem of the plant close to ground level. Apply herbicide to the cut stump using poison pot and brush or dripper bottle. This method is best suited to easy-to-treat weeds such as small-leaved privet (Ligustrum sinense), provided that the diameter of the stem at ground level is less than approximately three centimetres. If a glyphosate-/ metsulfuron methyl herbicide mix is being used in the poison pot, a greater range of weeds can be controlled using this method e.g. Easter cassia.
Scrape - Paint	Scrape as much of the stem as possible (one side of the stem) using a knife and apply herbicide to the scrape. Leave a small section of the vine unscraped, and then twist the vine so that the next scrape is made on the opposite side of the stem to the preceding scrape. Continue along the length of the vine, scraping and painting as much of the stem as possible, with scraping to be concentrated along the thicker stems close to the root of the plant. This is the best method to use for madeira vine, as it allows the chemical to translocate to the underground storage organs and aerial tubers which may be hanging in large clusters above head height. This avoids the potential problem of tubers from cut stems left hanging in the trees from dropping to the ground and sprouting. When scraping madeira vine stems a deep scrape is advisable – scrape right through to the fibrous, stringy section of the stem, taking care not to sever the vine. This method is also suitable for treatment of ochna.
Over-spraying	Over-spraying involves the use of knapsacks or power sprayers to treat large expanses of weed such as lantana thickets. The foliage must be covered with herbicide but not to the point of running off the plant. The dead plants remain in place and can be cut down at a later stage. Prior to over-spraying, any weeds that are growing closely around established native plants must be hand removed or treated by cut-scrape-paint.
Splatter Gun	This small gas-powered injector kit is fitted into a knapsack for easy carrying and delivers large droplets in a stream over the weed. The gun is used to deliver a concentrated herbicide (glyphosate or metsulfuron methyl) across large dense expanses of weed. The method is used for species such as lantana. Splatter gun involves spraying strips at one to two metre intervals over the thicket. The herbicide is then translocated throughout the entire plant. The method does not require the whole plant to be covered as in over-spray.
Spot-spraying	A knapsack filled with an appropriate herbicide mix is used by the operator to selectively control environmental weeds. A keen eye and an ability to distinguish between the native and weed species likely to be present, especially at seedling stage, is essential. Marker dye is added to the chemical mix to allow the operator to see what has already been sprayed, thus covering the ground weeds comprehensively and thoroughly Glyphosate and metsulfuron methyl are the main herbicides used for spot-spraying in ecological restoration, together with the addition of a penetrant and/or surfactant and marker dye.
Roll-hang	Vines such as mile-a-minute (Ipomoea cairica) which produce long stolons extending many metres along the surface of the ground, are suited to the roll-hang method. Locate the base of the plant and carefully pull up the runners and roll them up. The resulting roll of vine is then hung in the fork of a tree to dry out as if it is left on the ground it is likely to re-shoot. Where runners are climbing up into a tree they are cut off at head height prior to the runner being rolled up – there is no need to pull cut vines down from trees as this action is likely to damage the tree. The base of the vine is treated using the cutscrape-paint method.
Gouge-paint	This method applies to plant species that have a fleshy underground storage organ, such as the large tuber that is often found at the base of madeira vine. It is also particularly appropriate for the treatment of climbing asparagus (Protasparagus plumosus). If using this technique on climbing asparagus, first cut the stems that are growing into the canopy at head height and also at the base. The fleshy rhizome can then be gouged, or alternatively in the case of climbing asparagus, it may be struck several times firmly with the head of a pair of loppers, allowing the brown outer covering of the crown to peel away exposing the white fleshy inner section of the rhizome for application of herbicide. Gouge out sections of the fleshy base with a knife and apply herbicide using a paint pot and brush or dripper bottle within 10 seconds.

Note: Table adapted from a table in the SEQERF

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

WEED MANAGEMENT TECHNIQUES	
METHOD	**DESCRIPTION**
Basal Barking	This method involves mixing an oil-soluble herbicide in diesel/kerosene and painting or spraying the full circumference of the trunk or stem of the plant from ground level to a height of approximately 45cm. Basal bark application is suitable for thin-barked woody weeds including saplings, regrowth and multi-stemmed shrubs. The method will usually result in the mortality of difficult-to-control woody weeds at any time of the year, provided the bark is not wet or too thick to enable the herbicide to penetrate. The method should not be used in wet weather, adjacent to waterways or in areas where native trees and shrubs are located. The use should be restricted to situations where a weed is particularly difficult to control e.g. cherry guava and where other methods have been unsuccessful.
Wick Wiping	Wick wipers can be manually used with a sponge or wick applicator, attached to a container filled with herbicide or as an attachment towed by a tractor. The manual method can be used to selectively apply herbicide to the leaves of weeds growing in sensitive situations. The hand held container can leak and generally spot spraying would be recommended. The use of a tractor drawn wick wiper is used to control taller growing species such as introduced grasses and to encourage the growth of lower growing species. This method could be used in preparation for planting.
Stem Injection	Large woody weeds such as camphor laurel, coral trees (Erythrina spp, Privet Ligustrum spp) and umbrella trees are generally treated by stem-injection. Holes are drilled at regular intervals around the base of the tree and exposed roots using a drill. A tree injection syringe attached to a small capacity knapsack is used to fill the holes with the herbicide. Stem-injection of trees can also be undertaken using a hatchet to create cuts in a 'brickwork pattern' in trunks of trees for the application of herbicide (known as tree frilling). Frilling is more labour intensive than drilling. The greatest benefit of steminjection is that the trees can be left standing in situ as they die, provided there is no risk to humans or infrastructure from falling limbs. This creates convenient roosts for birds and other animals, and prevents the formation of large amounts of debris on the ground and damage to understorey plants which would result if the trees were to be cut down using a chainsaw.
Mechanical	**Mechanical weed control involves the use of powered and non-powered equipment such as brushcutters, chainsaws, slashers, shovels, pruners, saws, etc. These methods are best used in situations where there is a large, uninterrupted stand of weeds.**
Dig and Bag	Dig and remove tuberous/ rhizomatous root systems. Remove roots or whole plant in hard/ compacted soils. Place in suitable container and remove from site, dispose of by deep burial, burn or burial at a land fill, must not place declared weed species in recycling (mulch).
Hand-Pull	Remove totally from ground by hand (human). Perform when soil is moist. Applicable to small infestations or areas of environmental sensitivity (including sensitive watercrouses, when frogs are breeding, or presence of threatened species).
General Mechanical	May involve use of machinery (e.g. brushcutter, chainsaw, slasher, dozer, excavator). Suitable for lage infestations and weed trees. Initially cost-effective, but requires immediate revegetation of site or matting/ mulch application and extensive maintenance periods. Generates excessive soil and vegetation disturbance.

Note: Table adapted from a table in the SEQERF

Note: Source for information contained on this page from SEQERF.

ISO 9001 QUALITY Management System SOUTHPAC certifications
ISO 14001 ENVIRONMENT Management System SOUTHPAC certifications
AS 4801 OHS Management System SOUTHPAC certifications
Australian Institute of Landscape Architects

SCALE: AS NOTED

AMENDMENTS:

ISSUE	DATE	DESCRIPTION	CHECKED
A	06.10.2023	CLIENT ISSUE	RM
B	01.11.2023	PRELIMINARY ISSUE	RM

CLIENT: QUEENSLAND GOVERNMENT

PROJECT: BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW CHECKED: RM

DRAWING #: **11612 L RP 07 B**

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PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUB-REGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
1	Verbenaceae	Lantana camara var. camara (lantana)	10	S/O	Seedlings: Hand pull	Seedlings: CS&P (G1.5); Shrubs: blanket spray G100 or cut down and spray regrowth G100 or splatter gun using 1 part G to 9 parts water - apply only when plant is growing, not dormant (ref 1).
2	Asteraceae	Baccharis halimifolia (groundsel bush)	10	S/O	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1); Seedlings: CS&P (G1.5) or spray G200 (ref 1).
3	Crassulaceae	Bryophyllum delagoense (mother of millions)	8	H/O	Hand pull and dispose	Plantlets: spray G200 + MM or MM (ref 1).
4	Bignoniaceae	Macfadyena unguis-cati (cat's claw creeper)	5	V/O	Tubers: crown or dig up, bag and remove.	Regrowth and tuberlings: spray G100 + MM or F100 (ref 1).
5	Basellaceae	Anredera cordifolia (madeira vine)	8	V/O	Small Vines & Tubers: Hand pull. Bag and dispose.	Ascending Stems: S&P (GU); Tubers: gouge, scrape and paint (GU); Ground infestations: spray G200 or G200 + MM (ref 1).
6	Asparagaceae	Asparagus africanus (ornamental asparagus, asparagus fern)	7	V/O	dig out roots and dispose of at local council landfill site. remove entire crown and underground stem to prevent regrowth	fluroxypyr (200 g/L) @ 35 mL per 1 L diesel/kerosene
7	Ulmaceae	Celtis sinensis (Chinese celtis)	8	T/O	remove when small .hand pull or dig out small seedlings. combine dozing, burning and controlled grazing for large infestations	Stem injection, glyphosate (360 g/L) @ Undiluted at 1 mL per 2 cm of hole or cut
8	Lauraceae	Cinnamomum camphora (camphor laurel)	7	T/O	Seedlings: Hand pull	Saplings; CS&P (G1.5); Trees: F/I (G1 or G1.5) or C&P (G1.5 or GU for stems up to 8 diameter); Seedlings: spray G200 or G200 + MM (ref 1).
9	Anacardiaceae	Schinus terebinthifolius (broad-leaf pepper tree)	6	T/O	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 (ref 1).
10	Salviniaceae	Salvinia molesta (salvinia)	8	Ha/F	Mechanical removal of small infestations; Salvinia weevil (Biological control)	Aquatic areas: calcium dodecylbenzene sulphanate (AF-100) @ 1 part to 19 parts kerosene; diquat (vegetrol) 50-100L/ha or 4L/100L water; diquat (watrol) 50-100L/Ha or 4L/100L water; diquat (reglone) 5-10L/Ha or 400mL + 150mL Agral / 100L water (see ref 2.
11	Cabombaceae	Cabomba caroliniana (cabomba, fanwort)	4	Ha/F	Mechanical removal of small infestations	2, 4-D N-Butyl Ester (Rubber Vine Spray) @ 12.5L/ML water (see ref 2. for application guide).
12	Asteraceae	Chrysanthemoides monilifera subsp. rotundata (bitou bush)	3	S/OA	N/A	Stems: C&P or F/I (G1.5); Bushes: spray or cut down and spray regrowth G100 or MM (ref 1).

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
13	Pontederiaceae	Eichhornia crassipes (water hyacinth)	4	Ha/OF	Mechanical removal of small infestations	Waterways: 2, 4-D acid ('AF 300') @ 1:200 with water; Aquatic Areas: glyphosate @1-1.3L/100L water (see ref 2. for application guide).
14	Acanthaceae	Hygrophila costata (Glush weed)	3	Ha/F	Hand pull smal infestations. Can be controlled by planting competitive native species.	Glyphosate known to be effective.Species known to occur in waterways so EPA should be contacted before spraying (ref 4).
15	Oleaceae	Ligustrum lucidum (tree privet)	5	T/O	Seedlings: Hand pull	Saplings: CS&P or C&P (G1.5); Trees: F/I (G1 or G1.5) or C&P GU for stems up to 8cm diameter; Seedlings: spray MM or G200 + MM if other weeds such as Lantana or Camphor Laurel are present (ref 1).
16	Asteraceae	Sphagneticola trilobata (Singapore daisy)	6	H/O	Hand pull	Hand pull and/or spray G200 + MM (ref 1).
17	Asteraceae	Ageratina adenophora (crofton weed)	6	H/O	Hand pull and hang to dry.	Spray MM or G200 or G200 + MM if other weeds such as Lantana or Camphor Laurel are present (ref 1).
18	Verbenaceae	Lantana montevidensis (creeping lantana)	8	S/O	Fire and/or mechanical control	Spray (march to may): glyphosate 1L/100L water; metsulfuron methyl 10g/100L water; metsulfuron methyls + glyphosate 173g/100L water; Basal bark (anytime): triclopyr 1L/60L Diesel, picloram + triclopyr @ 1L/60L Diesel, Glyphosate, neat application; Splatt
19	Fabaceae	Neonotonia wightii (glycine)	5	H/A	N/A	Vines: CS&P (1:1.5) or spray G100 + MM or MM (ref 1).
20	Poaceae	Panicum maximum (green panic and guinea grass)	8	H/A	Hand or mechanical removal of small infestations	Spray: glyphosate @ 13mL/1L water (ref 2.)
21	Oleaceae	Ligustrum sinense (Chinese privet)	4	T/O	Seedlings: Hand pull	Saplings: CS&P or C&P (G1.5); Trees: F/I (G1.5); Seedlings: spray MM or G200 + MM if other weeds such as Lantana or Camphor Laurel are present (ref 1).
22	Ochnaceae	Ochna serrulata (ochna)	7	S/O	N/A	Stems: CS&P or S&P or F/I (G1.5); Seedlings and Regrowth: spray G200 + MM or MM. Trial basal bark F100 or G200 + MM (ref 1).
23	Asparagaceae	Asparagus aethiopicus cv. Sprengeri (asparagus ground fern)	5	H/O	dig out unwanted plants and dispose of at the appropriate council landfill. remove the entire crown of underground stem of plant to prevent regrowth	Spot spray - metsulfuronmethyl (600 g/L) @ 10 g per 100 L water plus wetting agent or 100 g/ha plus wetting agent. Cut stump, spot spray, Apply neat Diesel

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
24	Poaceae	Sporobolus pyramidalis and S. natalensis (giant rat's tail grasses)	8	H/U?	Hand or mechanical removal of small infestations	Small infestations: spray glyphosate @ 15mL/L water, flupropanate @ 2mL/L water + ionic wetter @ 1mL/Lwater; Dense Infestations: blanket spraying glyphosate 3L/ha, flupropanate 2L/ha (ref 2).
25	Asteraceae	Ageratina riparia (mistflower)	5	H/O	Hand pull and hang to dry.	Spray G100 or MM (ref 1).
26	Asclepiadaceae	Araujia sericifera (mothvine)	9	V/O	Seedlings & Vines: Hand pull. Bag and remove fruit.	Vines: CS&P (G1.5); Seedlings: spray G200 or G200 + MM or MM (ref 1).
27	Crassulaceae	Bryophyllum daigremontianum x B. delagoense (hybrid mother-of millions)	6	H/O	Hand pull and dispose	Plantlets: spray G200 + MM or MM (ref 1).
28	Convolvulaceae	Ipomoea cairica (mile-a-minute)	7	V/O	Vines & Runners: hand pull, roll up and hand up to dry.	Vines and Runners: CS&P (G1.5); Larger Stems, Roots and Nodes: spray G100 + MM (ref 1).
29	Sapindaceae	Cardiospermum grandiflorum (balloon vine)	7	V/O	Seedlings & Small Vines: Hand Pull	Stems: CS&P (G1.5); Seedlings or Small vines: spray G200 or G200 + MM (ref 1).
30	Asclepiadaceae	Cryptostegia grandiflora (rubber vine)	6	V/O	Scattereded or medium-density infestations: Where possible, repeated slashing close to ground level is recommended.	Foliar spray - Follow-up basal bark/cut stump/foliar spray as necessary with Triclopyr + picloram (Grazon DS, Grass-up, etc.) @ 0.35–0.5 L /100 L water
31	Phytolaccaceae	Rivina humilis (baby pepper)	8	H/O	Hand pull and hang to dry.	Spray G100 (ref 1).
32	Poaceae	Sporobolus africanus (Parramatta grass)	8	H/U	Hand or mechanical removal of small infestations	Small infestations: spray glyphosate @ 15mL/L water, flupropanate @ 2mL/L water + ionic wetter @ 1mL/Lwater; Dense Infestations: blanket spraying glyphosate 3L/ha, flupropanate 2L/ha (ref 2).
33	Poaceae	Sporobolus fertilis (giant Parramatta grass)	9	H/U	Hand or mechanical removal of small infestations	Small infestations: spray glyphosate @ 15mL/L water, flupropanate @ 2mL/L water + ionic wetter @ 1mL/Lwater; Dense Infestations: blanket spraying glyphosate 3L/ha, flupropanate 2L/ha (ref 2).
34	Poaceae	Eragrostis curvula (African lovegrass)	7	H/U	Chipped out before they flower. When chipping out the plant ensure that the tussock crowns are removed, as this will prevent regrowth. If in seed, the stems must be cut and bagged first.	Glyphosate (360 g/L) (e.g. Weedmaster® Duo) @ 10 ml/1 L water
35	Asteraceae	Gymnocoronis spilanthoides (Senegal tea)	3	Ha/F	place plant material in a sealed plastic bag, leave in sunlight to rot then burn or dispose of at a council-approved land fill tip	Glyphosate and metsulfuron-methyl @ 15mL/L water

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
36	Amaranthaceae	Alternanthera philoxeroides (alligator weed)	1?	Ha/U	physical removal of plant should not be attempted	Terrerstrial plants use Metsulfuron methyl (Brushoff®) + 1mL/L non-ionic wetter @ 80g/ha + 1mL/L non-ionic wetter or 10g/100L water + 1mL/L non-ionic wetter. Free floating plants Glyphosate (Roundup Biactive®) 10 mL/L
37	Passifloraceae	Passiflora suberosa (cork passionflower)	8	V/O	N/A	Stems: CS&P; Seedlings & Regrowth: spray G200 or G200 + MM (ref 1).
38	Poaceae	Melinis minutiflora (molasses grass)	5	H/A	Grazing or mowing	Spray: Fluazifop-P 212g/L @ 2L/Ha, Glyphosate 360g/L @ 1L/100L water (ref 2).
39	Aristolochiaceae	Aristolochia elegans (Dutchman's pipe)	8	V/O	Stems: Hand pull; Fruit: Bag and remove.	Stems: CS&P (G1.5); Seedlings: spray G200 or G200 + MM or MM (ref 1).
40	Convolvulaceae	Ipomoea indica (blue morning glory)	5	V/O	Vines and Runners: hand pull, roll up and hang to dry.	Vines and Runners: CS&P (G1.5); Larger Stems, Roots and Nodes: spray G100 + MM or F150 (ref 1).
41	Mimosaceae	Leucaena leucocephala (leucaena)	6	ST/A	Small plants: Hand pull or mechanical removal	Herbicide Control - Basal Bark application: triclopyr 240g/L + picloram 120g/L @ 1L/60L diesel; C&P: triclopyr 240g/L + picloram 120g/L @ 1L per 60L diesel; spray triclopyr 300g/l + picloram 120g/L @ 350mL per 100L water. Combination of chemical and mecha
42	Poaceae	Brachiaria mutica (para grass)	6	Ha/A	Grazing	Herbicide Control - Foliar application (Knapsack): glyphosate 360g/L @ 200mL/15L water; Foliar: glyphosate 360g/L @ 9L/Ha; Handgun: glyphosate 360g/L @ 1.3L/100L water (ref 2).
43	Hydrocharitacea e	Egeria densa (egeria waterweed)	2	Ha/F	hand pulling, cutting and digging with machines effective	N/A
44	Pinaceae	Pinus elliottii (slash pine)	4	T/A	Seedlings: Hand pull; Saplings and Trees: cut close to ground or ring-bark	Saplings and Trees: F/I (G1.5) ensuring thick bark is penetrated (ref 1).
45	Caesalpiniaceae	Senna pendula var. glabrata (Easter cassia)	7	ST/O	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1.5); Seedlings: spray G200 or G200 + MM or MM; collect and bag seeds (ref 1).
46	Poaceae	Chloris gayana (Rhodes grass)	9	H/A	Hand pulling and removal and digging of larger clumps	Spray: glyphosate @ 1l/100L water
47	Crassulaceae	Bryophyllum pinnatum (resurrection plant)	6	H/O	Hand pull and dispose	Plantlets: spray G200 + MM or MM (ref 1).
48	Asteraceae	Parthenium hysterophorus (parthenium weed)	6	H/U	hand pulling of small areas is not recommended	Spot spray 2,4-D amine 500 g/L @ 0.4 L/100 L
49	Caprifoliaceae	Lonicera japonica (Japanese honeysuckle)	3	V/O	Vines and Runners: hand pull, roll up and hang to dry.	Vines and Runners: CS&P (G1.5); Larger Stems, Roots and Nodes: spray G100 + MM or MM (ref 1).
50	Acanthaceae	Thunbergia alata (black eyed susan)	5	H/O	N/A	CS&P (G1.5); spray G200 or G200 + MM (ref 1).

Note: Herbicides must be applied by appropriately qualified/ supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered products (such rates supersede those noted in above tables), or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable.

Note: Source for information contained on this page from Queensland Herbarium (Qld Gov't).

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Australian Institute of Landscape Architects

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CLIENT: QUEENSLAND GOVERNMENT

PROJECT: BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW | CHECKED: RM

DRAWING #: **11612 L RP 08 B**

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BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
51	Fabaceae	Macroptilium atropurpureum (siratro)	8	V/A	N/A	Vines: CS&P (1:1.5) or spray G100 + MM or MM (ref 1).
52	Rosaceae	Rubus ellipticus (yellowberry)	4	S/O	slashing hinders growth, giving some control if plants are slashed before they seed	Grazon DS picloram/triclopyr 1:200 parts water + wetting agent
53	Colchicaceae	Gloriosa superba (glory lily)	3	V/O	N/A	Young Shoots: spray G200 or G200 + MM. Best results in Oct-Nov and by using 'Pulse' as surfucant (ref 1).
54	Verbenaceae	Phyla canescens (lippia, Condamine couch)	3	Ha/O	a combined approach of different control methods including chemical and mechanical with land management practices is most effective	Foliar spray 600 g/L Dichlorprop @ 5 ml / 1 L water or 2,4-D amine (500 g/L) + 1% crop oil @ 2–4 L/ha + 1% crop oil
55	Solanaceae	Solanum seaforthianum (Brazilian nightshade)	8	V/O	Hand pull	Spray G100 (ref 1).
56	Araceae	Pistia stratiotes (water lettuce)	3	Ha/OF	Mechanical removal of small infestations	Glyphosate 360g/L @ 1-1.3L/100L water or 6.9L/Ha; diquat 20g/L @ 4L/100L water or 50-100L/Ha (see ref 2. for application guide).
57	Asparagaceae	Asparagus plumosus (asparagus fern)	4	V/O	Rhizomes: crown and hang to dry.	Rhizomes: gouge and paint (G1.5); Stems: wind up and spray or cut high and low and spray regrowth G200 or G200 + MM (ref 1).
58	Commelinaceae	Tradescantia fluminensis (Qld use T. albiflora) (wandering jew)	5	H/O	N/A	Spray F150 (as per label) or G200 or G200 + MM; Collect and bag or roll and rake carefully. Dispose (ref 1).
59	Solanaceae	Cestrum parqui (green cestrum)	6	S/O	Seedlings: Hand pull	Stems: CS&P (G1.5) or spray G100 (ref 1).
60	Caesalpiniaceae	Senna septemtrionalis (arsenic bush, was S. floribunda)	6	S/O	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1.5); Seedlings: spray G200 or G200 + MM or MM; collect and bag seeds (ref 1).
61	Solanaceae	Solanum mauritianum (wild tobacco tree)	8	S/O	Seedlings: Hand pull	Shrubs: CS&P (G1.5) or F/I (G1:1.5); Seedlings: spray G200 (ref 1).
62	Apocynaceae	Catharanthus roseus (pink periwinkle)	5	S/O	Hand pull	Spray G100 (ref 1).
63	Passifloraceae	Passiflora subpeltata (white passion flower)	10	V/O	Stems: Hand pull	Stems: CS&P; Seedlings & Regrowth: spray G200 or G200 + MM (ref 1).
64	Fabaceae	Desmodium uncinatum (silverleaf desmodium)	5	H/A	Hand pull or crown and dispose	CS&P tuberous roots (G1.5); spray G200 or G200 + MM or MM; collect and bag seeds (ref 1).
65	Poaceae	Melinis repens (red Natal grass)	10	H/A	Grazing or mowing	Spray: Fluazifop-P 212g/L @ 2L/Ha, Glyphosate 360g/L @ 1L/100L water (ref 2).
66	Nymphaeaceae	Nymphaea caerulea subsp. zanzibarensis (blue lotus)	4	Ha/OF	Hand pull small infestations.	Spray with or Diquat Glyphosate. Occurs in waterways, thus EPA should be notified before any herbicide use (ref 5).
67	Onagraceae	Oenothera drummondii subsp. drummondii (beach evening primrose)	3	H/O	Hand pull	Spray G100 (ref 1).
68	Tiliaceae	Triumfetta rhomboidea (Chinese burr)	7	H/U	Hand pull	Spray G100 (ref 1).
69	Haloragaceae	Myriophyllum aquaticum (parrot's feather)	3	Ha/F	N/A	Spray: glyphosate 360g/L @ 100mL/10L water (ref 1).
70	Passifloraceae	Passiflora foetida (stinking passion flower)	7	V/O	Hand Pull	CS&P (G1.5); spray G200 or G200 + MM (ref 1).
71	Asteraceae	Verbesina enceliioides (crownbeard)	7	H/U	Vines: Hand pull and remove; Runners: Roll up and hang to dry.	Stems: S&P (GU); Regrowth and seedlings: spray G200 or G200 + MM (ref 1).
72	Poaceae	Paspalum mandiocanum (broad leaf paspalum)	3	H/A	N/A	Spray G200 - resistant to weaker strength (ref 1).
73	Poaceae	Paspalum dilatatum (paspalum grass)	10	H/A	Hand pull or dig up	Spray G100 (ref 1).
74	Ruppiaceae	Ruppia maritima (sea tassel)	2	Ha/F	Hand pull or dig up	Spray G100 (ref 1).
75	Arecaceae	Syagrus romanzoffiana (queen palm)	4?	T/O	Seedlings: Hand pull or crown; Trees: cut below growing point	Trees: F/I (G1.5); Seedlings: spray G200 + MM (ref 1).
76	Poaceae	Hymenachne amplexicaulis cv. Olive (hymenachne)	1?	Ha/A	a combined approach of different control methods including mechanical, chemical and biological with land management practices is most effective	360 g/L Glyphosate (includes Roundup Biactive & Weedmaster Duo) – 1 L/100L water or 10 L/ha delivered by boom
77	Asteraceae	Senecio tamoides (Canary creeper)	3	V/O	Vines: Hand pull and remove; Runners: Roll up and hang to dry.	Stems: S&P (GU); Regrowth and seedlings: spray G200 or G200 + MM (ref 1).
78	Poaceae	Cenchrus ciliaris (buffel grass)	4	H/A	Hand or mechanical removal of young plants	Herbicide Control - Glyphosate 7mL/L water; Dichlobenil 600g/100m2; Fluazifop 50-100mL/10L water (ref 2).
79	Acanthaceae	Thunbergia grandiflora (thunbergia, blue thunbergia)	2	V/O	N/A	CS&P (G1.5); spray G200 (ref 1).
80	Cactaceae	Opuntia tomentosa (velvet tree pear)	8	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	Spray; Basal Bark application; Injection: Triclopyr: .8L/60L diesel. Picloram + Triclopyr: 1L/60L diesel. Amitrole: 1mL/3cm (ref 3).
81	Euphorbiaceae	Ricinus communis (castor oil plant)	7	S/O	Seedlings: Hand pull	Shrubs: S: CS&P or F/I (G1.5); Seedlings: spray G200 (ref 1).
82	Asteraceae	Senecio madagascariensis (fire weed)	6	H/U	Vines: Hand pull and remove; Runners: Roll up and hang to dry.	Stems: S&P (GU); Regrowth and seedlings: spray G200 or G200 + MM (ref 1).
83	Cyperaceae	Cyperus involucratus (African sedge)	6	Ha/OF	Each has to be dug out with a spade and the entire plant turned over, exposing the root system while making sure all aerial parts of the plant are completely covered.	Aquatic areas - Glyphosate ipa Land—commercial/industrial, rights of way - Glyphosate-ipa, glyphosate-mas, imazapyr
84	Asteraceae	Tithonia diversifolia (Mexican sunflower)	5	H/O	N/A	Stems: CS&P (G1.5) or cut and spray regrowth and seedlings (G100 or MM) (ref 1).
85	Poaceae	Setaria sphacelata (South African pigeon grass)	9	H/A	Hand pull or dig up	Spray G100 (ref 1).
86	Asclepiadaceae	Gomphocarpus physocarpus (balloon cotton bush)	10	S/OU	Slash in winter and burn cuttings. Wanderer Butterfly can also be used as biological control.	Spray: glyphosate @ 1:1000 with water, in spring before seeding (ref 3).
87	Poaceae	Digitaria didactyla (Queensland blue couch)	9	H/A	Hand pull or cultivation	Spot Spray: glyphosate or 2,2-DPA (ref 3)
88	Caesalpiniaceae	Gleditsia triacanthos (honey locust)	7	T/O	For the control of dense infestations on grazing land, burning followed by spot spraying is an economical control method.	pastures non-agricultural land fluroxpyr1 (Starane 200®) @ 1.5 L - 75ml/100 L diesel
89	Poaceae	Paspalum notatum (bahia grass)	4	H/A	Hand pull or dig up	Spray G100 (ref 1).
90	Cactaceae	Opuntia monacantha (drooping tree pear, syn. O. vulgaris)	2	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	Spray; Basal Bark application; Injection: Triclopyr: .8L/60L diesel. Picloram + Triclopyr: 1L/60L diesel. Amitrole: 1mL/3cm (ref 3).
91	Poaceae	Paspalum conjugatum (paspalum grass)	7	H/A	Cut below crown.	Spot Spray: glyphosate or 2,2-DPA (ref 3).
92	Malpighiaceae	Hiptage benghalensis (hiptage)	3	S,V/O	Hand pull small infestations.	Seedlings: Foliar spray of dicamba, fluroxypyr, and triclopyr/picloram. Larger plants cut stump application of fluroxypyr and triclopyr/picloram with diesel, glyphosate with water and picloram undiluted (ref 7).
93	Solanaceae	Solanum torvum (devil's fig)	6	S/O	Seedlings: Hand pull	Shrubs: CS&P (G1.5) or F/I (G1:1.5); Seedlings: spray G200 (ref 1).
94	Caesalpiniaceae	Caesalpinia decapetala (thorny poinciana)	4	S,V/O	Seed-heads: Bag and remove.	Stems: CS&P (G1.5); Seedlings: spray G200 or G200 + MM or MM (ref 1).
95	Poaceae	Pennisetum alopecuroides (swamp foxtail)	7	H/O	Hand Pull	Spot Spray: glyphosate or 2,2-DPA (ref 3)
96	Verbenaceae	Duranta erecta (duranta)	6	ST/O	Shrubs: CS&P (1:1.5)	Spray G100 (ref 1).
97	Brassicaceae	Nasturtium officinale (Qld use Rorippa nasturtium-aquaticum) (watercress)	7	Ha/FU	Manually grub and destroy.	Spray G100 and replace with local species (ref 1).
98	Polygonaceae	Acetosa sagittata (rambling dock)	4	V/U	Tubers: Dig up, bag and remove.	Tubers: Spray G200 or G200 + MM or MM (ref 1).
99	Poaceae	Cynodon dactylon (couch, Bahama grass introduced cultivars)	10	H/OA	Hand pull small infestations, removing all roots or smother with mulch.	Spray: glyphosate @ 200mL/15L water. Follow up spray (ref 3).
100	Bignoniaceae	Tecoma stans (yellow bells)	4	ST/O	N/A	Stems: CS&P (G1.5) or spray G200; Seeds: collect, bag and remove (ref 1).
101	Rosaceae	Rhaphiolepis indica (Indian hawthorn)	3	ST/O	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 or G200 + MM or MM (ref 1).
102	Mimosaceae	Mimosa pudica (common sensitive plant)	4	S/A	N/A	Pastures - Fluroxypyr/Starane 200 @ 1.5 L/ha Between cropping applications (conservation tillage) - Dicamba/Banvel 200 @ 0.8-1.4 L/ha
103	Commelinaceae	Callisia fragrans (purple succulent)	3	H/O	N/A	Spray F100 or G200 or G200 + MM; Collect and bag or roll and rake carefully. Dispose (ref 1).
104	Scrophulariaceae	Paulownia tomentosa (paulownia)	3	T/AO	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 (ref 1).
105	Commelinaceae	Tradescantia zebrina (zebrina)	3	H/O	N/A	Spray F100 or G200 or G200 + MM; Collect and bag or roll and rake carefully. Dispose (ref 1).
106	Acanthaceae	Ruellia malacosperma (ruellia)	5	H/O	N/A	Spray G200 + MM (ref 1).
107	Poaceae	Pennisetum clandestinum (kikuyu grass)	4	H/A	Hand Pull	Spot Spray: glyphosate or 2,2-DPA (ref 3)
108	Liliaceae	Lilium formosanum (Taiwan lily)	5	H/O	Hand pull or crown and dispose	Spray G100 + MM or MM (ref 1).
109	Asteraceae	Sigesbeckia orientalis (Indian weed)	10	H/U	Hand pull or cultivation.	Spray with 2,4-D amine or sodium, pr MCPA + dicamba (ref 3).
110	Asteraceae	Bidens pilosa (cobbler's pegs)	10	H/U	Hand pull or cultivation.	Spray with 2,4-D amine or sodium, pr MCPA + dicamba (ref 3).
111	Cactaceae	Opuntia stricta (common prickly pear)	7	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	Spray; Basal Bark application; Injection: Triclopyr: .8L/60L diesel. Picloram + Triclopyr: 1L/60L diesel. Amitrole: 1mL/3cm (ref 3).
112	Poaceae	Eleusine indica (crowsfoot grass)	8	H/A	Pull and chip. Replant with native couch.	Spray: glyphosate or 2,2-DPA (ref 3).
113	Poaceae	Axonopus compressus (broad leaved carpet grass)	5	H/AO	Cut stems from roos.	Spot spray with Glyphosate (ref 3).
114	Lamiaceae	Salvia coccinea (red salvia)	9	H/O	remove small areas by hand or machine	Aquatic areas (drains, channels, margins of streams, lakes and dams) - calcium dodecylbenzene sulphonate (AF-100) @ 1 part in 19 parts kerosene
115	Asteraceae	Ageratum houstonianum (blue billygoat weed)	8	H/UO	N/A	Spray G100 or hand pull and spray regrowth G100 (ref 1).

Note: Herbicides must be applied by appropriately qualified/ supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered products (such rates supersede those noted in above tables), or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable.

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ISO 9001 QUALITY Management System SOUTHPAC certifications

ISO 14001 ENVIRONMENT Management System SOUTHPAC certifications

AS 4801 OHS Management System SOUTHPAC certifications

Australian Institute of Landscape Architects

SCALE: AS NOTED

AMENDMENTS:

ISSUE	DATE	DESCRIPTION	CHECKED
A	06.10.2023	CLIENT ISSUE	RM
B	01.11.2023	PRELIMINARY ISSUE	RM

CLIENT: QUEENSLAND GOVERNMENT

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DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW CHECKED: RM

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PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
116	Myrtaceae	Psidium guajava and P. guineense (yellow guava and West Indes guava)	4	ST/AO	N/A	Shrubs: CS&P or F/I (G1.5) or spray G200 + MM or MM. Trial basal bark F100 or G200 + MM (ref 1).
117	Rosaceae	Rubus bellobatus (kittatinny blackberry)	5	S/O	slashing hinders growth, giving some control if plants are slashed before they seed	Grazon DS picloram/triclopyr 1:200 parts water + wetting agent
118	Myrtaceae	Eugenia uniflora (Brazilian cherry)	4	ST/O	N/A	Stems: C&P or F/I (G1.5); Bushes: spray or cut down and spray regrowth G100 or MM (ref 1).
119	Oleaceae	Olea europaea (olive)	2	T/A	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 or G200 + MM (ref 1).
120	Poaceae	Brachiaria decumbens (signal grass)	4	H/A	Grazing	Herbicide Control - Foliar application (Knapsack): glyphosate 360g/L @ 200mL/15L water; Foliar: glyphosate 360g/L @ 9L/Ha; Handgun: glyphosate 360g/L @ 1.3L/100L water (ref 2).
121	Fabaceae	Stylosanthes scabra (shrubby stylo)	4	H/A	N/A	Vines: CS&P (1:1.5) or spray G100 + MM or MM (ref 1).
122	Commelinaceae	Commelina benghalensis (hairy wandering jew)	4	H/O	Collect and Bag	Spray G200 or G200 + MM (ref 1).
123	Poaceae	Pennisetum purpureum (elephant grass)	2	H/O	Grazing or mechanical removal	N/A (ref 2).
124	Zingiberaceae	Hedychium coronarium (wild ginger)	2	H/O	Small Plants: Hand pull and dispose	Small Plants: spray G200 or G200 + MM; Large Plants: cut and spray regrowth. If rhizomes are at ground level, cut stem and gouge rhizome - fill hole with G1.5 with injector kit or similar (ref 1).
125	Phytolaccaceae	Phytolacca octandra (inkweed)	10	H/O	Hand pull or crown	CS&P (G1.5) or C&P (G1.5); spray G100 (ref 1).
126	Asclepiadaceae	Asclepias curassavica (red cotton bush)	9	S/O	Hand pull; Slash	Slash and/or spray G100 (ref 1).
127	Solanaceae	Lycium ferocissimum (African boxthorn)	1?	S/O	N/A	Stems: C&P (G1.5); Regrowth: spray G200 + MM (ref 1).
128	Mimosaceae	Prosopis pallida (algaroba)	2	ST/O	When using mechanical control methods, it is important to remove the bud zone of the root system (about 30 cm below the ground surface). If this is not removed, re-shooting can occur.	Basal bark - triclopyr + picloram Access® @ 1L/60L diesel. Cut stump - triclopyr + picloram Access® @ 1L/60L diesel. Overall spray - triclopyr + picloram Grazon DS® @ 350ml/100L water plus a wetting agent if plant is growing actively
129	Juncaceae	Juncus articulatus (jointed rush)	1	Ha/FO	Hand pull.	Spot spray with Glyphosate, 2,2-DPA or MCPA + dicamba (ref 3).
130	Cactaceae	Opuntia aurantiaca (tiger pear)	1	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	Spray; Basal Bark application; Injection: Triclopyr: .8l/60L diesel. Picloram + Triclopyr: 1L/60L diesel. Amitrole: 1mL/3cm (ref 3).

Note: Herbicides must be applied by appropriately qualified/ supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered products (such rates supersede those noted in above tables), or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable.
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RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
131	Poaceae	Arundo donax (giant reed)	1	H/O	Physical removal of small infestations.	Spot spray or cut stump and spray with Glyphosate (ref 5).
132	Cactaceae	Opuntia imbricata (rope pear)	1	H/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	Spray; Basal Bark application; Injection: Triclopyr: .8l/60L diesel. Picloram + Triclopyr: 1L/60L diesel. Amitrole: 1mL/3cm (ref 3).
133	Bignoniaceae	Pyrostegia venusta (flame vine)	1	V/O	N/A	CS&P (G1.5); spray G200 (ref 1).
134	Poaceae	Cortaderia selloana (pampas grass)	2	H/O	Small Plants: dig out by hand or machine	Stems: C&P (G1.5) or cut back and slash and spray regrowth G100 (ref 1).
135	Solanaceae	Solanum hispidum (giant devil's fig)	5	S/O	Hand pull	Spray G100 (ref 1).
136	Agavaceae	Furcraea foetida (Cuban hemp)	3	S/OA	Dig out by hand or machine	CS& P near ground or spray MM (ref 1).
137	Agavaceae	Furcraea selloa (hemp)	1	S/OA	Dig out by hand or machine	CS& P near ground or spray MM (ref 1).
138	Agavaceae	Agave americana (century plant)	4	S/OA	Dig out by hand or machine	CS& P near ground or spray MM (ref 1).
139	Rutaceae	Murraya paniculata cv. Exotica (murraya)	6	S/O	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1.5); Seedlings: spray G200 (ref 1).
140	Rosaceae	Rubus discolor (R. fruticosus complex, a blakberry)	4	S/OA	slashing hinders growth, giving some control if plants are slashed before they seed	Grazon DS picloram/triclopyr 1:200 parts water + wetting agent. A variety of herbicides may be used to control this species including (ref 5).
141	Brassicaceae	Cakile edentula (American sea rocket)	4	H/U	Manually grub and destroy.	Spray G100 and replace with local species (ref 1).
142	Balsaminaceae	Impatiens walleriana (balsam)	2	H/O	N/A	Spray G100 (ref 1).
143	Agavaceae	Agave sisalana (sisal)	2	S/OA	Dig out by hand or machine	CS& P near ground or spray MM (ref 1).
144	Agavaceae	Agave vivipara var. vivipara (sisal)	2	S/OA	Dig out by hand or machine	CS& P near ground or spray MM (ref 1).
145	Rosaceae	Prunus munsoniana (wild goose plum)	7	ST/A	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1.5); Seedlings: spray G200 (ref 1).
146	Poaceae	Echinochloa crus-galli (barnyard grass)	6	H/A	Hand pull or dig out small infestations.	Spot spraying with Glyphosate or 2,2-DPA (ref 3).
147	Asteraceae	Solidago canadensis var. scabra (Canadian goldenrod)	7	H/O	Hand pull and hang to dry.	Spray MM or G200 or G200 + MM if other weeds such as Lantana or Camphor Laurel are present (ref 1).
148	Fabaceae	Pueraria lobata (kudzu)	3	V,S/O	Slash; Diminish by shading site	CS&P (G1.5); spray G200 or MM (ref 1).
149	Alismataceae	Sagittaria graminea var. platyphylla (sagittaria arrowhead)	3	Ha/FO	Physical removal of small infestations.	Spot Spray with Glyphosate at 1.0L:100L water (ref 5).
150	Nymphaeaceae	Nymphaea mexicana (yellow waterlily)	2	Ha/OF	Hand pull small infestations.	Spray with or Diquat Glyphosate. Occurs in waterways, thus EPA should be notified before any herbicide use (ref 5).
151	Poaceae	Phyllostachys aurea (fishpole bamboo)	1	S/O	N/A	Stems: cut and fill segment (G1.5); Regrowth: spray G100 (ref 1).
152	Euphorbiaceae	Jatropha gossypiifolia (cotton-leaf physic nut, bellyache bush)	1	S/O	Hand pull	Spray G100 (ref 1).
153	Malvaceae	Sida rhombifolia (Paddy`s lucerne)	9	S/U	Hand pull or dig out.	Spray with 2,4-D amine or fluoxypyr (ref 3).

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154	Poaceae	Themeda quadrivalvis (grader grass)	8	H/A	Hand pull or dig out small infestations.	Spot spraying with Glyphosate or 2,2-DPA (ref 3).
155	Poaceae	Andropogon virginicus (whisky grass)	6	H/A	Hand pull or dig out small infestations.	Spot spraying with Glyphosate or 2,2-DPA (ref 3).
156	Bignoniaceae	Jacaranda mimosifolia (jacaranda)	4	T/O	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 (ref 1).
157	Acanthaceae	Justicia betonica (squirreltail)	2	S/O	Hand pull smal infestations. Can be controlled by planting competitive native species.	Glyphosate known to be effective.Species known to occur in waterways, DERM should be contacted before spraying in waterways (ref 4).
158	Mimosaceae	Acacia boliviana (Bolivian wattle)	1	T/O	Mechanical or chain removal.	Basal Bark or cut stump application. Triclopyr 600g/L at 1.0L:120L diesel, Triclopyr + Picloram 240 g/l + 120 g/l at 1.0L:60L diesel, Picloram 45 g/kg undiluted (ref 5).
159	Simaroubaceae	Ailanthus altissima (tree of heaven)	1?	T/O	Seedlings: Hand pull	Seedlings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 or MM (ref 1).
160	Poaceae	Echinochloa colona (awnless barnyard grass)	9	H/A	Hand or mechanical removal of small infestations	Spray: glyphosate @ 13mL/1L water (ref 2.)
161	Cyperaceae	Cyperus brevifolius (Mullumbimby couch)	8	H/O	Each has to be dug out with a spade and the entire plant turned over, exposing the root system while making sure all aerial parts of the plant are completely covered.	Aquatic areas - Glyphosate ipa Land—commercial/industrial, rights of way - Glyphosate-ipa, glyphosate-mas, imazapyr
162	Moraceae	Morus alba (white mulberry)	3	T/O	N/A	Trees: F/I (G1.5), stack cut branches above the ground to dry; Saplings: CS&P (G1.5); Seedlings: spray G200 (ref 1).
163	Arecaceae	Colocasia esculenta (taro)	3	H/AO	Hand pull.	Cut at base and apply glyphosate or metsulfuron methyl. Plant often occurs in waterways so consult DERM prior to application (ref 6).
164	Cannaceae	Canna indica (canna lily)	3	H/O	Dig out entire plant	Cut/Slash and spay regrowth G200 or G200 + MM; Collect and bad seeds. Resistant to herbicide (ref 1).
165	Buddlejaceae	Buddleja madagascariensis (buddleja)	5	S,V/O	N/A	Stems: CS&P (1:1.5); Vines: spray or cut down and spray regrowth G200 (ref 1).
166	Bignoniaceae	Tecoma capensis (Cape honeysuckle)	3	ST/O	N/A	Stems: CS&P (G1.5) or spray G200; Seeds: collect, bag and remove (ref 1).

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
167	Cactaceae	Harrisia martinii (harrisia cactus)	2?	S/O	The use of the biological mealy-bug agent is recommended	Triclopyr + picloram at 1.0L:60L diesel, Dichlorprop 600 g/l at 1.0L/60L water, metsulfuron methyl 600 g/l at 2.0L:100L water Ref 5).
168	Acanthaceae	Thunbergia laurifolia (laurel clock vine)	1	V/O	N/A	CS&P (G1.5); spray G200 (ref 1).
169	Fabaceae	Erythrina crista-galli (cockspur coral tree)	2?	T/O	N/A	F/I (G1.5) or C&P stumps. Cut and stack branches above ground to dry to prevent resprouting. F/I sprouted branches (G1.5) or spray regrowth G200 + MM or MM. Trial Tordon (ref 1).
170	Sapindaceae	Koelreuteria elegans (Chinese rain tree)	1?	T/O	Seedlings: Hand pull	Trees: F/I (G1.5) or C&P stumps (G1.5); Saplings: CS&P (G1); stack cut branches above ground to dry; Seedlings: spray (G200) (ref 1).
171	Zingiberaceae	Hedychium gardnerianum (ginger lily)	1?	H/O	Small Plants: Hand pull and dispose	Small Plants: spray G200 or G200 + MM; Large Plants: cut and spray regrowth. If rhizomes are at ground level, cut stem and gouge rhizome - fill hole with G1.5 with injector kit or similar (ref 1).
172	Acanthaceae	Hypoestes phyllostachya (polka-dot plant	3	H/O	Hand pull or crown and dispose	Spray G200 or G200 + MM (ref 1).
173	Caprifoliaceae	Sambucus canadensis (American elder)	3	ST/O	Vines and Runners: hand pull, roll up and hang to dry.	Vines and Runners: CS&P (G1.5); Larger Stems, Roots and Nodes: spray G100 + MM or MM (ref 1).
174	Asteraceae	Conyza sumatrensis (tall fleabane)	9	H/U	Hand or mechanical removal of small infestations	Seedlings: Altrazine or Chlorosulfuron in combination with competitive native species; Plants: Glyphosate and Tordon 75-D mix. Glyphosate ration depends on other weeds present (ref 2).
175	Fabaceae	Tipuana tipu (tipuana)	2	T/O	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 (ref 1).
176	Asteraceae	Tagetes minuta (stinking roger)	8	H/U	Hand pull and hang to dry.	Spray MM or G200 or G200 + MM if other weeds such as Lantana or Camphor Laurel are present (ref 1).
177	Caesalpiniaceae	Chamaecrista rotundifolia (round-leaf cassia)	6	ST/A	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1.5); Seedlings: spray G200 or G200 + MM or MM; collect and bag seeds (ref 1).
178	Poaceae	Cenchrus echinatus (Mossman river grass)	8	H/A	Hand or mechanical removal of young plants	Herbicide Control - Glyphosate 7mL/L water; Dichlobenil 600g/100m2; Fluazifop 50-100mL/10L water (ref 2).

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CLIENT: QUEENSLAND GOVERNMENT

PROJECT: BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW | CHECKED: RM

DRAWING #: **11612 L RP 10 B**

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PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
179	Asteraceae	Conyza canadensis (Canadian fleabane)	10	H/U	Hand or mechanical removal of small infestations	Seedlings: Altrazine or Chlorosulfuron in combination with competitive native species; Plants: Glyphosate and Tordon 75-D mix. Glyphosate ration depends on other weeds present (ref 2).
180	Euphorbiaceae	Euphorbia cyathophora (painted spuge)	8	H/O	Hand pull	Spray G100 (ref 1).
181	Poaceae	Setaria palmifolia (palm leaf setaria)	5	H/O	Hand pull or dig up	Spray G100 (ref 1).
182	Euphorbiaceae	Euphorbia heterophylla (milk weed)	5	H/O?	Hand pull	Spray G100 (ref 1).
183	Fabaceae	Desmodium intortum (greenleaf desmodium)	4	H/A	Hand pull or crown and dispose	CS&P tuberous roots (G1.5); spray G200 or G200 + MM or MM; collect and bag seeds. Monitor regrowth over 2 - 3 years (ref 1).
184	Poaceae	Pennisetum setaceum (fountain grass)	3	H/O	Hand Pull	Spot Spray: glyphosate or 2,2-DPA (ref 3)
185	Asteraceae	Conyza bonariensis (flax-leaf fleabane)	7	H/U	Hand or mechanical removal of small infestations	Seedlings: Altrazine or Chlorosulfuron in combination with competitive native species; Plants: Glyphosate and Tordon 75-D mix. Glyphosate ration depends on other weeds present (ref 2).
186	Solanaceae	Solanum erianthum (a tobacco bush)	7	S/O	Hand pull	Spray G100 (ref 1).
187	Poaceae	Stenotaphrum secundatum (buffalo grass)	3	H/AO	Hand or mechanical removal of small infestations	Spray: glyphosate @ 13mL/1L water (ref 2.)
188	Apocynaceae	Cascabela thevetia (syn. Thevetia peruviana) (yellow oleander)	5	ST/O	Hand pull small infesttions. Slashing can be used but should be followed up by herbicide application.	Basal bark application of fluroxypyr (35mL:1L Diesel); Stem injection Glyphosate (1L:2L Water); Cut stump application of fluroxypyr (1L:55L Diesel; Foliar Spray of fluroxypyr 1:100 for larger plants. 1:200 for seedlings (ref 2).
189	Rubiaceae	Coffea arabica (coffee)	3	ST/A	Saplings: Hand pull	Shrubs: F/I (G1) between flower and fruit set; Saplings: CS&P (G1); Seedlings: spray G200 or G200 + MM (ref 1).
190	Bignoniaceae	Spathodea campanulata (African tulip tree)	1?	T/O	N/A	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 (ref 1).
191	Fabaceae	Macrotyloma axillare (perennial horse gram)	4	V,H/A	N/A	Vines: CS&P (1:1.5) or spray G100 + MM or MM (ref 1).
192	Iridaceae	Watsonia meriana var. bulbillifera (bulbil watsonia)	2	H/O	Dig up, bag and remove	Spray G200 + MM (ref 1).
193	Passifloraceae	Passiflora edulis (passion fruit)	6	V/AO	Hand Pull	CS&P (G1.5); spray G200 or G200 + MM (ref 1).
194	Asteraceae	Zinnia peruviana (wild zinnia)	6	H/O	Seedlings: Hand pull	Shrubs: CS&P or F/I (G1); Seedlings: CS&P (G1.5) or spray G200 (ref 1).

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

RANK	FAMILY	SCIENTIFIC & COMMON NAME	SUBREGION	LIFE FORM & SOURCE	NON-CHEMICAL CONTROL	CHEMICAL CONTROL
195	Dracaenaceae	Sansevieria trifasciata (sansevieria)	2?	H/O	Hand pull or dig up	Spray G100 + MM (ref 1).
196	Poaceae	Digitaria eriantha (pangola grass)	5	H/A	Hand pull or cultivation	Spot Spray: glyphosate or 2,2-DPA (ref 3)
197	Rosaceae	Eriobotrya japonica (loquat)	3	T/O	Seedlings: Hand pull	Saplings: CS&P (G1.5); Trees: F/I (G1.5); Seedlings: spray G200 or G200 + MM or MM (ref 1).
198	Cactaceae	Acanthocereus tetragonus (sword pear)	1	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	Spray; Basal Bark application; Injection: Triclopyr: .8L/60L diesel. Picloram + Triclopyr: 1L/60L diesel. Amitrole: 1mL/3cm (ref 3).
199	Mimosaceae	Acacia nilotica subsp. indica (prickly acacia)	3	T/A	Mechanical or chain removal.	Basal Bark or cut stump application. Triclopyr 600g/L at 1.0L:120L diesel, Triclopyr + Picloram 240 g/l + 120 g/l at 1.0L:60L diesel, Picloram 45 g/kg undiluted (ref 5).
200	Mimosaceae	Acacia farnesiana (mimosa bush)	6	T/A	Mechanical removal of small plants.	Basal Bark or cut stump application of Triclopyr + Picloram 240 g/l + 120 g/l at 1.0L:60L diesel. Foliar application of Clopyralid 300g/L at 500mL:1L water ref 5).

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

Explanatory notes:

Sub-region: Number of the ten sub-regions of the Southeast Queensland bioregion (Young and Dillewaard 1999) within which species recorded (Queensland Herbarium data).

Rec no.: Total number of records for species within study area, Queensland Herbarium CORVEG and HERBRECS data.

Scores: Based on panel data of invasiveness, 5 (highest) to 3 (moderate). ? indicate doubtful scores.

Life forms: T-tree (woody plant >5m), ST-small tree (2-5m), S-shrub (woody <2m), H-herb (grasses & forbes), Ha-aquatic herbs.

Source: A-agriculture, O-ornamental and landscaping, F-fish aquarium, U-unintentional introduction and/or contaminant.

REHABILITATION METHODOLOGY - SITE WORKS - WEED NOTES

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

Abbreviations: Control Methods

CS&P = cut scrape and paint
S&P = scrape and paint
C&P = cut and paint
F/I = frill or inject stem

Abbreviations: Herbicides

G = Glyphosate, eg. Roundup Biactive, Weedmaster Duo
MM = Metsulfuron methyl, eg, Brushoff
F = Fluroxypyr, eg. Starane

Abbreviations: Herbicide Dilution Rates for High Concentration Applications

GU = Glyphosate undiluted
G1 = 1 part water to 1 part glyphosate
G1.5 = 1.5 parts water to 1 part glyphosate
G4 = 4 parts water to 1 part glyphosate

Abbreviations: Herbicide Spray Concentrations

G100 = 100mL glyphosate per 10L of water + surfactant, eg 20mL LI 700 per 10L
G200 = 200mL glyphosate per 10L of water + surfactant, eg 50mL LI 700 per 10L
G100 + MM = 100mL glyphosate + 1.5g metsulfuron methyl per 10L of water + wetting agent, eg. 2mL Agral per 10L water
G200 + MM = 200mL glyphosate + 1.5g metsulfuron methyl per 10L of water + wetting agent, eg. 2mL Agral per 10L water
MM = 1.5g metsulfuron methyl per 10L water + wetting agent, eg. 2mL Agral per 10L water
F100 = 100mL fluroxypyr per 10L water
F150 = 150mL fluroxypyr per 10L water

Other Abbreviations

= Locally non-indigenous native species

Ref. 1. Big Scrub Rainforest Landcare Group (2008), 'Common Weeds of Subtropical Rainforests of Eastern Australia: A practical manual on their identification and control'
Ref. 2. Department of Primary Industries and Fisheries (QLD), 'Weeds and pest animals and ants'.
Ref. 3. Holland et al. (1996), 'Suburban Weeds', DPI QLD.
Ref 4. Port Stephens Council (NSW), 'Weed Busters'.
Ref 5. Depertment of Primary Industries (NSW), 'Noxious and Environmental Weed Handbook, 3rd Edition'.
Ref 6. Department of Environment and Conservation, 'Florabase', (DEC- WA)
Ref 7. Vitelli, J.S. and Madigan, B.A. and Van Haaren, P.E. and Setter, S. and Logan, P. (2009) Control of the invasive liana, Hiptage benghalensis. Weed Biology and Management, 9 (1). pp. 54-62.

Note: Herbicides must be applied by appropriately qualified/ supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered products (such rates supersede those noted in above tables), or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable.

Note: Source for information contained on this page from Queensland Herbarium (Qld Gov't).

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PROJECT: BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW | CHECKED: RM

DRAWING #: **11612 L RP 11 B**

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BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - PLANTING NOTES

Following Primary weed management works, areas requiring infill planting (assisted natural regeneration), and larger scale planting (reconstruction and fabrication) can be undertaken. Prior to installation, the following items should be considered:

- Species selection
- Sourcing plant material
- Timing of planting
- Site preparation
- Planting density
- Planting installation

Species Selection

Species selection is critical in achieving the desired ecological restoration outcomes for rehabilitation sites. Planting is typically derived from:

- Local Regional Ecosystem (RE) descriptions.
- Observed site native vegetation.
- Bioretention guideline requirements.
- Climatic and weather conditions observed on site (frost, salt-spray, etc.).
- 'Pioneer' species are useful in site stablisation and encouraging native regeneration.
- Utilising flowering and fruiting species are useful to attract wildlife and result in introduction of seeds.
- Diverse vegetation layers (trees, shrubs, groundcovers).
- Species availability from seed propagation and/ or local nurseries.

Refer to plant schedule for species and planting densities.

Sourcing Plant Material

There are a number of options for sourcing plant material for revegetation purposes. Propagation from site seed is a good outcome however is often limited by required timing of works. Sourcing planting from local nurseries is the commonly-chosen option and has the following benefits:

- Awareness of genetic considerations when collecting seed.
- Experience with breaking dormancy mechanisms in hard to germinate seeds.
- Highly successful propagation techniques.
- Ability to provide high quality stock to order
- Draw on industry resources.

Timing of Planting

The timing of planting should ideally be aligned with the wet season in SEQ (summer and autumn). This minimises the need for intensive watering to establishment planting. Planting between February to May is the most beneficial as it also seeks to avoid intense heat periods of summer. Despite this, it is understood planting may occur at various times within rehabilitation areas due to development timing needs.

Site Preparation

Site or planting preparation includes:

- Fencing to exclude grazing animals and people (if required).
- Pre-spraying of exotic grasses and other weeds to planting areas.
- Consideration of source of water for new planting (access tracks, temporary irrigation).
- Arranging delivery of mulch, jutenetting and tree guards (if required).
- Treatment of heavily compacted soils by ripping and/or application of gypsum.
- Soil amelioration as required

Planting Density

Plant density is calculated on a zone by zone basis. This allows planting to cater for various requirements including standard revegetation, infill only requirements such as canopy trees at low densities, as well dense bioretention plantings as per Bioretention Technical Guidelines (where/ if applicable). Refer to plant schedule for species and planting densities.

Planting Installation

The following outlines the preferred installation methodology for revegetation works within the rehabilitation areas. It has been designed to maximise plant establishment success rates and minimise plant mortality. Revegetation works shall be either undertaken or directly supervised by an experienced and qualified contractor. All works shall be in accordance with the provisions of this Rehabilitation Plan, and local government policies and Australian Standards.

REHABILITATION METHODOLOGY - SITE WORKS - PLANTING NOTES

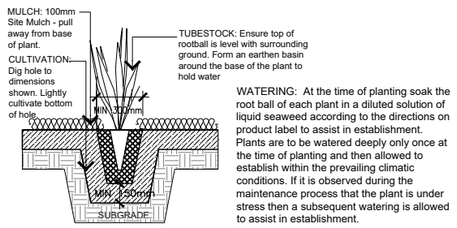
Plant installation methods shall include:

- Plants are to be vigorous, well established, hardened off, consistent with species or variety, free from disease and insect pests, with large root systems and no evidence of having been restricted or damaged. The landscape coordinator has the right to inspect and reject stock prior to planting.
- Tubestock is to be disease and pest free and purchased from local nurseries within 10kms of subject sites where possible.
- Plants are to be planted immediately after delivery to the planting site.
- Planting is to be undertaken in accordance with the planting module contained within this drawing sheet.
- Excavate planting medium to a depth suitable for the installation of tube or pot specimens. In areas where planting substrate is deemed to be very poor (compacted, nutrient deficient, hydrophobic, etc.) and above areas of potential frequent inundation and water flow, topsoil may be used.
- Pre-water plant hole, if soil is dry, to decrease root stress upon planting and assess the infiltration of water through the soil.
- Incorporate into the planting substrate the appropriate quantity of prepared water crystals or other suitable hydrating product such as Hortex 'Rainsaver' or 'Moisturaid'.
- Place plant into hole and backfill ensuring that the plant is upright and the stem is not covered in any less than 10mm or any more than 20mm of planting medium.
- Plants are to be watered thoroughly immediately after planting (ensure deep irrigation) and thereafter as required during the construction phase of the development depending on climatic conditions. Creation of a concave hollow around the base of each plant will aid water infiltration to the plant roots.
- A complete, slow release fertiliser is recommended, and is to be administered appropriately during planting. Top dressing with slow release fertiliser is preferred to avoid toxic levels of fertiliser accumulating in the plant hole around the plant roots.
- To ensure successful establishment, all planting surfaces must be covered in:
  a 100mm layer of high quality weed-free composted chip mulch (site mulch) - Note: to avoid possible stem rot in some 'drier' species ensure mulch is 'dished' and not covering plant stem by more than 20mm. Where available mulch material to be sourced from cleared vegetation material if adequately seasoned (12 weeks minimum).
  •• suitable individual anchored natural fibre weed mat (jutenetting); or
- A long term slow release fertiliser, such as Nutricote or similar product should be used for all plantings after initial plant establishment.
- A minimum 90% survival rate should be achieved.
- Any planting substitutions to be approved by Superintendent and Assessment Manager where applicable.
- Any wheel ruts from site works within rehabilitation areas to be rectified to minimise risk of erosion and use as conduits for introduced species (such as cane toads).
- Consideration for requirements under "Hygiene protocol for handling amphibians" by the Qld Government should be also given including washdown requirements and handling on site as required.

REHABILITATION METHODOLOGY - SITE WORKS - PLANTING NOTES

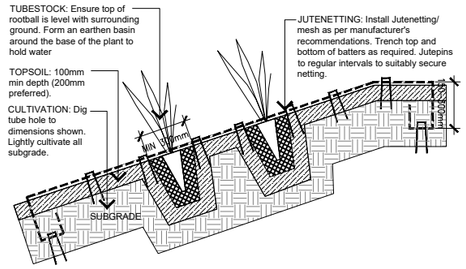
Typical planting details as below for standard medium/ mulch installation and jutenetting. Refer to manufacturer's recommendations for detailed jutenetting installation including pinning, etc.

Each individual planting location should be spot cultivated to at least 2 times the depth and twice the width of the plant stock size.



WATERING: At the time of planting soak the root ball of each plant in a diluted solution of liquid seaweed according to the directions on product label to assist in establishment. Plants are to be watered deeply only once at the time of planting and then allowed to establish within the prevailing climatic conditions. If it is observed during the maintenance process that the plant is under stress then a subsequent watering is allowed to assist in establishment.

Where evidence of plant damage is occuring, tree guards/ growtubes to be installed as required.

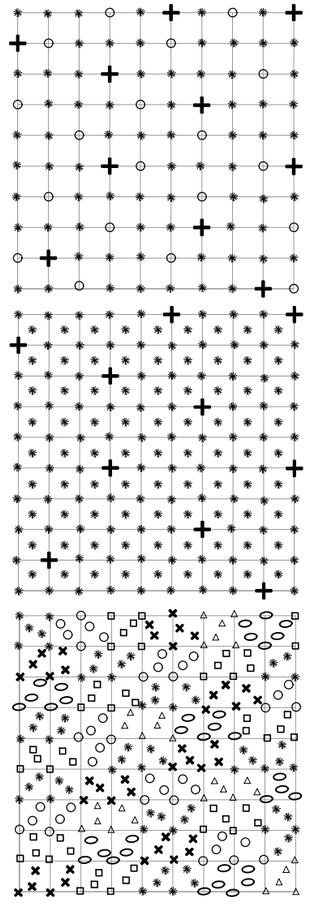


Jutenetting/ mesh to be installed as per manufacturer's recommendations. Indicative detail shown only.

Jutenetting/ mesh to be installed as per manufacturer's recommendations. Indicative detail shown only.

REHABILITATION METHODOLOGY - SITE WORKS - PLANTING NOTES

Revegetation planting locations shall be generally setout in accordance with a typical random grid pattern as shown below. Various typical densities shown. Refer to plant schedule for species and planting densities.



Note: Source for information contained on this page from SEQERF.

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DRAWN: FW CHECKED: RM

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BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - PLANT SCHEDULES

BUNDABERG HOSPITAL
ZONE 1 - EXISTING VEGETATION
Recommended Species List Total. Approximate Area = 306,500m2
Revegetation Allowance (assumed minor disturbances) - 16,000m2

NOTES:
1) Species selected from site and local species mix (RE 12.5.4)
2) Setback trees 3m min from all property boundaries, sewer, retaining walls and service alignments.
3) Refer to additional plans for general locations and additional details for planting notes.
4) Distribute plants in groups on site in random arrangement to be confirmed with superintendent on site.

SPECIES	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY OVERALL @ 1ER 1M²	QUANTITY
TREES				**1/10m2**	
Allocasuarina torulosa	Forest Oak	Tree	Tree	1/250m2	58
Angophora leiocarpa	Pink Bloodwood	Tree	Tube	1/85m2	175
Eucalyptus crebra	Narrow Leaved Ironbark	Tree	Tube	1/250m2	58
Lucalyptus exserta	Queensland Peppermint	Tree	Tube	1/85m2	175
Corymbia intermedia	Pink Bloodwood	Tree	Tube	1/85m2	175
Corymbia trachyphloia	Brown Bloodwood	Tree	Tube	1/85m2	175
Eucalyptus drepanophylla	White Mahogany	Tree	Tube	1/85m2	175
Eucalyptus siderophloia	Grey Ironbark	Tree	Tube	1/250m2	58
Eucalyptus tereticornis	Forest Red Gum	Tree	Tube	1/250m2	58
Lophestmon confertus	Brush Box	Tree	Tube	1/250m2	58
Lophestmon suaveolens	Swamp Box	Tree	Tube	1/250m2	58
Melaleuca viridiflora	Broad Leaved Paperbark	Tree	Tube	1/85m2	175
Melaleuca quinquenervia	Paperbark	Tree	Tube	1/250m2	58
				SUBTOTAL	**1456**
SHRUBS				**1/5m2**	
Acacia concurrens	Black Wattle	Shrub	Tube	1/50m2	285
Acacia disparrima	Acadia	Shrub	Tube	1/50m2	285
Acacia flavescens	Acadia	Shrub	Tube	1/50m2	525
Acacia leiocalyx	Black Wattle	Shrub	Tube	1/50m2	525
Allocasuarina littoralis	Black She Oak	Shrub	Tube	1/50m2	525
Banksia integrifolia	Coastal Banksia	Shrub	Tube	1/50m2	285
Grevillea banksii	Banks' Grevillea	Shrub	Tube	1/50m2	285
Jacksonia scoparia	Dogwood	Shrub	Tube	1/50m2	285
				SUBTOTAL	**3000**
GROUNDCOVERS				**1/m2**	
Cymbopogon refractus	Barbed Wire Grass	Ground	Tube	1/8m2	1875
Dianella longifolia	Flax Lilly	Ground	Tube	1/8m2	1875
Dianella caerulea	Blue Flax Lilly	Ground	Tube	1/8m2	1875
Eremochloa bimaculata	Poverty Grass	Ground	Tube	1/8m2	1875
Imperata cylindrica	Blady Grass	Ground	Tube	1/8m2	1875
Lomandra longifolia	Mat Rush	Ground	Tube	1/8m2	1875
Lomandra multiflora	Mat Rush	Ground	Tube	1/8m2	1875
Themeda triandra	Kangaroo Grass	Ground	Tube	1/8m2	1875
				SUBTOTAL	**15000**
				TOTAL	**19456**

BUNDABERG HOSPITAL
ZONE 2 - GENERAL REVEGETATION
Recommended Species List Total. Approximate Area = 6,500m2
(Overall density approximately 1 plants min per m2)

NOTES:
1) Species selected from site and local species mix (RE 12.5.4)
2) Setback trees 3m min from all property boundaries, sewer, retaining walls and service alignments.
3) Refer to additional plans for general locations and additional details for planting notes.
4) Distribute plants in groups on site in random arrangement to be confirmed with superintendent on site.

SPECIES	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY OVERALL @ 1ER 1M²	QUANTITY
TREES				**1/10m2**	
Allocasuarina torulosa	Forest Oak	Tree	Tree	1/250m2	30
Angophora leiocarpa	Pink Bloodwood	Tree	Tube	1/85m2	75
Eucalyptus crebra	Narrow Leaved Ironbark	Tree	Tube	1/250m2	30
Lucalyptus exserta	Queensland Peppermint	Tree	Tube	1/85m2	75
Corymbia intermedia	Pink Bloodwood	Tree	Tube	1/85m2	75
Corymbia trachyphloia	Brown Bloodwood	Tree	Tube	1/85m2	75
Eucalyptus drepanophylla	White Mahogany	Tree	Tube	1/85m2	75
Eucalyptus siderophloia	Grey Ironbark	Tree	Tube	1/250m2	30
Eucalyptus tereticornis	Forest Red Gum	Tree	Tube	1/250m2	30
Lophestmon confertus	Brush Box	Tree	Tube	1/250m2	30
Lophestmon suaveolens	Swamp Box	Tree	Tube	1/250m2	30
Melaleuca viridiflora	Broad Leaved Paperbark	Tree	Tube	1/85m2	75
Melaleuca quinquenervia	Paperbark	Tree	Tube	1/250m2	30
				SUBTOTAL	**660**
SHRUBS				**1/5m2**	
Acacia concurrens	Black Wattle	Shrub	Tube	1/50m2	135
Acacia disparrima	Acadia	Shrub	Tube	1/50m2	135
Acacia flavescens	Acadia	Shrub	Tube	1/50m2	205
Acacia leiocalyx	Black Wattle	Shrub	Tube	1/50m2	205
Allocasuarina littoralis	Black She Oak	Shrub	Tube	1/50m2	205
Banksia integrifolia	Coastal Banksia	Shrub	Tube	1/50m2	135
Grevillea banksii	Banks' Grevillea	Shrub	Tube	1/50m2	135
Jacksonia scoparia	Dogwood	Shrub	Tube	1/50m2	135
				SUBTOTAL	**1290**
GROUNDCOVERS				**1/m2**	
Cymbopogon refractus	Barbed Wire Grass	Ground	Tube	1/8m2	800
Dianella longifolia	Flax Lilly	Ground	Tube	1/8m2	800
Dianella caerulea	Blue Flax Lilly	Ground	Tube	1/8m2	800
Eremochloa bimaculata	Poverty Grass	Ground	Tube	1/8m2	800
Imperata cylindrica	Blady Grass	Ground	Tube	1/8m2	800
Lomandra longifolia	Mat Rush	Ground	Tube	1/8m2	800
Lomandra multiflora	Mat Rush	Ground	Tube	1/8m2	800
Themeda triandra	Kangaroo Grass	Ground	Tube	1/8m2	800
				SUBTOTAL	**6400**
				TOTAL	**8350**

BUNDABERG HOSPITAL
ZONE 3 - SWALE REVEGETATION
Recommended Species List Total. Approximate Area = 13,150m2
(Overall density approximately 3 plants min per m2)

NOTES:
1) Species selected from site and local species mix (RE 12.5.4)
2) Setback trees 3m min from all property boundaries, sewer, retaining walls and service alignments.
3) Refer to additional plans for general locations and additional details for planting notes.
4) Distribute plants in groups on site in random arrangement to be confirmed with superintendent on site.

SPECIES	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY OVERALL @ 1ER 1M²	QUANTITY
TREES (HIGH BANK ONLY)				**1/10m2**	
Allocasuarina torulosa	Forest Oak	Tree	Tree	1/75m2	180
Corymbia intermedia	Pink Bloodwood	Tree	Tube	1/75m2	180
Eucalyptus tereticornis	Forest Red Gum	Tree	Tube	1/75m2	180
Lophestmon confertus	Brush Box	Tree	Tube	1/75m2	180
Lophestmon suaveolens	Swamp Box	Tree	Tube	1/75m2	180
Melaleuca viridiflora	Broad Leaved Paperbark	Tree	Tube	1/75m2	180
Melaleuca quinquenervia	Paperbark	Tree	Tube	1/75m2	180
				SUBTOTAL	**1260**
GROUNDCOVERS				**3/m2**	
Cymbopogon refractus	Barbed Wire Grass	Ground	Tube	1/2.5m2	5635
Dianella longifolia	Flax Lilly	Ground	Tube	1/2.5m2	5635
Dianella caerulea	Blue Flax Lilly	Ground	Tube	1/2.5m2	5635
Imperata cylindrica	Blady Grass	Ground	Tube	1/2.5m2	5635
Lomandra longifolia	Mat Rush	Ground	Tube	1/2.5m2	5635
Lomandra multiflora	Mat Rush	Ground	Tube	1/2.5m2	5635
Themeda triandra	Kangaroo Grass	Ground	Tube	1/2.5m2	5635
				SUBTOTAL	**39445**
				TOTAL	**40705**

BUNDABERG HOSPITAL
ZONE 4 - DETENTION REVEGETATION
Recommended Species List Total. Approximate Area = 7,700m2
(Overall density approximately 3 plants min per m2)

NOTES:
1) Species selected from site and local species mix (RE 12.5.4)
2) Setback trees 3m min from all property boundaries, sewer, retaining walls and service alignments.
3) Refer to additional plans for general locations and additional details for planting notes.
4) Distribute plants in groups on site in random arrangement to be confirmed with superintendent on site.

SPECIES	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY OVERALL @ 1ER 1M²	QUANTITY
TREES (HIGH BANK ONLY)				**1/10m2**	
Allocasuarina torulosa	Forest Oak	Tree	Tree	1/115m2	55
Corymbia intermedia	Pink Bloodwood	Tree	Tube	1/115m2	55
Eucalyptus tereticornis	Forest Red Gum	Tree	Tube	1/115m2	55
Lophestmon confertus	Brush Box	Tree	Tube	1/115m2	55
TREES (ALL ZONES)				**1/5m2**	
Lophestmon suaveolens	Swamp Box	Tree	Tube	1/25m2	150
Melaleuca viridiflora	Broad Leaved Paperbark	Tree	Tube	1/25m2	150
Melaleuca quinquenervia	Paperbark	Tree	Tube	1/25m2	350
				SUBTOTAL	**1310**
SHRUBS (MID- HIGH BANK ONLY)				**1/5m2**	
Acacia flavescens	Acacia	Shrub	Tube	1/60m2	130
Acacia leiocalyx	Black Wattle	Shrub	Tube	1/60m2	130
Allocasuarina littoralis	Black She Oak	Shrub	Tube	1/60m2	130
Banksia integrifolia	Coastal Banksia	Shrub	Tube	1/60m2	130
Grevillea banksii	Banks' Grevillea	Shrub	Tube	1/60m2	130
Jacksonia scoparia	Dogwood	Shrub	Tube	1/60m2	130
				SUBTOTAL	**780**
GROUNDCOVERS				**3/m2**	
Carex appressa	"Tall Sedge"	Ground	Tube	1/2m2	3850
Imperata cylindrica	"Blady Grass"	Ground	Tube	1/2.5m2	1880
Ficinia nodosa	"Knobby club-sedge"	Ground	Tube	1/2m2	1880
Lomandra longifolia	"Long-leaved Matrush"	Ground	Tube	1/2m2	1880
Poa labillardieri	"Common Tussock Grass"	Ground	Tube	1/2m2	3850
Themeda australis	"Kangaroo Grass"	Ground	Tube	1/2m2	3850
				SUBTOTAL	**23100**
				TOTAL	**25190**

BUNDABERG HOSPITAL
ZONE 5 - WETLAND REVEGETATION
Recommended Species List Total. Approximate Area = 800m2
(Overall density approximately 8 plant min per m2)

NOTES:
1) Plant species selected from Bio-Retention Technical Guidelines (Water by Design). Upon 80% construction,
2) Setback trees 3m min from all property boundaries, sewer, retaining walls and service alignments.
3) Refer to additional plans for general locations and additional details for planting notes.
4) Distribute plants in groups on site in random arrangement to be confirmed with superintendant on site.

SPECIES	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY OVERALL @ 1ER 1M²	QUANTITY
TREES/ SHRUBS (MID- HIGH BANKS - ASSUME 50% OF AREA)				**1/5m2**	
Lophestmon suaveolons	Swamp Box	Tree	Tube	1/25m2	16
Melaleuca viridiflora	Broad Leaved Paperbark	Tree	Tube	1/25m2	16
Melaleuca quinquenervia	Paperbark	Tree	Tube	1/25m2	16
Allocasuarina littoralis	Black She Oak	Shrub	Tube	1/25m2	16
Banksia integrifolia	Coastal Banksia	Shrub	Tube	1/25m2	16
				SUBTOTAL	**80**
GROUNDCOVERS (MID-HIGH BANKS - ASSUME 50% OF AREA)				**6/m2**	
Carex appressa	"Tall Sedge"	Ground	Tube	1/1m2	260
Imperata cylindrica	"Blady Grass"	Ground	Tube	1/1m2	260
Ficinia nodosa	"Knobby club-sedge"	Ground	Tube	1/1m2	260
Lomandra longifolia	"Long-leaved Matrush"	Ground	Tube	1/1m2	260
Poa labillardieri	"Common Tussock Grass"	Ground	Tube	1/1m2	260
Themeda australis	"Kangaroo Grass"	Ground	Tube	1/1m2	260
				SUBTOTAL	**1560**
GROUNDCOVERS (LOW BANKS / MARSH AREAS- ASSUME 50% OF AREA)				**8/m2**	
Baumea articulata	Jointed Twig Rush	Ground	Tube	1/2m2	400
Baumea juncea	Bare Twig Rush	Ground	Tube	1/2m2	400
Cyperus exaltatus	Giant Sedge	Ground	Tube	1/2m2	400
Eleocharis cylindrostachys	Drooping Spike Rush	Ground	Tube	1/2m2	400
Eleocharis sphacelata	Tall Spike Rush	Ground	Tube	1/2m2	400
Gahnia sierberiana	Saw Sedge	Ground	Tube	1/2m2	400
Lepironia articulata	Grey Rush	Ground	Tube	1/2m2	400
Schoenoplectus mucronatus	Bog Bulrush	Ground	Tube	1/2m2	400
				SUBTOTAL	**3200**
				TOTAL	**4840**

NOTE:
Final planting species and densities subject to minor alteration at the direction of project landscape architect based on specific site areas during on-site inspections.

Note: Source for information contained on this page from SEQERF.

ISO 9001 QUALITY Management System SOUTHPAC certifications
ISO 14001 ENVIRONMENT Management System SOUTHPAC certifications
AS 4801 OHS Management System SOUTHPAC certifications
Australian Institute of Landscape Architects

SCALE: AS NOTED

AMENDMENTS:

ISSUE	DATE	DESCRIPTION	CHECKED
A	06.10.2023	CLIENT ISSUE	RM
B	01.11.2023	PRELIMINARY ISSUE	RM

CLIENT: QUEENSLAND GOVERNMENT

PROJECT: BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

DRAWING: **REHABILITATION PLAN REHABILITATION NOTES**

DRAWN: FW CHECKED: RM

DRAWING #: **11612 L RP 13 B**

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BUNDABERG HOSPITAL - LOT 23 BUNDABERG RING ROAD, THABEBAN

PRELIMINARY REHABILITATION NOTES

REHABILITATION METHODOLOGY - SITE WORKS - FAUNA NOTES

Consideration for fauna habitat and values should be given during rehabilitation site works and should seek to enhance and restore the existing native vegetation areas and promote safe fauna movement throughout the site and into the larger greenspace corridors where possible. It is assumed properties adjacent to the rehabilitation scope of works will undertake individual site analysis, fauna investigations, and implement future measures as required.

As part of these rehabilitation works, basic fauna works will be undertaken. These treatments will primarily involve:

- Fauna Habitat Value and Protection - Increased fauna habitat value within the rehabilitation areas.

Fauna Habitat Value and Protection

Rehabilitation Areas to include reuse of site fallen / hollow logs and site rock to create fauna safe havens and cover from predators for small fauna. This approach coupled with additional revegetation works allows greater fauna security and movement within the rehabilitation areas. Consideration for bushfire requirements should be reviewed to confirm no conflict in both the fauna and rehabilitation approaches. Refer indicative images below.

REHABILITATION METHODOLOGY - MAINTENANCE & MONITORING

Maintenance, as with all ecological restoration work is fundamental in ensuring project success. Maintenance of the planting includes:

- Herbicide spraying to control competing weeds.
- Watering while plants are establishing. This is often highly variable and depends on the suite of species planted, weather conditions and time of year when planted. A watering schedule may consist of watering every day for week 1, twice per week for weeks 2-6 and then weekly from weeks 6-12. Contractor to confirm final watering regime. Ongoing watering may be required subject to weather conditions during maintenance period.
- Repair of tree guards if they become damaged.
- Replenishment of mulch.
- Maintaining exclusion fencing; and
- Additional planting if required.

Additional planting may be required to replace plants that do not survive (e.g. to meet survival rate requirements, or to fill gaps), but it may also be necessary to introduce new species at different stages of vegetation succession. An adaptive management approach should be utilised, if one plant species consistently dies on a site, consider using in its place a species that is performing well.

Maintenance is required following installation of the plants, although if maintenance is regular and thorough during the first year, maintenance requirements are likely to taper off significantly in the following years.

The utilisation of benchmark criteria helps to determine rehabilitation success during the maintenance period and assists in prompting when additional maintenance activities are required. Typically accepted benchmarks or performance indicators for dedicated or open space rehabilitation works include:

- Compliance / 'On Maintenance' requirements;
  - All required planting completed.
  - 90% plant survival.
  - 100% kill rate of declared environmental weeds.
  - Maintenance access (including tracks, fencing, etc.).
- Ongoing / "Off Maintenance' requirements;
  - 80% plant survival.
  - Tree guards, stakes and general rubbish removed.
  - No remaining eroded or degraded areas.
  - 100% kill rate of declared environmental weeds.

The desired end-product is a fully-functioning system that can support itself in perpetuity, with minimal maintenance and input required.

REHABILITATION METHODOLOGY - MAINTENANCE & MONITORING

It is also critical for all parties to understand their responsibilities as part of the overall rehabilitation 'team'.

REHABILITATION TEAM RESPONSIBILITIES

PARTY	DESCRIPTION
Proponent	Ensure all consultants, contractors, sub contractors or others utilizing the area are aware of the Rehabilitation Plan. Appoint appropriate consultants and contractors to undertake works as prescribed on the drawings and conditioned by the Assessment Manager. Provide security via an uncompleted works bond and maintenance bond for the cost of works if required. Cover the costs of all necessary resources to ensure works are completed as per the approved documents.
Consultants	Brief proponent on their requirements in implementing and maintaining works as per the Rehabilitation Plan. Attend pre-start and compliance (on and off maintenance) inspections. Undertake monitoring and reporting to the Assessment Manager as set up by this document. Be available to respond to technical queries to the approved documentation when on-site conditions require changes. Liaise with the Assessment Manager throughout all stages of approval, initial works and maintenance of works.
Assessment Manager	Provide technical expertise via commentary on the approval of documentation. Attend pre-start and compliance (on and off maintenance) inspections. Reduce and release securities held against works at the completion of successful milestone inspections. Be available to respond to technical queries to the approved documentation when on-site conditions require changes. Accept and review maintenance reports as dictated (if required) in this document.
Contractor	Complete works in strict accordance with the documentation. Attend pre-start and compliance (on and off maintenance) inspections. Hold relevant licenses in applicable weed management/ revegetation/ fauna management, any required insurances for scope of works and an understanding of required Laws, Act, Policies and Guidelines. Recommend changes to the documentation when specific experience or on-site conditions require so. Hold minimum certifications such as Certificate III in Conservation and Land Management, or Certificate III in Horticulture, or Certificate III in Rehabilitation Construction, or equivalent experience in rehabilitation.

REHABILITATION METHODOLOGY - MAINTENANCE & MONITORING

Informal Monitoring of rehabilitation works is another method of determining ecological restoration success in conjunction with the adjacent benchmarks. Informal monitoring to occur through ongoing site inspections and note-taking. Notes to be distributed to the rehabilitation team and rectification works completed against notes.

Monitoring of the weed management and revegetation works allows for:

- Review of the pre-established performance indicators for measuring the success of the weed removal and control.
- Ensure level of protection for existing identified native vegetation inclusive of that which has naturally regenerated
- Review the rate of spread or contraction of weed infestation within the control program.
- Monitor the rate of assisted regeneration and revegetation of desirable native species promoted in areas where weeds have been removed.
- Identification of new weed threats or other factors which may be effecting areas designated for rehabilitation.

Monitoring timeframes may involve a series of key milestones:

- Prestart Inspection - On site meeting prior to the initial commencement of work. Typically involves Consultant, Contractor and Assessment Manager to work through rehabilitation areas and clarify any adjustments to scope against approved works.
- Compliance (On/ Off Maintenance) Inspections - At the completion of the Primary Site Works (Practical Completion), an inspection meeting will be held with the Consultant, Contractor and Assessment Manager to inspect the works on-site in relation to the approved plans and previously agreed benchmarks / performance indicators.
- Ongoing Monitoring Inspections- Informal monitoring to occur on a regular basis as highlighted above. These inspections will generally occur throughout the process, specifically before, during and after relevant compliance inspections.

Note: Source for information contained on this page from SEQERF.

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DRAWN: FW CHECKED: RM

DRAWING #: **11612 L RP 14 B**

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Attachment A15

Project Preliminary Land-based Offset Strategy

PRELIMINARY LAND-BASED OFFSET STRATEGY (EPBC2022/09397)

BUNDABERG HOSPITAL PROJECT

DECEMBER 2023

[VERSION 1.1]

Queensland Government

VERSION NUMBER AND DATE	PERSON RESPONSIBLE
VERSION 1.1 – DECEMBER 2023	MD / MS

TABLE OF CONTENTS

INTRODUCTION

This document presents the Preliminary Land Based Offset Strategy for impacts associated with the new Bundaberg Hospital Project. The proposed development site is located on Kay McDuff Drive in the suburb of Thabeban, on Lot 23 SP212513 and occurs on land that totals 65.3 ha (refer to Figure 1 for Site Context and Figure 2 for Site Aerial). The proposed action includes the main hospital, mental health inpatient unit, the facility support centre and multi-level car park. The proposed action comprises of approximately 24.2 ha of developable land with approximately 41.1 ha bushland retained to the south (refer to Figure 3 for the Hospital Development Plan).

On the 15th July 2022 a referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was made to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for a controlled action assessment. On the 3rd February 2023 this application was deemed a Controlled Action requiring assessment by "Preliminary Documentation".

The Controlled Action decision was based on the determination of potential impacts on the following Matters of National Environmental Significance (MNES):

- Listed threatened species and communities (sections 18 & 18A) protected under Part 3 of the EPBC Act, specifically:
    - Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (*Phascolarctos cinereus*) – Endangered.
    - Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable.
    - Greater Glider (*Petauroides volans*) – Endangered.

With the February 2023 controlled action determination, the DCCEEW provided a list of additional information required to be addressed within the Preliminary Documentation (PD) report. The PD additional information request formally outlined the need for the project to provide either an Offset Strategy or Offset Management Plan for any significant impacts occurring as part of the project. This document represents a Preliminary Offset Strategy.

PURPOSE AND STRUCTURE OF THE STRATEGY

The DCCEEW describes an Offset Strategy (OS) as a proof-of concept for a future offset proposal. It demonstrates a broad suitability and feasibility of offsets and commits to core timeframes. This OS has been prepared to demonstrate Queensland Health's commitments to delivering and EPBC Act compliant offset while they continue to secure and detail the proposal. This OS covers the following core sections:

1. Documents the impact proposal summarising the quantum impact on protected matters
2. Actions and processes being undertaken to date by Queensland Health in sourcing and securing suitable offset sites
3. Review of two (2) potential sites currently under consideration [site's de identified due to confidentiality]
4. Suitability of proposed offsets against the EPBC Act Offset Policy Criteria
5. Outcomes, Risks and Management Actions of Future Environmental Offsets
6. Measures to legally secure the offset site and values.

This OS includes a number of technical attachments which cover more detailed data from the impact site and the survey methodologies to be deployed at the offset site.

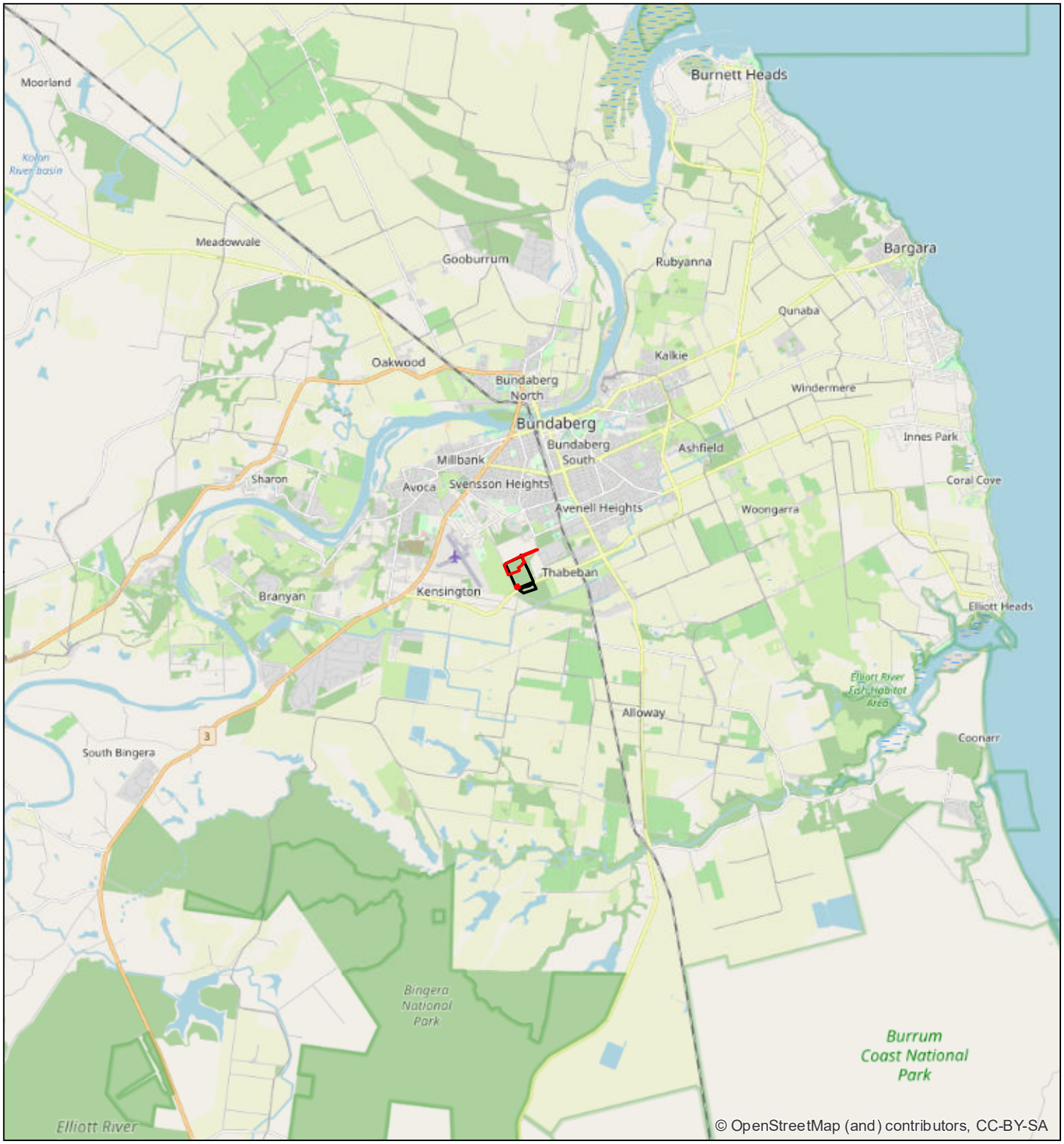
PROJECT SITE AND IMPACT SUMMARY

The Queensland Government has committed $1.2 billion to the New Bundaberg Hospital in the 2022 /23 budget as part of the *Queensland Health and Hospitals Plan.* The project will deliver an additional 121 beds and is scheduled for completion in the second half of 2027. The current Bundaberg Hospital is challenged by flooding constraints precluding its upgrade and re-use. After a significant site selection process Queensland Health located and sought numerous approvals for the construction of the new hospital in Thabeban, Bundaberg. One of the remaining approvals to be achieved is required under the EPBC Act for impacts on Koala and Grey-headed Flying-fox habitat.

Table 1 provides details on the impact area:

Table 1: Details on impact area

Address	Bundaberg Ring Road, Thabeban, Queensland, 4670
RPD	Lot 23 on SP212513 Lot 1 on SP285136
Referral Area	65.3ha
Development Footprint	24.2 ha
Retained Area	41.1 ha
NCA 1992	High Risk Area for Protected Plants
VMA 1999	Category X (non-remnant), Category B (Least Concern),
Fisheries 1994	No Waterways for Waterway Barrier Works are mapped onsite.
State Planning Policy	Does not apply
Koala Habitat	Does not apply
LGA	Bundaberg Regional Council
Planning Scheme / Local Plan	Bundaberg Regional Council Planning Scheme 2015
Existing Land Use	Open Space
Proposed Land Use	Hospital / Open Space



Legend

- Site DCDB
- Project Disturbance Footprint

Figure 1

Site Context

Queensland Government
Queensland Health

File ref. 11612 E Figure A1 Site Context A
Date 15/11/2023
Project Bundaberg Hospital

0 1 2 3 4 5 km

N

Scale (A4): 1:175,000 [GDA 2020 MGA Z56]

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Layer Source: © State of Queensland 2023

Legend

- Qld DCDB
- Site DCDB
- Project Disturbance Footprint

Figure 2

Site Aerial

Queensland Government
Queensland Health

File ref. 11612 E Figure A2 Site Aerial A
Date 15/11/2023
Project Bundaberg Hospital

0 50 100 150 200 250 m

N

Scale (A4): 1:8,000 [GDA 2020 MGA Z56]

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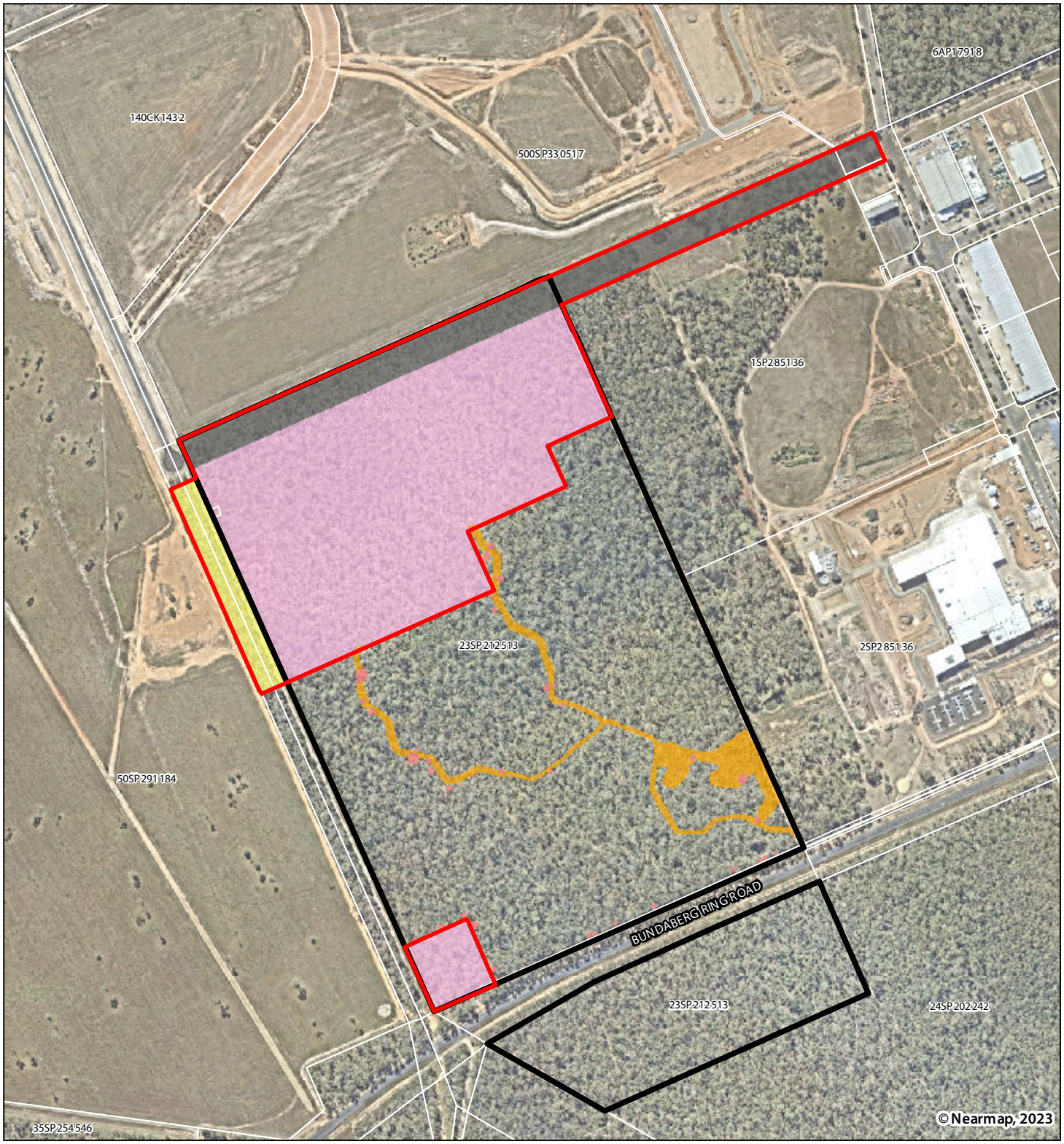
Layer Source: © State of Queensland 2023



Legend

- Qld DCDB
- Site DCDB
- Project Disturbance Footprint [24.2 ha]
- Proposed East-West Connection Road [5 ha]
- Johanna Boulevard Extension [1.4 ha]
- Development Area [17.8 ha]
- Stormwater Management Area [2.1 ha]
- Additional temporary impact [0.26 ha]

Figure 3

Development Footprint

Queensland Government
Queensland Health

File ref. 11612 E Figure A3 Development Footprint A
Date 15/11/2023
Project Bundaberg Hospital

0 50 100 150 200 250 m

N

Scale (A4): 1:8,000 [GDA 2020 MGA Z56]

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Layer Source: © State of Queensland 2023

MNES IMPACT SUMMARY

The assessment of construction and operational impacts shows that, while much of the identified impacts can be avoided and mitigated through retained areas and management measures, residual impacts will be created from the unavoidable loss of 23.56 hectares habitat critical to the survival of the Koala and potential GHFF foraging habitat. A number of management measures described throughout the Preliminary Documentation submission sufficiently mitigate the risk of increased injury or mortality to Koalas and GHFF (and Greater Glider should they occur) and the provision of the conservation areas will ensure that habitat and connectivity is maintained through the landscape, facilitating the long-term persistence and dispersal of target species.

Overall, the proposed hospital development will see the direct removal of 23.56 hectares of critical habitat for the Koala and foraging habitat for the GHFF. Offsets will need to be provided in accordance with the *Commonwealth Government's EPBC Act Environmental Offset Policy* for these impacts.

The residual impacts on the Koala as a result of the development will be the loss of 23.56 hectares of critical habitat with a Modified Habitat Quality Assessment (MHQA) score of 5.90 (rounded to a 6). The MHQA is a DCCEEW accepted methodology for application of measuring impacts on Koala habitat in consideration of future offset requirements. A copy of the MHQA methodology is included as Attachment 1 of the OS. The MHQA methodology is proposed to be deployed over the offset site and in the future measurement of improvements and conservation gains for the koala species. The detailed results of the MHQA for Koala Habitat at the new Bundaberg Hospital Site are included as Attachment 3 of this OS.

The residual impact on the Grey-headed Flying-fox (GHFF) as a result of the development will be the loss of 23.56 hectares of foraging habitat with a Grey-headed Flying-fox Foraging Habitat Assessment (GHFF-FHA) score of 5.16 (rounded to a 5). The GHFF-FHA is a DCCEEW accepted methodology for application of measuring impacts on GHFF habitat in consideration of future offset requirements. A copy of the GHFF-FHA methodology is included as Attachment 2 of the OS. The GHFF-FHA methodology is proposed to be deployed over the offset site and in the future measurement of improvements and conservation gains for the GHFF species. The Detailed results of the GHFF-FHA for GHFF Habitat at the new Bundaberg Hospital Site are included as Attachment 4 of this OS.

Impact Summary

Residual Impacts on Koala:
Removal of 23.56 hectares of critical habitat at a MHQA score of 5.90 (rounded to 6)

Residual Impacts on GHFF:
Removal of 23.56 hectares of foraging habitat at a GHFF FHA score of 5.16 (rounded to 5)

A01. Assessment Units

Notes:
This plan was prepared as a desktop assessment tool. The information on this plan is not suitable for any other purpose. Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

Layer Sources
© State of Queensland (Department of Resources) 2023.
Updated data available at
http://qldspatial.information.qld.gov.au/catalogue/
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Legend

- Qld DCDB
- Site DCDB
- Project Disturbance Footprint
- Non-remnant Vegetation

Assessment Units

- **AU1:** Remnant Regional Ecosystem 12.5.4 [64 ha]

Issue	Date	Description	Drawn	Checked
A	25/10/2023	Preliminary	TF	KH

0 50 100 150 200 m

Transverse Mercator | GDA 2020 | Zone 56 | 1:6,500 @ A3

Address / RPD: Bundaberg Ring Road, Thabeban

25/10/2023 | 11612 E A04 Assessment Units A

saunders havill group

Queensland Government
Queensland Health

Bundaberg Hospital

OFFSET STRATEGY – EPBC2022/09397

Pre-referral ecological consulting advice to Queensland Health stated the new Bundaberg Hospital Project was unlikely to have a significant impact of MNES. Despite this advice formal referral for a Controlled Action status was made to the DCCEEW, with the conclusion of the referral report recommending the project be determined not a controlled action. DCCEEW's determination varied from this advice with the project being declared a Controlled Action, a position which Queensland Health has accepted, however the result of this outcomes is that suitable offset sites for residual impacts were not considered prior to this determination. Queensland Health acknowledge and commit to delivering an Environmental Offset in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) Environmental Offset Policy.

The Bundaberg township is a regional area, with few EPBC matters or triggers and as a result does not retain and active environmental offset market. To source, review and consider environmental offset sites, Queensland Health developed and continue to implement a number of bespoke actions to aide in fast tracking the process of locating and securing a suitable offset site. This process is documented in this Offset Strategy to demonstrate commitment towards an offset outcome which provides conservation benefits for the koala and grey-head flying-fox.

QUEENSLAND HEALTH – OFFSET SITE SELECTION PROCESS

Action 1:

Queensland Health completed a review of the Queensland Government's surplus land holdings database for land under the ownership of other Government Departments.

Outcome:

No suitable sites were identified as available.

Action 2:

Queensland Health commissioned expert environmental offset brokerage company, Earthtrade to undertake a site sourcing and selection process. To further bolster this process the Queensland Health's property team also commenced a review and identification process of available offset sites approaching a number of local real estate agents in Bundaberg and the surrounding area.

Outcome:

34 potential offset sites have been identified by Earthtrade and Queensland Health to date. Each site identified were filtered through the following steps:

- Sites issued to the Saunders Havill Group (SHG) for detailed environmental mapping and database searches. Sites were considered against the following parameters:
    - Location from impact site

- Suitable habitat for the protected species or available to be revegetated into habitat for the protected species – Queensland Government Regional Ecosystem Mapping and Koala Mapping used as proxy.
- Suitable winter flowering foraging species at or the availability to revegetate with suitable winter flowing species for the Grey-headed Flying-fox.
- Nexus to known State or Commonwealth Government GHFF roost sites – searched at 20km and 40km
- Species records of the protected matters at or within the vicinity of the site – Atlas of living Australia, I-naturalist and Queensland Government's Wildnet.
- Connectivity to major habitat areas or corridors

- Sites considered suitable were documented and issued to DCCEEW for preliminary 'red flag' assessments to ensure no macro issues were overlooked.

Challenges with this Action:

While a number of suitable sites were identified, given market conditions, timeframes to review site information and procurement process saw sites enter and exit the market before certainty was obtained or procurement could occur. There is significant risk to the Queensland Government in the acquisition of a site for offsets that the Commonwealth Government may consequential not approve for this purpose.

Action 3:

In order to overcome procurement delays occurring with the securing of suitable sites, Queensland Health has looked to a streamlined offset acquisition process to purchase or secure a potential environmental offset site. This process aims to enable more timely contracting of potential offset sites, which has been supported by project governance and relevant approval processes.

Outcome:

A potential offset site (Potential Offset Site No. 1) has been identified and Queensland Health is progressing relevant investigations to support the procurement processes to secure the site. It is noted that DCCEEW have provided preliminary feedback on this potential offset site and pending the site being secured by Queensland Health, field surveys will occur. Land Owner information or site information for Site 1 is not able to be shared or published as the site is not yet under contract.

Potential Offset 1 is documented in further detail within the OS.

Action 4:

Given Potential Offset Site 1 is still progressing through the procurement processes and market conditions are buoyant, Queensland Health has further reached out the Queensland Department of Environment and Science (DES) holding meetings with relevant contacts to source available land owners and sites which have expressed interest through the Queensland Government Offset register.

Outcome:

DES has advised that a potential offset site on DES's Offset Expression Of Interest Register located approximately 60km North of Bundaberg (Potential Offset site No. 2) that is considered likely to satisfy the Commonwealth sizing requirements. At this stage only a desktop analysis to identify potential habitat has been undertaken, with no on-ground surveys completed. Additional desktop environmental searches have since undertaken by SHG who concur the site is highly suitable.

The landowner of Potential Offset Site 2 has been contacted by Queensland Health to explore if there is any opportunity to offset part of the property. Noting for privacy reasons, the landowner information or site information for Site 2 is not able to be shared or published.

Queensland Health acknowledges that DCCEEW cannot provide further suitability advice on a potential offset site without having seen a detailed proposal for the offset/mitigation measures proposed following on-ground surveys.

Potential Offset Site 2 is documented in more detail within this environmental OS.

Ongoing Actions:

As investigations and negotiations on Potential Offset Site 1 and 2 progress, Queensland Health continue to explore other sites with Earthtrade preparing monthly reporting on search parameters and options given current market conditions. Additional feedback regarding the process and suggestions from DCCEEW have also been incorporated into the process enabling a wider sieve of sites to be reviewed.

Queensland Health remains fully committed to delivering an offset which provides a substantial and measurable conservation gain for koala habitat and GHFF habitat and have invested a considerable volume of time and expense into various options.

POTENTIAL ENVIRONMENTAL OFFSET SITES

At the date of drafting of this OS Queensland Health were in negotiations on two (2) separate land based environmental offset solutions. They are broadly documented in this section of the OS to demonstrate firstly, that the Queensland Health offset selection process is yielding suitable prospects and secondly, that if negotiations crystalise either site has the potential to deliver the necessary offsets. As offset negotiations are ongoing and these options remain available on the market, they have been de-identified for the purposes of publication of the OS. Should these sites not crystalise, Queensland Health will continue to follow the offset selection process to identify and secure other site/s.

POTENTIAL ENVIRONMENTAL OFFSET SITE 1

Offset Site 1 is locally sourced land holding of just over 250ha and located 10.5km from the impact site. The land contains a mix of remnant vegetation, regrowth vegetated, isolated mature and immature trees and open paddock areas currently grazed under agistment lease. No formal surveys have been completed at the offset site; however, it was visited by an environmentally trained contractor who photographed and documented findings during a single half day inspection. The following important points are made in relation to the land holdings potential suitability as an offset site:

<u>General:</u>

- The land is located close to the impact site at 10.5km distance between each land holding.
- The land is part of a larger area of habitat beyond the land holding connecting in the immediate vicinity to protected riparian and creek corridor habitats.
- More broadly the land is within close proximity to Vera Scarth-Johnson Wildflower Reserve, Burrum Coast National Park and the Bingera National Park.
- There are not a large volume of immediate records for any threatened species in the immediately locality, however the surrounding reserves and National Parks all hold records for the protected matters.
- The land includes a mix of potential assessment units with the opportunity to improve and create new habitat.

<u>Koala Suitability</u>

- Mapped remnant vegetation polygons on and continuing off the site are mapped as “essential habitat’ for the koala species.
- Site regional ecosystems both in terms of vegetated areas and areas to be revegetated are dominated by suitable koala habitat species based on the following two Regional Ecosystem types:
    - RE 12.5.4 - *Eucalyptus latisinensis +/- Corymbia intermedia, C. trachyphloia subsp. trachyphloia, Angophora leiocarpa, Eucalyptus exserta woodland on complex of remnant*
    - RE 12.3.6 - *Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia open forest to woodland with a grassy ground layer dominated by species such as Imperata cylindrica.*
- Photos confirmed these species as present and identified a number of scratches at and surrounding the offset site.
- The offset land holdings provide the opportunity to improve existing koala habitat and recreate new habitat.

GHFF Suitability:

- Being relatively close to the impact site the offset land is well within the distances travelled by GHFF to a number of GHFF roost sites located in north Bundaberg and also close to the GHFF roose noted at Innes Park.
- *Eucalyptus tereticornis, Corymbia intermedia, Melaleuca quinquenervia* as scheduled in the dominate tree species within site regional ecosystems are all listed as species containing wintering flowering scores in support of GHFF.

Table 2: Offset Site 1		
Distance from Impact	10.5km	
Area (ha)	70.92 ha 71.273 ha Total: 257.793 ha 115.6 ha	
Local government area	Bundaberg Regional Council	
1. Federal Matters of National Environmental Significance IN PMST for the Offset Site		
A Protected Matters Report was generated from the environment.gov.au website and returned the following results. These matters may occur within a 5 km radius of the site and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.		
World Heritage Properties:	None	
National Heritage Places:	None	
Wetlands of International Importance:	None	
Great Barrier Reef Marine Park:	None	
Commonwealth Marine Area:	None	
Listed Threatened Ecological Communities:	5	
Community	***Status***	***RE Mapped***
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	No
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Yes - 12.3.6
Lowland Rainforest of Subtropical Australia	Critically Endangered	No
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Yes – 12.1.2
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and Southeast Queensland bioregions	Endangered	Yes – 12.3.11
Listed Threatened Species:	49	
Listed Migratory Species:	43	

2. State Matters					
2.1 Nature Conservation Act 1992 and subordinate legislation					
Error! Reference source not found.	Partially within high-risk area				
2.2 Vegetation Management Act 1999 and subordinate legislation					
Regulated Vegetation Management Map and Vegetation Management Supporting Map					
Regional Ecosystem	VMA status	Category	Area (ha)		
			Lot A	Lot B	Lot C
12.1.2	Least Concern	B			0.28
12.3.11	Of Concern	B	5.52		
12.3.6	Least Concern	B		5.37	2.7
12.5.4	Least Concern	B	10.35	5.97	59.27
Non-Remnant	None	X	99.73	51.27	8.68

Water	None	X		8.68	
Essential Habitat		*Phascolarctos cinereus* (Koala) *Crinia tinnula* (Wallum Froglet)			
Wetland/s		Present			
Bioregion		Coastal bioregions and sub-regions			
2.3 Koala Habitat Mapping					
Koala Priority Area (KPA)		Not within KPA			
Koala Habitat Area		Koala Habitat Area not present			
2.4 State Planning Policy Interactive Mapping System (selected environmental matters)					
3. Species Records					
Phascolarctos cinerus (Koala)		3 records			
Pteropus poliocephalus (Grey-headed Flying Fox)		19 records			
Petauroides armillatus (Central Greater Glider)		2 records			

Offset Site 1 – Photos

POTENTIAL ENVIRONMENTAL OFFSET SITE 1 - ANALYSIS

Field surveys have not been completed at Offset Site 1 and specific data required to understand the MHQA and GHFF-FHA are not known. Based on the preliminary site review and desktop data conservative estimates for these factors have been applied for the purposes of completing the EPBC Act Offset Guide Calculations. To enable the preliminary assessment of EPBC Act Guide review 2 Assessment Units have been derived from a combination of site photos and aerial imagery. These Assessment Units are:

- Assessment Unit 1 – Cleared Grazing Paddocks (92.4ha)
- Assessment Unit 2 – Remnant and Regrowth Vegetation (165.2ha)

Table 3 includes a summary of Offset Assessment Guideline (OAG) values applied to each assessment unit for the Koala species and Table 4 summarises applied values for the GHFF. Both are based on many like surveys, outcomes and approvals for land containing these assessment unit characteristics.

Attachment 4 contains the formal OAG Calculator Sheets

Table 3 – Offset Site 1 – Koala OAG – Preliminary Values

Attribute	AU 1 Estimate (92.4ha)	AU 2 Estimate (165.2ha)	Comment on applied value
Time – Averted Loss	20 years	20 years	20 Years is the maximum timeframe permissible within the calculator cell
Time Ecological benefit	20 Years	10 Years	AU1 – 20 years is applied to convert farming to native bushland. AU 2 – 10 years is applied to the existing vegetation to make a marginal improvement in quality
Risk – Without	0%	0%	A Risk of Loss cannot be justified for either assessment unit.
Risk – With	0%	0%	While the land will be legally secured there is no proposed change in Risk of Loss status with offset.
Confidence – Risk	100%	100%	No change – inconsequential value
Start Quality	3/10	7/10	AU1 – Farming paddocks are estimated a 3/10 based on a number of assessments completed in 'like' AUs. AU 2 – Mix of remnant and regrowth – low value remnant score is applied to this AU.
Quality Without	3/10	7/10	No evidence is available to justify a historical and continued decline in habitat quality
Quality With	6/10	8/10	AU 1 – Based on full revegetation and management over a 20-year timeframe to return paddocks to native bushland. AU 2 – Marginal improvements through replanting infill gaps, weed management and broader removal of grazing outcomes.
Confidence – Quality	60%	70%	AU 1 – Low confidence applied as field work has not confirmed start MQHA scores. AU 2 – Moderate confidence applied based on remnant / regrowth status and site investigation photos.
Percentage of Offset	92.68%	72.61%	Collectively this offset site caters for 165.29%

Note: Start and improvement scores are based on desktop MHQA estimates only and subject to change based on detailed site surveys

Table 4 – Offset Site 1 – GHFF OAG – Preliminary Values

Attribute	AU 1 Estimate (92.4ha)	AU 2 Estimate (165.2ha)	Comment on applied value
Time – Averted Loss	20 years	20 years	20 Years is the maximum timeframe permissible within the calculator cell
Time Ecological benefit	20 Years	10 Years	AU1 – 20 years is applied to convert farming to native bushland. AU 2 – 10 years is applied to the existing vegetation to make a marginal improvement in quality
Risk – Without	0%	0%	A Risk of Loss cannot be justified for either assessment unit.
Risk – With	0%	0%	While the land will be legally secured there is no proposed change in Risk of Loss status with offset.
Confidence – Risk	100%	100%	No change – inconsequential value
Start Quality	4/10	7/10	AU1 – Farming paddocks are estimated a 4/10 based on a number of assessments completed in 'like' AUs. AU 2 – Mix of remnant and regrowth – low value remnant score is applied to this AU.
Quality Without	4/10	7/10	No evidence is available to justify a historical and continued decline in habitat quality
Quality With	7/10	8/10	AU 1 – Based on full revegetation and management over a 20-year timeframe to return paddocks to native bushland. AU 2 – Marginal improvements through replanting infill gaps, weed management and broader removal of grazing outcomes.
Confidence – Quality	60%	70%	AU 1 – Low confidence applied as field work has not confirmed start MQHA scores. AU 2 – Moderate confidence applied based on remnant / regrowth status and site investigation photos.
Percentage of Offset	135.66%	96.22%	Collectively this offset site caters for 231.88%

Note: Start and improvement scores are based on desktop GHFF-FHA estimates only and subject to change based on detailed site surveys

POTENTIAL ENVIRONMENTAL OFFSET SITE 2

Potential Offset Site 2 has been identified through the Queensland Government's DES Environmental Offset Expression Of Interest Register and incorporates a very large rural land holding approximately 60km from the impact site. The land holding is large scale (927.8ha) and contains a diverse number of environmental characteristics ranging from remnant and regrowth vegetation, lineal strands of drainage line vegetation, creek frontage, cleared land and paddocks with scattered mature trees. The following important points are made in relation to the land holdings potential suitability as an offset site:

General:

- The land holding was recommended by the Queensland Government DES as, based on their mapping and data records, containing suitable habitat for the project matters.
- The land occurs amongst some very large tracts of native remnant bushland and contains frontage to Baffle Creek, which directly connects the land to the Mount Colosseum National Park.
- The northern half of the land holding is mapped as a biodiversity corridor of 'regional' significance and the creek frontage is mapped as corridor of 'state' biodiversity significance.
- Vegetated areas of the site are mapped with Multiple Matters of State Environmental Significance, including: Regulated Vegetation and Wildlife Habitat. Both of these layers are indicators for protected MNES.

Koala Suitability:

- Nearly all vegetation on-site is mapped as 'essential habitat' for the Koala species.
- Site regional ecosystems both in terms of vegetated areas and areas to be revegetated are dominated by suitable koala habitat species based on the following two Regional Ecosystem types:
    - RE 12.5.2 - *Corymbia intermedia, Eucalyptus tereticornis open forest on remnant Tertiary surfaces, usually near coast and on deep red soils*
    - RE 12.5.7 - *Corymbia citriodora subsp. variegata +/- Eucalyptus portuensis or E. acmenoides, E. fibrosa subsp. fibrosa open forest on remnant Tertiary surfaces. Usually deep red soils*
- The offset land holdings provide the opportunity to improve existing koala habitat and recreate new habitat.

GHFF Suitability:

- *Eucalyptus tereticornis, Corymbia intermedia, Corymbia citriodora* as scheduled in the dominate tree species within site regional ecosystems are all listed as species containing wintering flowering scores in support of GHFF.
- The land holding is a located in a very remote area of Queensland and there are not a many known GHFF roost sites mapped within the locality. The site is within the flying distance of the roost sites located ate Miriam Vale.

Table 5: Offset Site 2	
Distance from Impact	60km
Area (ha)	927.8 ha
Local government area	Gladstone Regional Council

4. Federal Matters of National Environmental Significance

A Protected Matters Report was generated from the environment.gov.au website and returned the following results. These matters may occur within a 5 km radius of the site and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

World Heritage Properties:	None	
National Heritage Places:	None	
Wetlands of International Importance:	None	
Great Barrier Reef Marine Park:	None	
Commonwealth Marine Area:	None	
Listed Threatened Ecological Communities:	4	
Community	***Status***	***RE Mapped***
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	No
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	No
Lowland Rainforest of Subtropical Australia	Critically Endangered	No
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and Southeast Queensland bioregions	Endangered	Yes – 12.3.3
Listed Threatened Species:	36	
Listed Migratory Species:	16	

5. State Matters

2.1 Nature Conservation Act 1992 and subordinate legislation

Error! Reference source not found.	Not within high-risk area

2.2 Vegetation Management Act 1999 and subordinate legislation

Regulated Vegetation Management Map and Vegetation Management Supporting Map

Regional Ecosystem	VMA status	Category	Area (ha)
12.12.4	Least concern	B	7.39
12.12.4	Least concern	R	<0.01
12.12.5	Least concern	B	66.53
12.12.5	Least concern	R	0.01
12.3.16	Endangered	B	14.32
12.3.16	Endangered	C	0.01
12.3.16	Endangered	R	0.07
12.3.17	Of concern	B	20.07
12.3.17	Of concern	C	0.04
12.3.17	Of concern	R	0.48
12.3.3	Endangered	B	9.85
12.3.3	Endangered	C	0.14
12.3.3	Endangered	R	0.16
12.3.7	Least concern	B	4.93
12.3.7	Least concern	C	0.01
12.3.7	Least concern	R	0.07
12.5.2	Endangered	B	145.37
12.5.2	Endangered	C	0.09
12.5.2	Endangered	R	0.60
12.5.7	Least concern	B	91.24
12.5.7	Least concern	C	0.07
12.5.7	Least concern	R	0.31
Non-Remnant	None	X	566.03
Essential Habitat		*Phascolarctos cinereus* (Koala)	

Wetland/s	Not present	
Bioregion	Coastal bioregions and sub-regions	
2.3 Koala Habitat Mapping		
Koala Priority Area (KPA)	Not within KPA	
Koala Habitat Area	Koala Habitat Area not present	
2.4 State Planning Policy Interactive Mapping System (selected environmental matters)		
	MSES – Wildlife habitat (endangered or vulnerable) MSES – Regulated vegetation (category B) MSES – Regulated vegetation (category C) MSES – Regulated vegetation (essential habitat) MSES – Regulated vegetation (intersecting a watercourse)	
	Not within coastal management district	
	Flood hazard area- Level 1 – Queensland floodplain assessment Flood hazard area - Local Government flood mapping area Bushfire prone area High Potential Bushfire Intensity Medium Potential Bushfire Intensity Potential Impact Buffer	
2.5 Development Assessment Mapping System		
	Queensland waterways for waterway barrier works - 1 – Low - 2 – Moderate - 3 – High - 4 – Major	
6. Gladstone LGA		
	Rural	
	MSES – Regulated vegetation MSES – Regulated vegetation (intersecting a watercourse) MSES – Wildlife habitat MSES – Wild rivers (high preservation area)	
	High Fire Risk Medium Fire Risk Potential Impact Buffer	
7. Species Records		
Phascolarctos cinerus (Koala)	No records	4 records (20km)
Pteropus poliocephalus (Grey-headed Flying Fox)	No records	0 records (20km)
Petauroides armillatus (Central Greater Glider)	No records	3 records (20km)
Petauroides volans (Southern Greater Glider)	No records	1 record (20km)

There are no photos of Potential Offset Site 2

POTENTIAL ENVIRONMENTAL OFFSET SITE 2 - ANALYSIS

Field surveys have not been completed at Offset Site 2 and specific data required to understand the MHQA and GHFF-FHA are not known. Based on the preliminary site review and desktop data conservative estimates for these factors have been applied for the purposes of completing the EPBC Act Offset Guide Calculations. To enable the preliminary assessment of EPBC Act Guide assessment 2 assessment units have been derived from a review of the State Government mapping layers and databases as a proxy for habitat suitability for threatened MNES. Despite the land holding having many stratums of vegetation types, maturity and intactness for the purposes of preliminary conservative estimates the land was stratified into two (2) Assessment Units:

- Assessment Unit 1 – Cleared Grazing Paddocks, Scattered Tree Zones and Narrow Drainage Gullys. (545.7ha)
- Assessment Unit 2 – Remnant and Regrowth Vegetation (381.8ha)

Given the very large scale of these offset areas offs areas were set at the minimum volume of each Assessment Unit required to achieve a minimum of 100% based on the assumed OAG values. The final offset maybe made-up a of a mix of each Assessment Unit or areas larger than those proposed.

Table 6 includes a summary of Offset Assessment Guideline (OAG) values applied to each assessment unit for the Koala species and Table 7 summarises applied values for the GHFF. Both are based on many like surveys, outcomes and approvals for land containing these assessment unit characteristics.

Attachment 5 contains the formal OAG Calculator Sheets

Table 6 – Offset Site 1 – Koala OAG – Preliminary Values

Attribute	AU 1 Estimate (85ha)	AU 2 Estimate (195ha)	Comment on applied value
Time – Averted Loss	20 years	20 years	20 Years is the maximum timeframe permissible within the calculator cell
Time Ecological benefit	20 Years	10 Years	AU1 – 20 years is applied to convert farming to native bushland. AU 2 – 10 years is applied to the existing vegetation to make a marginal improvement in quality
Risk – Without	0%	0%	A Risk of Loss cannot be justified for either assessment unit.
Risk – With	0%	0%	While the land will be legally secured there is no proposed change in Risk of Loss status with offset.
Confidence – Risk	100%	100%	No change – inconsequential value
Start Quality	4/10	7/10	AU1 – Farming paddocks with scattered trees adjoining major environmental land are estimated at 4/10 based on a number of assessments completed in 'like' AUs. AU 2 – Mix of remnant and regrowth – low value remnant score is applied to this AU.
Quality Without	4/10	7/10	No evidence is available to justify a historical and continued decline in habitat quality
Quality With	7/10	8/10	AU 1 – Based on full revegetation and management over a 20-year timeframe to return paddocks to native bushland. AU 2 – Marginal improvements through replanting infill gaps, weed management and broader removal of grazing outcomes / threats management.

Confidence – Quality	60%	70%	AU 1 – Low confidence applied as field work has not confirmed start MQHA scores. AU 2 – Moderate confidence applied based on remnant / regrowth status and other state government mapping.
Percentage of Offset	85.26%	85.7%	There is ample space within either assessment unit to cater for a complying Koala Habitat offset at this site. Collectively this site caters for 170.96%.

Note: Start and improvement scores are based on desktop MHQA estimates only and subject to change based on detailed site surveys

Table 7 – Offset Site 2 – GHFF OAG – Preliminary Values

Attribute	AU 1 Estimate (85ha)	AU 2 Estimate (195ha)	Comment on applied value
Time – Averted Loss	20 years	20 years	20 Years is the maximum timeframe permissible within the calculator cell
Time Ecological benefit	20 Years	10 Years	AU1 – 20 years is applied to convert farming to native bushland. AU 2 – 10 years is applied to the existing vegetation to make a marginal improvement in quality
Risk – Without	0%	0%	A Risk of Loss cannot be justified for either assessment unit.
Risk – With	0%	0%	While the land will be legally secured there is no proposed change in Risk of Loss status with offset.
Confidence – Risk	100%	100%	No change – inconsequential value
Start Quality	4/10	7/10	AU1 – Farming paddocks with scattered trees adjoining major environmental land are estimated at 4/10 based on a number of assessments completed in 'like' AUs. AU 2 – Mix of remnant and regrowth – low value remnant score is applied to this AU.
Quality Without	4/10	7/10	No evidence is available to justify a historical and continued decline in habitat quality
Quality With	7/10	8/10	AU 1 – Based on full revegetation and management over a 20-year timeframe to return paddocks to native bushland. AU 2 – Marginal improvements through replanting infill gaps, weed management and broader removal of grazing outcomes / threats management.
Confidence – Quality	60%	70%	AU 1 – Low confidence applied as field work has not confirmed start MQHA scores. AU 2 – Moderate confidence applied based on remnant / regrowth status and other state government mapping.
Percentage of Offset	85.15%	84.46%	There is ample space within either assessment unit to cater for a complying GHFF offset at this site. Collectively this site caters for 169.61%.

Note: Start and improvement scores are based on desktop GHFF-FHA estimates only and subject to change based on detailed site surveys.

COMPLIANCE WITH THE OFFSET POLICY

Table 8 lists the principles of the EPBC Act Environmental Offsets Policy and describes how the proposed offset strategy has been developed to adhere to these principles. Regardless of the offset site the preferred solution for Queensland Health is to deliver a large scale connected offset area with the opportunity for both the improvement of existing habitat values and the creation of new habitat for both protected matters. The offset will be 100% delivered through direct on ground outcomes. On the assumption one of the 'potential' sites outlined in the strategy are selected or a similar third property with like values and opportunities is presented the below criteria assessment demonstrates how this type of offset complies with the principals of the offset policy.

Table 8: Compliance with EPBC Act Environmental Offsets Policy Principles

Principle	Offset Strategy Compliance
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	The offset area delivers a conservation gain for the Koala and GHFF through: a) The creation of new habitat for both protected matters through the revegetation of portion of the offset land. b) Providing new connectivity with surrounding habitat for the protected matters. c) Providing further expansion and connectivity to other Habitat Areas confirmed as suitable for the same protected matters (Koala &GHFF). d) Introducing, funding and continually improving offset area Management Actions to reduce and manage threats (feral dogs, Lantana) in protected and created habitat areas. e) Averting the direct and indirect losses via declaring the land a Voluntary Declaration area for High Value Conservation under the *Vegetation Management Act 1999*. This removes future wholesale and selective clearing opportunities and through the management plan removes ongoing impacts caused by livestock intrusion into habitat areas.
Be built around direct offsets but may include other compensatory measures	The offset area includes legally securing the land area and undertaking necessary improvements to achieve a greater than 100% offset outcome for impacts calculated on the Queensland Health new Bundaberg Hospital Project for Koala Habitat & GHFF (100%). The Offset Area will be wholly achieved through direct delivery to land.
Be in proportion to the level of statutory protection that applies to the protected matter	The Koala is scheduled within the EPBC Act as 'Endangered'. Under the International Union for Conservation of Nature data the probability of annual extinction is 1.2. The GHFF is scheduled within the EPBC Act as 'Vulnerable'. Under the International Union for Conservation of Nature data the probability of annual extinction is 0.2.

	These factors apply through the meta data of the Offset Assessment Guide(OAG) calculation sheets for which each species has been assessed as achieving greater than 100% offset through the proposed offset area.
Be of a size and scale proportionate to the residual impacts on the protected matter	Direct and indirect impacts for the protected matters have been calculated at the impact site using the Modified Habitat Quality Assessment (MHQA – documented in Attachment 1) for the Koala and the Grey-headed Flying-fox Foraging Habitat Assessment (GHFF-FHA – Documented in Attachment 2) for the Grey-headed Flying-fox. Within the Assessment Guide calculator, the Quantum Impact for each species is listed as: • Koala (5.9 ha) • GHFF (5.16) To achieve and offset for both of these impacts the offset area provides a direct land-based outcome through habitat protection and recreation activities on historically cleared land devoid of native vegetation. Offset site surveys will deploy the MHQA and GHFF-FHA.
Effectively account for and manage the risks of the offset not succeeding	This offset strategy identifies 7 potential risks to some, or all of the offset principles and outcomes not being achieved at the potential offset sites, which is based on similar approved offset sites. Each of these risks have influenced the specific management actions proposed in the relevant assessment units where the risk may occur and more importantly the monitoring, measuring of success and adaptive management for the offset succeeding. Repetitive monitoring and survey replication is to be a feature of the Final and Approved Offset Management Plan to ensure adaptive management changes are made as soon as identified and throughout the life of the offset.
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs	The new Bundaberg Hospital Project is in the final stages of approval via the Queensland Government's Infrastructure Designation (ID) process and no formal offset conditions have been identified through this process. Therefore, without the triggering of the EPBC Act and the Controlled Action Assessment an offset as proposed in the Offset Strategy is not required for either of the protected matters and the offset site would not be protected in perpetuity for conservation purposes.
Be efficient, effective, timely, transparent, scientifically robust, and reasonable	Through conditions of approval the offset area will be legally secured prior to the commencement of any clearing on the impact site. The offset area and its value (as finalised through the EPBC Act Approval) will be legally secured through a Voluntary Declaration (V-Dec) declared under the Queensland Government's *Vegetation Management Act 1999*. A V-Dec protects land and values and is binding on future owners. The declaration and management plan will be noted on the land title, which informs

	prospective buyers of current declarations and management plans and where copies are available. This information is important to the property market as future owners will be bound by the plan and declaration. The legally securing of the land will be made through declaring the area as having High Nature Conservation Values. The V-Dec will be lodged and legally secured by evidence of encumbrance on Registered Land Title prior to the commencement of any clearing works on the Impact Site. The Final and Approved Offset Management Plan is to list the specifically designed scientific methodologies, in addition to the MHQA and GHFF-FHA for the measuring of base line and improved outcomes for the protected matters. The OMP will also require the use of tertiary trained and experienced experts along with appropriately certified and experienced contractors for the implementation of a host of actions.
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	<u>Potential Offset Site 1</u> Is proposed to directly purchase by the Queensland Government who will engage suitable experienced contractors to deliver all improvement and management works at the offset site. Monitoring will be completed in accordance with the final approved Offset Management Plan and reporting undertaken by independently commissioned tertiary trained ecological experts. All management plans, approval documents, annual compliance reports and other interim reports will be published on Queensland Health's website for public access. <u>Potential Offset Site 2</u> Is proposed to be legally secured and managed under long term arrangement via formal legal agreement on a third party land holder's property in accordance with controls and provisions under the *Queensland Government's Environmental Offset Act 2017*. Monitoring will be completed in accordance with the final approved Offset Management Plan and reporting undertaken by independently commissioned tertiary trained ecological experts. All management plans, approval documents, annual compliance reports and other interim reports will be published on Queensland Health's website for public access.

LEGALLY SECURING MECHANISM

The anticipated legal mechanism for the offset area and its values (as finalised through the EPBC Act Approval) will likely be legally secured through a Voluntary Declaration (V-DEC) declared under the Queensland Government's *Vegetation Management Act 1999* (VMA), which will require consultation with the Queensland Department of Resources. A V-DEC protects land and values and is binding on future owners. The Queensland Government describes the benefits of the VDEC as "*One of the strengths of a declaration is that it provides greater protection to areas of land containing environmentally valuable native vegetation*".

The declaration and management plan will be noted on the land title, which informs prospective buyers of current declarations and management plans and where copies are available. This information is important to the property market as future owners will be bound by the plan and declaration (Queensland Government, 2017).

The legally securing of the land will be made through declaring the areas as having High Nature Conservation Values. Based on the VMA criteria the Offset Area will be declared as achieving items (d) and (f) below:

To be considered for declaration as an area of high nature conservation value, the area must be one or more of the following:

a) *a wildlife refugium—an area where a species or a group of species has retreated due to a threatening process (e.g. climatic change);*

b) *a centre of endemism—an area containing concentrations of species that are largely restricted to the area;*

c) *an area containing a vegetation clump or corridor that contributes to the maintenance of biodiversity;*

RISK ANALYSIS

A limited number of risks associated with climate change, pest control, large scale rehabilitation and grazing land uses are evaluated for the offset property. Risks are generally described and assessed against the likelihood and consequence model outlined in the Commonwealth Government's Department of Environment – *Environmental Management Plan Guidelines* (2014). The following risk factors are to be considered in more detail in the Offset Management Plan following project approval.

Risk Item	Risk Description	Impact and Outcome
1	Wildfire or Uncontrolled Property Fire	— Loss of retained habitat — Loss of replanted habitat — Loss of MNES Species from the habitat — Prolonged recovery
2	Drought	— Unsuccessful revegetation (In full or part) — Dieback and stress of existing habitat — Slow offset growth rates
3	Shifting Habitat Range	— Climate change impacts on habitat locations and connectivity.
4	Plant Stock Failure	— Unsuccessful revegetation (In full or part) — Slow offset growth rates — Offset fails to achieve conservation gain inside offset timeframe
5	Pest Species Management	— Seasonal wild dog impacts on the koala species impairing offset habitat outcomes at the offset site.
6	Weeds Of National Significance	— Weeds of National Significance and other known environmental weeds in the region creating barriers to movement and impairing habitat growth and maturity.

7	Livestock control and access and trespass management.	— Impacts on new plantings and the impairment of existing habitat improvements. — Weed source and attractor for wild dogs.

OFFSET AREA MANAGEMENT ACTIONS

Based on the type of offset proposed which includes the combination of improving existing habitat and creating new habitat the following management measures are highly likely to be relevant and require detailed documentation in the Offset Management Plan (OMP):

- Wild Dog Management
    - Demonstrate that the number of wild dogs within the offset area is reduced against a pre-measured baseline survey data within 5 years of Offset Approval
    - Maintain numbers of wild dogs at the offset site at the reduced levels for the life of the offset.

- Weeds of National Significance Management
    - Demonstrate the extent of weed cover across the offset area is substantially reduced against a pre-measured baseline survey data within 5 years of Offset Approval
    - Maintain the reduced extent of WONS at the offset site at the reduced levels for the life of the offset.

- Stock Management
    - Remove all livestock from the offset area and terminate agistment agreements or leases
    - Install fauna friendly stock exclusion fencing around the offset area, if required, to exclude livestock from offset operations.
    - Ensure that any grazing is managed so as to prevent the risk of injury or mortality of koalas and is only implemented to manage the bushfire fuel load and or by future separate approval of the DCCEEW.

- Access and Trespass Management
    - Ensure that all perimeter fencing is intact and any breach is rectified.
    - By the end of year 1, issue a notification of the offset area, purpose and outcome to all adjoining landholders within a 1 km radius of the offset property;
    - Install measures to remove all recreational activities such a motorbike riding and 4WDing within the offset area.

- Bushfire Management
    - Develop an offset area Bushfire Management Plan which is endorsed by the Queensland Rural Fire Brigade by the end of year 5.

- Restoration and Rehabilitation Management
    - Undertake ecological restoration and rehabilitation work which contributes to the improvement of the condition of Assessment Unit 1 areas and facilitates natural regeneration within the offset area, such that the following outcomes are achieved:
        - Minimum stem density of 250 stems per hectare;

- Average recruitment of woody perennial species in the EDL is >75% of the benchmark for the relevant RE by the end of year 10, and maintained at that level;
- Average native plant species richness (trees, shrubs & grasses) >90% of the benchmark for the relevant RE by the end of year 20;
- Maintain average tree canopy height at >70% of the benchmark for the relevant RE by the end of year 20 for Assessment Unit 1 and end of year 10 for Assessment Unit 2;
- Maintain average tree canopy cover >50% of the benchmark for the relevant RE by the end of year 20 for Assessment Unit 1 and end of year 10 for Assessment Unit 2.

The proposed offset actions are all additional to those required under existing Queensland legislation.

FUTURE OFFSET MANAGEMENT PLAN

Upon finalising offset site selection detailed baseline surveys and EPBC Act approval for this project, an OMP will be prepared for the offset area and offset property. The OMP will provide details on the performance outcomes to be achieved, specific management actions required for each assessment unit, an estimate of the cost of management and details regarding the reporting and monitoring of the offset actions and outcomes. The OMP will primarily focus on where active management is required to restore ecosystem function.

The detailed OMP will be consistent with the DCCEEW Environmental Management Plan Guidelines, and include (at a minimum):

- A summary of the residual impacts to MNES;
- Detailed survey methodologies for determining baselines within the proposed offset area for feral animal abundance and extent of weed cover and MHQA for Koala and GHFF-FHA for the GHFF;
- A table of commitments made in the offset management plan to achieve the environmental objectives, and a reference to where the commitments are detailed in the offset management plan;
- Reporting and review mechanisms, and documentation standards to demonstrate compliance with management and environmental commitments in the offset management plan;
- An assessment of risks to achieving environmental objectives and risk management strategies that will be applied;
- A detailed monitoring program which includes:
    - Measurable performance indicators to monitor attainment of the offset completion criteria;
    - Trigger values for corrective actions; and
    - The timing and frequency of monitoring to detect trigger values and changes in the performance indicators;
- Proposed corrective actions, if trigger values are reached or performance indicators not attained; and
- Adaptive management.

The OMP will set out an active management period of 20 years; however, all management actions will be guided through monitoring and subsequent reporting. It is anticipated that management efforts will be greatest in the first five years, particularly to establish revegetation areas, new fencing (where applicable) and getting weed populations under control.

ATTACHMENTS

ATTACHMENT 1 – MHQA -DETAILED METHODOLOGY - KOALA

Modified Habitat Quality Assessment Methodology

The offset site has been assessed using a modified version of the Queensland State Governments *"Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy"* Version 1.2 April 2017. The purpose of this guideline is to provide a methodology for proponents to determine the habitat quality of a site under the Queensland Environmental Offsets framework. The guideline is a step-by-step methodology explaining how to measure habitat quality for land-based offsets. This methodology has been adopted and tailored/modified to assess the impacts and offsets relating to Matters of National Environmental Significance (MNES).

The traditional terrestrial habitat quality assessment assesses three (3) core indicators—site condition, site context and species habitat index.

The modified habitat quality assessment (MHQA) combines the three (3) core indicators into two (2) (site condition and site context) with each Site Condition being weighted 30% of the final score and Site Context being weighted 30% of the final score. The balance of the weighting (40 %) has been attributed to the third indicator which is independent of the traditional habitat quality assessment, being species stocking rate. The species stocking rate has been added to the MHQA to better incorporate MNES, and for the purpose of this preliminary documentation, the vulnerable-listed Koala MNES. The following section details the methodology utilised to assess the site condition, site context and species stocking rate under the MHQA.

Site Condition (30 %)

Assessing site condition is an integral step in determining specific quantification of impacts, while also determining whether an offset site is suitable to establish a desired capacity to support the prescribed environmental matters being offset. The on-site condition is a key element of habitat quality and has a direct influence on the biodiversity it supports. Site condition is assessed using a suite of attributes to describe the structure and function of the vegetation community, and is benchmarked against the expected range for a relatively undisturbed community.

The site condition assessment under the MHQA is assessed using fifteen (15) condition characteristics being:

- recruitment of woody perennial species in EDL;
- native plant species richness – trees;

- native plant species richness – shrubs;
- native plant species richness – grasses;
- native plant species richness – forbs;
- tree canopy height;
- Sub-canopy cover;
- tree canopy cover;
- native grass cover;
- organic litter;
- large trees;
- coarse woody debris;
- non-native plant cover;
- quality and availability of food and foraging habitat; and
- quality and availability of shelters.

Assessment methodology of the above condition characteristics do not differ from the traditional habitat quality assessment. In developing the MHQA to better incorporate MNES, two (2) species habitat index characteristics, being, quality and availability of food and foraging habitat and quality and availability of shelters have been added to the site condition indicator.

Site Context (30 %)

The site context assessment deals with the site and its adjacent surroundings. Site context is measured using a suite of attributes to describe the location of the habitat within the surrounding landscape and the influence of its associated threats. This assessment also considers the influence of adjacent vegetated areas and ecological corridors. Under the MHQA, site context is measured using the following seven (7) characteristics:

- size of patch;
- connectedness;
- context;
- ecological corridors;
- role of site location to species overall population in the state;
- threats to the species; and
- species mobility capacity.

Unlike the traditional habitat quality assessment methodology where site connectedness is assessed against the surrounding remnant vegetation only, the MHQA site connectedness is assessed against the surrounding MNES habitat, in this instance, Koala habitat. Whilst remnant eucalypt forest vegetation is critical habitat for Koala, equally Koalas can utilise areas of non-remnant vegetation or high value regrowth vegetation that does not yet achieve remnant status. Therefore, site context under the MHQA accounts for surrounding Koala habitat rather than remnant vegetation.

In developing the MHQA, three (3) species habitat index characteristics were nominated—role of site location to overall species population in the state, threats to the species and species mobility capacity.

Species Stocking Rate (40 %)

The MHQA incorporates species stocking rate as an attribute not discussed under the traditional terrestrial habitat assessment methodology. Species stocking rates are estimates of the Koala carrying capacity of the site at the time of undertaking the survey. Given the discreet nature of the Koala and limited to no published literature on habitat carrying capacity of the species, the species stocking rate scoring methodology has been derived through the collation of site specific surveys and surrounding contextual habitat analysis. Table 1 outlines the attributes utilised to assess species stocking rate.

Table 1:Species Stocking Rate Scoring

Species Stocking Rate Table

Presence detected on or adjacent to site (neighbouring property with connecting habitat)	/10
Species usage of the site (habitat type and evidenced usage)	/15
Approximate density (per ha)	/30
Role/importance of species population on site*	/15
Total Species Stocking Rate Score	/70
Species Stocking Rate Score – out of 4	

*SSR Supplementary Table	
Key source population for breeding	/10
Key source population for dispersal	/5
Necessary for maintaining genetic diversity	/15
Near the limit of the species range	/15

ATTACHMENT 2 – GHFF-FHA -DETAILED METHODOLOGY - GHFF

Assessment Methodology

The proposal results in the clearing and functional loss of 23.56 ha of vegetation that is identified as providing suitable foraging habitat for the Grey-headed Flying-fox. The impact and the offset sites have been assessed using a GHFF Foraging Habitat Assessment (GHFF FHA) tool developed by the Saunders Havill Group which adopts characteristics of the Queensland State Governments *"Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy"* Version 1.3 February 2020, while also integrating published scientific literature on GHFF foraging habitat.

The traditional terrestrial habitat quality assessment assesses three (3) core indicators—site condition, site context and species habitat index.

The GHFF FHA tool combines the aspects of the three (3) core indicators and published scientific literature into two (site condition and site context) with site condition being weighted with 40 % and site context weighted at 30 % of the final score. The balance of the weighting (30 %) has been attributed to the third indicator which is independent of the traditional habitat quality assessment, being species stocking rate. The species stocking rate assessment incorporated in the GHFF FHA tool is focussed on 'foraging habitat' for GHFF rather than GHFF stocking rates (presence/absence of the species). This assessment of 'foraging habitat' for species stocking rate has been incorporated in the GHFF FHA tool as GHFF roosting camp or species presence was not observed on-site, however, suitable foraging habitat for the species was evident. Therefore, the density of foraging habitat available on-site is considered an appropriate assessment benchmark for species stocking rate.

The following section details the methodology utilised to assess the site condition, site context and species stocking rate under the GHFF FHA.

Site Condition (40 %)

Assessing site condition is an integral step in determining specific quantification of impacts, while also determining whether an offset site is suitable to establish a desired capacity to support the prescribed environmental matters being offset. The on-site condition is a key element of habitat quality and has a

direct influence on the biodiversity it supports. Site condition is assessed using a suite of attributes to describe the structure and function of the vegetation community and is benchmarked against the expected range for a relatively undisturbed community.

The site condition assessment under the GHFF FHA is assessed using six condition characteristics being:

- Vegetation condition;
- Species richness (canopy trees);
- Flower scores (average);
- Timing of biological shortages;
- Quality of foraging habitat (trees >0.65 wt p*r); and
- Non-native plant cover.

Assessment methodology of the above condition characteristics is outlined below:

- *Vegetation condition* – This condition characteristic is assessed using the Queensland *Vegetation Management Act 1999* vegetation community status definition, being Category B (remnant), Category C (high-value regrowth) and Category X (non-remnant). This characteristic is scored from a desktop mapping perspective and verified on-ground during assessment. Refer to Table A1 for the benchmark scoring values for this condition characteristic.
- *Species richness (canopy trees)* – This condition characteristic is assessed using a 100 m X 20 m plot following the contour of the land when possible. Within the plot, all canopy tree and subcanopy tree specimens are recorded. It should be noted that non-GHFF foraging species are also documented. Refer to Table A2 for the benchmark scoring values for this condition characteristic.
- *Flower scores (average)* – This condition characteristic is assessed by analysing and cross-referencing the species recorded in the 'species richness (canopy trees)' characteristic with the published literature, specifically the information within *Ranking the feeding habitat of Grey-headed Flying-foxes for conservation management* (Eby and Law 2008) and the *Draft Recovery Plan for the Grey-headed Flying-fox* (DoEE 2017) and determining the flower score of the recorded canopy species. The individual score for each flowering GHFF foraging tree is then divided by the number of species recorded (GHFF foraging and non-GHFF foraging trees) to produce an average. The benchmark values for this condition characteristic have been derived from

the findings published by Eby and Law (2008) (*Ranking the feeding habitat of Grey-headed Flying-foxes for conservation management*). Refer to Table A3 for the benchmark scoring values for this condition characteristic.

- *Timing of biological shortages* – This condition characteristic is assessed by analysing and cross-referencing the species recorded in the 'species richness (canopy trees)' characteristic with the published literature, specifically the information within *Ranking the feeding habitat of Grey-headed Flying-foxes for conservation management* (Eby and Law 2008) and the *Draft Recovery Plan for the Grey-headed Flying-fox* (DoEE 2017) and determining the ability of the canopy species in the vegetation community to produce foraging habitat during biological shortages (food shortages, pregnancy and birthing, lactation, mating and conception, migration paths and fruit industries). It should be noted that this condition characteristic is weighted and 'food shortages' has been weighted heavier than the balance of the characteristics which are equal, as 'food shortages' is recognised as a major issue. Refer to Table A4 for the benchmark scoring values for this condition characteristic.
- *Quality of foraging habitat* – This condition characteristic is assessed by analysing and cross-referencing the species recorded in the 'species richness (canopy trees)' characteristic with the published literature, specifically the information within *Ranking the feeding habitat of Grey-headed Flying-foxes for conservation management* (Eby and Law 2008) and the *Draft Recovery Plan for the Grey-headed Flying-fox* (DoEE 2017) and determining which canopy species recorded contain a flower score greater than 0.65 wt p*r and is recognised as a significant food plant by Eby and Law (2008). It should be noted that species recorded that are not prescribed a value by Eby and Law (2008) but are recognised as GHFF foraging trees, have been given an average weighted value of related species or, in the case of *Eucalyptus crebra* (Narrow-leaved Ironbark) been prescribed a value of 0.65 and classified as a significant food plant given its importance as a winter flowering species as acknowledged in the *Draft Recovery Plan for the Grey-headed Flying-fox* (DoEE 2017). Refer to Table A5 for the benchmark scoring values for this condition characteristic.
- *Non-native plant cover* – This condition characteristic is assessed using a 100 m X 20 m plot following the contour of the land when possible. All non-native plant cover was assessed by estimating the cover of exotic species over the 100 m X 20 m plot. Refer to Table A6 for the benchmark scoring values for this condition characteristic.

It should be noted that for on-ground assessment purposes, the 100 m X 20 m plot utilised for the GHFF FHA overlaps with the on-ground condition characteristics of the koala MHQA.

Site Context (30 %)

The site context assessment deals with the site and its adjacent surroundings. Site context is measured using a suite of attributes to describe the location of the habitat within the surrounding landscape and the influence of its associated threats. This assessment also considers the influence of adjacent vegetated areas and ecological corridors. Under the GHFF FHA, site context is measured using the following six characteristics:

- Size of patch;
- Connectedness (active GHFF roost camps in a 20 km radius);
- Context (percentage of GHFF foraging habitat in a 20 km radius);
- Ecological corridors;
- Role of site location to species overall population in the state (active GHFF national flying-fox monitoring viewer 'level 3' roost camps in a 20 km radius); and
- Threats to the species.

Assessment methodology of the above context characteristics is outlined below:

- *Size of patch* – This context characteristic is assessed using a modified version of the traditional habitat quality assessment with the directly connected patch of GHFF foraging habitat to site measured. This context characteristic is measured using GIS. Refer to Table A7 for the benchmark scoring values for this context characteristic.
- *Connectedness* – This context characteristic is assessed by analysing the number of active GHFF roost camps (over the most recent monitoring period (15/05 – 18/05)) within a 20 km radius of the site. For consistency purposes this assessment is to utilise the data provided on the national flying-fox monitoring viewer (Australian Government). Refer to Table A8 for the benchmark scoring values for this context characteristic.
- *Context* – This context characteristic is assessed using a modified version of the traditional habitat quality assessment with the percentage of GHFF foraging habitat within a 20 km buffer of the site measured. This context characteristic is measured using GIS. Refer to Table A9 for the benchmark scoring values for this context characteristic.

- *Ecological corridors* – This context characteristic is assessed using the traditional habitat quality assessment methodology which involves determining the proximity of the site to state, bioregional, regional or sub-regional corridors. Refer to Table A10 for the benchmark scoring values for this context characteristic.
- *Threats to species* – This context characteristic is assessed by analysing the published scientific literature regarding threats to GHFF and determining the number and severity of the threatening processes observed at or adjacent to the site. Refer to Table A11 for the benchmark scoring values for this context characteristic.
- *Role of site location to species overall population in the state (active GHFF national flying-fox monitoring viewer 'level 3' roost camps in a 20 km radius)* – This context characteristic is assessed by determining the number of active GHFF roost camps level 3 or greater (over the most recent monitoring period (15/05 – 18/05)) within a 20 km radius of the site. For consistency purposes this assessment is to utilise the data provided on the national flying-fox monitoring viewer (Australian Government). Refer to Table A12 for the benchmark scoring values for this context characteristic.

Species Stocking Rate (40 %)

The GHFF FHA incorporates species stocking rate as an attribute not discussed under the traditional terrestrial habitat assessment methodology. As discussed above, species stocking rate for GHFF associated with this proposed action is related to the density of GHFF foraging habitat at the site at the time of undertaking the survey.

Baseline GHFF foraging tree surveys were undertaken by utilising the stem count methodology provided in the *Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (version 5.0)* (Neldner *et al.* 2019).

This methodology involves assigning the strata for canopy (T1) and subcanopy (T2) and then counting the number of individual tree specimens within the 100 m X 20 m plot (0.2 ha) that are classed as foraging species for GHFF. A tree that branches into two or more stems above 30 cm above the ground is counted as one individual. The stem density of canopy species recorded within the 0.2 ha plot is multiplied by five (5) to produce a stem density per ha. This number is then compared to the benchmark stem density per ha based on the sum of the T1 and T2 stem densities for RE12.5.4. Based on the technical descriptions, the average stem density taken as the sum of T1 and T2 is calculated as 555 per ha for RE12.5.4. Refer to Table A13 for benchmark scoring values for species stocking rate.

The species stocking rate scoring was determined by analysing the Technical Descriptions of Regional Ecosystems of Southeast Queensland (Ryan 2019) and the stem density per hectare associated with the technical description of the regional ecosystem.

Table A1: GHFF FHA Vegetation Condition Scoring

Score	Description
5	Category X / non-remnant
10	Category C / regrowth
20	Category B / remnant

Table A2: GHFF FHA Canopy Species Richness Scoring

Score	Description
0	0 GHFF foraging species
5	1 – 3 GHFF foraging species
10	4 – 6 GHFF foraging species
20	> 6 GHFF foraging species

Table A3: GHFF FHA Flower Score (average) Scoring

Score	Description
2	0.01 – 0.25
5	0.26 – 0.50

Score	Description
8	0.51 – 0.75
10	0.76 – 1.00

Table A4: GHFF FHA Timing of Biological Shortages Scoring

Score	Description
2.5	Food shortages
1.5	Pregnancy and birthing
1.5	Lactation
1.5	Mating and conception
1.5	Migration paths
1.5	Fruit industries
Total (/10)	Combine total of above

Table A5: GHFF FHA Quality of Foraging Habitat (trees >0.65 wt p*r) Scoring

Score	Description
0	0 significant GHFF foraging tree species
5	1 – 3 significant GHFF foraging tree species
10	4 – 6 significant GHFF foraging tree species
20	> 6 significant GHFF foraging tree species

Table A6: GHFF FHA Non-Native Plant Cover Scoring

Score	Description
1	> 50 % non-native plant cover
5	25 – 50 % non-native plant cover
10	5 – 25 % non-native plant cover
20	< 5 % non-native plant cover

Table A7: GHFF FHA Size of Patch Scoring

Score	Description
0	< 5 hectares
2	5 – 25 hectares
5	26 – 100 hectares
7	101 – 200 hectares
10	> 200 hectares

Table A8: GHFF FHA Connectedness Scoring

Score	Description
0	< 1 active Grey-headed Flying-fox camp within a 20 km radius
3	1 – 3 active Grey-headed Flying-fox camp within a 20 km radius
6	4 – 6 active Grey-headed Flying-fox camp within a 20 km radius
10	> 6 active Grey-headed Flying-fox camp within a 20 km radius

Table A9: GHFF FHA Context Scoring

Score	Description
0	< 10 % Grey-headed Flying-fox foraging habitat within a 20 km radius
3	10 – 30 % Grey-headed Flying-fox foraging habitat within a 20 km radius
6	31 – 75 % Grey-headed Flying-fox foraging habitat within a 20 km radius
10	> 75 % Grey-headed Flying-fox foraging habitat within a 20 km radius

Table A10: GHFF FHA Ecological Corridors Scoring

Score	Description
0	Not within an ecological corridor
6	Sharing a common boundary with an ecological corridor
10	Within an ecological corridor

Table A11: Threats to species (GHFF) scoring

Score	Description
1	High level threat to the species
5	Moderate level threat to the species
10	Low level threat to the species

Table A12: Role of site location to GHFF overall population in the State scoring

Score	Description
1	1 – 2 active level 3 Grey-headed Flying-fox camp within a 20 km radius

Score	Description
6	2 – 4 active level 3 Grey-headed Flying-fox camp within a 20 km radius
10	> 4 active level 3 Grey-headed Flying-fox camp within a 20 km radius

Table A13: GHFF Species Stocking Rate Scoring

Score	RE12.5.4
2	0-69
4	70-301
6	302-509
8	510-543
10	544-567
8	568-601
6	602-809
4	810-1041
2	>1042

ATTACHMENT 3 – MHQA -IMPACT SITE RESULTS - KOALA

Assessment Unit - Regional Ecosystem	AU 1 - Cat B - Open woodland vegetated area with Sporobolus pyramidalis dominating the ground layer (RE12.5.4)						
	RE12.5.4 Benchmark	Transect 1	Transect 2	Transect 3	Average of Transect(s)	% Benchmark	Score
SITE CONDITION							
Recruitment of woody perennial species in EDL	100	40	33	100	57.67	57.67	3
Native plant species richness - trees	5	10	12	11	11.00	220.00	5
Native plant species richness - shrubs	9	4	4	2	3.33	37.04	2.5
Native plant species richness - grasses	7	4	4	4	4.00	57.14	2.5
Native plant species richness - forbs	18	3	8	6	5.67	31.48	2.5
Tree canopy height (Canopy)*	17	18	19	17	18.00	105.88	5
Tree canopy height (Sub-canopy)*	8	10	8	10	9.33	116.67	5
					*Average tree canopy height		5
Tree canopy cover (Canopy)**	37	24.8	54.8	58.8	46.13	124.68	5
Tree canopy cover (Sub-canopy)**	14	45	44.5	51.5	47.00	335.71	3

	**Average tree canopy cover						4
Shrub canopy cover	19	20.3	6.9	19.5	15.57	81.93	5
Native grass cover*	42	16	6	7	9.67	23.02	1
Organic litter*	29	36	19	23	26.00	89.66	5
Large trees (euc plus non-euc) (per ha)	27	18	24	32	24.67	91.36	10
Coarse woody debris (per ha)	416	283	215	488	328.67	79.01	5
Non-native plant cover	0	70	80	75	75.00	75.00	0
Quality and availability of food and foraging habitat	NA	10	10	10	10.00	-	10
Quality and availability of shelter	NA	10	10	10	10.00	-	10
	Site Condition Score (/100)						70.5
	Overall Site Condition Score - out of 3						2.12
SITE CONTEXT							
Size of patch	10	5	5	5	5		5
Connectedness	5	2	2	2	2		2

Context	5	2	2	2	2		2
Ecological Corridors	6	0	0	0	0		0
Role of site location to species overall population in the state	5	5	5	5	5		5
Threats to the species	15	7	7	7	7		7
Species mobility capacity	10	7	7	7	7		7

	Site Context Score (/56)					28
	Overall Site Context Score - out of 3					1.50
SPECIES STOCKING RATE						
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	70			40		40
	Species Stocking Rate Score (/70)					40.00
	Overall Species Stocking Rate Score - out of 4					2.29
	Overall Assessment Unit Score					5.90

ATTACHMENT 4 – GHFF-FHA -DETAILED METHODOLOGY RESULTS - GHF

		Maximum Score	Assessment Unit – Regional Ecosystem	
			AU 1 Remnant RE12.5.4	
Site Condition (40%)	Vegetation Condition	20	20	AU 1 is mapped as Category B
	Species Richness	20	20	T1 – 7 GHFF species T2 – 8 GHFF species T3 – 8 GHFF species Average – 7.67 GHFF species
	Flower Score	10	8	T1 – 0.611 T2 – 0.559 T3 – 0.579 Average – 0.579
	Timing of Biological Shortages	10	10	T1 – 10 T2 – 10 T3 – 10 Average – 10
	Quality of Foraging Habitat	20	5	T1 – 3 species T2 – 2 species T 3 – 3 species Average – 2.67 species
	Non-native Plant cover	20	1	T1 – 70% T2 – 80% T3 – 75 Average – 75%
	Site Condition Score	100	64	
	Site Condition Score – out of 4	4.00	2.56	
Site Context (30%)	Size of Patch	10	5	Patch size is between 26 – 100 ha
	Connectedness	10	3	3 active camps within 20km

		Maximum	Assessment Unit – Regional Ecosystem	
	Context	10	3	25%
	Ecological Corridors	10	0	Not within
	Roles of the site location to the species overall population in the state	10	0	0 active level 3 GHFF camps within a 20km radius
	Threats to species	10	5	The site has barbed wire fencing, is not subject to bushfire controls and feral animal predators are present. A moderate threat level is prescribed
	Site Context Score	60	16	
	Site Context Score – out of 3	3.00	0.80	
Species Stocking Rate (30%)	GHFF Foraging Tree Density		6	T1 – 385 T2 – 340 T3 - 680 Average – 468.33
	Species Stocking Rate Score	10	6	
	Species Stocking Rate – out of 3	3.00	1.8	
	Total		5.16	

ATTACHMENT 5 – OFFSET ASSESSMENT GUIDES – POTENTIAL OFFSET SITE 1

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	14.14	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	14.14	Adjusted hectares	Potential Site 1 - AU1	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	92.4	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	13.10	92.68%	Yes	
									Future area without offset (adjusted hectares)	92.4	**Future area with offset (adjusted hectares)**	92.4								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**3**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**6**	3.00	60%	1.80	1.42				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	14.136	13.10	92.68%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	14.14	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	14.14	Adjusted hectares	Potential Site 1 - AU2	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	165.2	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	10.26	72.61%	No	
									Future area without offset (adjusted hectares)	165.2	**Future area with offset (adjusted hectares)**	165.2								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	70%	0.70	0.62				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	14.136	10.26	72.61%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

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

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

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**5**	Scale 0-10	
			Total quantum of impact	11.78	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.78	Adjusted hectares	Potential Site 1 - AU1	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	92.4	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	15.98	135.66%	Yes	
									Future area without offset (adjusted hectares)	92.4	**Future area with offset (adjusted hectares)**	92.4								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	4	**Future quality without offset (scale of 0-10)**	4	**Future quality with offset (scale of 0-10)**	7	3.00	60%	1.80	1.73				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.78	15.98	135.66%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

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

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**5**	Scale 0-10	
			Total quantum of impact	11.78	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.78	Adjusted hectares	Potential Site 1 - AU2	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	165.2	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	11.34	96.22%	Yes	
									Future area without offset (adjusted hectares)	165.2	**Future area with offset (adjusted hectares)**	165.2								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	70%	0.70	0.69				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.78	11.34	96.22%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

ATTACHMENT 6 – OFFSET ASSESSMENT GUIDES – POTENTIAL OFFSET SITE 2

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	14.14	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	14.14	Adjusted hectares	Potential Site 2 - AU1	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	85	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	12.05	85.26%	No	
									Future area without offset (adjusted hectares)	85.0	**Future area with offset (adjusted hectares)**	85.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	4	**Future quality without offset (scale of 0-10)**	4	**Future quality with offset (scale of 0-10)**	7	3.00	60%	1.80	1.42				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	14.136	12.05	85.26%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	14.14	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	14.14	Adjusted hectares	Potential Site 2 - AU2	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	195	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	12.12	85.70%	No	
									Future area without offset (adjusted hectares)	195.0	**Future area with offset (adjusted hectares)**	195.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	70%	0.70	0.62				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	14.136	12.12	85.70%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

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

This guide relies on Macros being enabled in your browser.

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

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

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**5**	Scale 0-10	
			Total quantum of impact	11.78	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.78	Adjusted hectares	Potential Site 2 - AU1	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	58	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	10.03	85.15%	No	
									Future area without offset (adjusted hectares)	58.0	**Future area with offset (adjusted hectares)**	58.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**5**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**8**	3.00	60%	1.80	1.73				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.78	10.03	85.15%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

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

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

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Bundaberg Hospital	**Area**	23.56	Hectares	
			Quality	**5**	Scale 0-10	
			Total quantum of impact	11.78	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.78	Adjusted hectares	Potential Site 2 - AU2	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	145	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%								
									Future area without offset (adjusted hectares)	145.0	**Future area with offset (adjusted hectares)**	145.0	0.00	95%	0.00	0.00	9.95	84.46%	No	
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	70%	0.70	0.69				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.78	9.95	84.46%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

CONFIDENTIAL ATTACHMENT – TO BE REMOVED FOR PUBLICATION

OFFSET SITE 1 AND 2 – ASSESSMENT UNIT PLANS