Department of Planning, Housing and Infrastructure

Our ref: MP10_0138-PA-153

Emma Bulkeley
Environmental Superintendent
Maules Creek Coal
P.O Box 56
Boggabri, NSW, 2382

04/11/2026

Maules Creek Coal – Biodiversity Management Plan

Dear Ms. Bulkeley

Thank you for submitting the Biodiversity Management Plan submitted in accordance with Condition B52, Schedule 3 of the consent for the Maules Creek (MP10_0138). I also acknowledge your response to the Department's review comments and request for additional information.

I note the Biodiversity Management Plan was updated to align with the new format and contains the information required by the conditions of approval.

Accordingly, as nominee of the Planning Secretary, I approve the revised Biodiversity Management Plan (Rev. 3.4 October 2026).

You are reminded that if there are any inconsistencies between the Biodiversity Management Plan and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Charissa Pillay on 02 99955944.

Yours sincerely



Stephen O'Donoghue
Director
Resource Assessments

As nominee of the Planning Secretary

Whitehaven

Maules Creek Coal Mine Biodiversity Management Plan

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1. Introduction

1.1 Overview of approved operations

The Maules Creek Coal Mine (MCCM) is an open cut mining operation located approximately 20 km north-east of Boggabri within the Narrabri Local Government Area, in NSW. The MCCM is operated by Maules Creek Coal Pty Ltd (a wholly owned subsidiary of Whitehaven Coal Limited [Whitehaven]) on behalf of the Maules Creek Coal Joint Venture (MCJV)[1].

The MCCM commenced operations in 2015 and has approval to produce up to 13 million tonnes per annum run-of-mine (ROM) coal via conventional open cut methods and process the coal at an on-site coal handling and processing plant (CHPP) for off-site transport by rail, until the end of December 2034.

The MCCM operates under project approval PA 10_0138 (granted 23 October 2012), inclusive of multiple modifications. Further details on each modification can be found in the 'Definition' section of project approval PA 10_0138.

A full project description, including baseline data, history of operations, current operating approach and mining methods are outlined within the Maules Creek Coal Mine Project Environmental Assessments and previous Annual Reviews for the site. These documents can be found on the Whitehaven Coal website.

1.2 Baseline data

Baseline biodiversity surveys were completed by Cumberland Ecology Pty Ltd as part of the MCCM Environmental Assessment. The studies found the Project Boundary (outlined in Figure 1) supports vegetation containing high diversity of native species, with several hundred flora species being recorded within the Leard State Forest and the surrounding landscape.

No threatened flora species were identified within the Project Boundary during the survey periods, however, a range of threatened plant species are known to occur in the locality surrounding the Project Boundary.

The following were identified within or in the vicinity of the Project Boundary:

- 22 mammal species (11 terrestrial, two arboreal and nine bat species);
- 132 bird species; and
- 25 reptile species.

No groundwater dependent ecosystems have been identified to occur within the Project Boundary.

1.3 Purpose

The purpose of this Management Plan is to provide an overview of, and direction for, the systems, processes and documentation established for the management of flora and fauna within the MCCM Project Boundary associated with the construction, operation and rehabilitation of the MCCM coal mine. This includes the management of potential and realised impacts of the approved action on Matters of National Environmental Significance (MNES), specifically the White Box–Yellow Box–Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community, Regent Honeyeater, Swift Parrot and Greater Long-eared Bat.

The management of MCCM's biodiversity offset areas, including the offsetting strategies and management requirements for these MNES, is addressed separately through the MCCM Offset Management Plan (OMP).

This Management Plan has been established to:

- ensure compliance with the conditions of all relevant active approvals;
- minimise impacts on biodiversity associated with mining activities;
- implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation or rehabilitation of the development;
- evaluate and report on the effectiveness of the biodiversity management system; and

[1] Refer to MCCM Environmental Management Strategy

- maintain an effective response mechanism to manage exceedances and complaints.

1.4 Scope

The scope of this Management Plan applies to all activities at MCCM, including mining, handling, transport, and storage of coal that have the potential to impact on the immediate and surrounding receiving environment.

This plan forms part of the Maules Creek Environmental Management Strategy (EMS) and is substantially integrated with the following plans and strategies:

- Rehabilitation Strategy;
- Rehabilitation Management Plan;
- Water Management Plan;
- Bushfire Management Plan; and
- Offset Management Plan.

In accordance with Schedule 2, Condition 1 of PA 10_0138, MCC will implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation, or rehabilitation of the development.

1.5 Management systems

MCCM; as a Whitehaven Coal operation, has well-established management systems. These management systems provide the framework to support the planning, implementation, monitoring and review to achieve continual improvement in biodiversity management. To minimise the biodiversity impacts from these activities, a risk-based approach has been established, which includes mechanisms for disturbance planning and biodiversity monitoring, providing feedback on the effectiveness of controls and enabling adaptive biodiversity management.

2. Legislative requirements

Requirements and commitments associated with biodiversity are defined within the Maules Creek Project Approval (PA 10_0138).

This BMP has been developed in accordance with the Project Approval and other relevant conditions, as provided in Appendix 1.

Standards, guidelines and additional legislation relevant to the preparation this BMP and the management of biodiversity at MCCM are available in Section 10.

3. Consultation and communication

This Management Plan has been prepared in consultation with the Department of Planning, Housing and Infrastructure (DPHI). In addition, MCCM has extensive consultation and communication processes, including but not limited to:

- a comprehensive community engagement program which includes a Community Consultative Committee (CCC);
- ongoing consultation with relevant government agencies including DPHI, the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) Conservation Programs, Heritage and Regulation Group (CPHR, formerly known as the Biodiversity, Conservation and Science (BCS) Group), Commonwealth DCCEEW, North West Local Land Services (NWLLS);
- a community response line (1800 942 836) which enables members of the community to contact environment and community staff directly to discuss concerns with biodiversity; and
- publicly available project approvals, environmental and other related documentation (annual reports, complaints register, CCC minutes) via the Whitehaven website.

Condition 51 (Schedule 3) of PA 10_0138 requires MCC to consult with DPI Fisheries regarding the general operation and design of the pump station and screens prior to construction of the permanent Namoi water pipeline and pump station. At this stage no permanent pump station has been implemented. Once a permanent pumping station is decided upon MCCM will consult with DPI Fisheries

4. Risk management

MCCM implements a comprehensive risk management system as documented in the *Whitehaven Coal HSE Risk Management Standard* (WHC-STD-HSE Risk Management) and the Whitehaven Coal HSE Risk Management Procedure (WHC-PRO-HSE Risk Management). Biodiversity risks and their associated control measures are documented in the MCCM Broadbrush Risk Assessment; the control measures are summarised in section 5 of this Management Plan. Operational and project related changes that have the potential to materially alter the biodiversity risk profile are managed through the Whitehaven Coal Management of Change Standard (WHC-STD-Management of Change).

5. Control measures

5.1 Overview of operation controls

The Project Approval requires MCC to implement reasonable and foreseeable avoidance and mitigation measures' regarding biodiversity. Key operational control measures are included in Table 5-1.

Table 5.1 Key Control Measures

Activity	Risk	Mitigation Measures	Responsibility	Timing
Vegetation clearing	Exotic flora and fauna Loss of biodiversity Disturbance of environmentally sensitive land Breeding season	**Land Disturbance Protocol** A Land Disturbance Protocol (LDP) form will be used to manage the clearance process and to document all licensing, safety and management requirements	Environment Superintendent or delegate	Ongoing
		Pre-clearance flora and fauna surveys An assessment to identify biodiversity features pre-clearance flora and fauna surveys will be conducted as per the WHC-PRO-OC-MCC-Clearing Operations, WHC-PRO-OC-MCC-Ecological Survey and recorded on the LDP form as summarised in section 5.2.2	Environment Superintendent or delegate	Ongoing
		Clearing activities Clearing of vegetation will be limited to the minimum necessary for each stage of the clearing, as summarised in section 5.2.2 and the WHC-PRO-OC-MCC- Clearing Operations The limits of clearing will be clearly marked prior to clearing Disturbance will be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary	Mine Services Superintendent	As required
		Timing of clearing Clearing of woodland/native forest is only permitted between 15 February and 30 April Under exceptional circumstances, minor clearing of woodland/ native forest is permissible outside of the period with the prior written consent of the Planning Secretary of DPHI Clearing will occur no more than 12 months in advance of the proposed mine plan during operations Clearing of other land disturbance may occur year-round Fauna mitigation measures will be developed and implemented, as appropriate	Environment Superintendent or delegate Operator	Ongoing
		Weed management Infestations of significant weeds (priority weeds or Weeds of National Significance [WONS]) will be recorded in the LDP form and mapped Inspections of vehicles and, where required, washing down vehicles and machinery Detailed weed management is summarised in section 5.2.5 and will be carried out in line with WHC-PRO-OC-MCC-Weed Management Protocol	Environment Superintendent or delegate	Ongoing
		Collection Seed collection will occur with clearing of vegetation, where possible to optimise seed collection, as summarised in section 5.2.7	Environment Superintendent or delegate	As required
		Propagation Propagation of seedlings will be undertaken in accordance with the Rehabilitation Management Plan (RMP) (Whitehaven, 2025) Records will include all source of propagation, species, quantities and dates	Environment Superintendent or delegate	As required
Rehabilitation	Loss of biodiversity	The procedures, protocols and targets for revegetation of the post-mining rehabilitation areas are covered in the RMP, and are summarised in section 5.3 A selection of habitat resources will be salvaged for reuse in rehabilitation as summarised in section 5.2.8	Environment Superintendent or delegate	Ongoing
Control of pest animals	Invasive animals outcompeting native	**Vegetation** Salvageable logs will be removed and felled trees will be wood chipped and stockpiled in a suitable area away from retained remnant vegetation	Environment Superintendent or delegate	Ongoing
		Waste handling Waste will be appropriately disposed offsite by a licensed waste contractor at a suitable facility	Environment Superintendent or delegate	Ongoing
		Implementation of Pest Animal Control Program as summarised in Section 5.4	Environment Superintendent or delegate	Ongoing
Control of erosion	Vegetation disturbance/clearing	Erosion and sediment control measures are contained within the MCCM Water Management Plan (Whitehaven, 2025).	Environment Superintendent or delegate	As required
Management of livestock grazing and agriculture	Livestock	Livestock will be excluded from active mine areas, areas undergoing active revegetation (i.e. planting or seeding) and all those areas with a Land Capability Class unsuitable for grazing	Environment Superintendent or delegate Landholders	Ongoing
Control of Access	Public access	Barriers (e.g. signage, fencing, locked gates) will be implemented to control public access and to regulate personnel access to areas of the Leard State Forest during weed or feral animal control	Field operators	Ongoing
Vehicle driving and signage	Injury to wildlife	Speed restrictions will be implemented, in line with the driving standard (WHC-STD-OC-MCC-Vehicles and Driving), to assist in minimising the risk of vehicle strike to fauna. Signs will be installed to caution drivers of known fauna crossings and remind them of speed limits.	All site personnel	Ongoing
Bushfire management	Fire	As per the Bushfire Management Plan and will include provisions for the following:	Fire Fighters and Controlled Burn	Ongoing

Activity	Risk	Mitigation Measures	Responsibility	Timing
	Loss of habitat	• perimeter asset protection zones; and • maintaining perimeter tracks according to specifications.	Practitioners	
Biodiversity Corridor	Impacts to native fauna and flora	No disturbance permitted to occur within the Biodiversity Corridor (vegetated corridor) Where disturbance is to occur within 10 m of the Biodiversity Corridor boundary, the area will be demarcated Refer Section 5.6 and Biodiversity Corridor Plan (Appendix 3)	Environment Superintendent or delegate	Ongoing
Inductions and staff education	Lack of awareness	Additional targeted and specific inductions/training for contract and operational staff directly involved in clearing of native vegetation in relation to the two-staged clearing protocols, exclusions zones, types of flora and fauna, in particular threatened species	All site personnel	As required

5.2 WHC-PRO-OC-MCC Clearing Operations

To minimise impacts on native flora native flora and fauna species and manage the impacts of exotic flora and fauna the following procedures will be followed.

5.2.1 Pre-clearance and post-clearance activities

The LDP WHC-PRO-OC-MCC-Land Disturbance Protocol is to be completed for each stage of clearing by the person responsible for the clearing activities, the relevant technical expert and signed off by MCCs Environmental Officer or a delegate and final authorisation by the Environmental Superintendent or delegate. The completion of this activity will be recorded and signed off in the LDP form.

5.2.2 Pre-clearance flora and fauna surveys

Initially, the environmental assessment will be reviewed to identify known locations of biodiversity features such as hollow bearing trees or bush rocks. These will be recorded on the LDP form.

Prior to clearing, a pre-clearing surveys will be conducted to identify if threatened plant species of habitat features are present. If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. Identified habitat features will be recorded and marked. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with BCS, DPHI and Cth DCCEEW (for Matters of National Environmental Significance [MNES]). The program will be documented in this BMP via an addendum or new revision (as part of the Annual Review process).

Tylophora linearis was identified during pre-clearing flora surveys during 2014 and 2015. Appendix 4 provides a propagation and translocation program for the species.

Pomaderris queenslandica was identified during pre-clearing flora surveys during 2015. Appendix 5 provides a propagation and translocation program for the species.

Pultenaea imminuata was identified during pre-clearing flora surveys during 2024. Appendix 6 provides a propagation and translocation program for the species

Pre-clearance fauna surveys will be conducted by the suitably qualified ecologist within one week prior to clearing. Any fauna utilising the area will be recorded.

Wildlife relocation beyond the coal lease boundary within the Leard State Forest will be done in accordance with a relevant permit from Forestry Corporation NSW.

Updated maps/plans, pre-determined habitat for the release of fauna, habitat features present in the site and recommended clearing procedures will be submitted to the Environmental Officer and shall be recorded and signed off in the LDP form.

5.2.3 Clearing activities

Before clearing woodland/forest native vegetation and isolated trees in grasslands, experienced wildlife carers and/or ecologists will attempt to capture and/or remove fauna that have the potential to be disturbed as a result of clearing activities. Clearing contractors will then be informed of any changes to the sequence of clearing if required (see below). Ecologists will be present on site during clearing and will provide ecological supervision to the clearing contractors throughout the process.

The clearing of woodland/forest native vegetation and isolated trees in grasslands will be conducted using a two-stage clearing process to allow fauna a chance to self-relocate upon nightfall:

1. Clearing will commence following the identification of potential habitat trees by the suitably qualified ecologist. Trees and/or logs/log piles marked with an “H” will not be cleared during the first stage; however, all vegetation around the marked features will be isolated. The suitably qualified ecologist will be present during the clearing to ensure the preservation of these marked features.

- Identified habitat trees will be left to stand overnight after Stage 1 clearing to allow resident fauna to voluntarily move from the area. Then, the habitat trees will be cleared using the following protocols:

- if possible, trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on;
- use a bulldozer or other suitable machinery to start pushing the tree over. Move the bulldozer over the roots and continue gently pushing the tree over. The tree should not fall heavily to the ground;
- remove branches with hollows and sections of trunk and set aside for immediate transfer to a storage area for eventual placement within rehabilitation areas (once available);
- the suitably qualified ecologist will investigate all hollows for the presence of fauna following felling of the tree; and
- the felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on.

Any animals that are inadvertently injured will be taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized. All persons working on the vegetation clearing will be briefed about the possible fauna present during land clearance, and what procedures will be undertaken in the event of an animal being injured or disturbed.

Results and outcomes of pre-clearance and clearance fauna surveys will be documented by the suitably qualified ecologist and submitted to MCCs Environmental Officer. This includes:

- species and numbers of individuals recorded;
- incidence of sick or injured animals and the actions taken to care for the fauna; and
- the species and numbers of individuals that were relocated.

If a new threatened species is identified that has not previously been identified as having potential to occur, the occurrence will be surveyed and fully documented. Results will be made available to CHPR and to Cth DCCEEW (if it is a species that is a MNES).

5.2.4 Timing of clearing

Clearing of woodland/forest native vegetation will be undertaken in late summer and early autumn (herein referred to as the “clearing window” between 15 February to 30 April) to avoid key breeding or hibernation seasons for threatened bat and bird species known to reside in the Leard State Forest.

In the event that clearing of woodland/forest native vegetation outside the clearing window was approved by the Secretary of DPHI, proposed clearing measures are identified below. Fauna mitigation measures will be developed and implemented as appropriate to minimise the impacts on fauna. The fauna mitigation measures for minor clearing will vary depending on the location of the proposed clearing, the time of year, susceptible threatened species, and habitat that is required to be cleared.

Nesting birds

- If the nest is suspected to be active (i.e. it suspected to contain eggs or young), the tree will not be cleared until after fledglings have left the nest or advanced fledglings are old enough to be cared for by a wildlife career for subsequent release; or
- if the nest is suspected to be inactive (i.e. not to contain eggs or young):
    - the tree will be cleared within two weeks following the confirmation that the nest is inactive; or
    - the nest will be removed from the tree to minimise the chance of the nest becoming active prior to clearance.

Bat roosts

Habitat trees with confirmed bat roosts will be managed by:

- shaking the tree with machinery prior to clearing to encourage bats to move to an alternative roost site;
- gently lowering the tree to the ground with the objective of causing minimal impact to the roost;
- placing the tree on the ground so the entrance to the hollow faces upwards (i.e. so bats are able to exit);
- inspecting the felled tree to confirm whether bats have exited the tree; and
- leaving the felled tree overnight to allow any remaining bats time to leave the hollow.

If a bat roost containing a maternity colony (young bats) is found during inspection of the felled tree, the following will be undertaken:

- If the roost is located in a portion of the tree that is not able to be relocated, the bat fauna will be collected and temporarily stored in a cool location for release at night.

- If the roost is located in a portion of the tree able to be relocated:
    - The cavity opening will be temporarily blocked with a piece of cloth.
    - The section of the tree will be removed using a chainsaw (or a suitable alternative low impact method) (noting that use of a chainsaw will be undertaken by a qualified chainsaw operator).
    - Adults and young captured leaving the roost are to be placed within the roost.
    - The ends of the extracted tree section and cavity openings will be temporarily blocked with a piece of cloth during transportation.
    - Collected roost and bat fauna will be temporarily stored in a cool location.
    - The roost will be returned to the location prior to dusk and positioned above the ground with a freefall of approximately 1-3 m.
    - The pieces of cloth will be removed once the tree section is fixed in an undisturbed location to allow bats to leave.
    - The roost to be checked the following morning for success of adult retrieval of young.
    - In the case of unsuccessful adult retrieval of young then the juvenile bats will be assessed by a veterinarian or experienced wildlife carer.

If habitat trees with suspected bat roosts are considered unlikely to contain bat roosts (following bat surveys), clearance will proceed. In consideration of the behaviour of many bat fauna species to use a number of roosts, trees containing potential bat habitat are to be felled, as soon as possible (ideally the following day) after a negative Anabat survey result.

If overhangs with suspected bat roosts are found during the pre-clearance surveys, the strategy may involve waiting until the bats have left the rock overhanging and block the entrance so they are unable to re-enter prior to clearance. Consideration will also be given to blocking tree hollows prior to clearance in the event that trees with empty hollows are left standing for more than 48 hours after checking the hollows.

5.2.5 Weed management

If recommended by MCCs Environmental Officer or suitably qualified ecologist, control of weeds will be undertaken to minimise the risk of spread of weeds during clearing. Weed control measures will be species specific and will be guided by published control measures, including:

- NSW Department of Primary Industries [DPI], 2018).
- *New South Wales Weed Control Handbook* [7th Edition] [DPI, 2018a].
- Local weed management plans published by the Narrabri Shire Council (2014).

Weed control will be undertaken for the targeted weed species based on seasonal conditions. The weed control program will involve:

- identifying weeds;
- application of weed control techniques in areas requiring weed control; and
- follow-up inspection weed control as required.

Follow-up weed control will be undertaken as required, in areas that have received past weeding treatments. Follow-up treatments ensure pressure is maintained on weeds, assisting regenerating or planted native plants to out-compete weed species.

Landholders are obliged to control priority weeds under the *NSW Biosecurity Act 2015*.

5.2.6 Management of Cultural Heritage values

Aboriginal and cultural heritage values within the MCCM Project Boundary will be managed under the MCCM Aboriginal Archaeology and Cultural Heritage Management Plan (Whitehaven, 2025).

5.2.7 Seed collection and propagation

Seed collection, management and storage will be undertaken in consideration of Greening Australia (various dates) *Florabank Guidelines* and as described in Rawlings *et al.* (2010) for local and regional provenance seed collection includes:

- collection of seed from several source sites with similar rainfall, soil, altitude, aspect and slope position to the revegetation site

to ensure they are most adapted to the landscape and environmental conditions;

- collection of seed from between 20-50 plants of each species for genetic diversity; and
- collection of seed from plants spaced approximately three plant-heights apart to prevent collection of too many closely related seeds.

For further detail on seed species, location of collection, volume of seed and storage methods, refer to RMP (WHC, 2025).

5.2.8 Maximising salvage of habitat resources

A selection of hollow-bearing trees, hollow-bearing logs and rocks will be salvaged for reuse in rehabilitation areas and/or selected recipient sites within nearby offsets that require enhancements.

Salvage of habitat features will take place during both Stage 1 and Stage 2 of clearing. The salvaged habitat features will be moved to a holding site for storage until a time that they can be emplaced in mine rehabilitation areas and in nearby offset areas to allow their continuation as potential fauna refuge sites. This will take place before and after clearing.

Relocation of bush rocks within the Leard State Forest or beyond the forest boundary will be undertaken as agreed with Forestry Corporation NSW.

The MCCM RMP describes the reuse of salvaged habitat resources on the mine rehabilitation.

5.3 WHC-PLN-MCC Rehabilitation Management Plan

An overview of some aspects of rehabilitation is provided below, for further details, refer to the RMP (Whitehaven, 2026).

5.3.1 Revegetation

Condition 44 of Schedule 3 of PA 10_0138 requires that, except for the area of the minimised final void, pre-mining native vegetation communities to be re-established (including 544 ha of Box-Gum Woodland CEEC) for a biodiversity conservation land use objective, with the area subject to finalisation of the RMP.

5.3.2 Salinity

Overburden and soil analysis undertaken as part of the Environmental Assessment for MCCM has not identified any saline material that would limit plant growth and development. MCC implements a soil sampling program including the rehabilitation areas and if saline material is encountered then soil amelioration options would be considered based on Subject Matter Experts advice. Options for managing salinity in the rehabilitation area could consider utilising saline tolerant colonising species as part the revegetation species mix as well as targeted engineering solutions to address hydrological (recharge and discharge) or material aspects to manage and mitigate future salinity impacts.

5.3.3 Long-term Conservation Security

In accordance with Condition 45A of Schedule 3 of PA 10_0138, by the end of December 2034, unless otherwise agreed by the Planning Secretary, MCC will make suitable arrangements to secure in perpetuity the Rehabilitation Area (2,078 ha less the area of the minimised void, to be approved by the Final Void and Mine Closure Plan) identified in Table 16 of PA 10_0138 to the satisfaction of the Planning Secretary.

5.3.4 Integration of rehabilitation area with the Biodiversity Offset Strategy

The MCCM Biodiversity Offset Strategy is outlined in Appendix 2 .This has been aligned with this Section 5 of the BMP and the linkage to the detailed documents that describe management of the post-mine landforms in accordance with the MCCM RMP and the MCCM Forward Program (January 2026) as well as the EPBC Approval 2010/5566 required MCCM Mine Site Rehabilitation Plan (April 2026). This BMP describes some aspects relevant to rehabilitation such as collection and propagation of seed (Section 5.2.7) consistent with Offset Area management (Section 5.3 of the OMP) as well as salvaging and reusing material for habitat augmentation (Section 5.8 of the OMP) as examples of the integrated approach taken.

5.4 Pest Animal Control Program

Pest animals congregate and breed in windrows of felled trees. Felled trees will be wood chipped and mixed into the topsoil for use in rehabilitation, to assist in the wood chipping trees will be temporarily windrowed. This will be done after all the salvageable logs with hollows have been removed. Any temporary piles of vegetation will be monitored to determine whether they are being used by pest

animals.

The pest animal program will involve:

- identifying pest animals through monitoring;
- application of pest animal control techniques in areas requiring control;
- follow-up monitoring of pest animal control areas; and
- follow-up pest animal control if required.

Target pest animals include:

- Feral Pig (*Sus scrofa)*;
- European Red Fox (*Vulpes)*;
- European Rabbit (*Oryctolagus cuniculus)*;
- Brown Hare (*Lepus capensis)*; and
- Feral Cat (*Felis catus)*.

Pest animal management will focus on the main pest animals recorded from the MCCM Project Boundary. However, all identified pest animals will also be managed in accordance with this BMP. The control of pest animals is intended to be adaptive and will be informed/reviewed based on the findings from the Pest Animal Monitoring Program (Section 6).

Control measures will include ground baiting, warren ripping and fumigation, and will be aligned with:

- *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs* (DEE, 2017).
- *PestSmart Toolkit* (Centre for Invasive Species Solutions, 2023).
- *Ecology and Management of Vertebrate Pests in NSW* (DPI, 2018b).
- *Threat Abatement Plan for Predation by European Red Fox* (DEWHA, 2008b).
- *NSW Threat Abatement Plan for Predation by the Red Fox* (*Vulpes vulpes*) (Office of Environment and Heritage {OEH}, 2011).
- *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (DEE, 2016).
- *Integrated Hare Control (Department of Environment and Primary Industries* [Victoria], 2015).
- *Threat Abatement Plan for Predation by Feral Cats* (DotE, 2015b).
- *Vertebrate Pest Control Manual* (DPI, 2020).

Control measures will be implemented by mine staff or by an appropriate Pest Control Contractor(s) as required. MCC will seek to co-ordinate pest animal control around the MCCM Boundary Project with neighbouring landholders and other mine operators. The program will also consider advice from neighbouring landowners regarding observations of target pest animals upon the mine site.

Signage will be erected in areas where baiting is occurring in accordance with the requirements of the *Pesticides Act* 1999, the *Pesticides Regulation* 2009 and all relevant Pesticide Control Orders.

5.5 WHC-STD-OC-MCC-Vehicles and Driving

This standard describes the vehicle driving standard on site, including measures to avoid vehicle and wildlife interactions.

5.6 Biodiversity corridor (vegetated buffer corridor)

Condition 7 (Schedule 2) and Condition 47 (Schedule 3) of PA 10_0138 require protection of the biodiversity corridor (vegetated buffer corridor) between the MCCM Project Boundary and that of the Boggabri Coal Project (Figure 2). MCC manages the biodiversity corridor (vegetated buffer corridor) in accordance with the Maules Creek Coal Mine Biodiversity Corridor Plan (Whitehaven, 2021a) which addresses the requirements of Condition 3 of EPBC Act Approval 2010/5566 and was approved by DAWE (now Cth DCCEEW) in December 2021.

The Biodiversity Corridor Plan (Whitehaven, 2021a; Appendix 3) provides measures to protect native vegetation within the biodiversity corridor and will be implemented to maintain the native vegetation in the biodiversity corridor and provide evidence that the Biodiversity Corridor will be protected in perpetuity. In 2013, when the EPBC Act approval was granted, it was acknowledged by the Department

that the biodiversity corridor occurs in Leard State Forest (State-owned zoned for forestry and mining). Prior to expiry of the EPBC Approval 2010/5566, MCC will pursue an alternate legal mechanism over the biodiversity corridor (or an alternative corridor) if one becomes available through consultation with the NSW Government or otherwise seek to extend the approval period to cover the timeframe required to put in place the required legal mechanism.

No disturbance will be permitted to occur within the Biodiversity Corridor (vegetated corridor); that is, no vehicles or machinery will be permitted entry and general pedestrian traffic will be discouraged.

6. Monitoring program

A Biodiversity Monitoring Program (Table 6-1) has been established to evaluate and report on:

- the change in the type, extent and density of major weed occurrences in the MCCM Project Boundary over time and provide recommendations about appropriate weed control required;
- regular inspections will also facilitate detection of new infestations of weeds and enable assessment of the effectiveness of the weed management measures;
- the abundance and distribution of pest animals within the MCCM Project Boundary will be monitored to provide the necessary information to trigger management actions and determine the efficacy of control measures aimed at reducing pest animal abundance; and
- the mine site monitoring program will be consistent as per the RMP with the offset area monitoring program to provide an ongoing collective management approach.

Details of the flora and fauna monitoring program undertaken for the MCCM Project are provided in the OMP.

Table 6-1 Biodiversity Monitoring Program

Methodology	Frequency	Data analysis and storage
Weed monitoring		
Environmental (e.g. WONS) and priority weeds will be monitored via inspections in the MCCM Project Boundary by a suitably qualified person(s) with experience in identification of weeds. If major weed infestations are discovered in the MCCM Project Boundary, the coordinates will be recorded, including the boundaries of large populations and details recorded regarding the estimated density of the infestation and the number of plants. Mapping will be prepared showing the extent of weeds requiring control. The weed monitoring program will target areas that are more susceptible to weeds (e.g. topsoil stockpiles, roadsides, drainage areas and mine rehabilitation). The weeds will be controlled as outlined in Table 5-1. Follow-up inspections will be undertaken to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures.	Twice a year (will include primary and secondary monitoring after weed control [a total of four weed monitoring events per year]).	All weed monitoring data will be stored in a database, and stored for later use and analysis. New species detected during surveys will be added to the database.
Pest monitoring		
Pest animal monitoring will adopt the relevant methodologies for specific pest animals, generally in accordance with the NSW *DPI Monitoring Techniques for Vertebrate Pests* (Mitchell and Balogh, 2007a to 2007e). Section 5.4 provides a list of target pest animals. Data on pest animal population/abundance from monitoring and control outcomes (e.g. date, activity, location) will be recorded. Native grazers that potentially inhibit restoration/revegetation (e.g. kangaroos) will be recorded. If grazing kangaroos are determined to be overabundant, the need for kangaroo control measures will be reviewed.	Pest animals will be monitored to observe population changes over time and efficacy of control measures. Annual review of the pest animal control measures, and follow-up works will be developed and implemented as required. Any proposed changes to frequency of monitoring will be discussed with CHPR and formalised in a revision to this BMP.	Data will be updated annually to analyse for trends and effectiveness of the control program.

7. Accountabilities

Table 7-1 Roles and responsibilities

Role	Accountability
General Manager	Ensure required resources and support to implement the BMP
Manager Technical Services	Authorise the BMP and future amendment Ensure induction and training relevant to the BMP Management and maintenance of monitoring network Regulatory notification and engagement Reporting and data review System maintenance and development Specific management responsibilities outlined in Table 5.1
Superintendent Environment	Support the Manager Technical Services and supervise biodiversity management and monitoring activities. Implementation of operational controls listed in Table 5.1
Environment Team	Undertake biodiversity management activities as directed by the Superintendent Environment for feral and pest animal monitoring and management/control
Field Operators and Technician	Undertake biodiversity management activities as directed by the Superintendent Environment and Environment Team for weed spraying, habitat augmentation, threatened species, revegetation ground preparation and other minor earthworks and waste/infrastructure removal, plus tree planting and maintenance activities
Fire Fighters and Controlled Burn Practitioners	Undertake biodiversity management activities as directed by the Superintendent Environment and Environment Team for fire management planning, hazard reduction management and ecological burn implementation
Training staff	Ecological awareness to be included in the inductions for staff, contractors and visitors to the mine site, outlining their role and responsibilities for the protection and/or minimisation of impacts to all native biodiversity
All Workers	Adhere to the relevant requirements of this Plan Modify activities to reduce biodiversity levels Specific management responsibilities outlined in Table 5.1

8. Compliance obligations

8.1 Incident notification

In accordance with Schedule 5, Condition 8 of PA 10_0138, MCC shall notify the Planning Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment immediately after becoming aware of the incident and shall notify of any other incident as soon as practicable. The Planning Secretary will be notified in writing through the Major Projects website.

8.2 Non-compliance notification

In the event of a non-compliance, the Planning Secretary must be notified in writing via the Major Projects website within seven days after becoming aware of any non-compliance. A non-compliance notification must identify the development and the application number for it, set out the condition of consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

8.3 Complaint handling

Whilst all endeavours will be made by MCC to avoid adverse biodiversity impacts on local landowners / residents, it is acknowledged

that impacts may occur. In order to ensure an appropriate and consistent level of reporting, response and follow-up to any complaints is adopted by MCC, the following complaints management protocol will be followed:

- a publicly advertised telephone complaints line will be in place to receive complaints;
- initial response is provided where practical within 24 hours of receipt of a complaint;
- an investigation will be initiated as per for an exceedance (section 8.1); and
- all details regarding the complaint including investigation outcomes and follow up actions will be documented in a complaints register.

A copy of the Complaints Register will be made available to the CCC and the complainant (on request) and updated monthly on the MCCM website. A summary of complaints received every 12 months will be included in the Annual Review.

9. Reporting and review

9.1 Reporting

9.1.1 Compliance reporting

An overview of any non-compliances or incidents received during the reporting year are included in MCCM's annual review. Refer to section 9.1.3 for further detail on the annual review.

9.1.2 CCC reporting

A Community Consultative Committee (CCC) has been established and will continue to be operated for the duration of operations on site. Regular briefings to the CCC will be provided, including regular reporting on the ecological performance of the MCCM.

9.1.3 Annual review

By the end of March each year, MCC will review their environmental performance for the previous calendar year. The biodiversity component of the Annual Review includes the required detail as per the *Post-approval requirements for State significant mining developments - Annual Review Guideline* (2015). The Annual Review will be sent to the relevant regulatory agencies for review and made publicly available on the MCCM website.

9.2 BMP review

In accordance with Schedule 5, Condition 5 of PA 10_0138, the BMP will be reviewed and revised (to the satisfaction of the Planning Secretary), within three months of the submission of the following documentation:

- Annual Review (Schedule 5, Condition 4);
- Incident Report (Schedule 5, Condition 8);
- Independent Environmental Audit (Schedule 5, Condition 10); and
- Any modification to the conditions of the PA 10_0138.

If necessary, the BMP will be revised to incorporate any recommended measures to improve the environmental performance of the resulting from audits, community complaints (section 8.3) and incident investigation findings (section 8.1). In addition, the review process will include ongoing evaluation of operational modifications, alternative methodologies and new technologies that become available for their potential to lessen environmental impacts.

9.3 Independent audit

In accordance with Schedule 5, Condition 10 of PA 10_0138, an Independent Environmental Audit (IEA) of MCCM was initially undertaken in 2015 and additional IEAs have been and will continue to be undertaken every 3 years since. The IEA includes a review of the MCCM water management system performance, assessment of compliance with the requirements in this plan, and implementation of management measures.

10. References

Centre for Invasive Species Solutions (2023) *PestSmart Toolkit.* Website: https://pestsmart.org.au/.

Commonwealth Department of Climate Change, Energy, the Environment and Water (2024) *Environmental Management Plan Guidelines*.

Department of Environment and Primary Industries (Victoria) (2015) *Integrated Hare Control*. Website: http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-animals/invasive-animal-management/established-invasive-animals/integrated-hare-control

Department of Environment, Water, Heritage and the Arts (2008b) *Threat Abatement Plan for Predation by the European Red Fox*. Canberra.

Department of Primary Industries (2018a) *New South Wales Weed Control Handbook – A Guide to Weed Control in Non-crop, Aquatic and Bushland Situations 7th Edition*. Website: https://dpi.nsw.gov.au/__data/assets/pdf_file/0017/123317/weed-control-handbook.pdf.

Department of Primary Industries (2018b) *Ecology and Management of Vertebrate Pests in NSW*.

Department of Primary Industries (2020) *Vertebrate Pest Control Management*.

Department of Primary Industries (2022a) *Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Foxes*.

Department of Primary Industries (2022b) *Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Pigs*.

Department of Primary Industries (2022c) *Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Rabbit*.

Department of Primary Industries (2022d) *Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Deer*.

Department of Primary Industries (2022e) *Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Goats*.

Department of Primary Industries (2022f) *Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Cats*.

Department of the Environment (2015b) *Threat Abatement Plan for Predation by Feral Cats*. Commonwealth of Australia, Canberra. In effect under the EPBC Act from 23-Jul-2015.

Department of the Environment (2016) *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)*.

Department of the Environment and Energy (2016) *Threat Abatement Plan for Competition and Land Degradation by Rabbits*. Commonwealth of Australia, Canberra, January 2016.

Department of the Environment and Energy (2017) *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs (Sus scrofa)*. Commonwealth of Australia, Canberra, March 2017.

Greening Australia (various dates) *Florabank Guidelines*. Website: https://www.greeningaustralia.org.au/publications/

Gregory N (2003). *Assessing the Humaneness of Pest Control Methods. In: Solutions for Achieving Humane Vertebrate Pest Control*. Proceedings of the 2003 RSPCA Australia Scientific Seminar held at the Telstra Theatre, Australian War Memorial, Canberra 25 February, 2003. Royal Society for the Prevention of Cruelty to Animals Australia, Canberra. Pp 65-84.

Hansen Bailey (2011) *Maules Creek Coal Project Environmental Assessment*. Prepared for Aston Coal 2 Pty Ltd.

Hunter Eco (2021) *Maules Creek Tylophora linearis Offset Package*. Prepared for Whitehaven Coal.

Mitchell, B. and Balogh, S. (2007a) *Monitoring Techniques for Vertebrate Pests, Feral Dogs*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007b) *Monitoring Techniques for Vertebrate Pests, Rabbits*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007c) *Monitoring Techniques for Vertebrate Pests, Feral Pigs*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007d) *Monitoring Techniques for Vertebrate Pests, Foxes*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007e) *Monitoring Techniques for Vertebrate Pests, Goats*. NSW Department of Primary Industries, Orange.

Narrabri Shire Council (2014) *Narrabri Shire Council*. Website: http://www.narrabri.nsw.gov.au/.

NSW DPIE (2024) Project Approval 10_0138 (Modifications 1-9).

NSW Government (2015) Annual Review Guideline; Post-approval requirements for State Significant Mining Development.

Office of Environment and Heritage (2011) *NSW Threat Abatement Plan For Predation by The Red Fox (Vulpes vulpes).*

Rawlings, K., Freudenberger, D. and Carr, D. (2010) *A Guide to Managing Box Gum Grassy Woodlands*. Caring for our Country Environmental Stewardship. Department of the Environment, Water, Heritage and the Arts, Canberra.

Saunders, D. L. and Tzaros, C. L. (2011) *National Recovery Plan for the Swift Parrot (Lathamus* discolor). Birds Australia, Melbourne.

Whitehaven Coal Limited (2022) *Maules Creek Coal Mine Aboriginal Archaeology and Cultural Heritage Management Plan*.

Whitehaven Coal Limited (2023) *Maules Creek Coal Mine Water Management Plan.*

11. Version control

Revision	Description	Author	Authorised by	Date
1.3	Approval of the BMP by DP&I (now DPHI)	Whitehaven Coal	Group Superintendent – Biodiversity	21 June 2013
1.7	Approval of the BMP by DP&E (now DPHI)	Whitehaven Coal	Group Superintendent – Biodiversity	14 May 2016
1.10	Approval of the BMP by DP&E (now DPHI)	Whitehaven Coal	Group Superintendent – Biodiversity	23 October 2014
2.5	Approval of the BMP by DP&E (now DPHI)	Whitehaven Coal	Group Superintendent – Biodiversity	26 April 2017
2.5	Approval of the BMP Addendum by DP&E (now DPHI)	Whitehaven Coal	Group Superintendent – Biodiversity	24 August 2022
-	Approval of the OMP* by DAWE (now Cth DCCEEW)	Whitehaven Coal	Group Superintendent – Biodiversity	20 December 2021
-	Submitted revised OMP* to include the additional offset areas approved by Condition 11A on 9 November 2023	Whitehaven Coal	Group Superintendent – Biodiversity	8 December 2023
3.1	New edition of the BMP* to incorporate the approved OMP and additional offset areas, and to reflect Modification 9 (for stakeholder review)	Whitehaven Coal	Group Superintendent – Biodiversity	13 June 2024
3.2	Revisions to the BMP* incorporating stakeholder review from consultation and submitted to NSW DPHI and Cth DCCEEW for approval	Whitehaven Coal	Group Superintendent – Biodiversity	16 October 2024
3.3	Revisions to the BMP* incorporating NSW DPHI and Cth DCCEEW feedback	Whitehaven Coal	Group Superintendent – Biodiversity	12 February 2025
3.4	Revision to the BMP removing OMP to Appendix 2	Whitehaven Coal	Manager Technical Services	28 October 2026

* Incorporated into this BMP

Figure 1: Regional Location

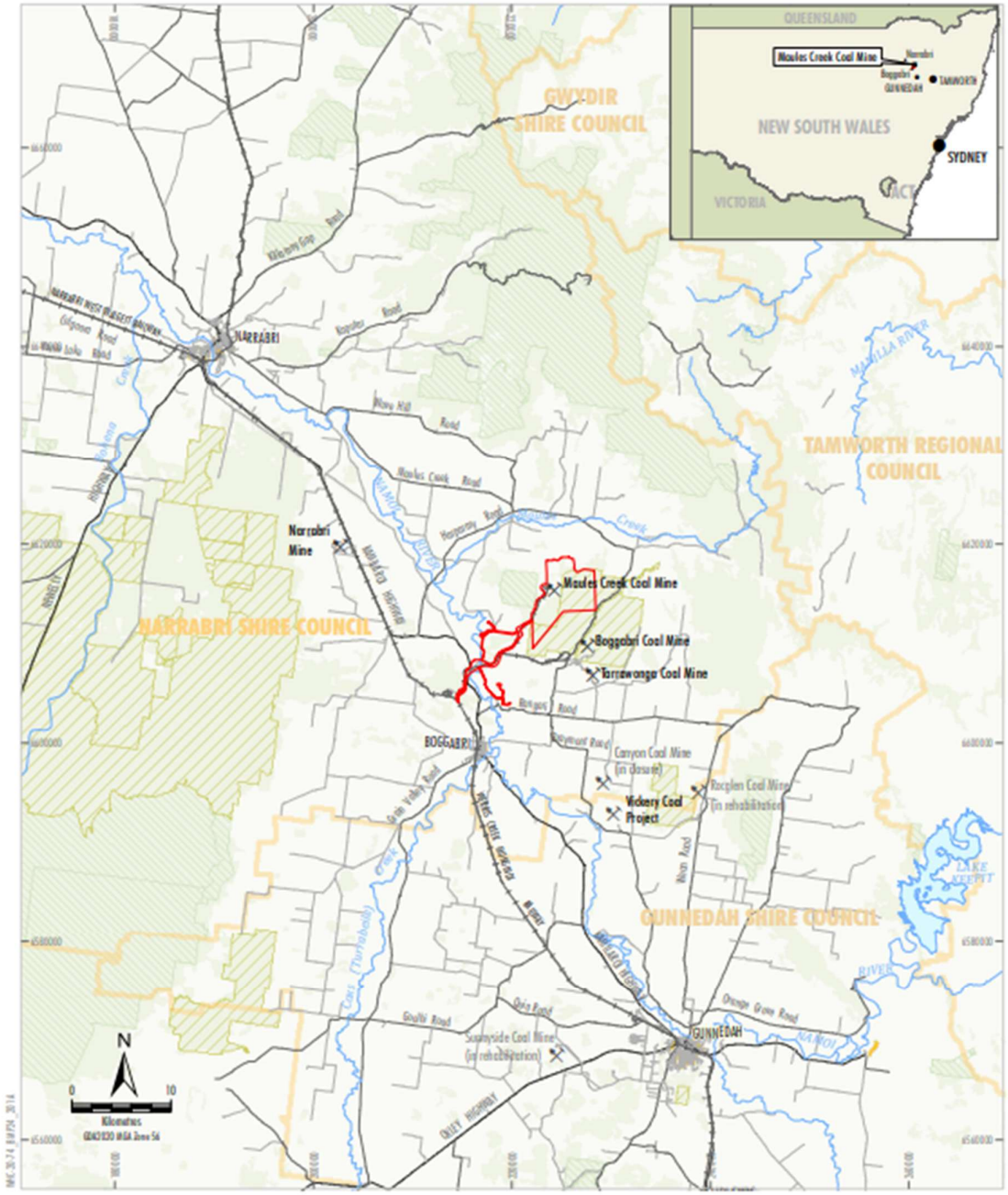
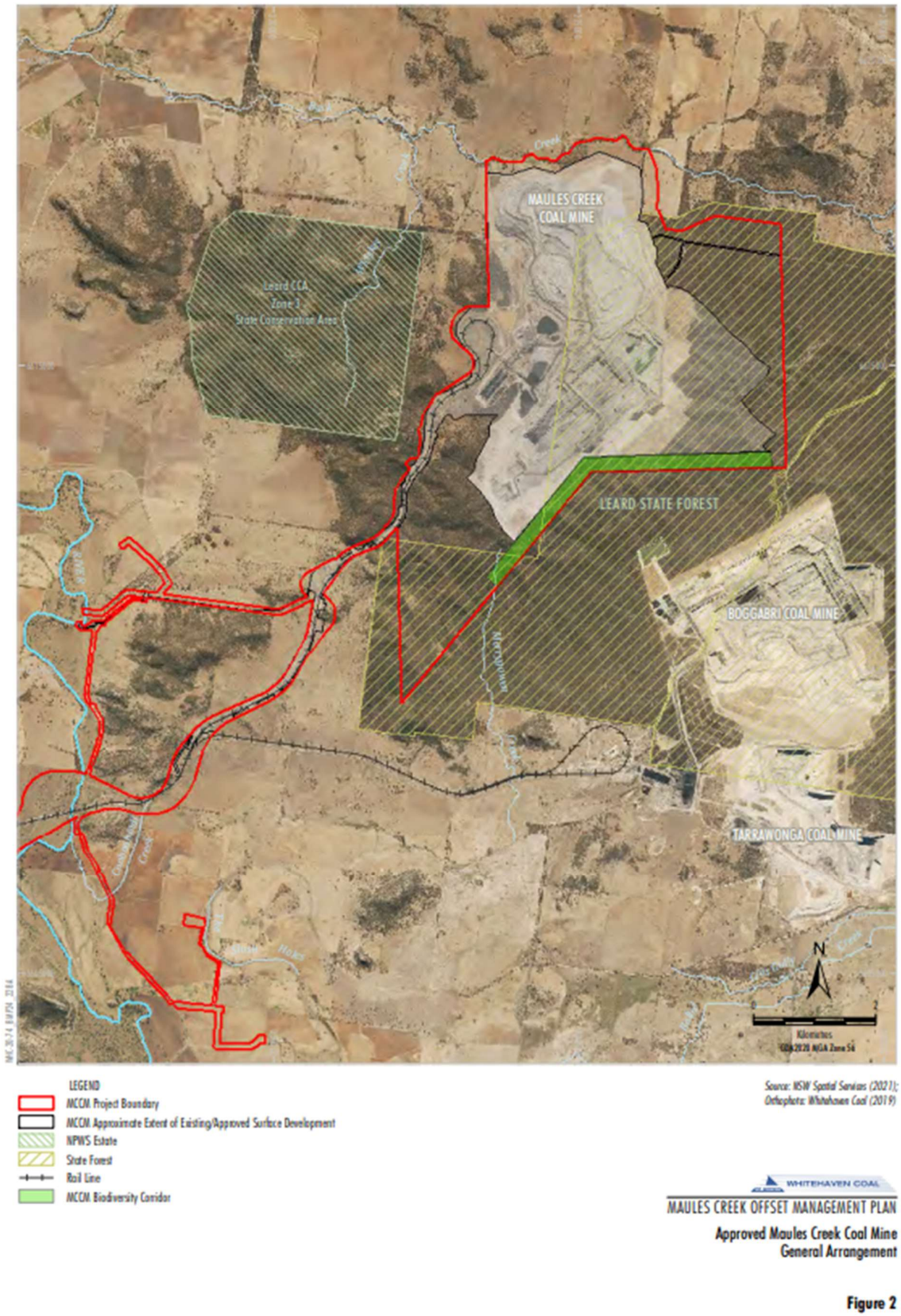


Figure 2: Approved Maules Creek Coal Mine General Arrangement



Appendix 1: Project approval conditions (PA 10_0138)

Table 11-1 Specific Management Plan Requirements

Approval condition				Relevant section of this BMP
Schedule 3: Environmental Performance Conditions				
Biodiversity Offset Strategy				
Condition 44 The Applicant must implement the biodiversity offset strategy summarized in Table 16 to the satisfaction of the Planning Secretary.				Refer to Appendix 2, OMP Please see Appendix 1 which outlines a

Table 16: *Summary of the Biodiversity Offset Strategy*

Offset Area	Offset Type	Nominal Size of the Offset Area (ha)
Kelso	Existing native woodland/forest of approximately 10,547.8 ha to be protected and enhanced (including approximately 4,114.4 ha of Box-Gum Woodland [woodland form] and approximately 17.6 ha of Belah Woodland). Restoration of woodland/forest within approximately 4,327 ha of derived native grassland and/or cleared land (including approximately 1,518 ha of Box-Gum Woodland CEEC [grassland form] and approximately 5 ha of Belah Woodland).	489
Velyama		703
Louenville		213
Teston South		336
Wollandilly		804
Thornfield		171
Onavale		558
Roseglass		1,465
Bimbooria		623
Wirradale and Wongala South		4,447
Mount Lindesay		2,337
Triangle		742
Neranghi North		567
Coonoor		574
Long Gully		353
Teston North		205
Tralee		294
	Subtotal	**14,881**

44 (Cont.)	Rehabilitation Area	Except for the area of the minimized final void, pre-mining native vegetation communities to be re-established (including 544 ha of Box-Gum Woodland CEEC) for a biodiversity conservation land use objective, with the area subject to finalization of the Rehabilitation Management Plan as required under this approval. Note: the final mix and area of native vegetation communities is subject to the Rehabilitation Management Plan.	2,078 (less the area of the minimised void approved under the closure plan required under this approval)	Section 5.3 Table 5-1
		Total	16,959	
Security of Offsets				
45	By 30 March 2025, unless otherwise agreed by the Planning Secretary, the Applicant must make suitable arrangements to secure in perpetuity the Long Gully, Triangle, Neranghi North and Coonoor offset areas identified in Table 16, to the satisfaction of the Planning Secretary Note: All other biodiversity areas in Table 16 have been secured under conservation agreements			Refer to Appendix 2, OMP
45A	By the end of December 2034 unless otherwise agreed by the Planning Secretary, the Applicant must make suitable arrangements to secure in perpetuity the Rehabilitation Area			Section 5.3 Table 5-1

	identified in Table 16, to the satisfaction of the Planning Secretary.	
Agricultural Production in Offset Areas		
46	Offset areas are to be managed primarily for the purpose of compensating for biodiversity impacts of the project and improving regional biodiversity outcomes. However, to the extent that limited agricultural production on the lots purchased for offsets is compatible with these objectives, the Biodiversity Management Plan and other conditions of the approval, the Applicant must: (a) include in the Biodiversity Management Plan (see condition 52 below) an agricultural suitability assessment of surplus land on the offset properties, in particular for proposed corridor enhancement zones; and (b) maintain the agricultural productivity of the surplus areas.	Refer to Appendix 2, OMP
47	For the vegetated buffer corridor required to be retained and protected under condition 7 of schedule 2 of this approval, the Applicant must: (a) use its best endeavours to work cooperatively with the Applicant of the Boggabri Coal Project to enhance the functioning of the area as a biodiversity corridor; and (b) include in the Biodiversity Management Plan (see condition 52 below) the details as to how impacts on the corridor are to be minimized, to the satisfaction of the Planning Secretary.	Table 5-1 Section 5.6 Figure 2
Threatened Species		
48	For the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland Endangered Ecological Community, the Applicant must: (c) ensure that the Biodiversity Offset Strategy and site Rehabilitation Strategy is focused on protection rehabilitation, re-establishment and long-term maintenance of viable stands of this community; (d) investigate in consultation with BCS and the North West LLS, all factors likely to enhance or impede the effective long term restoration of degraded remnants of this EEC in offset areas or regeneration of this EEC on disturbed areas (both offset areas and the site); (e) within 24 months of the date of this approval (and if possible, in conjunction with Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy), submit a report of this investigation and provide an implementation plan to maximise the prospects for rehabilitation and regeneration of this EEC on the offset areas and the site, for approval by the Planning Secretary; and (f) incorporate the approved implementation plan into the revised Biodiversity Management Plan, required under condition 52.	Refer to Appendix 2, OMP
49	For all threatened species on site, the Applicant must ensure that the Biodiversity Offset Strategy and Rehabilitation Strategy are focused on protection, rehabilitation and long-term maintenance of viable stands of suitable habitat for these species. Note: the threatened fauna species on site include: Regent Honeyeater, Fork Tailed Swift, White Throated Needletail, Rainbow Bee-eater, Satin Flycatcher, Speckled Warbler, Swift Parrot, Brown Treecreeper, Diamond Firetail, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Varied Sittella, White-browed Woodswallow, Black Chinned Honeyeater, Painted Honeyeater, Little Eagle, Spotted Harrier, Black Necked Stork, Square Tailed Kite, Turquoise Parrot, Barking Owl, Masked Owl, Easter False Pipistrelle, Greater Long-eared Bat, Yellow-bellied Sheath Tail Bat, Eastern Cave Bat, Eastern Bent-wing Bat, and Koala.	Refer to Appendix 2, OMP
50	The Applicant must: (a) investigate, in consultation with BCS and the North West LLS, all factors likely to enhance or impede the effective long term provision of suitable habitat(s) for the following species: Regent Honeyeater, Speckled Warbler, Brown Treecreeper, Diamond Firetail, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Varied Sittella, Black Chinned Honeyeater, Painted Honeyeater, Little Eagle, Spotted Harrier, Turquoise Parrot, Barking Owl, Masked Owl, Eastern False Pipistrelle, Greater Long-eared Bat, Yellow-bellied Sheath Tail Bat and Little Pied Bat; (b) within 24 months of the date of this approval (and if possible, in conjunction with Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy), submit a report of this investigation and provide an implementation plan to ensure delivery of suitable areas of	Refer to Appendix 2, OMP

	viable habitat for the species included in (a) above, for approval by the Planning Secretary; and	
	(c) incorporate the approved implementation plan into the revised Biodiversity Management Plan, required under condition 52.	
Biodiversity Management Plan		
52	The Applicant must prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Planning Secretary. This plan must:	
	(a) be prepared in consultation with BCS, Commonwealth DCCEEW, CCC, and the North West LLS, and be submitted to the Planning Secretary for approval prior to commencement of construction;	Section 3
	(b) describe how the implementation of the biodiversity offset strategy would be integrated with the overall rehabilitation of the site.	Table 5-1 Section 5.3
	(c) describe the short, medium, and long term measures that would be implemented to:	Section 5 Refer to Appendix 2, OMP
	- manage the remnant vegetation and habitat on the site and in the offset area/s (if and when applicable); and	
	- implement the biodiversity offset strategy (if and when applicable), including detailed performance and completion criteria;	
	(d) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy, and triggering remedial action (if necessary);	Refer to Appendix 2, OMP
	(e) include a detailed description of the measures that would be implemented including the procedures to be implemented for:	
	- enhancing the quality of existing vegetation and fauna habitat; - restoring native vegetation and fauna habitat on the biodiversity areas and rehabilitation area through focusing on assisted natural regeneration, targeted vegetation establishment and the introduction of naturally scarce fauna habitat features;	Refer to Appendix 2, OMP
	- maximising the salvage of resources within the approved disturbance area – including vegetative, top and sub-soils and cultural heritage resources – for beneficial reuse in the enhancement of the biodiversity areas or rehabilitation area;	Sections 5.2.6 and 5.2.8 Refer to Appendix 2, OMP
	- collecting and propagating seed;	Table 5-1 Section 5.2.7
	- minimising the impacts on fauna on site, including undertaking pre-clearance surveys;	Table 5-1 Section 5.2.2
	- improving the connectivity and corridor function of the offset areas to provide an east/west corridor to the Namoi River and demonstrating that this corridor is enhanced and maintained;	Refer to Appendix 2, OMP
	- managing any potential conflicts between the proposed restoration works in the biodiversity areas and any Aboriginal heritage values (both cultural and archaeological);	Refer to Appendix 2, OMP
	- managing salinity;	Section 5.3 Refer to Appendix 2, OMP
	- controlling weeds and feral pests;	Table 5-1 Sections 5.2.5, 5.4 and 6 Refer to Appendix 2, OMP
	- controlling erosion;	Table 5-1 Refer to Appendix 2, OMP
	- managing grazing and agriculture on site, including detailed assessment of the suitability of grazing for conservation management outcomes;	Table 5-1 Refer to Appendix 2, OMP
	- controlling access; and	Table 5-1 Refer to Appendix 2, OMP

	- bushfire management	Table 5-1 Refer to Appendix 2, OMP
	(f) include a seasonally based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria.	Section 6 Refer to Appendix 2, OMP
	(g) identify the potential risks to the successful implementation of the biodiversity offset strategy and include a description of the contingency measures that would be implemented to mitigate against these risks.	Refer to Appendix 2, OMP
	(h) include details of who would be responsible for monitoring, reviewing, and implementing the plan.	Section 7
	Note: the Biodiversity Management Plan and Rehabilitation Management Plan need to be substantially integrated for achieving biodiversity objectives for the rehabilitated mine-site.	Table 5-1 Section 5.3
Conservation Bond		
55	Within 6 months of approval of any revision to the Biodiversity Management Plan required under condition 52 above, the Applicant must review and update as necessary the Conservation and Biodiversity Bond lodged with the Department to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria of the Biodiversity Management Plan. The sum of the bond must be determined by:	Refer to Appendix 2, OMP
	(a) calculating the full cost of implementing the biodiversity offset strategy (other than land acquisition costs); and	
	(b) employing a suitably qualified quantity surveyor to verify the calculated costs, to the satisfaction of the Planning Secretary.	
	If the biodiversity offset strategy is completed generally in accordance with the completion criteria in the Biodiversity Management Plan to the satisfaction of the Planning Secretary, the Planning Secretary will release the bond. If the biodiversity offset strategy is not completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Planning Secretary will call in all or part of the conservation bond and arrange for the satisfactory completion of the relevant works. With the agreement of the Planning Secretary, this bond may be combined with rehabilitation security deposit administered by the Resources Regulator.	
	Note: Alternative funding arrangements for long term management of the Biodiversity Offset Strategy, such as provision of capital and management funding as agreed by BCS as part of a Biobanking or Biodiversity Stewardship Agreement or transfer to conservation reserve estate can be used to reduce the liability of the conservation and biodiversity bond.	
Biodiversity Audit		
56	By the end of December 2017 and then every 5 years, unless the Planning Secretary agrees otherwise, the Applicant must commission suitably qualified, experienced and independent person/s, whose appointment has been approved by the Planning Secretary, to undertake an audit of the revegetation of the rehabilitation area, management and restoration within the Biodiversity Offset Strategy areas to the satisfaction of the Planning Secretary. This audit must:	Refer to Appendix 2, OMP
	(a) include consultation with BCS, North West LLS, DPHI Crown Lands, Commonwealth DCCEEW, CCC and the Resources Regulator;	
	(b) assess the performance of the revegetation in the rehabilitation area completed to date against the completion criteria in the Rehabilitation Management Plan;	
	(c) assess the performance of management and restoration in the off-site Biodiversity Offset Strategy areas completed to date against the completion criteria in the Biodiversity Management Plan;	
	(d) identify any measures that should be implemented to improve the performance of rehabilitation, management and restoration within the rehabilitation and biodiversity offset areas; and	
	(e) if the completion criteria have not been met, or are not adequately trending towards being met, determine the likely ecological value of the rehabilitation and restoration once completed, and recommend additional measures to augment the Biodiversity Offset Strategy to ensure that it adequately offsets the project's impacts on biodiversity.	
	If the audit recommends the implementation of additional measures to augment the Biodiversity	

	Offset Strategy in accordance with (e) above, then within 6 months of the completion of the audit the Applicant must revise the Biodiversity Offset Strategy, in consultation with the Department, BCS and Commonwealth DCCEEW, and to the satisfaction of the Planning Secretary.	
Schedule 5: Environmental Management, Reporting, and Auditing		
3	***Management Plan Requirements*** The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:	This BMP Section 10
	(a) detailed baseline data;	Refer to Appendix 2, OMP
	(b) a description of: - the relevant statutory requirements (including any relevant consent, licence or lease conditions); - any relevant limits or performance measures/criteria; - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Sections 2 and 3 Refer to Appendix 2, OMP
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria	Section 2 Refer to Appendix 2, OMP
	(d) a program to monitor and report on the: - impacts and environmental performance of the project; - effectiveness of any management measures (see c above);	Table 5-1, Section 5, 6 and 9
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	Refer to Appendix 2, OMP
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 9 Refer to Appendix 2, OMP
	(g) a protocol for managing and reporting any: - incidents; - complaints; - non-compliances with statutory requirements; and - exceedances of the impact assessment criteria and/or performance criteria; and	Section 9
	(h) a protocol for periodic review of the plan.	Section 9

Appendix 3: Biodiversity Corridor Plan

MAULES CREEK COAL MINE

BIODIVERSITY CORRIDOR PLAN

August 2021

Edition	Rev	Comments	Date
1	1	Initial Draft Document	18 April 2013
1	2	Report Submitted to SEWPAC (now DAWE) for Approval	9 May 2013
2	1	Revision to address stakeholder comments	18 January 2021
2	2	Revision to address stakeholder comments	17 August 2021

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1 INTRODUCTION

1.1 BACKGROUND

The Maules Creek Coal Mine (MCCM) is located in the Gunnedah Basin approximately 18 kilometres (km) north-east of Boggabri in New South Wales (NSW). The MCCM is a joint venture between Aston Coal 2 Pty Limited (a wholly owned subsidiary of Whitehaven Coal Limited [Whitehaven]) (75 percent [%]), ICRA MC Pty Ltd (an entity associated with ITOCHU Corporation) (15%) and J-Power Australia Pty Ltd (a wholly owned subsidiary of Electric Power Development Co., Ltd.) (10%). Maules Creek Coal Pty Ltd (MCC) is a wholly owned subsidiary of Whitehaven which manages the MCCM on behalf of Aston Coal 2 Pty Ltd, ICRA MC Pty Ltd and J Power Australia Pty Ltd.

The Commonwealth Minister for the Environment granted approval for the MCCM under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) in 2013 (EPBC Approval 2010/5566). A requirement of the MCCM EPBC Approval, is the preparation and implementation of this Biodiversity Corridor Plan (BCP). The biodiversity corridor, subject to the plan, is defined under the EPBC Approval 2010/5566 as:

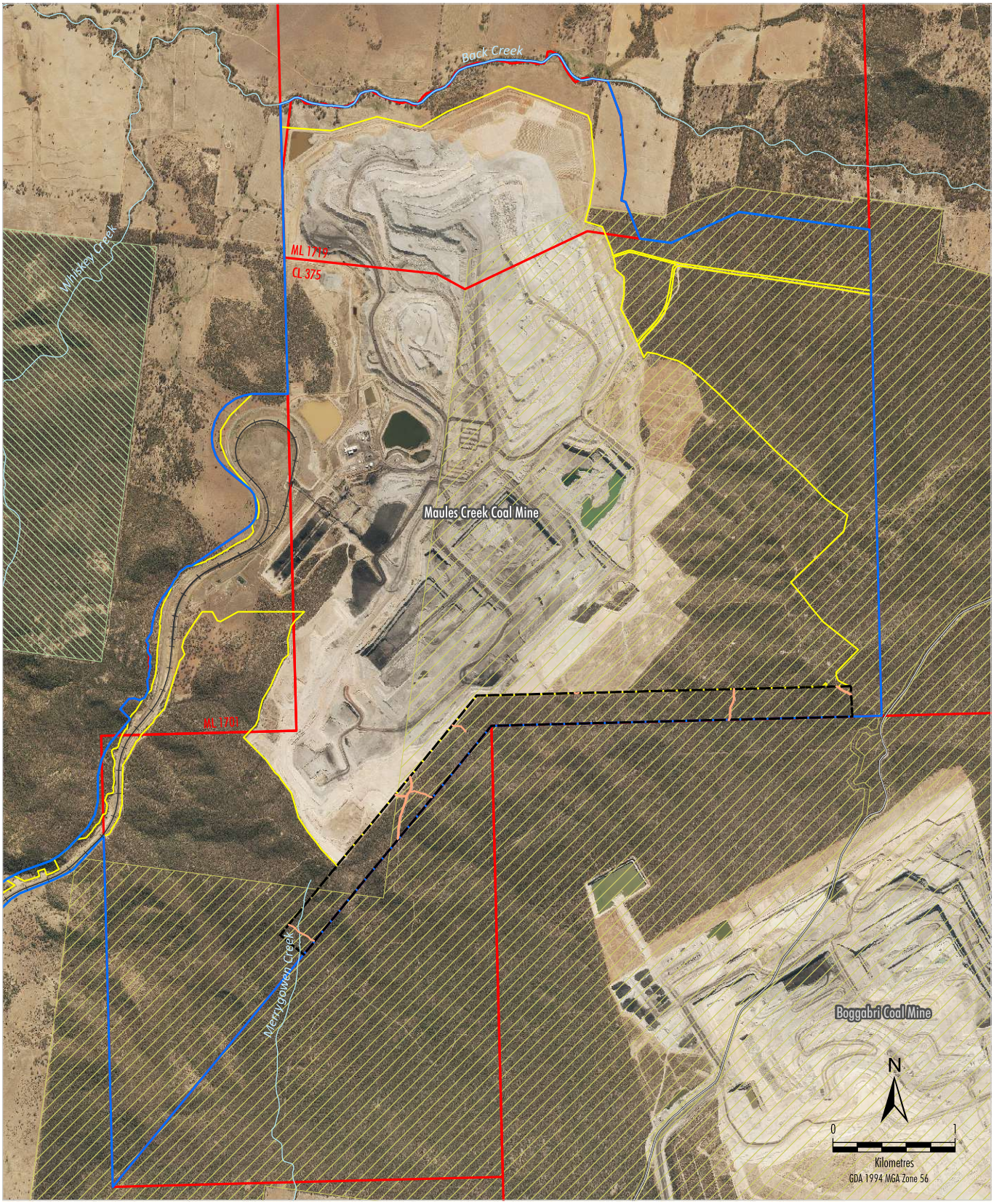
> *An area of native vegetation at least 250 m wide that has not been previously cleared for mining, which links the existing native vegetation to the east and west of the Maules Creek and Boggabri coal mine leases and is located within the Maules Creek coal mine lease where it is adjacent to the Boggabri coal mine lease boundary. The purpose is to ensure that a minimum 500 m wide native vegetation corridor is maintained between the Boggabri and Maules Creek mines and that any alternative corridor provides equivalent or better ecosystem functionality (including habitat for the regent honeyeater, swift parrot and greater long-eared bat).*

The biodiversity corridor is located across low hills known as the Willow Tree Range. The Willow Tree Range is a dry, stony and relatively infertile sandstone ridgeline elevated at approximately 360 metres (m) above sea level. At this present time, the vegetation within the biodiversity corridor exists as part of a much larger patch of native vegetation within the Leard State Forest and adjoining private land. The area set aside as the biodiversity corridor will not take on the configuration of the specified width corridor until mining for both the MCCM and BCM advance to within 500 m of each other. The biodiversity corridor is shown in Figure 1.

1.2 PURPOSE OF THE BIODIVERSITY CORRIDOR PLAN

The purpose of this BCP is to provide a plan that addresses the requirements of Condition 3 of EPBC Approval 2010/5566 which states:

> *The person taking the action must submit a Biodiversity Corridor plan for the approval of the Minister within three months of the date of this approval. The plan must address the following matters:*
>
> *a) protection of native vegetation of a total width of 500 metres (m) where the Maules Creek coal lease boundary is adjacent to the Boggabri coal mine lease boundary;*
>
> *b) maintenance in perpetuity of this area as a biodiversity corridor, and*
>
> *c) evidence that the biodiversity corridor will be protected in perpetuity through a legal mechanism that would provide the equivalent protection of a conservation covenant.*
>
> *The approved Biodiversity Corridor must be implemented.*



WHC-20-74_BCP_201B

LEGEND
- Mining Tenement Boundary
- NPWS Estate
- State Forest
- Project Boundary
- Approximate Extent of Existing/Approved Surface Development
- Corridor Access Tracks
- Indicative Biodiversity Corridor

Source: NSW Spatial Services (2020); Orthophoto Whitehaven Coal (April 2019)

WHITEHAVEN COAL

MAULES CREEK BIODIVERSITY CORRIDOR PLAN

Biodiversity Corridor Location

Figure 1

1.3 STRUCTURE OF THE DOCUMENT

This BCP is structured to address the requirements in Condition 3 of EPBC Approval 2010/5566 and includes the following information:

- Section 2 describes measures to protect native vegetation within the biodiversity corridor.
- Section 3 describes the measures that MCCM will implement to maintain the native vegetation in the biodiversity corridor in perpetuity.
- Section 4 describes the evidence that the biodiversity corridor will be protected in perpetuity.

The measures described in this plan have been implemented by MCC since commencement of the MCCM.

2 MEASURES TO PROTECT NATIVE VEGETATION

MCC has various measures to protect native vegetation outside the approved clearing limit under EPBC Approval 2010/5566, including native vegetation within the biodiversity corridor. These measures include:

- land disturbance protocol (LDP) (Section 2.1);
- marking the limits of clearing (Section 2.2);
- controlling access (Section 2.3); and
- staff education (Section 2.4).

These measures are SMART (Specific, Measurable, Achievable, Realistic, Time-bound) as described below. A table analysing the risks and measures is provided in Appendix A in consideration of the *Environmental Management Plan Guidelines* (Department of the Environment, 2014).

In addition to the below, MCC minimises mine surface water runoff, artificial lighting, and mine generated dust through its existing management programmes.

2.1 LAND DISTURBANCE PROTOCOL

MCC has a LDP form used to manage the clearance process and to document all licensing, safety and management requirements. The LDP form is an environmental checklist that must be completed prior to each stage of clearing by the person responsible for the clearing activities, the relevant technical expert signed off by MCC's Environmental Superintendent or a delegate, and finally authorised by the Site Manager or a delegate as described in the Mining Operations Plan (MOP).

A key requirement of the LDP is the confirmation that any proposed vegetation clearing is allowed by the project approval. The LDP process includes using a Geographical Information System (GIS) to assist in checking relevant features such as tenement and approval boundaries, mapped vegetation and archaeological features.

Additionally, activities in proximity to the biodiversity corridor involve inspections to manage and ensure potential mining impacts are minimised and managed appropriately.

This measure is SMART.

2.2 MARKING LIMITS OF CLEARING

To protect native vegetation outside the approved clearing limit under EPBC Approval 2010/5566, the following management measures will be undertaken in regard to marking the limits of clearing:

- The current limits of clearing will be marked any time prior to clearing either by high visibility tape at appropriate intervals, fencing or an equivalent boundary marker.
- Disturbance at any time will be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond the marked clearing limit.

The person responsible for the clearance activities will ensure that the boundary markers are installed to enable the suitable environmental and technical inspections of the proposed disturbance can be undertaken, and ultimately that disturbance can be limited to the marked area approved for disturbance. The completion of this activity will be recorded and signed off in the LDP form. This measure is SMART.

2.3 CONTROL OF ACCESS

Measures will be implemented to control access to the MCCM Project Boundary (which includes the biodiversity corridor).

Fencing
Fences are at selected locations around the perimeter of the MCCM Project Boundary. In areas where the biodiversity corridor can be directly accessed from the active mining area, fencing and signage is present to limit and inform personnel of the restricted access to those whom have been authorised to enter. Fences are periodically inspected to monitor access and integrity of the fence. Please refer to Section 2.5 regarding implementation and monitoring measures.

Gates
Access to the MCCM Project Boundary has been restricted through the use of locked gates. Only authorised personnel have access to keys. All persons entering the mine site are required to enter through the security gate which this both manned and has electronic barriers accessible via induction cards. Please refer to Section 2.5 regarding implementation and monitoring measures.

Signage
Signage is in place to assist in communicating that access restrictions apply to authorised personnel. The biodiversity corridor has signage in place at regular intervals to identify and delineate the biodiversity corridor and associated restricted access. The signage is in place in areas directly accessible from the active mining area. Please refer to Section 2.5 regarding implementation and monitoring.

Induction and staff education is described below.

2.4 INDUCTIONS AND STAFF EDUCATION

Staff, contractors and visitors who intend to enter the biodiversity corridor will be inducted prior to entry to make them aware of their role and responsibilities for the protection of the biodiversity corridor.

Engagement is undertaken with the adjoining mining company, Idemitsu Coal, who equally have conditions of approval in relation to the biodiversity corridor.

This measure is SMART.

2.5 SUMMARY

Table 2-1 provides the measures described in Section 2, timeframe for implementation, targets, corrective actions and monitoring planned for each measure.

Table 2-1
Summary of Measures to Protect Native Vegetation

Measure	Timeframe for Implementation	Targets	Corrective Actions	Monitoring
Land Disturbance Protocol (Section 2.1)	Prior to clearing	No unauthorised clearing	N/A	Authorisation by the Site Manager or a delegate
Marking the Limits of Clearing (Section 2.2)	Prior to clearing	No unauthorised clearing	N/A	Authorisation by Site Manager or a delegate
Controlling Access (Section 2.3)	Prior to entry	No staff, contractors or visitors entering the corridor without an induction	N/A	Periodic inspections.
Staff Education (Section 2.4)	Prior to entry	No staff, contractors or visitors entering the corridor without an induction	N/A	Periodic inspections.

3 MEASURES TO MAINTAIN THE NATIVE VEGETATION

MCC has various measures to maintain native vegetation outside the approved clearing limit under EPBC Approval 2010/5566, including the biodiversity corridor. In accordance with Condition 3(b) of EPBC Approval 2010/5566, this section describes measures to maintain the native vegetation within the biodiversity corridor in its current state without additional degradation from weeds, animal pests or bushfire. The biodiversity corridor occurs in Leard State Forest (State-owned zoned for forestry and mining) and MCC will undertake measures in consultation with NSW Forestry Corporation.

These measures are SMART (Specific, Measurable, Achievable, Realistic, Timebound) as described below. A table analysing the risks and measures is provided in Appendix A in consideration of the *Environmental Management Plan Guidelines* (Department of the Environment, 2014).

3.1 CONTROL OF WEEDS

A weed control program will be undertaken to control the occurrence and spread of weed species (e.g. Weeds of National Significance [WoNS] and priority weeds) in the MCCM Project Boundary (which includes the biodiversity corridor) in accordance with the NSW *Biosecurity Act, 2015*. The weed control program will involve:

- identifying weeds;
- application of weed control techniques in areas requiring weed control; and
- follow-up inspection weed control as required.

Weed control will be undertaken for the targeted weed species based on seasonal conditions.

Follow-up weed control will be undertaken as required, in areas that have received past weeding treatments. Follow-up treatments ensure pressure is maintained on weeds, assisting regenerating native plants to out-compete weed species.

Monitoring will be undertaken to document the change in the type, extent and density of major weed occurrences in the MCCM Project Boundary over time and provide recommendations about appropriate weed control required. Environmental weeds (e.g. WoNS) and priority weeds will be monitored via inspections in the MCCM Project Boundary by a suitably qualified person(s) with experience in identification of weeds. Mapping will be prepared showing the extent of weeds requiring control. Environmental weeds (e.g. WoNS) and priority weeds will be monitored at least annually.

3.2 CONTROL OF FERAL ANIMALS

A feral animal control program will be undertaken to reduce the abundance of feral animals in the MCCM Project Boundary (which includes the biodiversity corridor) and maintain a low abundance of feral animals. The feral animal program will involve:

- identifying feral animals through monitoring;
- application of feral animal control techniques in areas requiring control;
- follow-up monitoring of feral animal control areas; and

- follow-up feral animal control if required.

Feral animal control will be undertaken in consideration of the control recommendations outlined in the Department of Primary Industries (DPI) *Vertebrate Pest Control Manual* (DPI, 2020) and that control strategies follow the NSW Codes of Practices (COPs) and Standard Operating Procedures (SOPs).

The abundance and distribution of feral animals within the MCCM Project Boundary will be monitored to provide the necessary information to trigger management actions and determine the efficacy of control measures aimed at reducing feral animal abundance. Feral animal monitoring will adopt the relevant methodologies for specific feral animals, generally in accordance with the NSW DPI *Monitoring Techniques for Vertebrate Pests* (Mitchell and Balogh, 2007a to e) so that a range of methods may be used such as transects, spotlighting, sand pads, cameras, traps, etc. Feral animals will be monitored on a frequency agreed with the NSW Department of Planning, Industry and Environment (DPIE).

3.3 BUSHFIRE MANAGEMENT

MCCM is suitability equipped to respond to any fires on site and assist the NSW Rural Fire Service, Forestry Corporation NSW, emergency services and National Parks and Wildlife Service as much as possible if there is a fire in the surrounding area.

3.4 SUMMARY

Table 3-1 provides the measures described in Section 3, timeframe for implementation, targets, corrective actions and monitoring planned for each measure.

Table 3-1
Summary of Measures to Maintain Native Vegetation

Measure	Timeframe for Implementation	Targets	Corrective Actions	Monitoring
Control of Weeds (Section 3.1)	• Monitoring surveys biannually • Management control informed by survey results	• Control the spread of Weeds of National Significance [WoNS] and priority weeds.	• Incorporate into subsequent monitoring and management	Biannual
Control of Animal Pests (Section 3.2)	• Monitoring surveys biannually. • Feral animals will be monitored on a frequency agreed with the NSW Department of Planning, Industry and Environment (DPIE).	• Monitoring completed bi-annually • Feral animal control informed by monitoring	• Feral animal control undertaken considering the Department of Primary Industries (DPI) Vertebrate Pest Control Manual (DPI, 2020)	Biannual
Bushfire Management (Section 3.3)	• Response provided as required	• No uncontrolled fires caused by MCCM mining activities	• N/A	As required

4 MECHANISM FOR PERPETUAL PROTECTION

Condition 3 of EPBC Approval 2010/5566 states that this plan must address a number of matters including:

> *c) evidence that the biodiversity corridor will be protected in perpetuity through a legal mechanism that would provide the equivalent protection of a conservation covenant.*
>
> *The approved Biodiversity Corridor must be implemented.*

In 2013, when the EPBC Act approval was granted, it was acknowledged by the Department that the biodiversity corridor occurs in Leard State Forest (State-owned zoned for forestry and mining). The Statement of Reasons issued by the Commonwealth Minister for the Environment under section 130(1) and 133 of the EPBC Act provides some insight as to the manner in which the biodiversity corridor was conditioned. Relevant extracts are provided below.

> *The department is of the view that Whitehaven would be unable to secure a conservation covenant on the corridor. However, under NSW conditions the barrier coal can only be mined if there is a legally secured corridor of equal ecological function in place. Therefore, the department recommends that the requirement to secure a legally binding conservation covenant to protect the proposed 500m wildlife corridor be removed in favour of requiring the proponent to prepare a plan that achieves an equivalent environmental outcome. Any attempt to alter the width or level of protection for the corridor would be subject to your approval, through conditions specifying that any variation must be approved by the minister.*

The EPBC Approval 2010/5566 provides a legal mechanism to protect the biodiversity corridor until such time that the approval expires (31 December 2053). This is because Condition 3 of EPBC Approval 2010/5566 requires preparation of this plan to protect and maintain the corridor and states that the approved biodiversity corridor must be implemented (Section 2).

The Department's *EPBC Act Policy Statement - Expiry Dates for Approvals* (Department of Sustainability, Environment, Water, Population and Communities [SEWPaC], 2013) states:

> *Approval conditions that involve offsets may require that an area of land is protected and managed 'in perpetuity'. However, it is not possible for an approval to have effect in perpetuity. In these cases, the approval period would cover the timeframe required to put in place the required contracts, agreements or covenants that will give effect to the conditions of approval.*

Prior to expiry of the EPBC Approval 2010/5566, MCC will pursue an alternate legal mechanism over the biodiversity corridor (or an alternative corridor) if one becomes available through consultation with the NSW Government or otherwise seek to extend the approval period to cover the timeframe required to put in place the required legal mechanism.

The MCCM and BCM EPBC Approvals 2010/5566 and 2009/5256 require MCC and Boggabri Coal Pty Limited to progressively revegetate native forest and woodland in the MCCM and BCM Project areas. It is anticipated that this will contribute to providing habitat opportunities for fauna prior to expiry of these approvals.

5 REPORTING AND REVIEW

5.1 REPORTING SURVEY DATA

In accordance with Condition 31 of the Approval Decision EPBC 2010/5566, survey data will be recorded so as to conform to data standards notified from time to time by DAWE. When requested by the DAWE, MCC will provide all species and ecological survey data and related survey information from ecological surveys undertaken for MNES. This survey data will be provided within 30 business days of request, or in a timeframe agreed to by DAWE in writing.

In accordance with Condition 39 of the Approval Decision EPBC 2010/5566, MCC will maintain accurate records substantiating all activities and outcomes associated with or relevant to Approval Decision EPBC 2010/5566, including measures taken to implement BCP, and make them available upon request to the DAWE.

5.2 REPORTING REQUIREMENTS

A report pertaining to the annual compliance with EPBC Approval 2010/5566 will be published on the MCCM website by 31 March each year after the anniversary of commencement of the MCCM in accordance with Condition 34 of the EPBC Approval 2010/5566. Non-compliance with any of the conditions will be reported to DAWE at the same time as the compliance report is published.

5.3 BIODIVERSITY CORRIDOR PLAN PUBLISHING

The BCP will be published on the MCC website. Any revisions to this BCP will be published on the MCC website within one month of being approved.

5.4 REVISION OF THE BIODIVERSITY CORRIDOR PLAN

In accordance with Condition 36 of the Approval Decision EPBC 2010/5566, if MCC wishes to carry out any activity otherwise than in accordance with this BCP (as it pertains to Approval Decision EPBC 2010/5566), MCC will submit a revised BCP to DAWE for the Minister's written approval. The varied activity shall not commence until the Minister has approved the revised plan in writing. The Minister will not approve a revised plan, unless the revised plan would result in an equivalent or improved environmental outcome. The BCP will be managed in accordance with this BCP (once approved) until such time as an alternative biodiversity corridor is identified and approved in a revised BCP (if identified and approved).

In accordance with Condition 37 of the Approval Decision EPBC 2010/5566, if the Commonwealth Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities or listed migratory species to do so, the Minister may request MCC to make specified revisions to this BCP and submit the revised plan for the Minister's written approval. MCC must comply with any such request. The revised approved plan must be implemented. Unless the Minister has approved the revised plan then MCC must continue to implement the originally approved plan, as specified in the conditions.

6 REFERENCES

Department of Sustainability, Environment, Water, Population and Communities (2013) *EPBC Act Policy Statement - Expiry Dates for Approvals.*

Department of Primary Industries (2020) *Vertebrate Pesticide Manual.*

Mitchell, B. and Balogh, S. (2007a) *Monitoring Techniques for Vertebrate Pests, Feral Dogs*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007b) *Monitoring Techniques for Vertebrate Pests, Rabbits*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007c) *Monitoring Techniques for Vertebrate Pests, Feral Pigs*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007d) *Monitoring Techniques for Vertebrate Pests, Foxes*. NSW Department of Primary Industries, Orange.

Mitchell, B. and Balogh, S. (2007e) *Monitoring Techniques for Vertebrate Pests, Goats*. NSW Department of Primary Industries, Orange.

APPENDIX A

RISK ASSESSMENT

Table A1
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk Level		Likelihood	Consequence	Risk Level
Vegetation clearance	Unplanned vegetation clearance within the biodiversity corridor by mining related activities not managed by a Land Disturbance Protocol (LDP).	Possible	High	Medium	• Land Disturbance Protocol (Section 2.1) • Please refer to Table 2-1	Unlikely	Minor	Low
	Mining related disturbance in the biodiversity corridor prior to approval	Unlikely	High	Medium	• Marking the Limits of Clearing (Section 2.2) • Please refer to Table 2-1	Unlikely	Minor	Low
Access and unplanned disturbance	Unauthorised access by staff, contractors and visitors undertaking work.	Possible	Moderate	Medium	• Controlling Access (Section 2.3) • Please refer to Table 2-1	Unlikely	Minor	Low
	Unauthorised access and/or inadvertent disturbance	Possible	Moderate	Medium	• Staff Education (Section 2.4) • Please refer to Table 2-1	Unlikely	Minor	Low
Ecological hazards	Listed weed species are identified in the biodiversity corridor	Likely	Minor	Low	• Control of weeds (Section 3.1) • Refer to Table 3-1	Possible	Minor	Low
	Feral animals access the biodiversity corridor	Likely	Moderate	Medium	• Control of animal pests (Section 3.2) • Refer to Table 3-1	Possible	Minor	Low
	Indirect impacts beyond assessed criteria	Possible	Minor	Low	• Management of potential indirect impacts per relevant aspects of Project Approval PA10_0138.	Unlikely	Minor	Low
	Uncontrolled bushfire occurs in the biodiversity corridor	Possible	Major	High	• Bushfire management (Section 3.3) and Table 3-1	Unlikely	Moderate	Low

Table A-2 Likelihood and Consequence

Qualitative measure of likelihood (how likely is it that this event/issue will occur after control strategies have been put in place)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Qualitative measure of consequences (what will be the consequence/result if this issue does occur rating)	
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

Source: Department of the Environment (2014)

Table A-3 Risk Rating

	Consequence				
	Minor	**Moderate**	**High**	**Major**	**Critical**
Highly Likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

Source: Department of the Environment (2014)

Appendix 4: *Tylophora linearis* Propagation and Translocation Program

ecoplanning
ecology | planning | offsets

Propagation and Translocation Program





Tylophora linearis

Maules Creek Coal Mine

Prepared for: Whitehaven Coal

12 June 2024 Version: 1.0

PROJECT NUMBER	2023-160-06			
PROJECT NAME	Propagation and Translocation Program			
PROJECT ADDRESS	Maules Creek Coal Mine			
PREPARED FOR	Whitehaven Coal			
AUTHOR/S	Brian Towle, Tammy Paartalu			
REVIEW	**Technical**	**QA**	**Version**	**Date to client**
	Brian Towle		1.0	12 June 2024
LICENCES	**Scientific Licence**		SL101557 & C0005930	
	Bionet Sensitive Species Data Licence		1115	
	Animal Research Authority Ethics Licence		Fauna Surveys and Monitoring (16/346)	
	Scientific Collection - Aquatic		P19/0009-1.0 & OUT19/2602	

This report should be cited as: 'Ecoplanning (2024). Propagation and Translocation Program – *Tylophora linearis*. Prepared for Whitehaven Coal.'

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Glossary and abbreviations

Acronym	Description
BC Act	*Biodiversity Conservation Act 2016*
BCS	Biodiversity, Conservation and Science Directorate within the NSW DCCEEW
BMP	Biodiversity Management Plan
Cth. DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water (formerly DotE)
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DEWHA	Former Commonwealth Department of Environment, Water, Heritage and the Arts, now Cth. DCCEEW
DotE	Former Commonwealth Department of the Environment, now Cth. DCCEEW
DPHI	NSW Department of Planning, Housing and Infrastructure
DPIE	Former NSW Department of Planning, Industry and the Environment now DPHI or NSW DCCEEW
DSEWPAC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities, now Cth. DCCEEW
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
MCCM	Maule Creek Coal Mine
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
PAC	Planning Assessment Commission
SCA	State Conservation Area

Acronym	Description
TFPP	Threatened Flora Project Plan
TSC Act	*Threatened Species Conservation Act 1995* (repealed; now BC Act)
WHC	Whitehaven Coal

1 Introduction

In accordance with Project Approval (PA 10_0138) Schedule 3, Condition 52, a Biodiversity Management Plan (BMP) has been prepared by Whitehaven Coal Pty Ltd (WHC) for the Maules Creek Coal Mine (MCCM; WHC 2017). A revision to this BMP is currently underway (WHC In prep.) and Section 3.1.2 of the revised BMP, states that:

> "*Prior to clearing, a pre-clearing flora survey will be conducted to search for threatened plant species that have potential to occur, based on habitat available. If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with BCS, DPHI and Cth DCCEEW (for Matters of National Environmental Significance [MNES]).*"

Tylophora linearis is a herbaceous twiner or subshrub which is listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) and as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The species was identified at Maules Creek Coal Mine (MCCM) during pre-clearing surveys in 2014 and 2015. A propagation and translocation program for *Tylophora linearis* was previously prepared in consultation with Dr Colin Driscoll (Hunter Eco), the former Office of Environment and Heritage (OEH) and the former NSW Department of Planning and Environment, and was included in Appendix C of the BMP (WHC 2017). In 2020 and 2021, an updated Threatened Flora Project Plan ('TFPP'; Ecoplanning 2021a) and *Tylophora linearis* Restoration and Translocation Strategy (Ecoplanning 2020a) were prepared to support the propagation and translocation program (WHC – 2017 Appendix D), pending the next revision of the BMP.

Management actions undertaken by WHC to date for *Tylophora linearis* have been documented annually in the MCCM Annual Reviews (Hunter Eco 2015a - 2017; WHC 2019; Ecoplanning 2020b-2024).

This propagation and translocation program has been prepared for inclusion in a revised BMP (WHC In prep.) and reviews, updates, and supersedes the previous *Tylophora linearis* Propagation and Translocation Plan (WHC 2017) and the *Tylophora linearis* Restoration and Translocation Strategy (Ecoplanning 2020a). This program has been prepared to fulfil the ongoing requirements of revised BMP (WHC In prep.). Further, this propagation and translocation program is integrated as part of WHCs TFPP (Ecoplanning 2021a) which provides overarching guidance on the management habitat for threatened flora species within and adjacent to WHC mining operations and Biodiversity Offset Areas (hereafter referred to as WHC managed areas).

This program adopts the definition of 'translocation' as included in the third version of the *Guidelines for the Translocation of Threatened Plants in Australia* (Commander et al. 2018), which is:

> *"… the deliberate transfer of plants or regenerative plant material from an ex situ collection or natural population to a new location, usually in the wild. It includes reintroduction, introduction, reinforcement, assisted migration and assisted colonization.*

Translocations involve a diverse range of methods including: seed collection and propagation; propagation via cuttings or tissue culture; planting of containerised plants; direct seeding; transplantation of whole plants from one site to another; and the transfer of soil, leaf litter, brush or pollen."

1.1 Nomenclature

Recent studies of the *Tylophorinae* (Liedde-Schumann et al. 2016; Liedde-Schumann and Meve 2018) found the previously unrelated genera *Tylophora* and *Vincetoxicum* to be intermingled and all species within the *Tylophora* genus were renamed as members of the *Vincetoxicum* genus. As part as these studies, *Tylophora linearis* was renamed *Vincetoxicum fosteri* (Liedde-Schumann and Meve 2018). While this name change has been adopted by the Council of Heads of Australasian Herbaria and the Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth. DCCEEW), it has not yet been adopted by the BC Act, PlantNet (2023) or the documentation of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW). Naming throughout this report follows the current listing of the species under the BC Act, as *Tylophora linearis*, although all information presented applies equally to the synonymous *Vincetoxicum fosteri*, as listed under the EPBC Act.

1.2 Aims and objectives

The overall aim of this propagation and translocation program is to directly support the conservation of *Tylophora linearis,* and to maintain a self-sustaining, genetically diverse population of the species within the WHC managed areas, which is capable of surviving in the long term. To ensure long-term survival, research suggests that populations of around 200 to 250 plants are required to minimise reduced genetic and demographic outcomes associated with small populations (Young and Brown 1999). Across WHC managed lands various naturally occurring sub-populations of *Tylophora linearis* are present, with the size of these sub-populations variable between seasons and individual sub-populations. Therefore, success of the translocation program would be achieved by maintaining these existing sub-populations, including translocated populations, and where possible reinforcing these populations with genetic diversity from sub-populations within the approved MCCM disturbance areas. Specific objectives of this program include the following:

- Guide the successful translocation of *Tylophora linearis* individuals, grown from seed, stem cuttings, or whole turve translocations, to suitable habitat within the protected areas that form part of the WHC managed lands.
- Provide clear management and monitoring measures to ensure the long-term success of the program.

This program primarily represents a 'Salvage' and 'Reinforcement' translocation according to the definitions of Commander et al. (2018). That is, the translocation aims to transfer seedlings grown under ex situ conditions and/or seed to locations where there is an existing population of *Tylophora linearis*. The source of regenerative material is to include individuals within the approved MCCM disturbance areas ('salvage') and material from natural populations across WHC managed lands and State Forests.

1.3 Ecology of *Tylophora linearis*

1.3.1 Distribution and population size

Tylophora linearis was first described by Forster (1992) when there were only four records, three in NSW and one in Queensland. The species was listed as 'Endangered' in NSW at the commencement of the NSW *Threatened Species Conservation Act 1995* (TSC Act). Forster *et al.* (2004) then reported the rediscovery of the species adding 390 stems from three new locations in NSW. In 2008 the NSW Scientific Committee conducted a review of current *Tylophora linearis* information which concluded that there were 10 confirmed populations in NSW consisting of 250 to 500 mature individuals (NSW Scientific Committee 2008). In early 2009 the listing of the species under the TSC Act was downgraded from 'Endangered' to 'Vulnerable'. The species was listed as 'Endangered under the EPBC Act in October 2008, having previously been listed as Endangered under the *Threatened Flora Amendment* (June 1994) to the previous Commonwealth *Endangered Species Protection Act 1992.*

NSW BioNet Atlas (NSW DCCEEW 2024) holds 1,625 *Tylophora linearis* records distributed from West Wyalong in the south to Yetman in the north, and the Pilliga region in the west to Murrurundi in the east (**Figure 1.1**). Very large populations of the species have been detected in multiple locations across NSW with population density extrapolations used to estimate the number of stems, or individuals. Eco Logical Australia (2012) recorded populations of *Tylophora linearis* within Pilliga East State Forest, Pilliga State Conservation Area (SCA), Pilliga East SCA, Pilliga Nature Reserve and Bibblewindi State Forest and estimated the total population of *Tylophora linearis* within the Pilliga and Pilliga Outwash Catchment Management Authority subregions as 183,908 stems (Eco Logical Australia 2012). Hunter Eco (2014) estimated that the median *Tylophora linearis* population in an area taking in the Pilliga region, Leard State Forest, Leard State Conservation Area and the Mt Kaputar area was in excess of one million stems. Hunter Eco (2015b) also estimated a median population of 9,360 stems in 720 ha of Doona State Forest. Records of *Tylophora linearis* across the region are shown in **Figure 1.2**.

Occurrence within WHC managed lands

The presence of *Tylophora linearis* within the MCCM disturbance area was not identified until pre-clearance surveys in 2014 and 2015, after the commencement of the approved vegetation clearing. Therefore, it is impossible to quantify the exact number of individuals of *Tylophora linearis* within the MCCM Project Boundary. Since the species was recorded within the approved MCCM disturbance area, *Tylophora linearis* has been recorded across multiple WHC managed lands. A summary of occurrences of *Tylophora linearis* and modelled habitat for the species (Hunter Eco 2021) across WHC managed lands is summarised in **Table 1.1** with recorded locations shown in **Figure 1.2**.

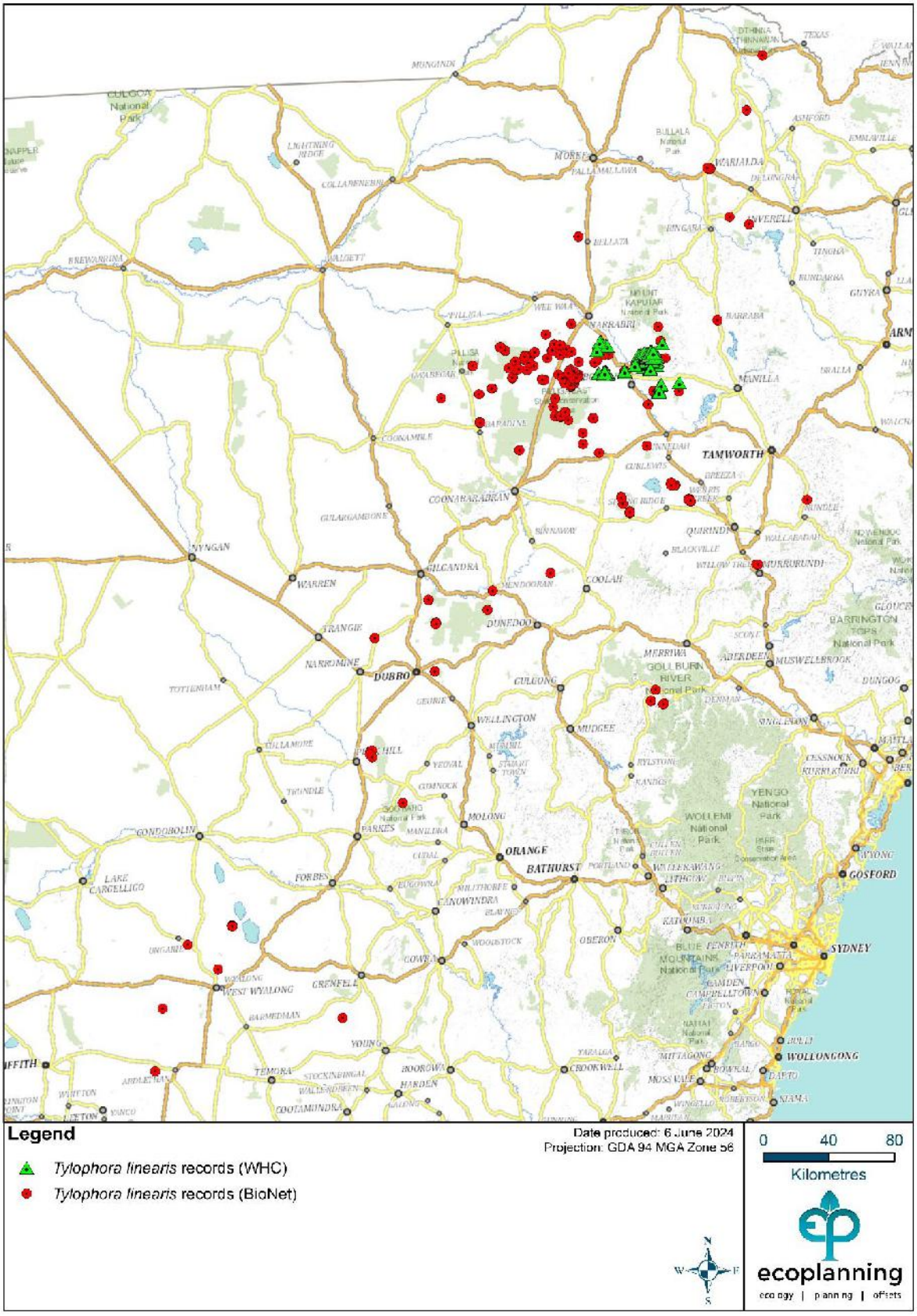


Figure 1.1: Occurrence of *Tylophora linearis* across NSW

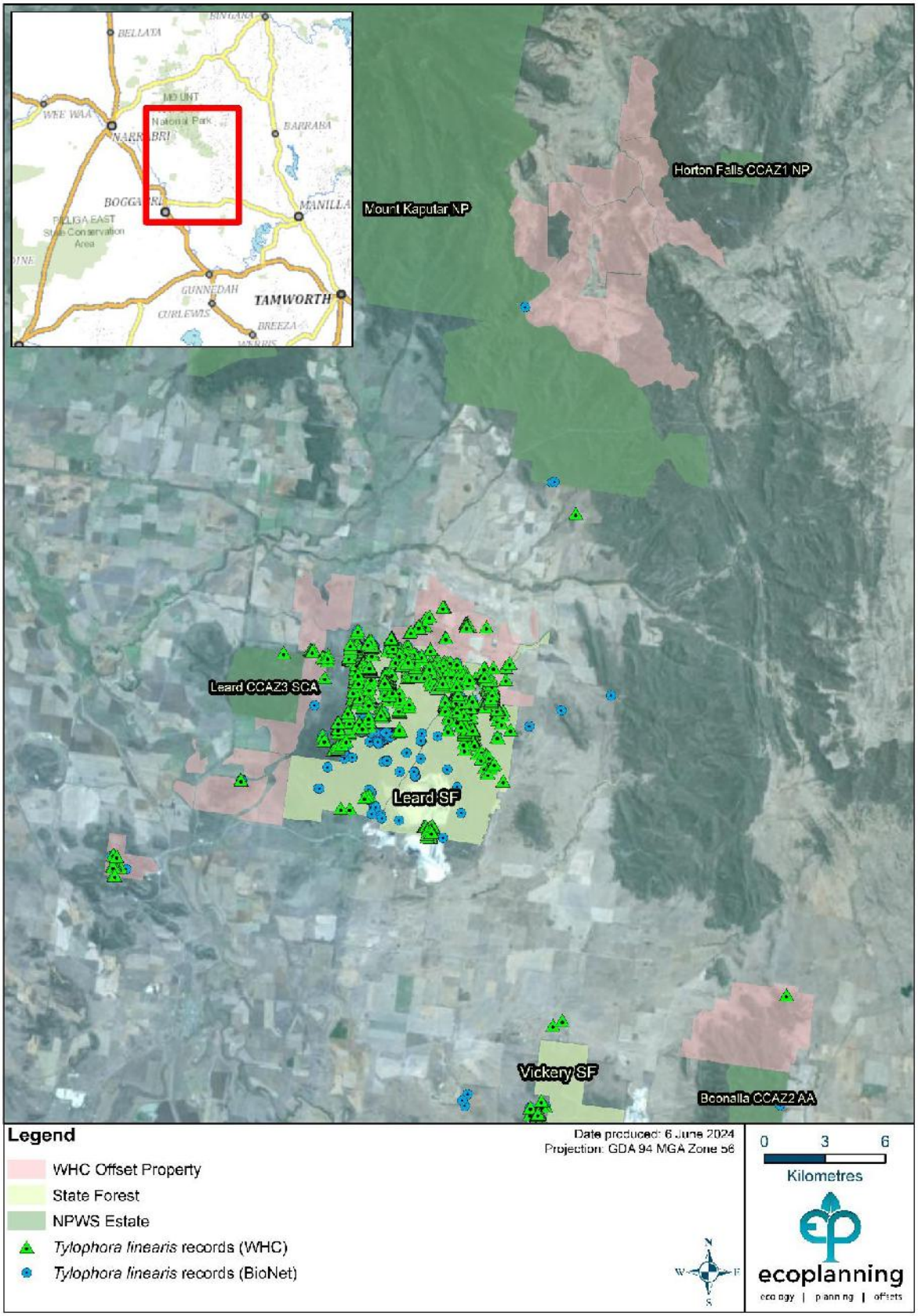


Figure 1.2: Occurrences of *Tylophora linearis* across the region

Table 1.1: The habitat for *Tylophora linearis* across the MCCM Offset Areas (after the *Tylophora linearis* Offset Package, Hunter Eco 2021)

Offset Area	Offset Area (ha)	Area of Existing Habitat for *T. linearis* (ha)	Area of Revegetation within Former Potential Habitat for *T. linearis* (ha)	Total Existing and Future Habitat for *T. linearis* (ha)
Bimbooria	622.5	374.6	146.2	520.8
Coonoor	574.1	82.7[A]	0	82.7
Kelso	489.4	268.3	151	419.3
Long Gully	352.9	0[B]	0	0
Louenville	213.1	178.5	26.2	204.7
Mt Lindesay	2337.1	379.9[C]	12.6[D]	392.5
Neranghi North	567.1	107.9[E]	0	107.9
Onavale	557.7	101.8	79.5	181.3
Roseglass	1465.3	1039.4	132.7	1172.1
Teston South	336.2	234.1	57.5	291.6
Thornfield	171.3	31.8	68	99.8
Triangle	665.9	39.9[F]	0	39.9
Velyama	702.6	55.8	474.8	530.6

Offset Area	Offset Area (ha)	Area of Existing Habitat for *T. linearis* (ha)	Area of Revegetation within Former Potential Habitat for *T. linearis* (ha)	Total Existing and Future Habitat for *T. linearis* (ha)
Wollandilly	804.4	224.1	315.5	539.6
Wirradale & Wongala South	4469.2	588.7[G]	116[H]	704.7
Total Area (ha)	**14328.8**	**3707.5**	**1580**	**5287.5**
Ratio Offset to Clearance				**3.5:1**

[A] Includes 413.4 ha low probability habitat discounted by 80% (Coonoor).

[B] Offset lies outside model bounds and in high rainfall area. Probability of occurrence assumed to be zero (Long Gully).

[C] Includes 1,899.3 ha low probability habitat discounted by 80% (Mt Lindesay).

[D] Includes 62.8 ha low probability revegetation habitat discounted by 80% (Mt Lindesay).

[E] Includes 539.4 ha low probability habitat discounted by 80% (Neranghi North).

[F] Includes 199.5 ha low probability habitat discounted by 80% (Triangle).

[G] Includes 2,943.5 ha low probability habitat discounted by 80% (Wirradale & Wongala South).

[H] Includes 580 ha low probability revegetation habitat discounted by 80% (Wongala South).

1.3.2 Habitat associations

Habitat for *Tylophora linearis* has been variously described as dense shrublands over-topped by Eucalypts, *Callitris glaucophylla* or *Allocasuarina luehmannii* (Forster et al. 2004; NSW Scientific Committee 2008; PlantNet 2023). The BioNet Threatened Biodiversity Data Collection (NSW DCCEEW 2024) recognises that *Tylophora linearis* is known or likely to be associated with 162 different plant community types. This indicates that the species is a habitat generalist rather than specialist. Hunter Eco (2021) identifies that the species occupies a broad range of habitats across multiple environment variables, as follows:

- elevation range 200 m to > 600 m;
- slope of flat to > 8 degrees;
- seven Australian Soil Classification types (Chromosols, Ferrosols, Kurosols, Rudosols and Tenosols, Sodosols, Vertosols, Kurosols Natric);
- seven geological ages (Carboniferous, Cretaceous, Devonian, Jurassic, Permian, Quaternary and Tertiary); and
- rainfall from 500 to 800 mm per year.

A review of habitat descriptions associated with records of *Tylophora linearis* on BioNet (NSW DCCEEW 2024) identified a number of records as occurring within regrowth *Callitris glaucophylla* or within areas described as open woodlands. Eco Logical Australia (2012) noted that their observations of *Tylophora linearis* from the Pilliga Forests occurred across a broad range of vegetation types which often had evidence of disturbance from forestry or recent fire. Specifically, Eco Logical Australia (2012) noted that the species was most often found in areas of vegetation which had been heavily burnt by a 2007 wildfire, along track edges and in recently cut road drains. Records of *Tylophora linearis* within the MCCM Project Boundary and surrounds have occurred in association with forested and woodland areas and commonly in areas identified as having a midstorey of *Callitris glaucophylla* (Cumberland Ecology 2011).

1.3.3 Life-cycle

Tylophora linearis is a perennial species, although the life-cycle of the species commonly includes a reduction, or the complete absence, of above ground biomass during extended dry periods (Ecoplanning 2020a). Forster et al. (2004) describe an underground rhizome from which the plant can re-sprout following fire, a feature that would also accommodate the reduction and re-sprouting of above-ground biomass in response to rainfall. Occurrences of *Tylophora linearis* are commonly quantified as a number of stems rather than individual plants because multiple stems of *Tylophora linearis* can originate from a rhizome (common underground root) with all stems arising from the same rhizome being genetically identical and part of a single plant (Forster et al. 2004; Niche 2014). A population of *Tylophora linearis* will typically consist of a number of genetically different parent plants each capable of producing multiple clones (stems). The term 'ramets', which refers to the group of clones belonging to a parent plant, can be used to quantify the population of clonal plants. However, this quantification cannot be readily applied in the field and is dependent upon genetic analysis.

The inflorescence of *Tylophora linearis* consists of up to eight flowers produced on umbels with flowering time reported as spring (Harden 1992; PlantNET 2023). However, previous monitoring surveys have also recorded flowering within autumn months (Niche 2014;

Ecoplanning 2020a). Fruiting is thought to occur 2 to 3 months after flowering (DPIE 2020). Pollinators for *Tylophora linearis* are unknown, although it is thought that insect-mediated transfer of pollen between flowers is necessary for pollination of the species, as this is the case with most Asclepiad species (Ollerton & Liede 1997; Foster et al. 2004). Members of the Family Asclepiadaceae form sac-like structures called pollinia (singular pollinium) that contain a number of pollen grains. These pollinia are the product of only one anther and are transferred during pollination as a single unit (Sinha & Mondal 2011; Niche 2014). This species is also at least partially clonal (Foster et al. 2004), whereby plants can produce new plants vegetatively.

1.3.4 Threats

Documented threats to *Tylophora linearis* (DEWHA 2008; DPIE 2020) and are primarily associated with forestry activities including track maintenance, which is likely due to the widespread occurrence of the species across State Forests. Other identified threats to the species include grazing, fire and introduced weeds.

2 Approvals and requirements

Relevant management plans, approval conditions and requirements which relate to *Tylophora linearis* are summarised in **Table 2.1**.

Table 2.1: MCCM statutory requirements and management plans relevant to *Tylophora linearis*

Approval / Management plan	Requirement	Response
Approval under the EPBC Act (EPBC Approval 2010/5566), Condition 32	*"In the event that any additional matters of national environmental significance are recorded within the project area and a significant impact on the matter/s is likely, the department must be notified in writing within 14 days of the matter/s being recorded. In accordance with condition 37, the Minister may request that the person taking the action revise any relevant plans to ensure better protection of the relevant matter/s."* In a letter to Whitehaven (dated 18 July 2014), the Department states: "*the Department will accept, on a precautionary basis, a 3:1 ratio of known Tylophora linearis habitat. Alternatively, Whitehaven may apply the EPBC Act Environmental Offset Policy and Guide. Should you apply the offset policy, the Department recognises that this is a little known and cryptic species and that as such, compensatory measures may be appropriate."*	On the 16 April 2014, the former Department of the Environment (DotE) was notified of the presence of the additional MNES. The *Tylophora linearis* Offsets Package was delivered (as documented in Hunter Eco 2021) and approved by the former Commonwealth Department of Agriculture, Water and Environment on 28 September 2021.
Project Approval (PA 10_0138) Schedule 3, Condition 52	"*The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General."*	A BMP has been prepared (WHC 2017) and is currently being revised (WHC In prep.).
Biodiversity Management Plan - Section 3.1.2	*"Prior to clearing, a pre-clearing flora survey will be conducted to search for threatened plant species that have potential to occur, based on habitat available. If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and*	A propagation and translocation program for *Tylophora linearis* was previously prepared (Appendix C of the

Approval / Management plan	Requirement	Response
	propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with BCS, DPHI and Cth DCCEEW (for Matters of National Environmental Significance [MNES]).”	MCCM BMP [WHC 2017]). This propagation and translocation program reviews, updates, and supersedes the previous Propagation and Translocation Plan (WHC 2017).

3 Current and past management actions and trials

Completed management actions undertaken by WHC to date for *Tylophora linearis* have been documented within the MCCM Annual Reviews. The previous *Tylophora linearis* propagation and translocation program (WHC 2017) included the following stages:

- Stage 1 – Root architecture and growth study (complete).
- Stage 2 – Seed production monitoring (complete).
- Stage 3 – Seed collection and storage (complete).
- Stage 4 – Seed propagation (complete); and
- Stage 5 – Translocation trials (complete).

Stages 1 – 4 of the previous *Tylophora linearis* propagation and translocation program (MCCM BMP 2017 Appendix C) were completed and documented in annual reports (Hunter Eco 2016; Hunter Eco 2017; WHC 2018; Ecoplanning 2020). Actions outlined within the updated TFPP (Ecoplanning 2021a) and Restoration and Translocation Strategy (Ecoplanning 2020a) for *Tylophora linearis* are as follows:

- Monitoring of the translocated individuals for life cycle/ecological analysis.
- Surveillance of natural populations of *Tylophora linearis* to continue to monitor seed production and germination, identify any threats to threatened flora and to increase knowledge of each species' ecology and reproductive habits.
- Where propagules are available, further translocations of *Tylophora linearis* via multiple methods including salvage translocations of whole plants (from within approved MCCM disturbance areas) and seed collection to enable further germination trials.

The following sections summarise the works completed to date, and general results as presented within Annual Reviews (Hunter Eco 2015a - 2017; WHC 2019; Ecoplanning 2020b-2024).

3.1 Root architecture and growth study

During mine clearing activities in 2014, a selection of *Tylophora linearis* within the area to be cleared were excavated to document their root architecture and growth. Niche (2014) conducted a study of the root architecture of *Tylophora linearis* to better understand possible constraints to translocation of whole plants. It was shown that the species has a rhizomatous root structure (**Figure 3.1**). Of the 27 emergent stems excavated, nine were connected to a rhizome. *Tylophora linearis* is therefore at least partially clonal. In many instances a thickened, vertical rhizome was observed connecting the aerial stem to a thinner horizontal rhizome. Stems recorded in the immediate vicinity of other stems may therefore be clones of a single plant.

Forster et al. (2004) describes that *Tylophora linearis* has an underground rhizome from which more than one aerial stem can emerge, but the extent of the underground rhizome was unknown before this study.



Figure 3.1: *Tylophora linearis* root architecture showing rhizomatous root structure (Source: Niche 2014)

3.2 Seed production monitoring, collections and propagation

Seed production monitoring initially involved monitoring of 20 flowering *Tylophora linearis* plants for the development of fruit over four months commencing in May 2014 (Niche 2014). Only one mature fruit was recorded and collected during the seed production monitoring, although six pods were opportunistically collected from a single plant within the mine footprint on 20 August 2014 (Niche 2014). A total of 157 seeds from the seven collected pods were utilised for the initial germination trial. These seeds were subject to propagation trials which found Gibberellic Acid treatment resulted in 60% higher germination than untreated seed, suggesting the presence of a dormancy mechanism.

Between 2015 and early 2020, there were no further opportunities to collect seed (Ecoplanning 2020a). Since 2020, ongoing monitoring of both translocated populations of *Tylophora linearis* and naturally occurring populations across the WHC managed lands has been conducted in accordance with the Restoration and Translocation Strategy (Ecoplanning 2020a). The purpose of this monitoring and surveillance includes monitoring seed production. However, this monitoring has not resulted in detection of any opportunities for seed collection form naturally occurring populations. In Autumn 2020, a total of 13 seeds from *Tylophora linearis* were collected from pods produced by translocated plants within the MCCM Wollandilly Offset Property (see **section 3.2**). Unfortunately, much of the collected seed was not viable and only a single seed was successfully germinated with the single germinant short-lived and dying shortly after germination.

In association with the regular inspections of naturally occurring populations of T*ylophora linearis* inspections in accordance with the TFPP (Ecoplanning 2021a), a hand-pollination trial commenced during spring 2023. This trial involved hand pollination of a subset of observed flowering *Tylophora linearis* with subsequent inspections undertaken to determine whether any pods have been produced as a result of hand-pollination attempts. To date, no pods have been produced from hand pollinated flowers.

3.3 Translocation trials

From the initial seed collections in in August 2014, a propagation trial commenced) producing 77 seedlings which were translocated into seven enclosures within the Wollandilly Offset Property on 3 December 2015 (**Figure 3.2; Figure 3.3**; **Figure 3.4**). Post-translocation monitoring of these plants from 2015-2024 has identified a survival rate of approximately 6.5 %. The low survival rate of these plants is at least partially the result of a very high attrition rate in the period immediately after planting, with 83% estimated to have died within the first 12 months (Hunter Eco 2016). This high number of plants which died in the first 12 months after planting may be attributed to low soil moisture before the plants could establish. A supplementary watering regime is to be established as per relevant guidelines (Commander et al. 2018) for all future translocations as documented in **section 5.3.7**.

The surviving translocated *Tylophora linearis* have flowered and produced fruit (**Figure 3.3**), which has also created opportunities for further seed collection and germination (as discussed in **section 3.2**). The flowering and seed production of translocated plants demonstrates continued progress towards the previously stated goal of establishing self-sustaining populations of *Tylophora linearis* from the translocated individuals.

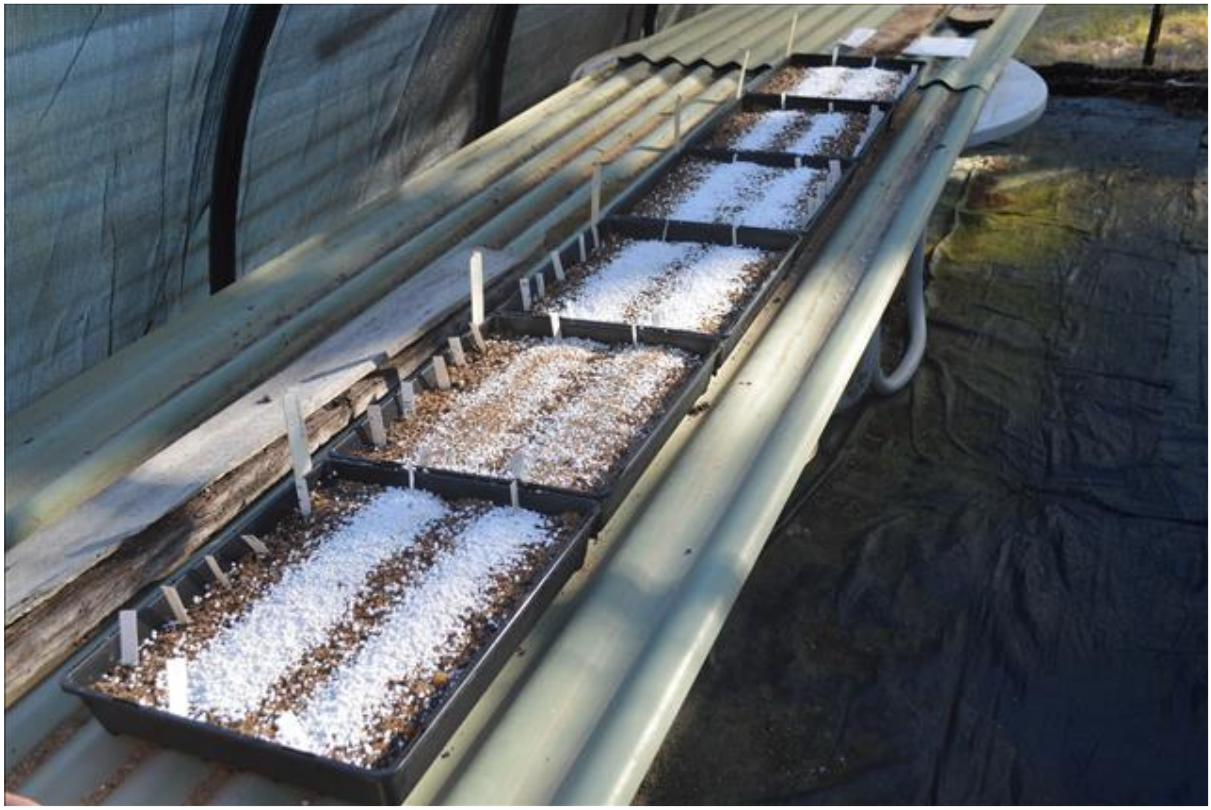


Figure 3.2: Seed propagation trials (Source: Hunter Eco 2015a)



Figure 3.3: *Tylophora linearis* tubestock prior to prior to translocation (left; Source Hunter Eco 2016) and translocated individual with developing follicle (right).

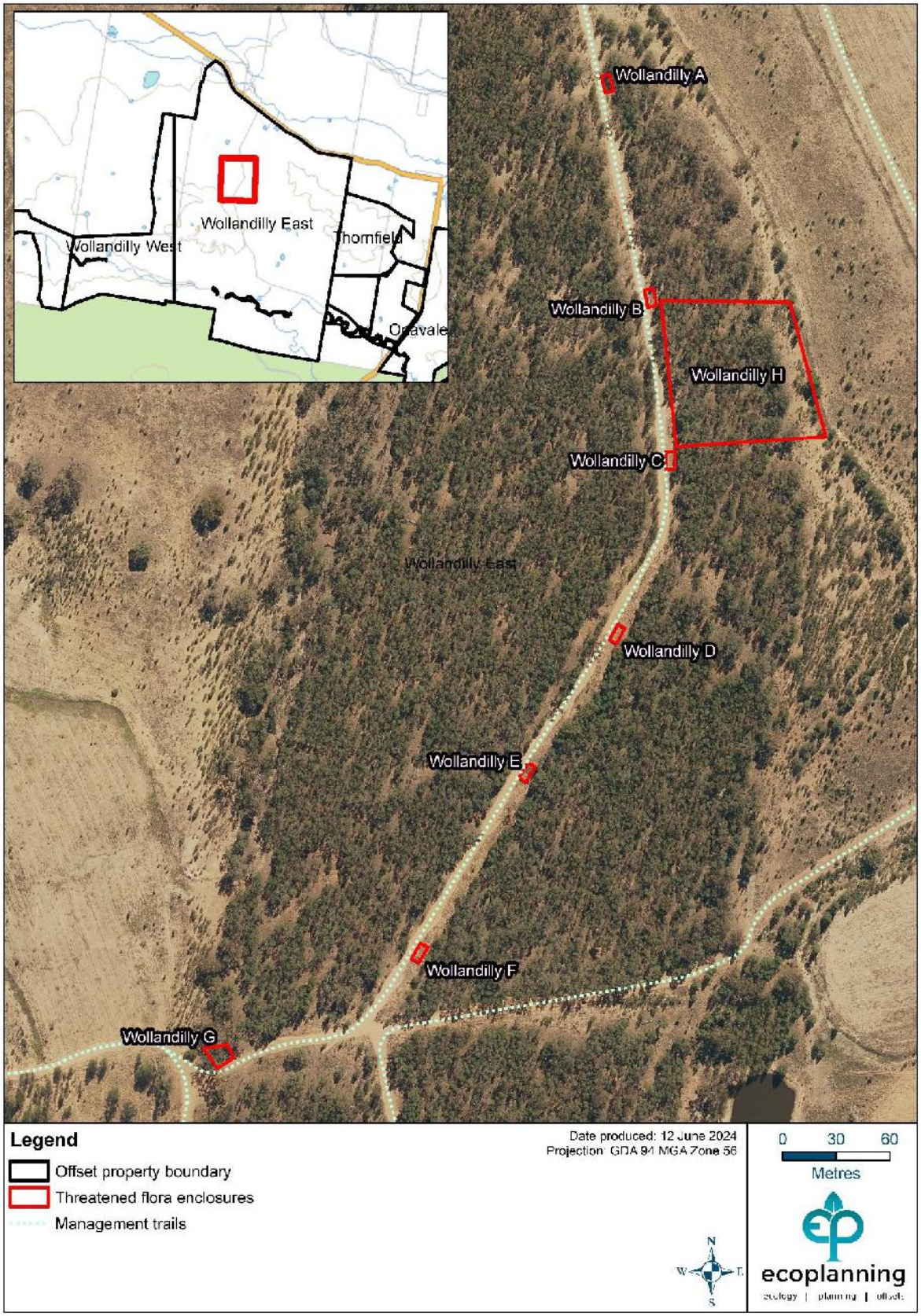


Figure 3.4: Existing recipient sites within the Wollandilly Offset Property

3.3.1 Topsoil translocation

Translocation of topsoil from *Tylophora linearis* habitat within the approved MCCM disturbance areas was undertaken in 2019. Approximately 20 cm of topsoil (including shrubs and ground cover) from supporting *Tylophora linearis* (identified during pre-clearance surveys) was translocated and spread within five enclosures, designated E1 – E5, located within the Teston South Offset Property (**Figure 3.5**; **Figure 3.6**). The Teston South site was chosen as a recipient site based upon the following:

- The presence of modelled suitable habitat,
- Previous *Tylophora linearis* records within the Offset Property,
- The proximity to the donor sites,
- The presence of natural woodlands
- The proximity to existing tracks for delivery, management and monitoring access.

Topsoil was spread at a similar depth to the excavation depth (20 cm). The enclosures were watered approximately weekly from June to October, with the watering regime reduced to monthly from October to better approximate natural conditions of wetting and drying. Topsoil had initially been placed in a stockpile prior to transfer to each enclosure site. Following transfer to the five enclosures a small patch of topsoil remained. This patch serves as a control site with no fencing or watering. Monitoring of the five enclosures involves recording soil moisture levels, recording the number of *T. linearis* stems present (quarterly inspections with all stems flagged, numbered, their length measured and dated) and weed monitoring. As of the end of 2023, there were no *Tylophora linearis* stems recorded in the transplantation enclosures at Teston South.



Figure 3.5: Topsoil translocation site within Teston South Offset Property

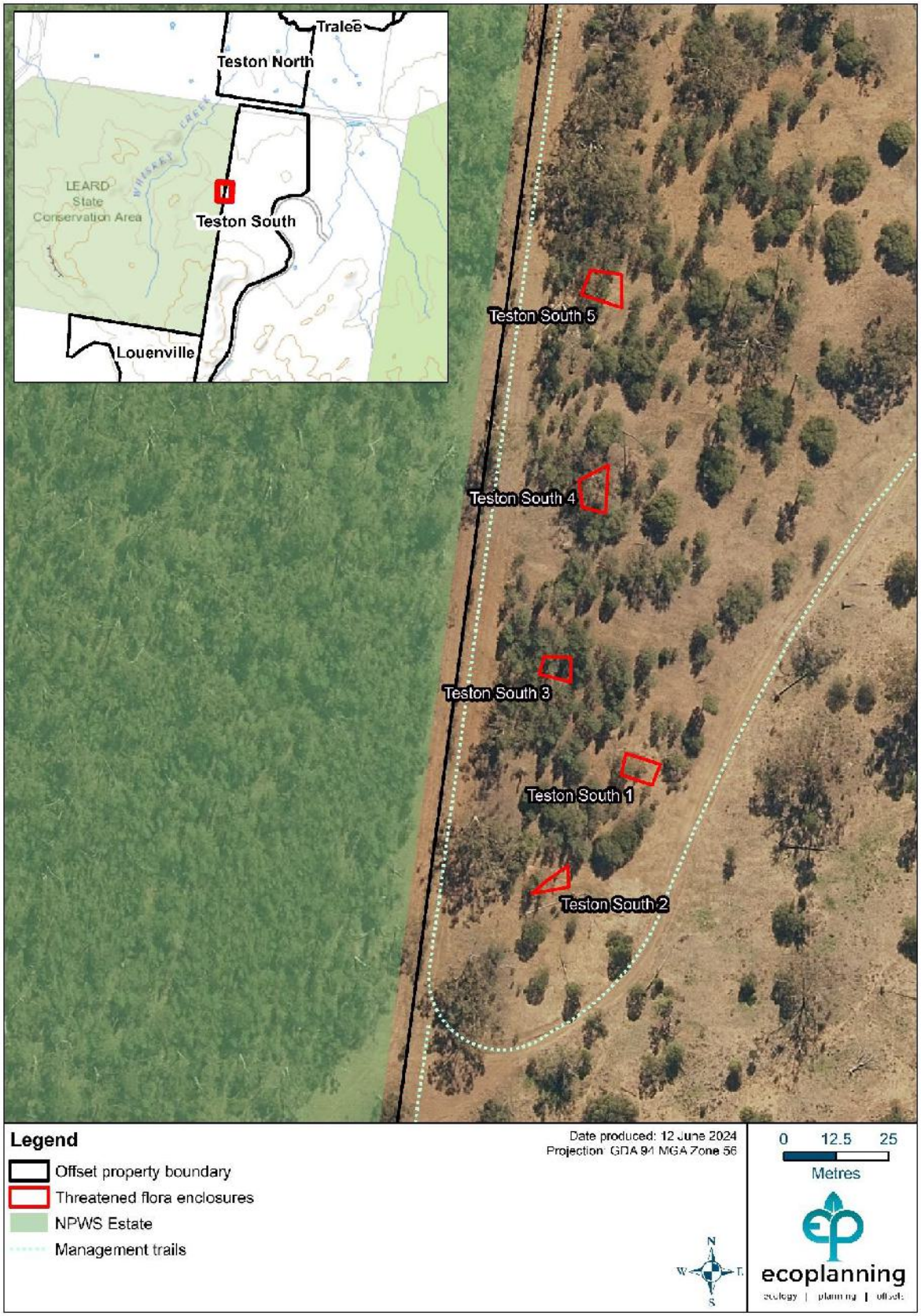


Figure 3.6: Existing recipient sites within the Teston South Offset Property

4 Protection and restoration management actions

Details of management actions across WHC managed lands to maintain, protect and enhance habitat for naturally occurring populations of *Tylophora linearis*, including any additional populations detected in the future, and translocated populations of the species, are detailed within the TFPP (Ecoplanning 2021a). These actions include, but are not limited to, the following:

- Exclusion of livestock grazing to promote natural regeneration.
- Weed and feral animal control.
- Access control.
- Bushfire management.
- Active revegetation (planting or direct seeding) depending on the success of natural regeneration.

These management actions aim to address all the identified threats to *Tylophora linearis* (DPIE 2020) which are associated with habitat disturbance and loss, invasion by introduced weeds, and inappropriate fire regimes. Several actual and potential additional threats to *Tylophora linearis* have also been observed in the WHC managed lands, including herbivory by macropods and rabbits as well as insect attack. As a result, fences have been constructed around existing recipient sites to prevent grazing by macropods and stock.

4.1 Monitoring

Monitoring of translocated *Tylophora linearis* individuals and habitat is to continue under this program, including future translocations, to:

- Increase undertaking of the biology of the species.
- Provide early warning of problems with the actions undertaken as part of the translocation.
- Generate quantitative evidence of translocation success or failure against stated objectives.
- Document information on population dynamics within areas of habitat.
- Highlight ways to make future translocations more effective.

Additionally, monitoring of naturally occurring populations of *Tylophora linearis* is required to document the health of these populations including the operation of any recognised threats.

Consistent within monitoring of translocations to date, all translocated seedlings are permanently tagged, and data collected prior to planting to enable comparisons over time, between individuals and between recipient sites. All translocated seedlings should undergo monitoring, not a subset. Monitoring of translocated seedlings is to take place monthly for the first year after a seedling is planted, quarterly for the two proceeding years and biannually after that. Monitoring should be ongoing, dependent on the success of the program.

Consistent with monitoring to date, reference sites must also be monitored to provide benchmark data and assist in determining attrition or impacts that may be attributed to a natural event that has impacted the general population and not just translocated individuals.

Variables to be monitored at translocation and reference sites are detailed within **Table 4.1**. Collection of this data should provide quantitative data which will guide future management actions including:

- Time to maturity (e.g. first flowering)
- Flowering / fruiting (comparisons between sites and populations).
- What proportion of plants are producing viable seed?
- Are plants in certain locations / situations surviving better than others? Can anything be inferred from this?
- Evidence of second generation and abundance.
- Any experimental micro-siting and treatment variables implemented as part of the program (e.g. fenced / unfenced, shaded / unshaded).

All aspects such a watering frequency, unusual climatic conditions and rainfall should also be considered and documented.

Table 4.1: Data to be monitored for translocated *Tylophora linearis*

Variable	Data to be recorded
Vegetative growth	Height of individual plant
Plant health / vigour	Repeatable scale of measurement as per the following: 1 Plant dead 2 Widespread dieback/damage 3 Dieback/damage observed on multiple branches 4 Minor dieback/damage evident on isolated leaves or branches 5 Healthy plant with no signs of dieback/damage
Reproductive status	Repeatable scale of measurement as per the following: 1 No. flowers (incl. buds) or fruits observed 2 Isolated flowers or fruits 3 Flowering/fruiting on 5 - 25% of branches 4 Flowering/fruiting on 25 - 75% of branches 5 Flowering/fruiting on 75 - 100% of branches

5 Restoration and translocation program

This propagation and translocation program has been prepared based upon a review of species ecology, scientific reviews, results of previous management actions, best practice guidelines and the project approvals to maximise the chance of successfully achieving the aim of the translocation as outlined within **Section 1**.

5.1 Justification for ongoing translocations

The requirements of the project approval (PA 10_0138) and the MCCM BMP provide justification for ongoing translocation of *Tylophora linearis* including translocation of any additional individuals occurring within the MCCM surface development area. Considering the applicable approvals for the MCCM surface development areas and therefore the fate of any additional plants located within the surface development area, any attempts at salvage translocations represent worthwhile actions to minimise impacts to the species. It is noted that based upon the relatively small extent of remaining habitat within the MCCM surface development areas, opportunities for additional salvage translocations in the future may be limited. The translocation actions included within this program are to be undertaken in conjunction with management actions outlined in Section 4 which aim to protect habitat and build resilience.

In addition to salvage translocations occurring within the MCCM surface development area, translocations utilising seeds collected from WHC managed lands, is justified to increase understanding of the species biology and to reinforce existing translocated populations. Increased understanding of the species biology may lead to improve management techniques for the population of the species occurring across WHC managed lands.

5.2 Recipient site selection

The existing recipient sites within the Wollandilly (**Figure 3.4**) and Teston South (**Figure 3.5**) Offset Properties will form the recipient sites for this plan. That is, any future translocations will aim to reinforce the existing translocated populations. The nominated recipient sites include existing fenced enclosures to exclude threats and these fenced areas should be the initial planting locations for any additional *Tylophora linearis* seedlings produced as part of this plan. If additional seedlings become available in subsequent seasons planting may occur across the larger recipient sites outside the existing enclosures (where individual plant guards may be used to protect seedlings from grazing or trampling).

5.3 Translocation methodology

This propagation and translocation program has been prepared based upon a review of species ecology, scientific reviews, results of previous management actions, best practice guidelines (the Australian Network for Plant Conservation Guidelines for the Translocation of Threatened Plants in Australia; Commander et al. 2018) and the project approvals to maximise the chance of successfully achieving the aim of the translocation as outlined within **Section 1**.

Experience has shown that this species is inconsistent and irregular in terms of the availability of both reproductive and/or salvage materials. Therefore, a number of translocation methods have been outlined in this program to allow for the translocation (only if the opportunity

presents) to adapt to available resources and where the initial results of one method prove unsuccessful. It is possible that more than one option may be implemented concurrently, where the availability of seeds and seedlings permit. WHC propose methods of translocation of *Tylophora linearis* in the following order of preference:

1. Seed collection.
2. Seed germination/propagation.
3. Salvage transplanting; and
4. Stem cutting / tissue culture (pending further investigations on viability).

Translocation via seed collection, seed propagation and planting is considered one of the most effective sources of regenerative material due to capacity to encompass a large proportion of the species diversity within a population (Commander et al. 2018). This method also represents one of the most common methods for translocation (Silcock et al. 2019) and has been utilised with some degree of success for the species (see **section 3**). The collection of available *Tylophora linearis* seed from the MCCM impact area and a proportion of seed from WHC managed lands and wild populations in other areas (e.g. Leard State Forest under Threatened Species Licence and with permission from Forestry Corporation NSW), and planting of seedlings germinated in a nursery, represents the most effective way to achieve the aims of the translocation.

A key limiting factor for the propagation and translocation program is likely to be the availability of seed. Niche (2014) suggested that given the low rate of flowering and fruit set observed in *Tylophora linearis,* propagation from stem cuttings was considered likely to be more viable than relying on the propagation of seed alone. Therefore, this program includes production of seedlings from cuttings or tissue culture as a secondary option if ongoing seed collection is unsuccessful. Propagation using cuttings or tissue culture may not capture sufficient diversity as plants propagated using these methods are genetic clones of their source plant and so care must be taken in tracking source material to ensure one clone is not over represented in the *ex situ* collection (Commander et al. 2018) if even feasible at all for this species.

Poor results from rhizome trials were seen during both the WHC studies and studies of other *Tylophora* species (Ecos Environmental 2017). This approach would require significant disturbance to plants and would only to be possible for ‘salvage’ plants. Based upon the low success rate in the past using topsoil or rhizome translocation, a modified technique involving whole turve translocation is recommended for any ‘salvage’ translocations.

5.3.1 Seed collection

A combination of favourable rainfall and temperature is necessary for stem growth and flowering (Niche 2014), which is likely to affect seed production. The previously observed low rate of seed production have limited seed-based propagation in the past and may limit the proposed program. Seed should be collected from all ‘salvage’ *Tylophora linearis* in impact areas prior to their transplantation. Identification of *Tylophora linearis* with follicles should be undertaken as part of pre-clearance surveys.

Seed has previously been collected over a variety of months (March, April, May, August [Niche 2014, Ecoplanning 2020b]) and fruiting appears to be opportunistic in response to favourable conditions. To maximise the probability of collecting seed, plants from known populations

should be inspected regularly to detect inflorescence and their subsequent development into fruit. As per the TFPP (Ecoplanning 2021a), inspections should be quarterly, however this frequency may be decreased during unfavourable conditions (prolonged dry periods) and increased where flowering or early stages of fruit development are observed. Where fruiting is recorded, inspection frequency should be increased to ensure any seed collection opportunities are not missed. Where possible, seed should be collected from geographically separated areas by undertaking searches for reproductive material across all known populations. To maximise the amount of seed of *Tylophora linearis* collected from the source population, seed collection should also occur across multiple years.

Seed collection, management and storage should be undertaken in consideration of Florabank guidelines (http://www.florabank.org.au/) and the relevant Threatened Species Licences (C0005930). Specifically, seed collection is to:

- Be limited to a maximum of 20 % of the follicles/fruits from each plant annually.
- Include no more than 100 individuals from within Leard State Forest, Jacks Creek and Pilliga East State Forests per year.
- Collect seed from spatially separated individuals to reduce chance of collecting seeds from related plants.
- Be fully documented so that data on the plants and locations where seed collection occurred can be tracked over time.

To date only a small quantity of seed has been collected from *Tylophora linearis*, due to limited seed production, and seed retention has not been practical. In the event that any large quantities of seed are collected, retention of some seed collected seed (20%) is recommended to enable planting over multiple years and allows for future plantings and cuttings if the initial plantings/translocations fail. Generally, staggered translocations give better protection against the potential consequences of adverse stochastic events (Commander et al. 2018).

5.3.2 Seed germination

Tylophora linearis seeds collected will be used for germination and plant propagation. Studies undertaken by Hunter Eco (2015a) found Gibberellic Acid treatment resulted in 60% higher germination than untreated seed, suggesting the presence of a dormancy mechanism. The fact that there was 50% germination of untreated seed suggests either that dormancy is weak or had been partially broken, possibly by cold storage of seeds for 3 months prior to the germination trial (Hunter Eco 2015a). Ultimately, the seed germination techniques employed including any further trials utilising different techniques will be determined by the quantity of seed available. Where limited seed is available, the results of the previous seed germination trials (including Hunter Eco 2015a) should inform germination techniques with previously successful methods applied preferentially. Where larger quantities of seed are available, an experimental approach may be employed to test other germination techniques, however all seed pre-treatments (e.g. scarification, stratification, after-ripening) used should be fully documented.

Where successful seed germination occurs, seedlings should have a structure to encourage the twining habit of the species and avoid seedlings becoming intertwined in the nursery.

5.3.3 Stem cuttings

For species where timing of fruit set and seed release are not available, and for species with clonal reproduction, cuttings, division, grafting or using micropropagation techniques are alternative sources of propagules. As outlined above, cuttings should be collected as a second option should seed availability and / or successful seed propagation be limited. Where inspections of wild populations detect limited or no flowering or follicle development of *Tylophora linearis* over the spring period, stem cuttings should be collected from healthy and robust individuals of the species. Cuttings should either be taken by qualified horticulturalists, or under their direction, ensuring that resources and materials are ready and available to receive the cuttings.

Vegetative cuttings and cutting media should be treated with a systemic fungicide. An experimental approach including the use of hormone solution or powder to encourage root development should be employed before being planted into cutting mix in trays or pots. The techniques and for cuttings, including any experimental treatments, should be fully documented and any subsequent cutting propagation should review the results of previous trials.

Stem cuttings should be preferentially collected from plants within approved mine disturbance footprints (i.e. salvage plants) and only from existing populations within the WHC managed lands where large, robust, multi-stemmed individuals are identified. No more than 5% of plant material from any one plant within WHC managed lands should be removed (not applicable to salvage translocations) and greater than 10 m should be left between sampled plants to avoid sampling from potential clones.

Once plant material has been collected, the time necessary for propagation needs to be considered. All cuttings should be taken to the nursery to allow for a period of 'hardening off.' Plants require sufficient time in the nursery to obtain a size and condition that is robust enough for handling during the planting phase, usually including a 'hardening off' period to adjust them to conditions more like the recipient site. Commander et al. (2018) suggests that the process of hardening off and root strike can take between 6 and 12 months.

Some level of short-term success and early research suggests that microhabitat placement, seasonal rainfall and access to supplementary water (irrigation) are essential for translocation success in stem cutting translocations (Commander et al. 2018). Cuttings from WHC managed lands should not be taken or planted during adverse weather conditions and during long dry periods additional water may be required. All stem cuttings should be translocated to sites currently supporting existing populations and to a location that best mimics the microhabitat features where existing plants occur.

Tissue culture

This method is noted in this program but is not considered as primary restoration and transplantation method in this program due to technical and cost challenges with method. Tissue culture is likely to be an expensive option and can take up to 24 months before planted growth using this method would be ready for translocation if even feasible at all for this species. Micropropagation techniques, such as tissue culture, involve inducing small pieces of plant tissue to form a new plant. These techniques require specialised equipment, facilities and expertise (Commander et al 2018).

5.3.4 Salvage transplanting

A combination of translocation techniques are to be employed as part of salvage translocation of any *Tylophora linearis* within approved MCCM disturbance areas. It is noted that based upon the limited extent of remaining habitat within the MCCM surface development areas, opportunities for additional salvage translocations in the future may be limited. However, where opportunities for salvage translocations are identified, the following methods should be utilised:

1. Seed collection.
2. Stem cuttings.
3. Whole plant translocations.

All seed detected during pre-clearance surveys should be collected from *Tylophora linearis* in impact areas prior to disturbance. Additionally, stem cuttings should be taken from a sample of stems (preferentially selecting larger healthier individuals and ensuring spatial separation between recipient cuttings to maximise genetic diversity within cuttings), to test the viability of this propagation method. Treatment of collected seed and cuttings should be as detailed within sections 5.1.2 and 5.1.3.

Transplanting entire plants from naturally occurring populations has a low success rate as many plants die without successfully reproducing at their new location. Despite the low success rate of this technique, transplantation is considered a worthwhile mitigation measure considering the fate of plants within the mine footprint. Preliminary trials and studies have demonstrated that transplanting of whole turves, rather than just topsoil, result in higher success rates and significantly lower ongoing management of weeds (Commander et. al 2018). Further, results obtained from rhizome (topsoil) transplantation studies of *Tylophora linearis* undertaken by Hunter Eco (2020) are still unknown. Given the uncertainty around the success of this approach, and the success of projects transplanting other *Tylophora* sp. (Ecos Environmental 2017), the use of whole plant translocation, including whole turve relocation, is proposed for the *Tylophora linearis* 'salvage' translocations that form part of this program. As many individuals, or stems, as possible should undergo 'salvage' transplanting via whole turve relocation. However, due to the time & equipment required for the process and uncertainty of success, it is anticipated that a maximum of 20 turves per season could be collected for translocation to enable adequate management to occur.

Turves is a plant that is removed in a block of soil without breaking the soil and roots, if possible, which requires careful excavation. Excavation, transport and replanting should be carried out as quickly as possible. Once planted, the soil plug associated with a whole plant transplant can often have gaps between it and the natural ground. Such gaps can result in a rapid loss of soil moisture and should be in-filled by ensuring soil is used to fill all gaps (Commander et al. 2018). Transplanted plants should be watered during transplanting to minimise water stress and planted at pre-marked points. Salvaged whole plants can often die from the shock to the plant associated with transplanting without regular, ongoing care.

A proportion of the *Tylophora linearis* turves from the impact area should be salvaged for direct transplanting (75%) and the remaining 25% removed and maintained in a nursery for continued growth under nursery conditions. Maintaining salvaged *Tylophora linearis* within a nursery

aims to increase survival rates and if established, could be used for tissue cultures / stem cuttings.

It is important to note that seed collection, recipient site selection (see **section 5.2**) and preparation must be undertaken prior to the removal of any 'salvage' plants. All salvaged plants should be labelled at the recipient site in a manner that allows them to be found should the individual die back.

5.3.5 Translocation of propagated seedlings

Following successful seed germination, or propagation via cuttings, seedlings should be planted into the WHC managed lands consistent with techniques utilised to date. Specifically, plantings should occur in autumn/winter, with high soil moisture and low levels of heat stress. Planting should be conducted in the following manner:

1. Prepare a hole for each plant with an auger (or similar) to a depth of approximately 750 mm, and width 50% wider than the largest pot size. Rough the sides of the hole to ensure that it is not round or glazed.
2. Return the soil to the hole and pour 10-15 litres of water onto the soil.
3. Prepare an additional hole in the same manner that will be used to monitor soil moisture.
4. Return 2-3 days later after steps 1-3 for planting.
5. Make sure potted plants have been watered the day prior to planting.
6. Remove plant from pot and trim roots, as required.
7. When planted, the soil level of the potted plant should sit 40 mm below ground level creating a dish. Cover root ball by 40 mm.
8. Place tree guard around the plant, if required.
9. Apply approximately 5 litres of water onto each plant.
10. Monitoring plant and soil moisture weekly. Test for moisture using a fork or dig the soil in the additional hole and observe soil moisture, then replace soil.
11. Only water if required. Overwatering may prevent healthy root growth.
12. Do not apply fertiliser.

5.3.6 Fencing and protection

Several potential threats have been observed in the WHC managed lands, including trampling and herbivory by vertebrates and invertebrates or other inadvertent sources of disturbances. Planted individuals require protection from vertebrate grazing and will either have a tall hingejoint (grid mesh) fence around each recipient site, or guards around individual plants. Demarcating style fence (plain top wire) will be installed around the extent of known populations with signage to minimise inadvertent disturbance. As proposed planting locations are within existing *Tylophora linearis* habitat (see **section 5.2**), existing fencing is already present.

5.3.7 Watering schedule

All translocated plants should be marked clearly so they can be found easily for watering and monitoring. Watering during hot and/or dry periods may be beneficial during the plant establishment phase. If a site is exposed to seasonally dry conditions, Commander et al. (2018) recommend providing weekly or fortnightly water to translocated individuals during the first two dry seasons to mitigate losses during this time.

All translocated individuals should be watered during planting. Initial watering should replicate frequent, small rainfall events (10 mm max and approximately four litres per plant), and later watering should replicate infrequent, large rainfall events (>10 mm and approximately seven to eight litres per plant, or until soils are saturated). Follow-up watering should also occur during any extended dry periods (absence of weekly rainfall in excess of 5 mm in a single rainfall event) or if any signs of dieback are observed which may be linked to dry conditions. Decisions regarding the watering schedule after planting will need to be made based upon the rainfall at the time and the response of planted seedlings during monitoring. Lack of post-translocation care and ongoing monitoring are factors that commonly lead to failure of translocation projects (Commander et al. 2018). Post-translocation actions including timing, frequency and amount of watering should be documented to inform decision-making for any future planting events.

5.3.8 Translocation schedule

Past research on translocations has shown that past translocations have been unsuccessful for several reasons including hot and dry conditions over summer and frost damage in colder regions (Commander et al. 2018). Planting within WHC managed lands will aim to occur in autumn/winter, with high soil moisture and low levels of heat stress. Planting timing and frequency will be determined based on availability of *Tylophora linearis* seedlings.

Seed propagation will occur following the collection of sufficient seed or mature plant material (if insufficient seed is collected). Commander et al. (2018) suggest that seed propagation usually takes about 12 to 18 months and the study on *Tylophora linearis* conducted by Hunter Eco (WHC 2019) showed that it took 13 months to germinate and grow to a suitable sized seedling for planting. Therefore, timeframes for germination need to be considered and accounted for when planning for the translocation.

6 Review and reporting

The outcomes of implementation of this propagation and translocation program will reported in the MCCM Annual Reviews summarising the results of quarterly inspections on the various stages of the propagation and translocation program as well as any recommendations.

7 References

Commander, L.E., Coates, D., Broadhurst, L., Offord, C.A., Makinson, R.O. and Matthes, M (2018). Guidelines for the translocation of threatened plants in Australia. Third Edition. Australian Network for Plant Conservation, Canberra.

Cumberland Ecology (2011). Maules Creek Coal Project: Ecological Assessment. Unpublished Report prepared for Hansen Bailey. Available online: https://whitehavencoal.com.au/Documentations/Maules%20Creek%20Mine/Environmental%20Management,%20Monitoring%20&%20Compliance/Environmental%20Assessments/MCC-Environmental%20Assessment-Appendix%20I%20-%20Ecological%20Impact%20Assessment%20Part%201.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Approved Conservation Advice for *Tylophora linearis*. Canberra: Department of the Environment, Water, Heritage and the Arts. Available online: http://www.environment.gov.au/biodiversity/threatened/species/pubs/55231-conservation-advice.pdf

Department of Planning, Industry and the Environment (DPIE) (2020). *Tylophora linearis* – profile. Available online: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10815

Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) (2024). NSW BioNet. Available online: http://www.bionet.nsw.gov.au/.

Ecoplanning (2020a). Restoration and Translocation Strategy: *Tylophora linearis*. Unpublished report prepared for Whitehaven Coal, dated 26 October 2020.

Ecoplanning (2020b). *Tylophora linearis* Propagation and Translocation Program – Annual Report 2019, Maules Creek Coal Mine. Unpublished report prepared for Whitehaven Coal, dated 26 March 2020.

Ecoplanning (2021a). Threatened Flora Project Plan v 2.1. Unpublished report prepared for Whitehaven Coal, dated 9 December 2021.

Ecoplanning (2021b). *Tylophora linearis* Propagation and Translocation Program – Annual Report 2020, Maules Creek Coal Mine. Unpublished report prepared for Whitehaven Coal, dated 15 March 2021.

Ecoplanning (2022). *Tylophora linearis* Propagation and Translocation Program – Annual Report 2021, Maules Creek Coal Mine. Unpublished report prepared for Whitehaven Coal, dated 25 February 2022.

Ecoplanning (2023). *Tylophora linearis* Propagation and Translocation Program – Annual Report 2022, Maules Creek Coal Mine. Unpublished report prepared for Whitehaven Coal.

Ecoplanning (2024). *Tylophora linearis* Propagation and Translocation Program – Annual Report 2023, Maules Creek Coal Mine. Unpublished report prepared for Whitehaven Coal, dated 25 March 2024.

Ecos Environmental Pty Ltd (2017). Warrell Creek to Nambucca Heads Upgrade of the Pacific Highway Threatened Flora Translocation Project Annual Monitoring Report – Year 2. Prepared for Pacifico. Available online: https://www.pacifichighway.nsw.gov.au/sites/default/files/media/documents/2018/Warrell%20Creek%20to%20Nambucca%20Heads%20Upgrade%20threatened%20flora%20translocation%20monitoring%20report%202017.pdf

Eco Logical Australia (2012). North-east Pilliga Forest Targeted threatened flora survey. Unpublished report prepared for Santos Limited. Available online: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6038%2120190227T052444.364%20GMT

Forster, P.I. (1992). A Taxonomic Revision of *Tylophora* R. Br. (Asclepiadaceae: Marsdenieae) in Australia. *Australian Systematic Botany* **5**, 29-51.

Forster, P.I., Binns, D. and Robertson, G. (2004). Rediscovery of *Tylophora linearis* P.I. Forst. (Apocynaceae:Asclepiadoidae) from New South Wales, with revision of its conservation status to vulnerable. *Austrobaileya* **6(4)**: 941-947.

Harden, G.J, (ed) (2002). Flora of NSW: Volume 2. NSW University Press, Kensington.

Hunter Eco (2014). Population Density Estimation of *Tylophora linearis* in Leard State Forest and the Immediate Region. Unpublished report to Whitehaven Coal July 2014.

Hunter Eco (2015a). Maules Creek Coal Mine *Tylophora linearis* Propagation and Translocation Program Annual Report 2014-2015. Unpublished report prepared for Whitehaven Coal, dated March 2015.

Hunter Eco (2015b). Caroona Coal Project Baseline Flora Report. Unpublished report to BHP Billiton March 2015.

Hunter Eco (2016). Maules Creek Coal Mine *Tylophora linearis* Propagation and Translocation Program Annual Report 2015-2016. Unpublished report prepared for Whitehaven Coal, dated February 2016.

Hunter Eco (2017). Maules Creek Coal Mine *Tylophora linearis* Propagation and Translocation Program Annual Report 2016. Unpublished report prepared for Whitehaven Coal, dated February 2017.

Hunter Eco (2021). Maules Creek Coal Mine *Tylophora linearis* Offset Package. Unpublished Report prepared for Whitehaven Coal, dated June 2021.

Liedde-Schumann, S., Khanum, R. Mumtaz, A.S., Gherghel, I. and Pahlevani, A. (2016). Going west – A subtropical lineage (Vincetoxicum, Apocynaceae: Asclepiadoideae) expanding into Europe. *Molecular Phylogenetics and Evolution* **94 (2016)** 436–446

Liedde-Schumann S. & Meve U. (2018) Vincetoxicum (Apocynaceae—Asclepiadoideae) expanded to include Tylophora and allies. *Phytotaxa* **369**, 129.

Niche Ecology and Heritage (2014). Maules Creek Coal - *Tylophora linearis* Seed Monitoring and Root Architecture Report. Prepared for Whitehaven Coal.

NSW Scientific Committee (2008). Final Determination to list the vine *Tylophora linearis* P.I.Forst. as a Vulnerable Species. Available online: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2008-2010/Tylophora-linearis-vulnerable-species-listing

Ollerton, J. and Liede, S. (1997). Pollination systems in the Asclepiadaceae: a survey and preliminary analysis. *Biological Journal of the Linnaean Society* **62**: 593-610.

PlantNET (The NSW Plant Information Network System) (2023). Royal Botanic Gardens and Domain Trust, Sydney. Available online: http://plantnet.rbgsyd.nsw.gov.au

Silcock, J.L., Simmons, C.L., Monks, L., Dillon, R., Reiter, N., Jusaitis, M., Vesk, P.A., Byrne, M. and Coates, D.J. (2019). Biological Conservation Vol 236, August 2019, p 211-222.

Sinha, S. and Mondal, A.K. (2011). The morphological diversification of pollinia of some members of Asclepiadaceae. *African Journal of Biotechnology* **10**: 7981-7986.

Whitehaven Coal (2017). Maules Creek Coal Mine – Biodiversity Management Plan. Unpublished report available online: https://whitehavencoal.com.au/Documentations/Maules%20Creek%20Mine/Environmental%20Management,%20Monitoring%20&%20Compliance/Environmental%20Management%20Plans,%20Strategies%20and%20Programs/MCC-Biodiversity%20Management%20Plan.pdf

Whitehaven Coal (2019). Maules Creek Coal Mine *Tylophora linearis* Propagation and Translocation Program Annual Report 2018. Unpublished report dated March 2019.

Young, A.G. and Brown, A.H. (1999). Paternal bottlenecks in fragmented populations of the grassland daisy *Rutidosis leptorrhynchoides*. Genetics Research 73(2), 111-117.

Appendix 5: *Pomaderris queenslandica* Propagation and Translocation Program

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Propagation and Translocation Program





Pomaderris queenslandica

Maules Creek Coal Mine

Prepared for: Whitehaven Coal

12 June 2024 Version: 1.2

PROJECT NUMBER	2023-160-06			
PROJECT NAME	Propagation and Translocation Program			
PROJECT ADDRESS	Maules Creek Coal Mine			
PREPARED FOR	Whitehaven Coal			
AUTHOR/S	Brian Towle, Bruce Mullins. Jai Brien-Cooper			
REVIEW	**Technical**	**QA**	**Version**	**Date to client**
	Brian Towle		1.0	29 May 2024
			1.1	7 June 2024
			1.2	12 June 2024
LICENCES	**Scientific Licence**		SL101557 & C0005930	
	BioNet Sensitive Species Data Licence		1115	
	Animal Research Authority Ethics Licence		Fauna Surveys and Monitoring (16/346)	
	Scientific Collection - Aquatic		P19/0009-1.0 & OUT19/2602	

This report should be cited as: 'Ecoplanning (2024). Propagation and Translocation Program– *Pomaderris queenslandica*. Prepared for Whitehaven Coal.'

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Glossary and abbreviations

Acronym	Description
ANBG	Australian National Botanic Gardens
BC Act	*Biodiversity Conservation Act 2016*
BCS	Biodiversity, Conservation and Science Directorate within the NSW DCCEEW
BMP	Biodiversity Management Plan
Cth. DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DPHI	NSW Department of Planning, Housing and Infrastructure
DAWE	Former Department of Agriculture, Water and Environment, now Cth. DCCEEW
DotE	Former Department of the Environment, now Cth. DCCEEW
DPE	Former NSW Department of Planning and Environment, now either DPHI or NSW DCCEEW
DPIE	Former Department of Planning, Industry and the Environment, now either DPHI or NSW DCCEEW
DSEWPAC	Former Department of Sustainability, Environment, Water, Population and Communities, now Cth. DCCEEW
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
MCCM	Maule Creek Coal Mine
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Former NSW Office of Environment and Heritage, now NSW DCCEEW

Acronym	Description
PCT	Plant Community Type
TFPP	Threatened Flora Project Plan
WHC	Whitehaven Coal

1 Introduction

In accordance with Project Approval (PA 10_0138) Schedule 3, Condition 52, a Biodiversity Management Plan (BMP) has been prepared by Whitehaven Coal Pty Ltd (WHC) for the Maules Creek Coal Mine (MCCM; WHC 2017). A revision to this BMP is currently underway (WHC In prep.) and Section 3.1.2 of the revised BMP, states that:

> "*Prior to clearing, a pre-clearing flora survey will be conducted to search for threatened plant species that have potential to occur, based on habitat available. If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with BCS, DPHI and Cth DCCEEW (for Matters of National Environmental Significance [MNES])."*

Pomaderris queenslandica (Scant Pomaderris), an endangered species listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), was identified within the MCCM during pre-clearing flora surveys in 2015. A propagation and translocation program for *P. queenslandica* was previously prepared in consultation with Dr Colin Driscoll (Hunter Eco), Office of Environment and Heritage (OEH) and the Department of Planning and Environment (DPE) and was included in Appendix D of the BMP (WHC 2017). In 2021, an updated Threatened Flora Project Plan (Ecoplanning 2021a) and *P. queenslandica* Restoration and Translocation Strategy (Ecoplanning 2021b) were prepared to support the propagation and translocation program (WHC – 2017 Appendix D), pending the revision of the BMP.

Management actions undertaken by WHC to date for *P. queenslandica* have been documented annually in the MCCM Annual Reviews (Hunter Eco 2016; Hunter Eco 2017; WHC 2018; Ecoplanning 2020-2024).

This propagation and translocation program has been prepared for inclusion in the revised BMP (WHC In prep.) and reviews, updates, and supersedes the previous *P. queenslandica* Propagation and Translocation Plan (WHC 2017) and the *P. queenslandica* Restoration and Translocation Strategy (Ecoplanning 2021b). This program has been prepared to fulfil the ongoing requirements of the revised BMP (WHC In prep.). Further, this propagation and translocation program is integrated as part of WHCs Threatened Flora Project Plan (TFPP; Ecoplanning 2021) which provides overarching guidance on the management habitat for threatened flora species within and adjacent to WHC mining operations and Biodiversity Offset Areas (hereafter referred to as WHC managed areas).

This program adopts the definition of 'translocation' as included in the third version of the *Guidelines for the Translocation of Threatened Plants in Australia* (Commander et al. 2018), which is:

> *"… the deliberate transfer of plants or regenerative plant material from an ex situ collection or natural population to a new location, usually in the wild. It includes reintroduction, introduction, reinforcement, assisted migration and assisted colonization.*

Translocations involve a diverse range of methods including: seed collection and propagation; propagation via cuttings or tissue culture; planting of containerised plants; direct seeding; transplantation of whole plants from one site to another; and the transfer of soil, leaf litter, brush or pollen."

1.1 Aims and objectives

The overall aim of this propagation and translocation program is to directly support the conservation of *P. queenslandica,* and to maintain a self-sustaining, genetically diverse population of the species within the WHC managed areas, which is capable of surviving in the long term. To ensure long-term survival, research suggests that populations of around 200 to 250 plants are required to minimise reduced genetic and demographic outcomes associated with small populations (Young and Brown 1999). Therefore, success of the propagation and translocation program would be achieved by translocations establishing one or more sub-populations with between 200 and 250 individuals and with population size either stable (recruitment equal to any losses) or trending up (recruitment greater than losses). While resources are available, WHC aims to continue undertaking translocations until five stable and resilient (between 200-250 individuals) sub-populations of *P. queenslandica* have been established across WHC managed lands.

The specific objectives of this strategy include:

- To guide the successful translocation of *P. queenslandica* individuals grown from seed, stem cuttings, or soil seedbank transfer, to suitable habitat within the protected areas that form part of the WHC managed lands
- To provide clear management and monitoring measures to ensure the long-term success of the propagation and translocation program

This strategy primarily represents a 'Reinforcement' and 'Introduction' translocation according to the definitions of Commander et al. (2018). That is, the translocation aims to transfer seedlings grown under *ex situ* conditions and/or seed to locations where there is an existing population of *P. queenslandica* (including previously translocated individuals). This strategy also identifies locations for future 'introductions', involving translocations to an area where the species has not previously occurred (but is within the known range of the species and provides similar habitat to known occurrences).

1.2 Ecology of *Pomaderris queenslandica*

1.2.1 Distribution and population size

Pomaderris queenslandica is a medium sized woody shrub 2–3 m high. The species was first described by White (1951) from Queensland, although the geographical range extends south into NSW including the North Coast, New England Tablelands, North West Slopes and Central Western Slopes (including Hunter Valley) regions of NSW (Bell 2001). Across its wide range, records of the species are uncommon, and populations are typically small (well less than 1000 plants; Bell 2001). Within NSW, larger populations exceeding 1,000 individuals are limited to the Pilliga Forests region, with the population occurring within Jacks Creek and Pilliga East State Forest having been estimated to include at least 4,000 individuals in 2010 (DPIE 2020a).

The presence of *P. queenslandica* was initially identified within the MCCM Project Boundary by Cumberland Ecology (2015), and subsequently validated by Niche Environment and Heritage, during flora pre-clearance surveys undertaken between February and April 2015 (**Figure 1.1**). The entire population consisted of 463 plants all of which were within the approved MCCM disturbance footprint (WHC 2017) and have since been impacted by the approved MCCM.

Natural occurrences of *P. queenslandica* have also been recorded within additional WHC managed lands, specifically the 'Narrabri Onsite' offset site (Rosevale, West Haven and Greylands properties; **Figure 1.1**). The exact population of *P. queenslandica* within the 'Narrabri Onsite' offset site is unknown, with counts in spring 2021 (Ecoplanning 2021d) recording between 15-20 mature individuals in flower and numerous seedlings within the Rosevale Property. However, individuals within the Narrabri Onsite offset site are located within habitat contiguous with Jacks Creek State Forest where a population of *P. queenslandica* in excess of 4,000 individuals has been recorded (DPIE 2020a; **Figure 1.1**).

Based upon the regional distribution of the species, it is possible other natural occurrences of the species are present within other WHC managed lands but have been undetected to date. It is noted that *P. queenslandica*, has previously been reported as occurring within the Greenwood Biodiversity Stewardship Agreement property (formerly known as the proposed Offset Site 7 for the Vickery Coal Mine), however these plants have subsequently been confirmed by the National Herbarium of NSW as *Alphitonia excelsa* (Red Ash).

Details of translocated populations of *P. queenslandica* within WHC managed lands are detailed in **Section 3**.

1.2.2 Habitat associations

Known habitat preferences for *P. queenslandica* are limited, with the species having been generally identified as occurring in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and often along creeks (DPIE 2020b; Bell 2019). However, individuals of the species from the Pilliga Forests have also been recorded from "…*rocky ridge crests and slopes*" (DPIE 2020b). Similarly, Bell (2019) reports a population near Glen Gallic as occurring on a ridgeline, noting that the ridgeline habitat is unusual for the species, and that nearby sheltered slopes and gullies may support many more individuals. Plants recorded by Cumberland Ecology (2015) within MCCM as part of pre-clearance surveys were along sheltered ephemeral drainage lines within vegetation equivalent to the Plant Community Type (PCT) '*Narrow-leaved Ironbark – White Cypress Pine Woodland on slopes and flats in the Coonabarabran – Pilliga Scrub regions* (PCT 394)'.

1.2.3 Life-cycle

Flowering of *P. queenslandica* has been identified as occurring from August to October in Queensland (Elliot & Jones 2010) and during spring-summer in NSW (PlantNET 2020). Observations of naturally occurring and translocated individuals within WHC managed lands has recorded flowering in spring months with mature seed produced in summer. No specific studies into the pollination mechanism of *P. queenslandica* have been identified, although insects have been considered the most likely pollinators for species of *Pomaderris*. Results of monitoring of the species across WHC managed lands indicate that the species is not pollinator

limited with flowering and seed production consistently observed in each year where monitoring has occurred.

Ants are identified as the main mechanism of dispersal of Australian *Pomaderris* species due to the presence of a small elaiosome within the seeds (Patykowski et al. 2016). *Pomaderris queenslandica* seeds demonstrate physical dormancy (an impermeable seed coat; BioBankSeed 2019), an ecological strategy of other *Pomaderris* species for growing in fire-prone ecosystems (Natale 2016). This physical dormancy suggests that *Pomaderris* seeds may remain viable in the soil for up to 20 years in the absence of fire (Patykowski et al. 2014). Mechanical scarification, consisting of chipping the surface of each seed with a scalpel, has been successfully used to break the physical dormancy (BioBankSeed 2019). Additionally, heat treatments have been shown to break the physical dormancy with temperatures between 130-150 ºC optimal for breaking seed dormancy (BioBankSeed 2024).

The natural lifespan of *P. queenslandica* is unknown, however, other *Pomaderris* species are reported to have a natural lifespan of 10 to 30 years (Patykowski et al. 2014), with some individuals documented as living much longer.

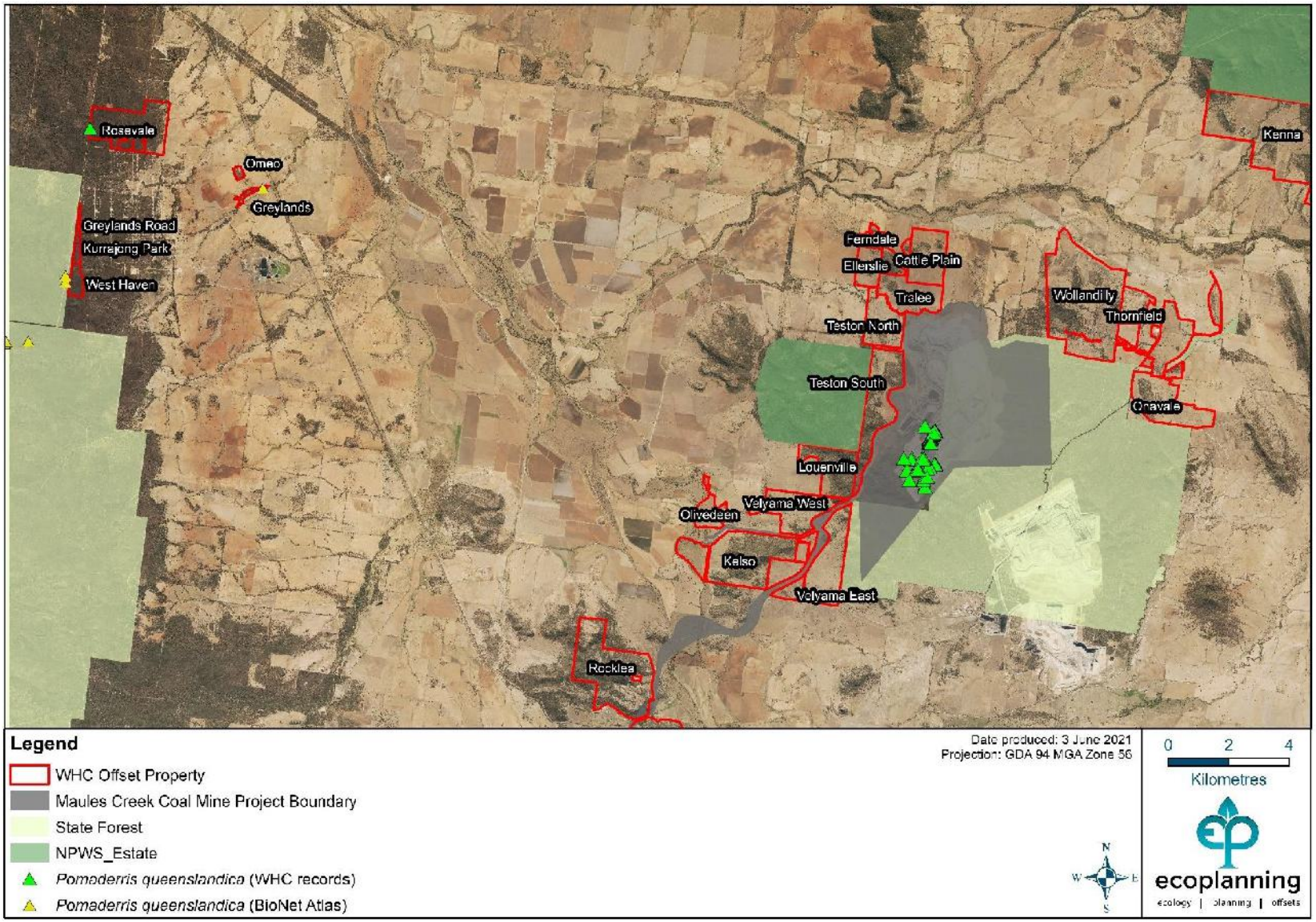


Figure 1.1: Natural *Pomaderris queenslandica* populations within the MCCM Project Area and WHC managed lands.

2 Approvals and requirements

Relevant management plans, approval conditions and requirements which relate to *P. queenslandica* are summarised in **Table 2.1**.

Table 2.1: MCCM statutory requirements and management plans relevant to *P. queenslandica*

Approval / Management plan	Requirement	Response
Project Approval (PA 10_0138) Schedule 3, Condition 52	"*The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General."*	A BMP has been prepared (WHC 2017) and is currently being revised (WHC In prep.).
Biodiversity Management Plan - Section 3.1.2	*"Prior to clearing, a pre-clearing flora survey will be conducted to search for threatened plant species that have potential to occur, based on habitat available. If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with BCS, DPHI and Cth DCCEEW (for Matters of National Environmental Significance [MNES])."*	A propagation and translocation program for *P. queenslandica* was previously prepared (Appendix D of the MCCM BMP [WHC 2017]). This propagation and translocation program reviews, updates, and supersedes the previous *P. queenslandica* Propagation and Translocation Plan (WHC 2017).

3 Current and past management actions and trials

Completed management actions undertaken by WHC to date for *P. queenslandica* have been documented within the MCCM Annual Reviews. The previous *P. queenslandica* propagation and translocation program (WHC 2017) included the following stages:

- Stage 1 – Root architecture study (complete).
- Stage 2 – Seed collection (complete).
- Stage 3 – Cuttings propagation (complete).
- Stage 4 – Seed germination (complete); and
- Stage 5 – Translocation trials (ongoing).

Stages 1 – 4 of the previous *P. queenslandica* propagation and translocation program have been completed and documented in annual reports (Hunter Eco 2016; Hunter Eco 2017; WHC 2018; Ecoplanning 2020). The stages completed to date, and general results have included:

- a root architecture study (which identified a shallow root system)
- seed collection (with approximately 2,000 seeds collected in 2016 from within the MCCM boundary)
- propagation of cuttings (with one successful strike from over 400 cuttings in 2016)
- seed germination trials (demonstrating that a physical seed dormancy exists, but which can be broken with treatments including scarification)

Stage 5 (Translocation) commenced in 2017, with a single propagated cutting being planted at the Wollandilly Offset. Translocation trials from Stage 5 of the program are ongoing (WHC 2019; Ecoplanning 2020; Ecoplanning 2021b) and are documented in more detail below.

3.1 Translocation trials

The outcomes of ongoing translocation trials, representing Stage 5 of the *P. queenslandica* propagation and translocation program (WHC 2017 Appendix D) and ongoing trials in accordance with the *P. Queenslandica* Restoration and Translocation strategy (Ecoplanning 2021b) are summarised in **Table 3.1**. Results of each trial to the end of December 2023 are presented in the following sections.

Table 3.1: Summary of *P. queenslandica* translocations to December 2023

Source (provenance)	Date	№ of plants translocated	Translocation Method	Surviving translocations	Cumulative count of surviving plants
MCCM project boundary	November 2017	1	Cuttings	0/1	0
	July 2020	34	Seed collection & propagation	29/34	29
	September 2020	134*	Topsoil (translocation)	131/134*	160
	September 2020	12*	Topsoil (stockpile)	12/12*	172
	August 2021	83	Seed collection & propagation	74/83	246
Rosevale / Jacks Creek SF	May 2022	70		62/70	308
	September 2023	143		133/143	441

*An estimated 134 individuals of *Pomaderris queenslandica* were observed in the topsoil translocation area in 2021. During 2023 98 % of monitored subset of this population was surviving in 2023 and this has been extrapolated for the estimated total population.

3.1.1 Cuttings

The propagation of cuttings found only one successful strike from over 400 cuttings (**Plate 3.1**). The single *P. queenslandica* plant, propagated from a stem cutting taken onsite at MCCM during 2015, was planted at the Wollandilly Offset site in 2017 (**Figure 3.1**; **Plate 3.1**). The single *P. queenslandica* was planted along a drainage line within the upper slopes of the Wollandilly Offset site, which supported regenerating *Eucalyptus albens* (White Box). The *P. queenslandica* was planted within the vicinity of large *E. albens* trees, in a position that would provide shade for the *P. queenslandica*, whilst avoiding competition for soil moisture with the large root systems of the mature trees. A protective enclosure around the *P. queenslandica* was added following damage caused by macropods. In March 2020, the single *P. queenslandica* plant was recorded as dead having died at some time since the last inspection in December 2019, with no foliage observed during March 2020.



Plate 3.1: ***Pomaderris queenslandica*** **cuttings in propagation (left; Source: Hunter Eco 2016) and during planting (right; source: WHC 2017).**

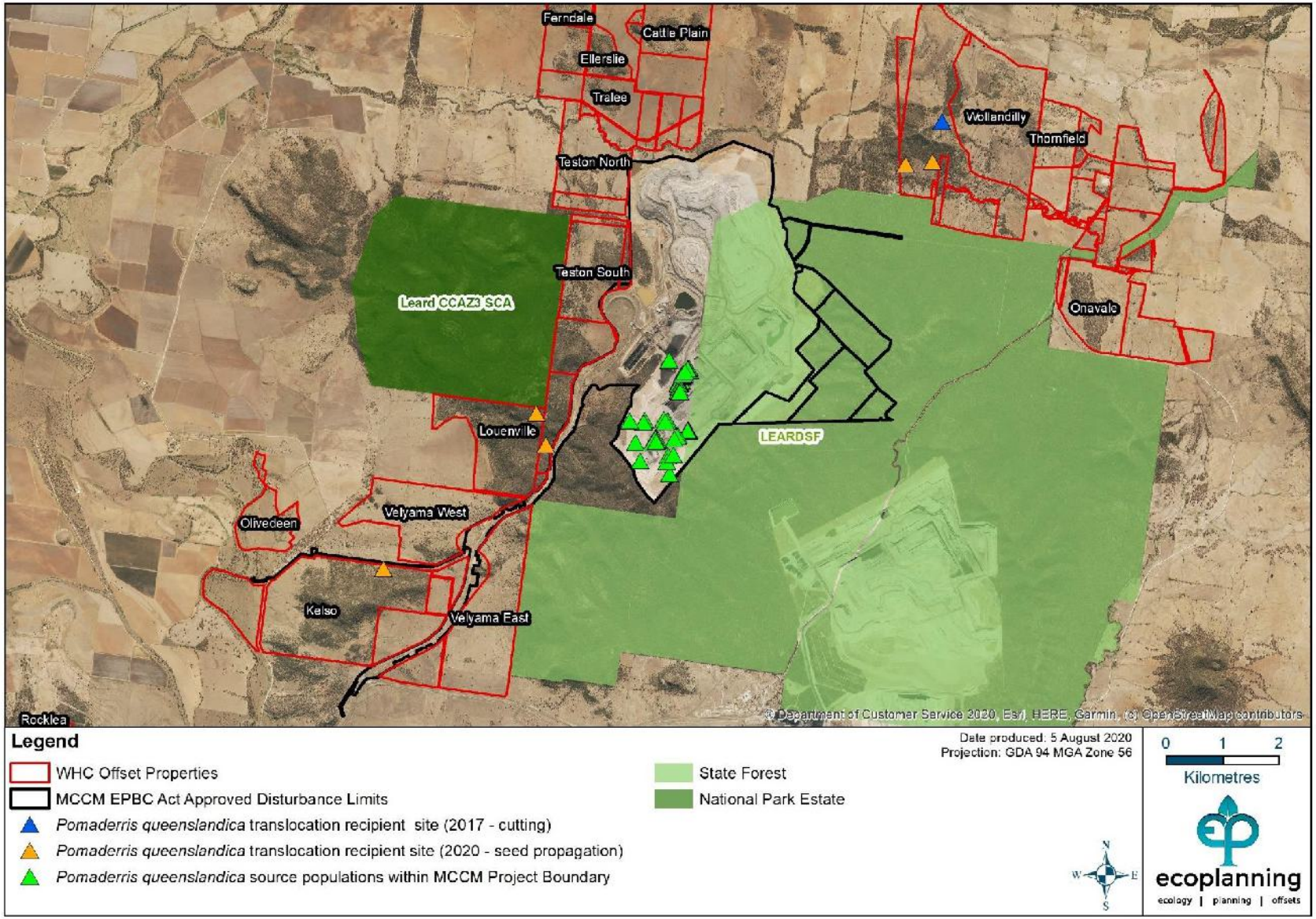


Figure 3.1: *Pomaderris queenslandica* translocation recipient sites

3.1.2 Seed propagation

A seed germination trial by BioBankSeed commenced during 2019 from seed collected in 2016 (BioBankSeed 2019). The seed germination trials found seeds of *P. queenslandica* recorded no or little increase in seed mass following placement on moist filter paper at room temperature for 24 hrs. Consequently, it has been concluded that *P. queenslandica* seeds have a physical dormancy associated with an impermeable seed coat. This dormancy has been identified in other *Pomaderris* species as an ecological strategy for growing in fire-prone ecosystems, with the seed coat broken over time or following fire (Natale 2016).

Seed viability tests conducted by BiobankSeed (2019) involved dissection and visual assessment of 15 full seeds. A total of 188 seeds were randomly selected and cut before 15 full seeds where obtained. Seed viability of the 15 full seeds were tested with a 1% solution of 2,3,5-triphenyl tetrazolium chloride (TTZ test). One of the 15 tested seeds was shown to be unviable by the TTZ test with an additional two seeds only weakly viable (embryos of these absorbed stain only partially). Therefore, seed viability was low with only 14 of 188 tested seed viable.

From seed collected in 2016 a total of 34 individuals of *P. queenslandica* were grown by BioBankSeed and Fields Environmental Solutions for translocation in Winter 2020 (**Plate 3.2**). Recipient sites for the 34 plants planted in July 2020 were selected according to physical, biotic, and management criteria and in locations where environmental variables (vegetation communities, slope, elevation, vegetation structure etc.) matched previously known populations or habitat. See **Appendix A** for details of environmental variables at the source and selected recipient sites. These selected recipient sites were sufficiently spread to ensure that any stochastic environmental conditions, such as fire, are unlikely to impact the entire translocated population. Four properties were selected as optimal recipient sites for the 34 *P. queenslandica* plants: Kelso (1 site), Louenville (1 site), Teston South (1 site) and Wollandilly (2 sites; **Figure 3.1**; **Table 3.2**).

In July 2020, 34 *P. queenslandica* seedlings were planted across the five recipient sites, with seven (7) *P. queenslandica* individuals planted within each recipient site except Kelso (six plants; **Table 3.2**). Fences were erected around each recipient site to protect translocated plants from macropods, with a minimum dimension of 10x10 m (**Plate 3.2**). Sites were selected within 150 m of an access point (i.e. road or clearing) to enable watering, if required. A watering regime was established which aimed to replicate natural periods of wetting and drying.

Additional seedlings from the seed collected within the MCCM boundary in 2016 were grown across 2020 and 2021 with 83 *P. queenslandica* seedlings planted on the 27 August and 20 September 2021 within and adjacent to the enclosures established for the 2020 plantings (**Table 3.2**).

Searches for reproductive material of *P. queenslandica* in September 2020 at known locations enabled seed collection from the Rosevale Offset Property and Pilliga East / Jacks Creek State Forest populations by Fields Environmental in October and November 2020. These collections yielded a total of 58 grams equivalent to 60,650 seeds. Approximately 10,000 seeds from this collection were sent in June 2021 to the National Seedbank and have been banked with a fraction sent to the World Seed Bank.

From seed collected from the Rosevale Offset Property and Pilliga East / Jacks Creek State Forest populations in October and November 2020, an additional 70 seedlings were translocated into the Louenville recipient site in May 2022 and 143 *P. queenslandica* seedlings were translocated to the Wollandilly East and West translocation sites in September 2023 (**Table 3.2**).

Each translocated *P. queenslandica* seedling has a sequential reference number to facilitate ongoing monitoring, with details of the plantings in each recipient site detailed in **Appendix B**. In accordance with Section 4.1 of the *P. queenslandica* restoration and translocation strategy (Ecoplanning 2021b) monitoring of translocated plants occurred monthly for the first year after a seedling is planted, quarterly for the next two years and biannually after that. Results of monitoring of translocated populations are compared to results from a reference population, a monitored natural population of *P. queenslandica* within the Rosevale property (**Figure 1.1**). A total of 20 plants within the Rosevale property population are monitored in accordance with Section 4.1 of the *P. queenslandica* restoration and translocation strategy (Ecoplanning 2021b).

As of December 2023, monitoring of all *P. queenslandica* translocated from germination trials between 2020 and 2023 recorded a survival rate of approximately 84 % (278 individuals surviving from 330 individuals planted). Additionally, flowering and seed production has been observed across all translocated sub-populations. This is a significant step towards the stated aims for the propagation and translocation program to *"…support the conservation of P. queenslandica, and to maintain a self-sustaining, genetically diverse population of the species within the WHC Offset Properties*". Results of monitoring up to December 2023 indicate that the translocated populations become more resilient (higher rates of survivorship and flowering) with time as plants become established, with the health, growth, and flowering of younger translocated plants more susceptible to water stress during hot dry conditions. Encouragingly, the older more established translocations appear more resilient to water stress and drought conditions with fewer plant deaths and more flowering observed in older cohorts of translocated plants.



Plate 3.2: *Pomaderris queenslandica* germinants and seedlings (top; Source: BioBankSeed 2019) and translocated plants and fencing within the Kelso Offset Property (bottom; Source WHC)

Table 3.2: Summary of translocated *P. queenslandica* seedlings across recipient sites

Recipient site (property)	Planting Cohort				Total
	2020	2021	2022	2023	
Kelso	6	16	-	-	22
Louenville	7	17	70	-	94
Teston South	7	17	-	-	24
Wollandilly (East)	7	17	-	61	85
Wollandilly (West)	7	16	-	82	105
Total	**34**	**83**	**70**	**143**	**330**

3.1.3 Soil seedbank transfer

Prior to clearing vegetation within the 2015 MCCM disturbance area, topsoil was collected from around the identified *P. queenslandica* populations and stockpiled (**Plate 3.3**). Loose topsoil was scraped off the surface from an area bounded by approximately 1 metre outside of the drip line of the outer plants of a population. This topsoil was sieved and searched for seeds. A total of forty (40) seeds were retrieved and these were used in an initial germination trial. Upon final clearing, all the topsoil from around the plants was collected and stored for later transfer to a site suitable for in situ germination. Topsoil was stored in piles no greater than 1 metre deep.

On 1 September 2020, spread of topsoil commenced at the Teston South Offset Property (**Plate 3.4**). The topsoil recipient site selected was located at the interface between previously disturbed and regenerating grasslands and woodland areas whilst also being in proximity to a minor drainage line. This location has been selected so that disturbance to existing woodland areas was avoided during topsoil transfer while ensuring any *P. queenslandica* which germinate are in suitable habitat and afforded some shading from adjacent woodland areas. The location of the soil transfer is shown in **Figure 3.2**.

In preparation for topsoil transfer, topsoil was stockpiled at an interim location within the Teston South Offset Property, the recipient area was fenced, broad-leaved weeds were sprayed with herbicide, vegetation was slashed, and the recipient area was lightly ripped along the contours as an erosion control measure and to aid water infiltration and aeration. Existing topsoil was retained (not removed) as the stockpiled soils were consider likely to have undergone nutrient leaching and loss of soil microbe diversity. Topsoil was spread directly from a truck with a limited tray opening, to approximately 10 – 20 cm in depth. This avoided any need to spread any soil with machinery and potentially compact the topsoil.

In the second quarter of 2022, surveys of the topsoil recipient site identified recently germinated *P. queenslandica* within the soil translocation exclosure, although an accurate count of all individuals was not possible (minimum population size counted as 111 individuals). In addition to the topsoil recipient site, *P. queenslandica* was also identified within the interim topsoil storage location within the Teston South property (**Figure 3.2**). Confirmation of the identification of the seedlings as *P. queenslandica* was confirmed from specimens lodged with

the NSW Herbarium (**Appendix C**). Subsequent surveys of the topsoil recipient exclosure and interim stockpile location in August 2022 estimated the population size of *P. queenslandica* within the topsoil recipient site as 134 individuals, with 12 individuals counted within the interim stockpile location.

As of December 2023, monitoring of a subset of the *P. queenslandica* which germinated from topsoil within the Teston South offset property recorded a survival rate of approximately 98 % (51 individuals surviving from 52 individuals monitored). Additionally, flowering and seed production has been observed across this translocated population representing an important step towards the stated aims for the propagation and translocation program to "*…support the conservation of P. queenslandica, and to maintain a self-sustaining, genetically diverse population of the species within the WHC Offset Properties*".



Plate 3.3: ***Pomaderris queenslandica*** **topsoil stockpile (Source WHC)**



Plate 3.4: Spread *P. queenslandica* topsoil within Teston South Offset Property (Source WHC)

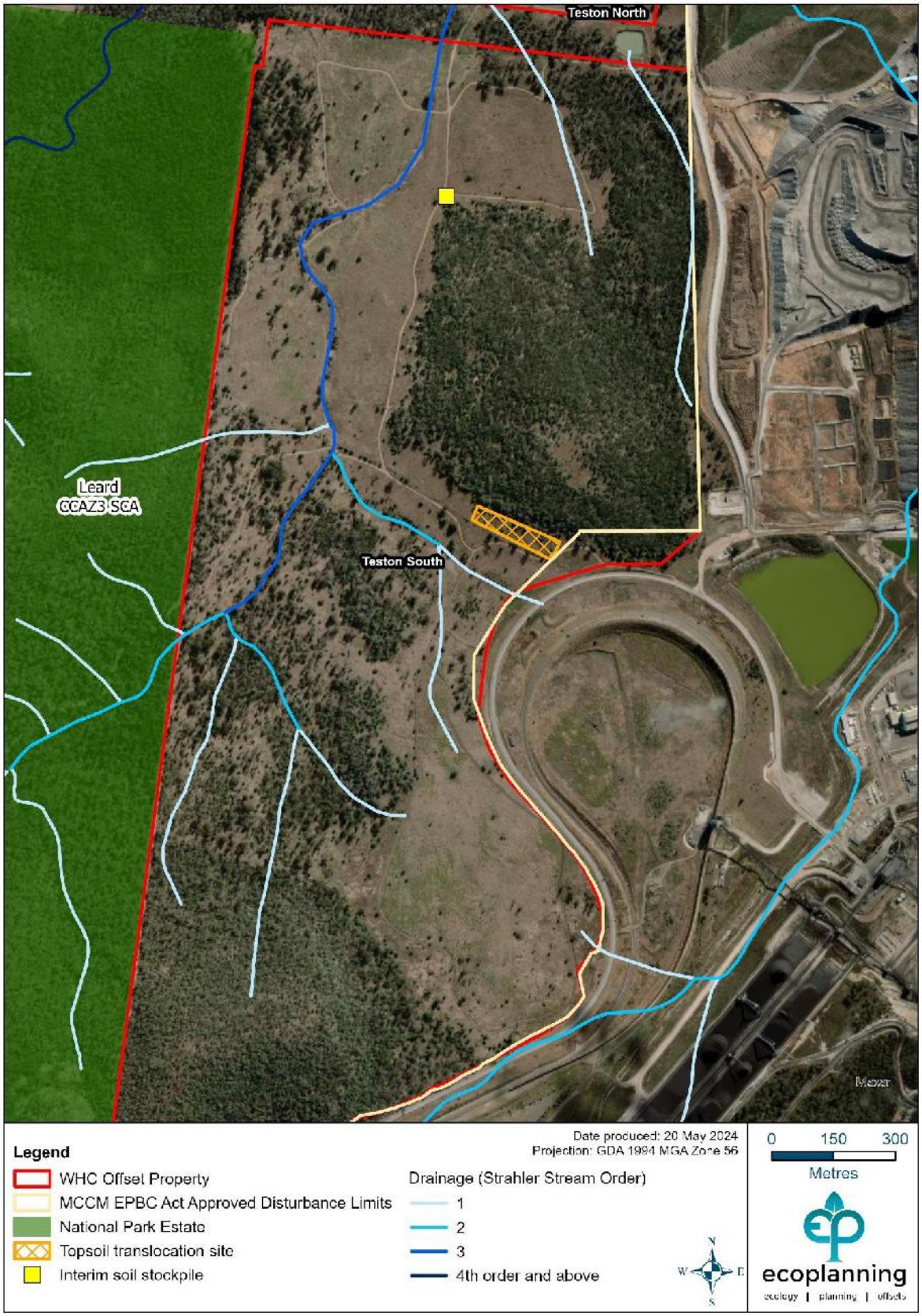


Figure 3.2: Location of *P. queenslandica* topsoil spreading

4 Protection and restoration management actions

Details of management actions across WHC managed lands to maintain, protect and enhance habitat for naturally occurring populations of *P. queenslandica*, including any additional populations detected in the future, and translocated populations of the species, are detailed within the TFPP (Ecoplanning 2021a). These actions include, but are not limited to, the following:

- Exclusion of livestock grazing to promote natural regeneration
- Weed and feral animal control
- Access control
- Bushfire management
- Active revegetation (planting or direct seeding) depending on the success of natural regeneration

These management actions aim to address all the identified threats to *P. queenslandica* (DPIE 2020b) which are associated with habitat disturbance and loss, invasion by introduced weeds, and inappropriate fire regimes.

Several actual and potential additional threats to *P. queenslandica* have also been observed in the offset areas, including herbivory by macropods and goats. As a result, fences have been constructed around existing recipient sites to prevent grazing by macropods and stock.

4.1 Monitoring

Monitoring of translocated *P. queenslandica* individuals and habitat is to continue under this program including future translocations to:

- Provide early warning of problems with the actions undertaken as part of the translocation
- Generate quantitative evidence of translocation success or failure against stated objectives
- Document information on population dynamics within areas of habitat
- Highlight ways to make future translocations more effective

Additionally, monitoring of naturally occurring populations of *P. queenslandica* are required to document the health of these populations including the operation of any recognised threats.

Consistent within monitoring of translocations to date, all translocated seedlings must be permanently tagged, and data collected prior to planting to enable comparisons over time, between individuals and between recipient sites. All translocated seedlings should undergo monitoring, not a subset. Monitoring of translocated seedlings is to take place monthly for the first year after a seedling is planted, quarterly for the two proceeding years and biannually after that. Monitoring should be ongoing, dependent on the success of the program.

Consistent with monitoring to date, reference sites must also be monitored to provide benchmark data and assist in determining attrition or impacts that may be attributed to a natural event that has impacted the general population and not just translocated individuals. Approximately 20 individuals from the natural population of *P. queenslandica* within the

Narrabri Offset (**Figure 1.1**), including a variety of age classes are currently used as reference site and monitored quarterly to assess rates of attrition, flowering, fruiting and natural recruitment. Permanent photos points have been established, and photos are taken from the same place for each monitoring event.

Variables to be monitored at translocation and reference sites are detailed within **Table 4.1**. Collection of this data should provide quantitative data which will guide future management actions including:

- Time to maturity (e.g. first flowering)
- Flowering / fruiting (comparisons between sites and populations).
- What proportion of plants are producing viable seed?
- Are plants in certain locations / situations surviving better than others? Can anything be inferred from this?
- Evidence of second generation and abundance.
- Any experimental micro-siting and treatment variables implemented as part of the program (e.g. fenced / unfenced, shaded / unshaded).

All aspects such a watering frequency, unusual climatic conditions and rainfall should also be considered and documented.

Table 4.1: Data to be monitored for translocated *P. queenslandica* and reference plots

Variable	Data to be recorded
Vegetative growth	Height of individual plant
Plant health / vigour	Repeatable scale of measurement as per the following: 1 Plant dead 2 Widespread dieback/damage 3 Dieback/damage observed on multiple branches 4 Minor dieback/damage evident on isolated leaves or branches 5 Healthy plant with no signs of dieback/damage
Reproductive status	Repeatable scale of measurement as per the following: 1 No. flowers (incl. buds) or fruits observed 2 Isolated flowers or fruits 3 Flowering/fruiting on 5 - 25% of branches 4 Flowering/fruiting on 25 - 75% of branches 5 Flowering/fruiting on 75 - 100% of branches

5 Restoration and translocation program

This propagation and translocation program has been prepared based upon a review of species ecology, scientific reviews, results of previous management actions, best practice guidelines and the project approvals to maximise the chance of successfully achieving the aim of the translocation as outlined within **Section 1**.

For a translocated population to persist in the short term there needs to be enough propagules to establish a viable population and protect against genetic, demographic, and environmental stochasticity; good survival and establishment of the translocated individuals; management and control of threats; and flowering, fruiting and natural recruitment at rates similar to natural populations. For a population to persist in the long term it also needs to possess sufficient genetic diversity to retain its evolutionary potential to adapt to long-term environmental change or infrequent extreme events (Commander et al. 2018). These requirements form the basis of this program. Specifically, this program includes actions to source a large number of propagules, to maximise diversity and to control threats with the aim of maximising survival and establishment of translocated individuals. The proposed *P. queenslandica* translocation incorporates multiple translocation methods to increase the likelihood of success should one method prove unsuccessful. These include:

- Planting of existing nursery-grown plants
- Translocation using seed to reinforce current translocation populations
- Translocation using cuttings to reinforce current translocation populations
- Soil transfer

This propagation and translocation program has been developed considering the Australian Network for Plant Conservation *Guidelines for the Translocation of Threatened Plants in Australia* (Commander et al. 2018).

5.1 Justification for ongoing translocations

The requirements of the project approval (PA 10_0138) and the MCCM BMP provide justification for ongoing translocation of *P. queenslandica* including translocation of any additional individuals occurring within the MCCM surface development area. Additionally, ongoing reinforcement of translocated populations aims to maximise the chance of achieving the aims of this program, that is establishing a self-sustaining, genetically diverse population of the species within the WHC Offset Properties, which is capable of surviving in the long term.

Considering the applicable approvals for the MCCM surface development areas and therefore the fate of any additional plants located within the surface development area, any attempts at salvage translocations represent worthwhile actions to minimise impacts to the species. The translocation actions included within this program are to be undertaken in conjunction with management actions outlined in Section 4 which aim to protect habitat and build resilience.

5.2 Recipient site selection

Future translocation sites should aim to reinforce all existing populations to establish viable sub-populations to protect against genetic, demographic, and environmental stochasticity. However, future site selection may respond to the relative success of earlier translocation

events and bias planting in those sub-populations/sites with the highest levels of success or avoid planting in sub-populations/sites where success has been limited due to ongoing threats (i.e. herbivory, insect damage or other unknown threats to survival).

Future translocations should include reinforcement plantings (plantings within the five current translocation/recipient sites) until these populations have viable populations and are of a size to protect against genetic, demographic, and environmental stochasticity with flowering, fruiting, and natural recruitment at rates similar to natural populations. Research across Australia confirms that small populations show reduced genetic and demographic outcomes in perennial species (Broadhurst et al. 2008b; Llorens et al. 2012; Llorens et al. 2013; Yates et al. 2007a; Yates et al. 2007b; Young and Brown 1999) and suggests that populations of around 200 to 250 plants are required to minimise these effects. Once sub-populations reach this size (200-250 individuals), additional translocations sites may be established. Planting in partially disturbed sites (e.g. denser canopy, denser shrub layer) as part of an experimental approach to compare success in intact and partially disturbed sites may be considered where sufficient seedlings are available to enable this to be undertaken and a robust assessment of the results. Planting in heavily disturbed sites is not recommended as this is considered unlikely to be successful.

Where additional topsoil translocations are to occur, additional recipient sites will need to be selected. Topsoil recipient site selection should select one or more areas located at the interface between previously disturbed and regenerating grasslands and woodland areas whilst also being in proximity to minor drainage lines. These locations are to be selected so that disturbance to existing woodland areas can be avoided during the topsoil transfer, whilst ensuring any *P. queenslandica* which germinate are in suitable habitat and afforded some shading from adjacent woodland areas.

5.3 Translocation methodology

The translocation methods outlined in this program allow for the translocation to adapt to available resources, particularly where the initial results of one method prove unsuccessful. It is possible that more than one option may be implemented concurrently, where the availability of seeds and seedlings permit, and as new techniques are developed. However, the proposed methods appear broadly in order of preference below, based on the success to date of previous efforts to propagate and translocate the species.

The collection of *P. queenslandica* seed from WHC lands and State Forests (including Leard, Jacks Creek and Pilliga East [subject to licences]) and planting of seedlings germinated in a nursery, represents the most effective way to achieve the aims of the translocation. Although there has been a low success rate from cuttings in the past, this method should be retained to ensure there is a second option should seed availability and / or successful seed propagation be limited.

5.3.1 Seed collection

Translocation via seed collection, seed propagation and planting, represent one of the most effective ways of collecting regenerative material due to the capacity to encompass a large proportion of the species diversity within a population (Commander et al. 2018). As a result, this is one of the most common methods for translocation in general (Silcock et al. 2019). This

method has also proved successful to date with 330 translocated individuals planted into Offset Properties since winter 2020 (**Table 3.2**), with additional seedlings being raised in the nursery (Fields Environmental Solutions).

It is likely that sufficient seed for the purposes of this program is currently held by BioBankSeed. Where additional seed is required in the future, seed should be sourced from a variety of sub-populations across WHC managed lands and adjacent State Forests to increase diversity within the supply of seed for this program. Where possible, seed should be collected from geographically separated areas, although still within the Gunnedah and Narrabri region, as this is likely to maximise the capture of genetic diversity. To ensure the necessary supply of seed of *P. queenslandica*, seed collection may be required across multiple seasons.

Seed collection, management and storage should be undertaken in consideration of Florabank guidelines (http://www.florabank.org.au/). Seed collection permits for threatened species will usually include conditions limiting collections to 20% of the seeds from any individual and from a proportion of individuals in each population depending on the abundance and distribution of the species. This is to ensure that the seed collection does not impact on the fecundity of the source population (Commander et al. 2018).

5.3.2 Seed germination

Pomaderris queenslandica seeds, including existing collections and any future collections, will be used for germination and plant propagation. Seeds will be propagated in a nursery and plants will be translocated to existing translocation sites to reinforce the size and diversity of these populations. Generally, staggered translocations give better protection against the potential consequences of adverse stochastic events (Commander et al. 2018) and an ongoing program of germinations and translocation should be implemented across multiple seasons.

Potential limiting factors to this propagation and translocation program would include, seed availability, seed dormancy and seed viability. However, based upon the success of seed collection and germination trials to date (conducted by BioBankSeed [2019]), these limitations are unlikely to impact the success of this program. Specifically, BioBankSeed (2019) found that dormancy in *P. queenslandica* is robust, and a combination of different dormancy-breaking treatments are required to increase seed viability, and the success of translocations. Seed pre-treatments (e.g. scarification, stratification, after-ripening) should follow methods used to date (BioBankSeed 2019) and should be fully documented, including the time required for these treatments.

The results of previous trials should be reviewed prior to future seed collection and germination. Treatments which have proved successful in previous seasons should be applied preferentially in subsequent seasons.

5.3.3 Stem cuttings

Species of *Pomaderris* have been successfully propagated from stem cuttings in the past (e.g. Australian National Botanic Gardens (ANBG) [2012] and Gardiner [2002]). Gardiner (2002) reported a small number of successful cuttings of *P. aspera*, while the ANBG (2012) reported that cuttings from *P. intermedia* strike readily, when the plant is dipped into a hormone solution. Propagation of the threatened *P. delicata* has also been undertaken successfully via cuttings (McDougall et al. 2018) as seed production is low in this species. Propagation of stem cuttings

of *P. queenslandica* by WHC (2019) in 2015 resulted in a low strike rate, with only one successful strike from over 400 cuttings, although it is unclear if the procedures followed similar techniques as have been successfully applied to other *Pomaderris* species (e.g. ANBG 2012 and Gardiner 2002).

Although there has been varying success in propagation of *Pomaderris* from stem cuttings in the past, this method may be utilised where seed collection and germination is limited or impractical. Therefore, this program details a strategy to produce seedlings from cuttings using either germinated seedlings or mature plant material.

Cuttings should be undertaken in consultation with industry experts to identify the best treatments for cuttings and the likely times for collection and propagation of the species. Initial trials should follow methods identified for other *Pomaderris* species including firm young growth dipped into a hormone solution (ANBG 2012 and Gardiner 2002).

Some level of short-term success and early research suggests that microhabitat placement, seasonal rainfall, and access to supplementary water (irrigation) are essential for translocation success in stem cutting translocations (Commander et al. 2018). Cuttings should not be taken and planted during adverse weather conditions and during long dry periods additional water may be required.

5.3.4 Translocation of propagated seedlings

Following successful seed germination, or propagation via cuttings, seedlings should be planted into the WHC offset areas consistent with techniques utilised to date. Specifically, plantings should occur in autumn/winter, with high soil moisture and low levels of heat stress. Planting should be conducted in the following manner:

1. Prepare a hole for each plant with an auger (or similar) to a depth of approximately 750 mm, and width 50% wider than the largest pot size. Rough the sides of the hole to ensure that it is not round or glazed.
2. Return the soil to the hole and pour 10-15 litres of water onto the soil.
3. Prepare an additional hole in the same manner that will be used to monitor soil moisture.
4. Return 2-3 days later after steps 1-3 for planting.
5. Make sure potted plants have been watered the day prior to planting.
6. Remove plant from pot and trim roots, as required.
7. When planted, the soil level of the potted plant should sit 40 mm below ground level creating a dish. Cover root ball by 40 mm.
8. Place tree guard around the plant, if required.
9. Apply approximately 5 litres of water onto each plant.
10. Monitoring plant and soil moisture weekly. Test for moisture using a fork or dig the soil in the additional hole and observe soil moisture, then replace soil.
11. Only water if required. Overwatering may prevent healthy root growth
12. Do not apply fertiliser.

5.3.5 Fencing and protection

Several potential threats to *P. queenslandica* have been observed in the WHC managed lands including herbivory. A fence must be erected around each recipient site, or as populations spread because of future translocations, individual tree guards may be used. Fences or individual guards should be of a type which excludes macropods and additional measures to exclude rabbits and hares may be required depending on the different sites. Where individual tree guards are utilised, these guards should remain in place until plants are of a suitable size and are considered able to tolerate and survive the level of grazing pressure present within the relevant Offset Property. Stakes may also be used to support the plants initially, if required.

5.3.6 Watering schedule

All translocated plants should be marked clearly so they can be found easily for watering and monitoring. Watering during hot and/or dry periods may be beneficial during the plant establishment phase. If a site is exposed to seasonally dry conditions, Commander et al. (2018) recommend providing weekly or fortnightly water to translocated individuals during the first two dry seasons to mitigate losses during this time.

All translocated individuals should be watered during planting. Initial watering should replicate frequent, small rainfall events (10 mm max and approximately four litres per plant), and later watering should replicate infrequent, large rainfall events (>10 mm and approximately seven to eight litres per plant, or until soils are saturated). Follow-up watering should also occur during any extended dry periods (absence of weekly rainfall in excess of 5 mm in a single rainfall event) or if any signs of dieback are observed which may be linked to dry conditions. Ultimately, decisions regarding the watering schedule after planting will need to be made based upon the rainfall at the time and the response of planted seedlings during monitoring. Lack of post-translocation care and ongoing monitoring are factors that commonly lead to failure of translocation projects (Commander et al. 2018). Post-translocation actions including timing, frequency and amount of watering should be documented to inform decision-making for any future planting events.

5.3.7 Soil seedbank transfer

As detailed in **section 3.1.3**, topsoil transfer has been successfully trialled in the past and resulted in translocation of moderately large number of *P. queenslandica* individuals (at least 134 individuals) into WHC managed lands. Consequently, this method is proposed as part of this program where additional *P. queenslandica* are identified within any approved disturbance areas. It is noted that this technique is typically only recommended (e.g. Commander et al. 2018) where the recipient site is adjacent to the source population due to the potential to transport diseases such as dieback (e.g. *Phytophthora cinnamomi*). However, there is very low risk of *Phytophthora cinnamomi* away from the NSW Coast and Tablelands due to low annual rainfall (McDougall & Liew 2020). Nonetheless, soil translocation recipient site selection should avoid transporting soil across large distances due to the risk of disease spread.

The methods for any future soil translocations should follow the techniques successfully applied in the past. Specifically, topsoil is to be collected from around the *P. queenslandica* inside the approved disturbance area and stockpiled until transported to the recipient site.

Topsoil to a depth of approximately 50 mm should be collected from all areas supporting *P. queenslandica* up to a maximum of approximately 45 m^3 or 75 tonnes. Where *P. queenslandica* occurs at varying density across large areas (therefore generating large volumes of topsoil in excess of 45 m3 or 75 tonnes) topsoil should be preferentially collected from areas supporting the highest density of *P. queenslandica*. All other topsoils are to be managed in accordance with the MCCM Soil Management Protocol as documented within the WHC Mine Site Rehabilitation Plan (WHC 2016). This includes stripping, stockpiling where not utilised immediately, and spreading within rehabilitation areas.

Topsoil recipient sites should be fenced as per existing management of threatened flora enclosures. These enclosures should then be inspected quarterly to identify any *P. queenslandica* seedlings. Where *P. queenslandica* individuals are identified, individuals are to be demarcated and monitored in accordance with **Section 4.1**.

5.4 Translocation schedule

Planting should be conducted over 3-5 seasons (or more) to allow for lessons learned to be incorporated into the future translocations and as it gives better protection against the potential consequences of adverse stochastic events (Commander et al. 2018). While resources are available, translocations involving plantings should continue until ten stable and robust (between 200-250 individuals) sub-populations of *P. queenslandica* have been established across the WHC Offset Properties.

Commander et al. (2018) suggest that seed propagation usually takes about 12 to 18 months to germinate and grow to a suitable sized seedling for planting, which is broadly similar to the experience from the previous seed propagation trials (**Section 3.1.2**). Therefore, timeframes for germination need to be considered and accounted for when planning for the translocation.

6 Review and reporting

The outcomes of implementation of this propagation and translocation program will reported in the MCCM Annual Reviews summarising the results of quarterly inspections on the various stages of the propagation and translocation program as well as any recommendations.

7 References

Australian National Botanic Gardens (ANBG) (2012). Growing Native Plants: *Pomaderris intermedia.* Online resource: https://www.anbg.gov.au/gnp/interns-2005/pomaderris-intermedia.html [Accessed 10/08/2020]

Bell, S. (2001). Notes on the distribution and conservation status of some restricted plant species from sandstone environments of the upper Hunter Valley, New South Wales. *Cunninghamia* **7(1)**: 77-88.

Bell, S. (2019). Additions and amendments to the rare or threatened vascular plants of Wollemi National Park, central eastern New South Wales. *Cunninghamia* **(2019) 19**: 043–056.

BioBankSeed (2019) *Pomaderris queenslandica seed germination report 2019*. Unpublished report prepared for Whitehaven Coal.

BioBankSeed (2024) Threatened Flora Report (Nov 23-Jan 24). Unpublished report prepared for Whitehaven Coal.

Broadhurst LM, Young AG, Forrester R (2008). Genetic and demographic responses of fragmented *Acacia dealbata* (Mimosaceae) populations in southeastern Australia. Biological Conservation 141(11), 2843-2856.

Commander, L.E., Coates, D.J., Broadhurst, C.A., Makinson, R.O. and Matthew, M. (2018). *Guidelines for the Translocation of Threatened Plants in Australia – Third Edition*. Australian Network for Plant Conservation.

Cumberland Ecology (2015). Preclearance Survey Data from Maules Creek Coal Mine.

Ecoplanning (2020) *Pomaderris queenslandica* Propagation and Translocation Program 2019 Annual Report. Unpublished report prepared for WHC dated 31 March 2020.

Ecoplanning (2021a). Threatened Flora Project Plan. Unpublished report prepared for Whitehaven Coal dated 9 December 2021.

Ecoplanning (2021b). *Pomaderris queenslandica* Restoration and Translocation Strategy v1.2. Unpublished report prepared for Whitehaven Coal, dated 7 September 2021.

Ecoplanning (2021c) *Pomaderris queenslandica* Propagation and Translocation Program 2020 Annual Report. Unpublished report prepared for WHC dated 15 March 2021.

Ecoplanning (2021d) Threatened Flora Monitoring Report – Q3 2021. Unpublished report prepared for WHC.

Ecoplanning (2022) *Pomaderris queenslandica* Propagation and Translocation Program 2021 Annual Report. Unpublished report prepared for WHC dated 24 March 2022.

Ecoplanning (2023) *Pomaderris queenslandica* Propagation and Translocation Program 2022 Annual Report. Unpublished report prepared for WHC.

Ecoplanning (2024) *Pomaderris queenslandica* Propagation and Translocation Program 2023 Annual Report. Unpublished report prepared for WHC dated 25 March 2024.

Elliot, W.R. and Jones, D.L. (2010). Encyclopaedia of Australian Plants Suitable for Cultivation – Ninth Edition. Melbourne.

Gardiner, B. (2002). *Propagation of selected understorey species*. Victorian Department of Primary Industries. Available online: http://www.ccmaknowledgebase.vic.gov.au/resources/Difficult_to_Propagate_Understorey_Species.pdf.

Hunter Eco (2016). *Maules Creek Coal Mine Pomaderris queenslandica Propagation and Translocation Program Annual Report 2015-2016*. Unpublished report dated February 2016 prepared for Whitehaven Coal.

Hunter Eco (2017). *Maules Creek Coal Mine Pomaderris queenslandica Propagation and Translocation Program Annual Report 2016*. Unpublished report dated February 2017 prepared for Whitehaven Coal.

Llorens, T., Byrne, M., Yates, C., Nistelberger, H. and Coates, D. (2012). Evaluating the influence of different aspects of habitat fragmentation on mating patterns and pollen dispersal in the bird-pollinated Banksia sphaerocarpa var. *caesia*. *Molecular Ecology* 21(2), 314-328.

Llorens, T.M., Yates, C.J., Byrne, M., Nistelberger, H.M., Williams, M.R. and Coates, D.J. (2013). Complex interactions between remnant shape and the mating system strongly influence reproductive output and progeny performance in fragmented populations of a bird-pollinated shrub. *Biological Conservation* 164(August 2013), 129-139.

McDougall K, Armstrong R, McAuliffe J, Taylor D (2018) Threatened plant translocation case study: Pomaderris delicata (Delicate Pomaderris), Rhamnaceae. Australasian Plant Conservation. *Bulletin of the Australian Network for Plant Conservation Inc* **27(1)**, 10-12.

Natale, S. (2016). The role of fire in the population dynamics of the threatened plant species *Pomaderris walshii* and *Pomaderris adnata*. Thesis submitted BEnviSc Hons, School of Earth & Environmental Sciences, University of Wollongong, 2016.

NSW Department of Planning, Industry and Environment (DPIE) (2020a). BioNet Atlas – Species Sightings Search. Accessed at: https://www.environment.nsw.gov.au/wildlifeatlas/about.htm

NSW Department of Planning, Industry and Environment (DPIE) (2020b). Saving our Species Program. Accessed at: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program

NSW Office of Environment and Hertiage (OEH) (2020). Scant Pomaderris (*Pomaderris queenslandica*) – Species Profile. Accessed at: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10656

Patykowski, J. Gibson, M. and Dell, M. (2014). A review of the conservation ecology of round-leaf Pomaderris *'Pomaderris vacciniifolia*' F. Muell. ex Reissek (*Rhamnaceae*). The Victorian Naturalist, **131 (2)**: 44-51.

Patykowski J, Dell M, and Gibson M (2016). Germination Ecology and Seed Dispersal of a Critically Endangered Plant: A Case Study of *Pomaderris vacciniifolia* (Round-Leaf Pomaderris). PLoS ONE 11(8): e0161665. https://doi.org/10.1371/journal.pone.0161665

PlantNET (2020). NSW Flora Online. Accessed at: http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Pomaderris~queenslandica

Silcock, J.L., Simmons, C.L., Monks, L., Dillon, R., Reiter, N., Jusaitis, M., Vesk, P.A., Byrne, M. and Coates, D.J. (2019). *Biological Conservation* **236**: 211-222.

White, C. T. (1951). A previously undescribed species of *Pomaderris. Queensland Naturalist* **14**: 48.

Whitehaven Coal (WHC) Maules Creek Coal Mine Site Rehabilitation Plan. Available online: https://whitehavencoal.com.au/wp-content/uploads/2019/08/MCC-Mine-Site-Rehabilitation-Management-Plan.pdf

Whitehaven Coal (WHC) (2017). Maules Creek Coal Mine Biodiversity Management Plan. Available online: https://whitehavencoal.com.au/our-business/our-assets/maules-creek-mine/

Whitehaven Coal (WHC) (In prep.). Maules Creek Coal Mine Biodiversity Management Plan. 3rd edition.

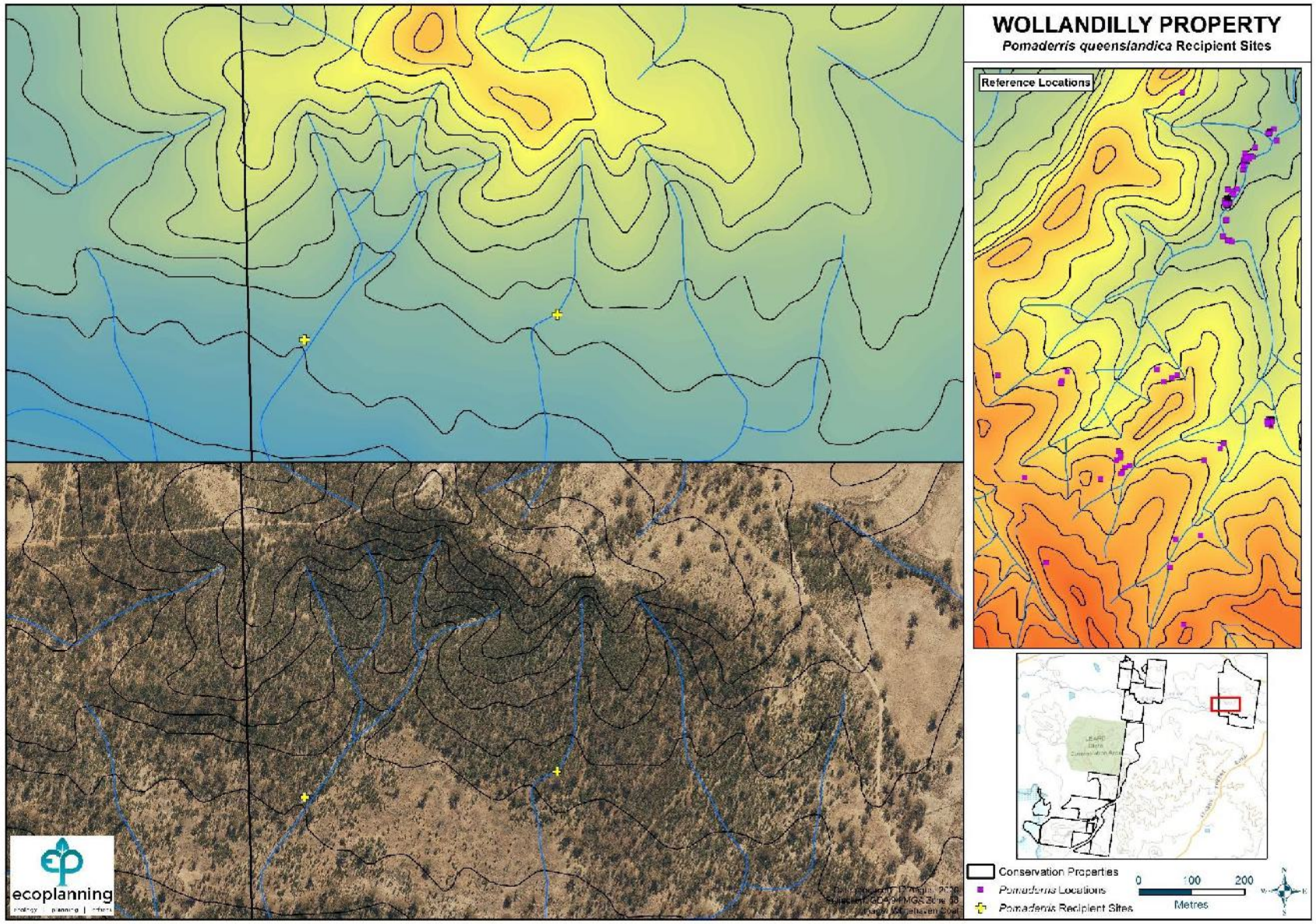
Whitehaven Coal (WHC) (2018). *Pomaderris queenslandica* Propagation and Translocation Program Annual Report 2017. Unpublished reported dated March 2018.

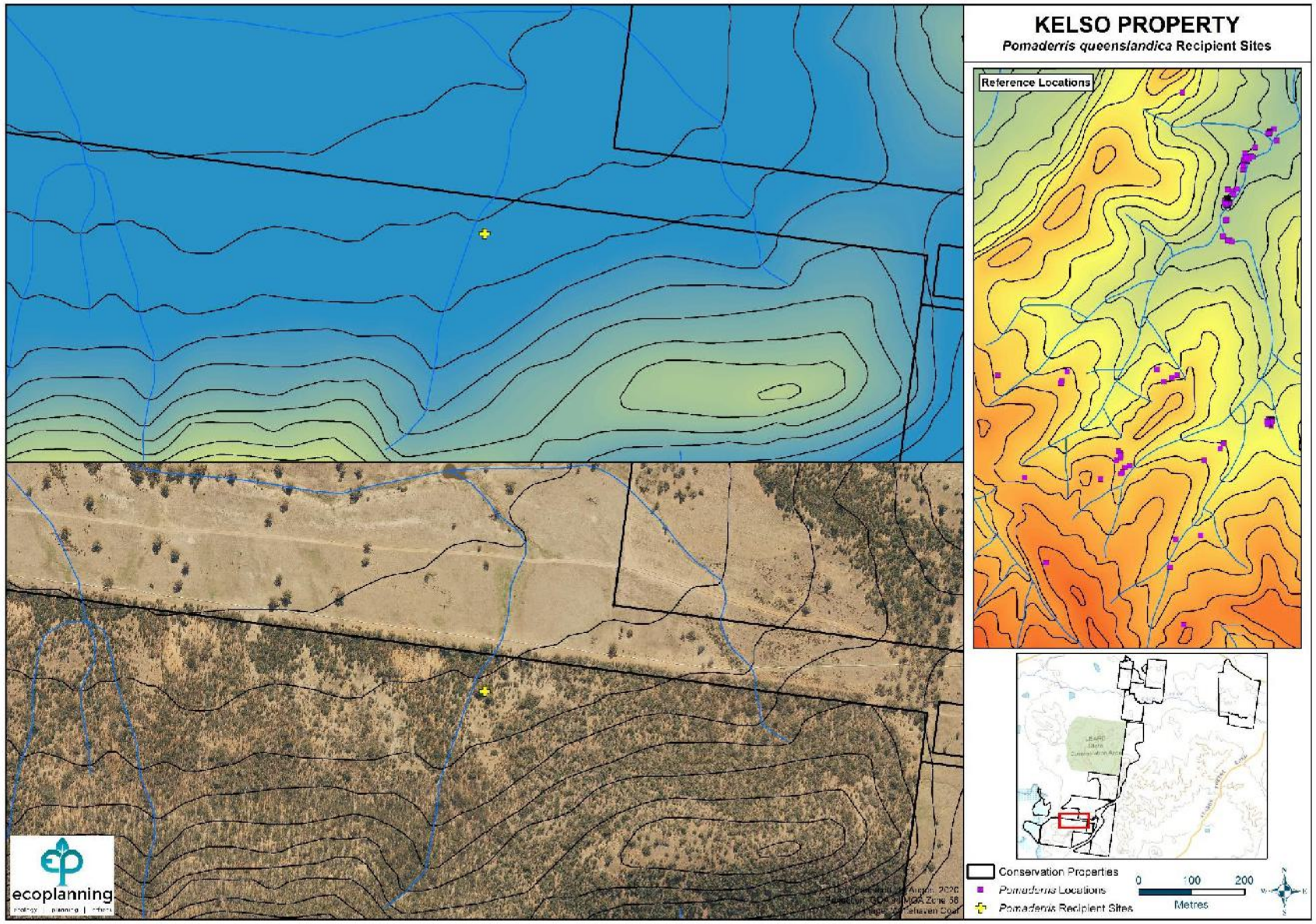
Yates, C.J., Coates, D.J., Elliott, C. and Byrne, M. (2007a). Composition of the pollinator community, pollination and the mating system for a shrub in fragments of species rich kwongan in south-west Western Australia. *Biodiversity and Conservation* **16(5)**: 1379-1395.

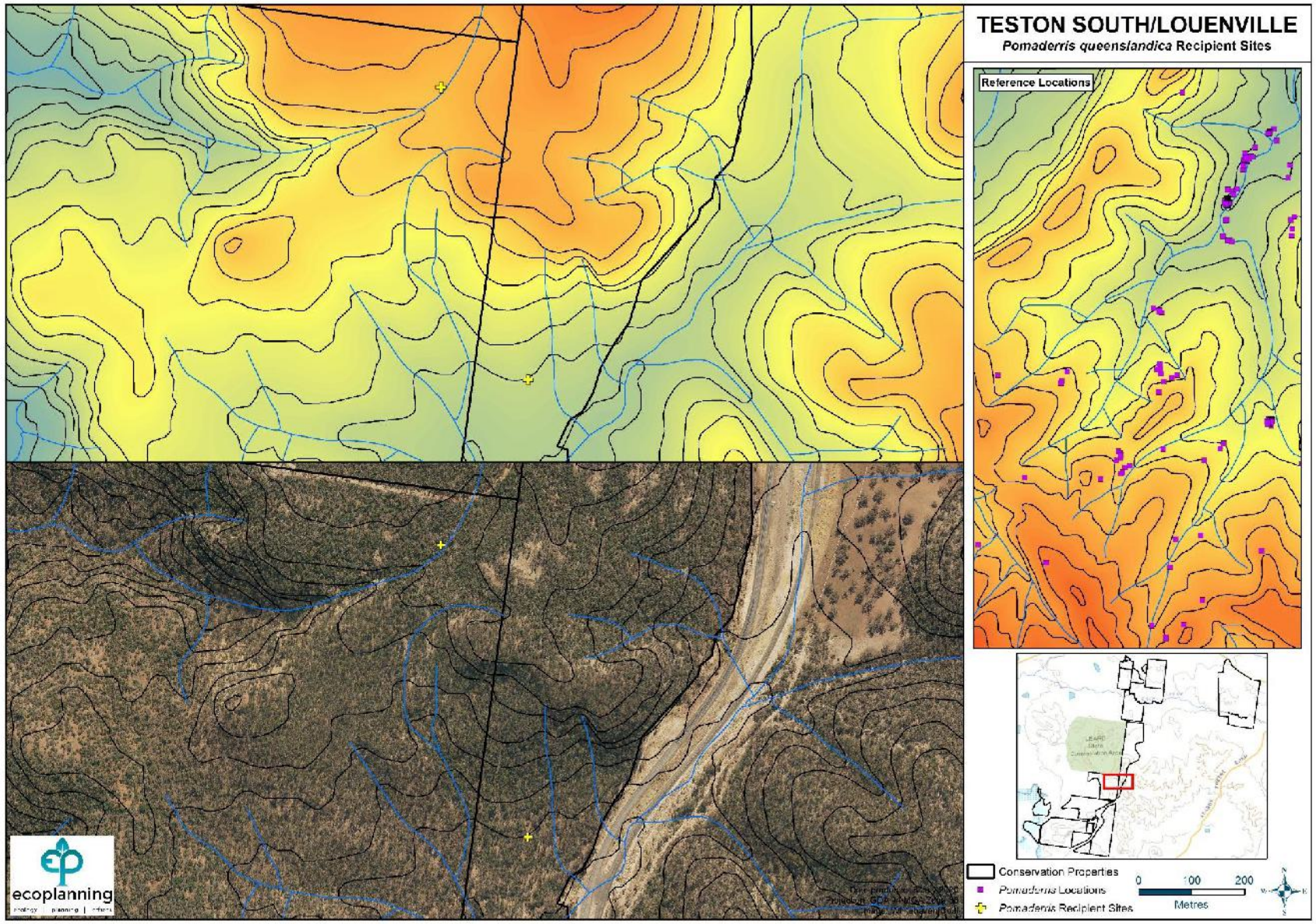
Yates, C.J, Elliott, C., Byrne, M., Coates, D.J. and Fairman, R. (2007b). Seed production, germinability and seedling growth for a bird-pollinated shrub in fragments of kwongan in south-west Australia. *Biological Conservation* **136(2)**: 306-314.

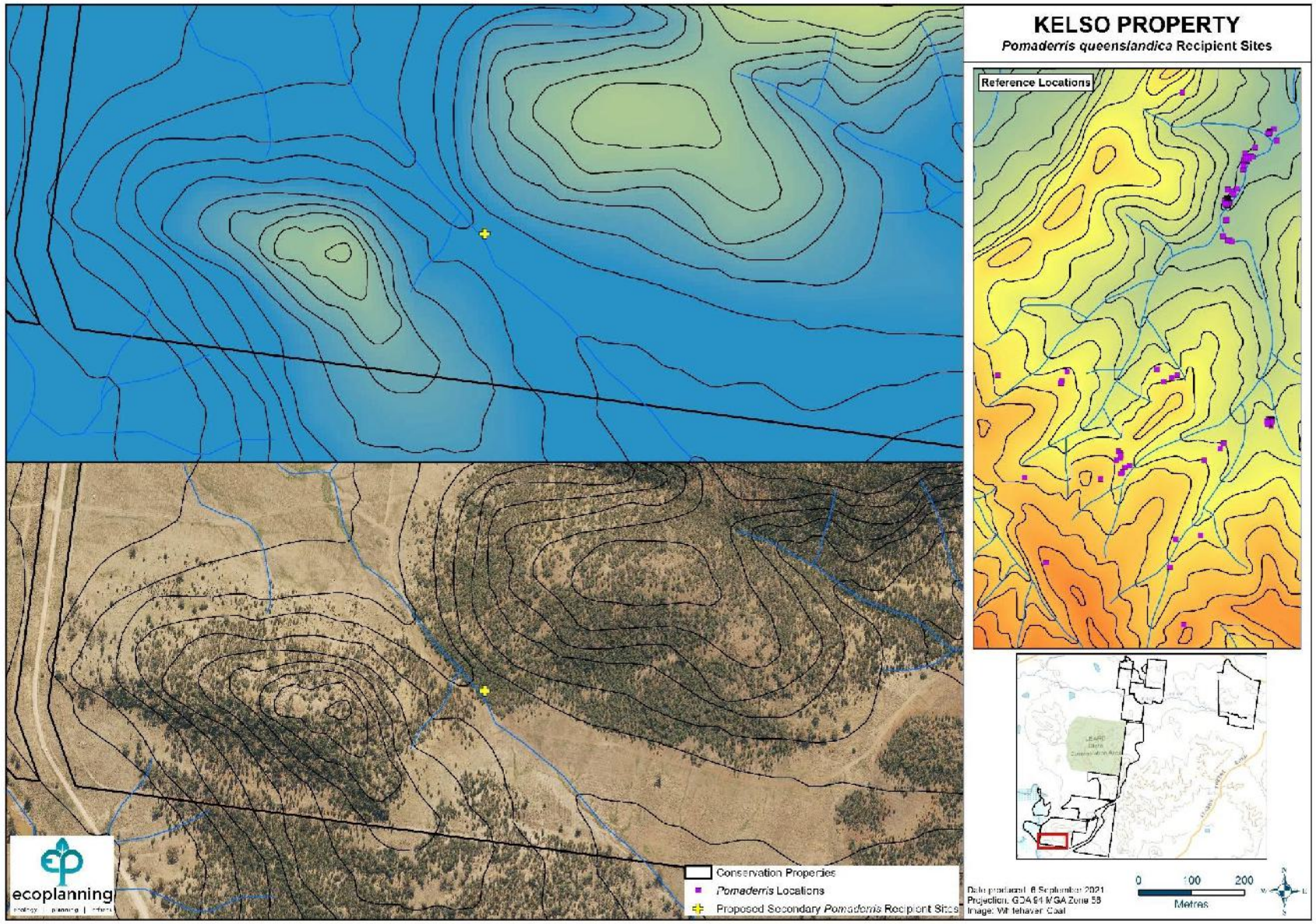
Young, A.G. and Brown, A.H. (1999). Paternal bottlenecks in fragmented populations of the grassland daisy *Rutidosis leptorrhynchoides*. *Genetics Research* **73(2)**: 111-117.

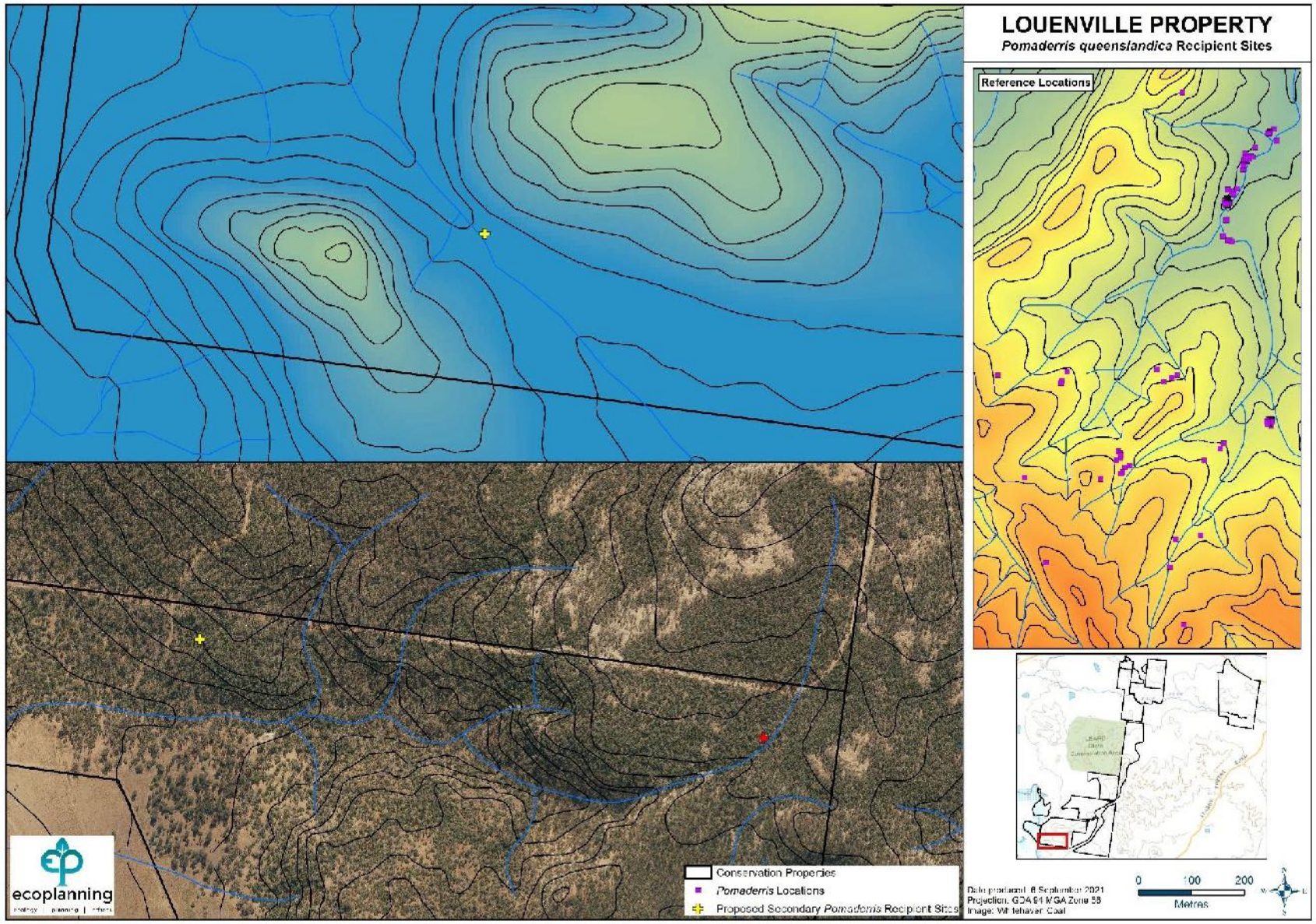
Appendix A Recipient site selection

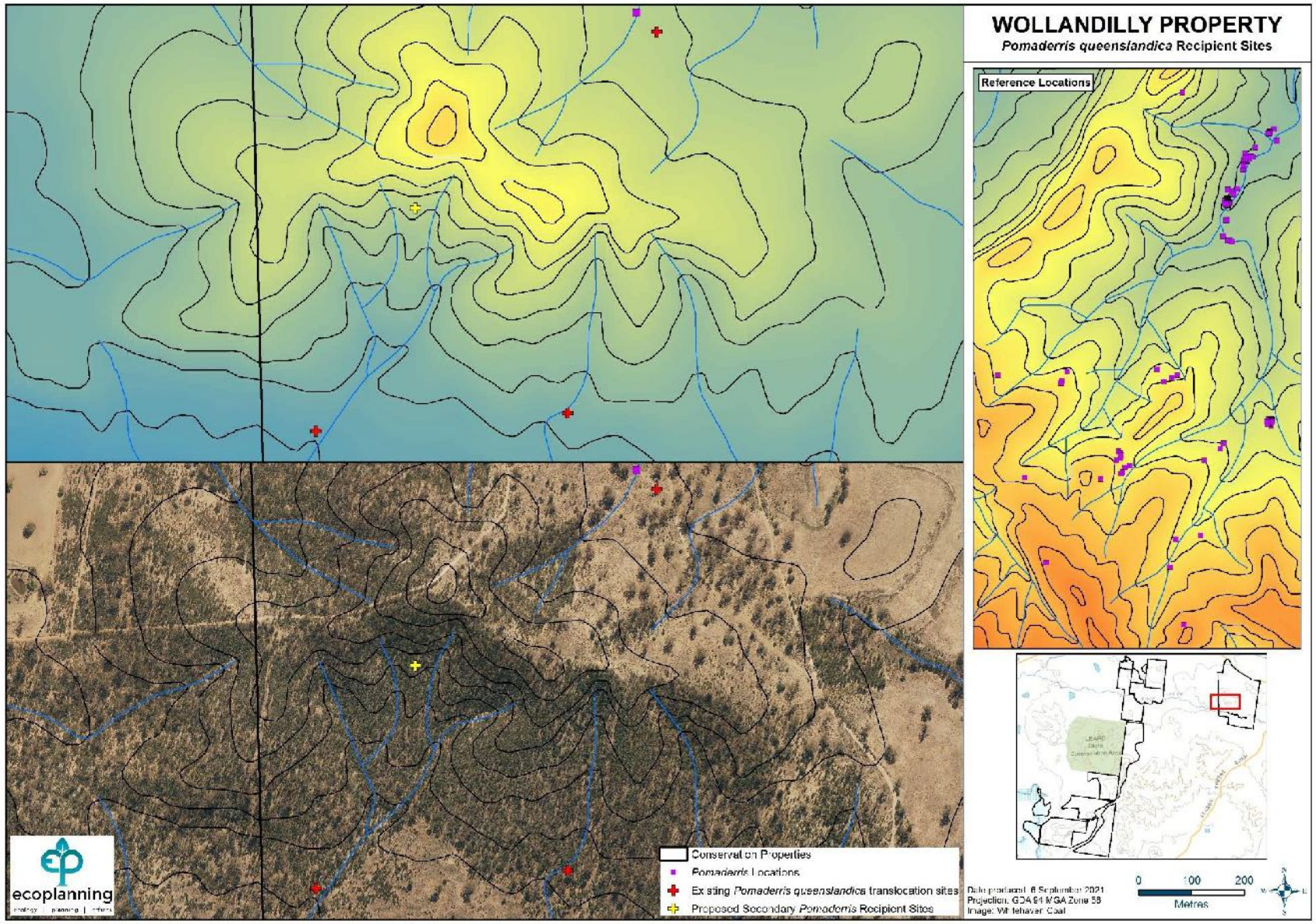

WOLLANDILLY PROPERTY
Pomaderris queenslandica Recipient Sites
Reference Locations
Conservation Properties
Pomaderris Locations
Pomaderris Recipient Sites
0
100
200
Metres
ecoplanning


KELSO PROPERTY
Pomaderris queenslandica Recipient Sites
Reference Locations
ecoplanning
Conservation Properties
Pomaderris Locations
Pomaderris Recipient Sites
0
100
200
Metres


TESTON SOUTH/LOUENVILLE
Pomaderris queenslandica Recipient Sites
Reference Locations
ecoplanning
Conservation Properties
Pomaderris Locations
Pomaderris Recipient Sites
0
100
200
Metres


KELSO PROPERTY
Pomaderris queenslandica Recipient Sites
Reference Locations
ecoplanning
Conservation Properties
Pomaderris Locations
Proposed Secondary *Pomaderris* Recipient Sites
0
100
200
Metres


LOUENVILLE PROPERTY
Pomaderris queenslandica Recipient Sites
Reference Locations
ecoplanning
Conservation Properties
Pomaderris Locations
Proposed Secondary *Pomaderris* Recipient Sites
0
100
200
Metres


WOLLANDILLY PROPERTY
Pomaderris queenslandica Recipient Sites
Reference Locations
ecoplanning
Conservation Properties
Pomaderris Locations
Existing *Pomaderris queenslandica* translocation sites
Proposed Secondary *Pomaderris* Recipient Sites
Projection: GDA94 MGA Zone 56
0
100
200
Metres

Appendix B *Pomaderris queenslandica* plantings

Recipient site (property)	Plant ID
2020 Plantings	
Kelso	32, 33, 34, 14, 15, 16
Louenville	1, 2, 3, 25, 26, 27, 28
Teston South	10, 11, 12, 13, 29, 30, 31
Wollandilly (East)	4, 8, 9, 21, 22, 23, 24
Wollandilly (West)	5, 6, 7, 17, 18, 19, 20
2021 Plantings	
Kelso	45, 69, 70, 80, 81, 82, 83, 84, 85, 86, 87, 98, 99, 100, 101 (outside enclosure) 88 (inside enclosure)
Louenville	38, 39, 43, 89, 90, 93, 94, 95, 106, 107, 108, 109 (outside enclosure) 40, 49, 91, 92, 96 (inside enclosure)
Teston South	44, 47, 50, 53, 55, 56, 57, 59, 102, 103, 104, 105 (outside enclosure) 51, 52, 54, 58, 97 (inside enclosure)
Wollandilly (East)	46, 48, 67, 68, 71, 76, 77, 78, 79, 114, 115, 116, 120 (outside enclosure) 72, 73, 74, 75 (inside enclosure)
Wollandilly (West)	35, 36, 37, 41, 42, 61, 62, 64, 110, 111, 112, 113 (outside enclosure) 60, 63, 65, 66 (inside enclosure)
2022 Plantings	
Louenville	121-190 (outside enclosure)
2023 Plantings	
Wollandilly (East)	273-333
Wollandilly (West)	191-272

Appendix C NSW Herbarium correspondence

The Royal
BOTANIC GARDENS
& Domain Trust

National Herbarium of New South Wales

Jai BRIEN-COOPER
Ecoplanning
1/345 Lawrence Hargrave Dr
Thirroul, NSW 2515

BIS Enquiry No: 22037
Botanical.Is@botanicgardens.nsw.gov.au
Ph. No: (02) 4631 5135
Date: 20th October 2022

Dear Jai,

Re: specimen identification – from Boggabri area

Your specimens have been determined as the following:

- [redacted]
- *Pomaderris queenslandica* – det. A.E. Orme, 19th Oct 2022 – specimen retained
  Simple hairs on undersurface of leaves not quite as dense as other material of this species, but otherwise consistent.

[redacted]

Thank you for your enquiry.

Yours sincerely,

Andrew Orme
Identification Snr Technical Officer
Botanical Identification Service

AUSTRALIAN INSTITUTE OF BOTANICAL SCIENCE

visit NSW Flora Online at plantnet.rbgsyd.nsw.gov.au
to help you identify the plants of New South Wales

NSW GOVERNMENT | Planning, Industry & Environment

The Botanical Identification Service email address is BotanicalIs@botanicgardens.nsw.gov.au
Mrs Macquaries Road Sydney NSW 2000 • Telephone (02) 4631 5135 or (02) 4631 5136

Royal Botanic Gardens and Domain Trust, a statutory body within the Department of Planning, Industry and Environment

Appendix 6: *Pultenaea imminuata* Propagation and Translocation Program

ecoplanning
ecology | planning | offsets

Pultenaea imminuta Propagation and Translocation Program





Maules Creek Coal Mine

Prepared for: Whitehaven Coal Ltd.

28 February 2025 Version: 1.3 – Draft

PROJECT NUMBER	2023-180-02			
PROJECT NAME	*Pultenaea imminuta* Propagation and Translocation Program			
PROJECT ADDRESS	Maules Creek Coal Mine			
PREPARED FOR	Whitehaven Coal Ltd.			
AUTHOR/S	Brian Towle & Jai Brien-Cooper			
REVIEW	**Technical**	**QA**	**Version**	**Date to client**
	Lucas McKinnon		1.0 - Draft	29 February 2024
			1.1 – Draft	18 April 2024
	Brian Towle & Jo Daly		1.2 – Draft	29 January 2025
	Brian Towle		1.3 – Draft	28 February 2025
COVER PANNEL	Left – *P. imminuta* in flower (M. Robinson) Right – *P. imminuta* in fruit (B. Brown)			
LICENCES	**Scientific Licence**		SL101557	
	Bionet Sensitive Species Data Licence		1115	
	Animal Research Authority Ethics Licence		Fauna Surveys and Monitoring (16/346)	
	Scientific Collection - Aquatic		P19/0009-1.0 & OUT19/2602	

DRAFT

This report should be cited as: 'Ecoplanning (2025). *Pultenaea imminuta* Propagation and Translocation Program – *Maules Creek Coal Mine*. Prepared for Whitehaven Coal Ltd..'

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Glossary and abbreviations

Acronym	Description
BC Act	NSW *Biodiversity Conservation Act 2016*
BMP	Biodiversity Management Plan
DotE	Former Commonwealth Department of the Environment (now Commonwealth DCCEEW)
Commonwealth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DP&E	Former NSW Department of Planning and Environment (now DPHI and NSW DCCEEW)
DPHI	NSW Department of Planning, Housing and Infrastructure
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
MCCM	Maules Creek Coal Mine
OEH	Former NSW Office of Environment and Heritage (now NSW DCCEEW)
PA	Project Approval
PCT	Plant Community Type
SF	State Forest
TFPP	Threatened Flora Project Plan
WHC	Whitehaven Coal Limited

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1 Introduction

In accordance with Project Approval (PA 10_0138) Schedule 3, Condition 52, a Biodiversity Management Plan (BMP) has been prepared by Whitehaven Coal Pty Ltd (WHC, 2017) for the Maules Creek Coal Mine (MCCM). Section 4.1.2 of the BMP, states that if during flora pre-clearance surveys a threatened species is identified:

> "*…the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with OEH, DP&E and DotE (for Matters of National Environmental Significance [MNES]).*"

Boggabri Bush-pea (*Pultenaea imminuta*) was identified during the flora pre-clearing surveys undertaken by Ecoplanning in February 2024. *Pultenaea imminuta* is a very recently described species, having been previously included with the *P. setulosa* species complex (Barrett et. al. 2024). At the time of preparation of this plan, *P. imminuta* was not listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), or the EPBC Act[1]. However, a nomination for listing of the species under the BC Act as 'Critically Endangered' is currently in preparation (R. Barrett pers. comm. 2024). In anticipation of the species becoming listed as a threatened species, WHC has requested that Ecoplanning prepare a propagation and translocation program to address the above quoted section of the MCCM BMP (WHC 2017) for *P. imminuta* to be incorporated into a draft MCCM BMP 2025 in preparation.

This propagation and translocation program has been prepared to fulfil the requirements of section 4.1.2 of the MCCM BMP. Further, this propagation and translocation program will be integrated into WHCs Threatened Flora Project Plan (TFPP; Ecoplanning 2021) which provides overarching guidance on the management habitat for threatened flora species within and adjacent to WHC mining operations and Biodiversity Offset Areas (hereafter referred to as WHC managed areas).

This propagation and translocation program adopts the definition of 'translocation' as included in the third version of the Guidelines for the Translocation of Threatened Plants in Australia (Commander et al. 2018), which is:

> *"… the deliberate transfer of plants or regenerative plant material from an ex situ collection or natural population to a new location, usually in the wild. It includes reintroduction, introduction, reinforcement, assisted migration and assisted colonization. Translocations involve a diverse range of methods including: seed collection and propagation; propagation via cuttings or tissue culture; planting of containerised plants; direct seeding; transplantation of whole plants from one site to another; and the transfer of soil, leaf litter, brush or pollen."*

This strategy primarily represents a 'salvage' translocation according to the definitions of Commander *et al.* (2018). That is, the translocation aims to transfer regenerative material,

[1] The entity from which *P. imminuta* was recently split, *P. setulosa*, is listed as vulnerable under the EPBC Act. However, for the purposes of the listing under the EPBC Act, *P. setulosa* is treated in the narrow taxonomic sense and the listing applies only to individuals within the Broad Sound to the Marlborough area in Queensland (Commonwealth DCCEEW 2024).

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including from individuals within approved disturbance areas to locations where there is either an existing population of *P. imminuta* or habitat which is broadly equivalent to that in which the species has been previously recorded.

1.1 Aims and objectives

In anticipation of the species becoming listed as a threatened species, Whitehaven has requested that Ecoplanning prepare a propagation and translocation program to address the above quoted section of the MCCM BMP (WHC 2017) for *P. imminuta*. The overall aim of this propagation and translocation program is to support the conservation of *Pultenaea imminuta*, and to maintain a self-sustaining population, genetically diverse population of the species within WHC managed areas, which is capable of surviving in the long-term. This program provides:

- An estimate of the population size and extent of *P. imminuta*;
- A review of translocation methods, including the collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds; and
- Methodology for propagating and translocating *P. imminuta*.

Further this propagation and translocation program will:

- Outline actions for the protection, restoration and management of habitat for *P. imminuta*.
- Provide guidance on the methodologies for the translocation of *P. imminuta* individuals grown from seed, stem cuttings, or soil seedbank back within WHC managed areas.
- Provide clear management and monitoring measures to ensure the long-term success of the translocation program.

1.2 Ecology of *Pultenaea imminuta*

1.2.1 Distribution and population size

Pultenaea imminuta is a shrub reported to grow to approximately 0.6 m (Barrett et. al. 2024), although has been observed to grow to approximately 1.2 m (pers. obs.; **Figure 1.1**). Until very recently, the species was only known from two vouchered collections (D. Landenberger – 2009; M. Robinson 2021) and a third unvouchered record (sighting by Tanya Bangel on 3 Oct. 2018, BioNet Atlas Record No. LJJSI0149462; DCCEEW 2024) all within an approximately 4 km area (**Figure 1.2**). Additional observations of the species were made by Ecoplanning during pre-clearance surveys of the approved MCCM surface development area in February 2024. The population was estimated and mapped as per Section 4.1.2 of the MCCM BMP (WHC 2017), with results presented in **Table 1.1**.

All recorded locations of *Pultenaea imminuta* are located within Leard State Forest (SF) and are shown in **Figure 1.2**. Based upon field surveys conducted by Ecoplanning in February 2024, the total population size was estimated to be approximately 3,000 individuals, with a summary of the sub-populations provided in **Table 1.1**.

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Table 1.1: Known sub-populations of *Pultenaea imminuta*

Sub-population (Source)	Location / Tenure	Date of most recent survey	Number of individuals
Landenberger (2009)	Leard SF - Boggabri Coal (CL 368)	September 2009	Not recorded
BioNet Atlas (2018)	Leard SF - Boggabri Coal (CL 368)	Unknown	Not recorded
M. Robinson (2021) and inspected by Ecoplanning in 2024	Leard SF - Biodiversity Corridor	February 2024	~1600
Ecoplanning (2024)	WHC MCCM surface development area	March 2024	1,200*
Ecoplanning (2024)	Leard SF – South-west of MCCM surface development area	February 2024	34

* Estimate based upon a combination of actual counts and extrapolation from transect data through the sub-population.



Figure 1.1: *P. imminuta* within the MCCM surface development area (B. Brown)



Figure 1.2: Recorded locations of *Pultenaea imminuta*

1.2.2 Habitat associations

Habitat for *Pultenaea imminuta* has been described as (Barret et. al. 2024):

> *"… eucalypt and cypress pine woodland on skeletal soils derived from basalt over conglomerate on mid to upper slopes of hills. Recorded in association with Acacia cheelii, A. leiocalyx, Aristida ramosa, Austrostipa scabra, Callitris glaucophylla, Calotis sp., Cheilanthes distans, Dodonaea stenophylla, D. truncatiales, D. viscosa subsp. angustifolia, D. viscosa subsp. mucronata, D. viscosa subsp. viscosa, Eucalyptus crebra, E. dwyeri, Geijera parviflora, Gonocarpus elatus, Melichrus urceolatus, Notelaea microcarpa var. microcarpa, Oxytes brachypoda, Pimelea neo*anglica, *Pomax umbellata, Psydrax odorata, Rytidosperma fulvum, Rytidosperma racemosum* and *Senna aciphylla*."

Based upon Ecoplanning field observations in February 2024, and previous collection notes, habitat for *Pultenaea imminuta* most closely resembles Plant Community Types (PCT) 592 'Narrow-leaves Ironbark – Cypress Pine – White Box shrubby open forest' and PCT 427 'Cypress pine – Tumbledown Red Gum low open woodland to grassland on rocky benches'. This is supported by the State Vegetation Type Map (SVTM; NSW DCCEEW 2024), which maps these two PCTs (PCT 592 and PCT 497) as occurring across all areas within 100 m of recorded locations of *P. imminuta* (**Figure 1.4**).

Within this habitat type, the species is typically associated with mid to upper slopes, a very open vegetation structure, and skeletal soils with a high density of small (5-10 cm diameter) surface rock. A review of regional surface geology maps (Pratt 1998) indicates that the areas of high surface rock where *P. imminuta* has been found are associated with the upper layers of the Maules Creek Formation. As described by Pratt (1998), the Maules Creek Formation has "*basal carboniferous claystone, pelletoridal clay sandstone, passing into fining-up cycles of sandstone, siltstone, and coal. Conglomerate dominant towards top*".

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Figure 1.3: Typical habitat for *P. imminuta* (J. Brien-Cooper – February 2024)

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Figure 1.4: Vegetation mapping indicating the Plant Community Type at the location of all known *P. imminuta* records.

1.2.3 Life-cycle

Informed by the single observations of flowers of *P. imminuta* in September 2021 (M. Robinson; see cover photo) and recent seed collections in February 2024 (Ecoplanning 2024; **Figure 1.5**), the phenology of the species appears to be broadly consistent with majority of *Pultenaea* species. That is, flowering occurs in Spring with seed produced in Summer (Auld 1996, Benson & McDougall 1996). Due to the recent recognition of the species, and the very restricted distribution, there is very little additional information available on the life-cycle of *P. imminuta.* However, a review of available information for the genus (which is largely informed by the studies compiled by Benson & McDougall (1996) for the Central Coast and Central Tablelands Botanical Divisions) and the broader Fabaceae family (Auld 1996), a number of generalisations can be made:

- *P. imminuta* is likely to be pollinated by native bees attracted by pollen, nectar or both, resulting in a high incidence of outcrossing. The very few reported observations of pollinators of *Pultenaea* species are of native bees (Benson & McDougall 1996), although numerous insects are associated with flowers of the broader Fabaceae with native and introduced bees, wasps, beetles and flies all identified as potential pollinators (Auld 1996).
- Seed are likely to have a high level of physical dormancy and high level of viability. Where documented, seed viability in *Pultenaea* ranged from 90 to 100% with the non-dormant faction of seeds ranging from 10 to 59 % (Benson & McDougall 1996).
- Initial seed dispersal in *Pultenaea* and the Fabaceae varies from passive to explosive, while secondary seed dispersal is primarily by ants, although distances seeds are dispersed are generally less than 10 metres (m) (Auld 1996).
- It is highly likely that *P. imminuta* plants are killed by fire and post fire-recruitment occurs from the soil seed bank (e.g. an obligate seeder). This is the dominant fire response of the genus *Pultenaea*, although there are some examples of species with mature plants resprouting post fire (Benson & McDougall 1996; Auld 1996). No resprouting plants were observed during surveys by Ecoplanning in February 2024.



Figure 1.5: Seed of *P. imminuta* (B. Brown – February 2024)

1.2.4 Genetic analyses

Following identification of the species at MCCM; a genetic analysis was undertaken of the two populations of *P. imminuta* by the NSW Research Centre for Ecosystem Resilience (Bloom-Quinn & Van Der Merwe 2024). The study used samples collected from 74 individuals from two populations of *P. imminuta*; one population from the MCCM 2024 surface development area (accounting for 50 individuals) and the other from the Biodiversity Corridor (24 individuals) (**Figure 1.2**). Bloom-Quinn & Van Der Merwe (2024) made multiple findings and recommendations from on their analyses, which are summarised below.

Although the two populations assessed were relatively close (separated by approximately 2.5 km), each population was genetically distinct but not highly differentiated. They attribute the differentiation of the two populations to genetic drift facilitated by pollinating insects maintaining fidelity to each population (i.e. pollinators not travelling between the two populations). Bloom-Quinn & Van Der Merwe (2024) found that there is a moderate level of inbreeding at both the sites, but that observed heterozygosity remains moderately high. The relatively high levels of heterozygosity, lack of next of kin and absence of clusters of highly related individuals suggests that the species is a preferentially outcrossing plant and that individuals needs to be genetically distant to reproduce successfully. Additionally, pollinators are likely move freely within a site not necessarily staying within a small patch.

The genetic analysis found that each of the two sampled sites hold 90% of the species total alleles, which is encouraging. However, 10% of the common alleles identified with the sequencing of the sampled material from each site are unique to a single site. Analysis of cuttings from each of the individual plants made by Fields Environmental Solutions from the MCCM 2024 surface development area (see section 4.5) indicate that over 10% of the unique diversity of the species has been salvaged. This operation was thus important for maintaining evolutionary valuable material that can contribute towards the survival of the species. Analyses for genetically optimised collections favoured sampling more individuals from the Biodiversity Corridor.

Bloom-Quinn & Van Der Merwe (2024) made the following four recommendations:

1. When establishing a new population material from the two sites should be mixed to maximise genetic diversity and genetic health.
2. Any newly created population needs to maintain high levels of genetic diversity and in all circumstances cuttings that come from the same individual or seed from the same parent should not be planted together. The genetic data indicates that the individuals included in this study were not related and all are thus suitable for translocations.
3. The ex-situ material held by Fields Environmental is of genetic value and the collection should be maintained. Nursery staff should take care to maintain information on maternal lines so that these individuals can be kept separate during the establishment of new populations.
4. To optimise genetically diverse plantings use approximately 30% of plants from Leard SF and 70% from Biodiversity Corridor. Make sure that these individuals represent unique individuals and are not clones (cuttings) from the same maternal line. Multiple new sites can be established to ensure survival. Multiple stochastic processes can lead to failure to survive, and we recommend at least four genetically diverse translocation sites.

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2 Approvals and requirements

Relevant management plans, approval conditions and requirements which relate to *P. imminuta* are summarised in **Table 2.1**.

Table 2.1: Statutory requirements and management plans relevant to *P. imminuta*

Approval / Management plan	Requirement	Response
Maules Creek Coal Mine		
Project Approval (PA 10_0138) Schedule 3, Condition 52	"*The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General..*"	A Biodiversity Management Plan (BMP) has been prepared.
Biodiversity Management Plan - Section 4.1.2	"*If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with OEH, DP&E and DotE.*"	This propagation and translocation program.

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3 Protection and restoration management actions

P. imminuta is known to occur within the Biodiversity Corridor between the Boggabri and Maules Creek mining projects. The retention of a vegetated buffer corridor of 500 m between the Boggabri and Maules Creek mining projects was recommended by the NSW Planning Assessment Commission, the former NSW Office of Environment and Heritage (OEH; now NSW DCCEEW), the NSW Department of Planning and Environment (DP&E; now Department of Planning, Housing and Infrastructure (DPHI)), and subsequently included in the Boggabri (09_0182) and Maules Creek (10_0138) project approvals.

Consistent with the existing management of known populations of threatened flora recorded within WHC managed areas, standard management actions will be applied to *P. imminuta* habitat for any future identified naturally occurring populations. These actions include, but are not limited to, the following:

- Exclusion of livestock grazing to promote natural regeneration.
- Weed and pest animal control.
- Access control (enclosure and demarcation fencing).
- Bushfire management.
- Active revegetation (planting or direct seeding) depending on the success of natural regeneration.

The existing monitoring of known populations of threatened flora recorded within WHC managed areas will also be applied to *P. imminuta*, such as visual inspections of threatened flora enclosures undertaken quarterly, or in response to incidents (e.g. bushfire), to detect disturbance factors, presence of pest animal species, grazing pressure from over-abundant native herbivores and the presence of exotic weed species. These inspections aim to monitor seed production, germination and to increase knowledge of each species' ecology and reproductive habits.

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4 Translocation strategy

This translocation strategy has been prepared based on a review of the known ecology of the species (including inferences from related species where knowledge gaps occur), scientific reviews, results from previous management actions for threatened flora, best practice guidelines, and the project approvals to maximise the chance of successfully achieving the aim of the translocation as outlined within **Section 1**.

For a translocated population to persist in the short-term, there needs to be:

- A sufficient number of propagules to establish a viable population and protect against genetic, demographic and environmental stochasticity,
- Good survival and establishment of the translocated individuals,
- Management and control of threats; and
- Flowering, fruiting, and natural recruitment at rates similar to natural populations.

For a population to persist in the long term it also needs to possess sufficient genetic diversity to retain its evolutionary potential to adapt to long-term environmental change or infrequent extreme events (Commander et al. 2018). These requirements form the basis of this strategy. Specifically, this strategy includes actions to source propagules that maximise diversity; mitigate threats with the aim of enhancing the chances of survival and establishment of translocated individuals. The proposed *P. imminuta* translocation incorporates multiple translocation methods to increase the likelihood of success should one method prove unsuccessful. These translocation methods include:

- Salvage translocations, including the following techniques.
  - seed collection
  - cuttings
  - soil translocation
- Seed collection (from non-salvage plants) and propagation

Transplanting entire plants, including their root ball, is not proposed due to the limited success associated with this technique. Transplanting whole plants from naturally-occurring populations has a low success rate as many plants die without successfully reproducing at their new location (Commander et al. 2018). Additionally, the rocky habitat in which *P. imminuta* typically occurs is likely to make this process even more difficult as root balls are unlikely to remain cohesive. Resources are considered better applied to increasing the number of propagules collected via alternative techniques.

4.1 Justification for translocations

The requirements of the project approval (PA 10_0138) and the MCCM BMP provide justification for a translocation of *P. imminuta* occurring within the MCCM surface development area. Considering the applicable approvals for the MCCM surface development areas and therefore the fate of plants located within the surface development area, any attempts at salvage translocations represent worthwhile actions to try minimise impacts to the species. The translocation actions included within this strategy are to be undertaken in conjunction with management actions outlined in Section 3 which aim to protect habitat and build resilience

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through habitat restoration and mitigating threatening processes (including pest and weed control).

Translocation via seed collection, seed propagation and planting, represent one of the most effective ways of collecting regenerative material due to the capacity to encompass a large proportion of the species diversity within a population (Commander et al. 2018). As a result, this is one of the most common methods for translocation in general (Silcock et al. 2019). This strategy has been successfully utilised for other threatened flora species found on WHC managed areas (e.g. *Pomaderris queenslandica* and *Bertya opponens*).

4.2 Recipient site selection

As detailed within **Section 1.2**, the current understanding of the range and habitat associations of *P. imminuta* suggest that the species occupies a particular micro-habitat within the broader habitats for PCT 592 and 427. This micro-habitat is characterised by mid to upper slopes with a very open vegetation structure, and skeletal soils with a high density of small (5-10 cm diameter) surface rock. Consequently, identification of similar habitats within WHC managed areas has been key to selecting recipient sites where translocations are likely to be successfully undertaken. An assessment of WHC managed areas (prioritising locations adjacent to the Leard SF and Leard State Conservation Area) has been undertaken to identify areas which represent suitable recipient sites. In accordance with the recommendations of Bloom-Quinn & Van Der Merwe (2024), four recipient sites have been identified as part of this plan. These translocation sites are located in the Onavale, Wollandilly, Teston East, and Teston South offset properties (**Figure 4.1**).

As part of the process for selecting the four recipient sites, the following site characteristics were reviewed using available resources:

- Local surface geology using mapping completed by Pratt (1998).
- Validated vegetation mapping (targeting areas mapped as PCT 427 and 592).
- Topographic position (mid slope and a southerly aspect).

In addition to the above, recipient sites have been selected which have sufficient spatial separation to minimise the risk of stochastic events (e.g. wildfire) having a detrimental effect on multiple sites at the same time. As such, selected recipient sites are separated by at least 1 km.

The habitat features of each nominated recipient site is summarised in **Table 4.1** and examples of each recipient site is shown in **Figure 4.2**. Vegetation mapping and topography of each recipient site are shown in **Figure 4.3** (Onavale), **Figure 4.4** (Teston East), **Figure 4.5** (Teston South), and **Figure 4.6** (Wollondilly). It is noted that the Teston South recipient site includes the Soil Seedbank translocation site (as described in **Section 4.7**).

For the Onavale, Teston South and Wollondilly recipient sites (**Figure 4.3**, **Figure 4.5**, and **Figure 4.6)** the proposed translocations would represent 'introductions' defined as attempts to establish a population in a site where it has not previously occurred but is within proximity to the known range of the species and provides similar habitat to known occurrences. For the Teston East recipient site (**Figure 4.4**) the proposed translocations would represent a 'reinforcement' which is defined as adding individuals of a species into an existing population with the aim of enhancing population viability by increasing population size, genetic diversity

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and/or representation of specific demographic groups or stages. The proposed Teston East recipient site includes an estimated 20 individuals of *P. imminuta*.

Within the nominated recipient sites (**Figure 4.1**), the exact placement of translocated individuals and associated protection fencing will be subject to future due diligence assessments to select the most suitable location(s) in each nominated recipient site. Translocation sites would be approximately 2.4 – 3.0 ha to have capacity to support the recommended population sizes (200-250; **Section 4.2**) and planting densities (<1 plant / 12 m^2, **Section 4.6**).

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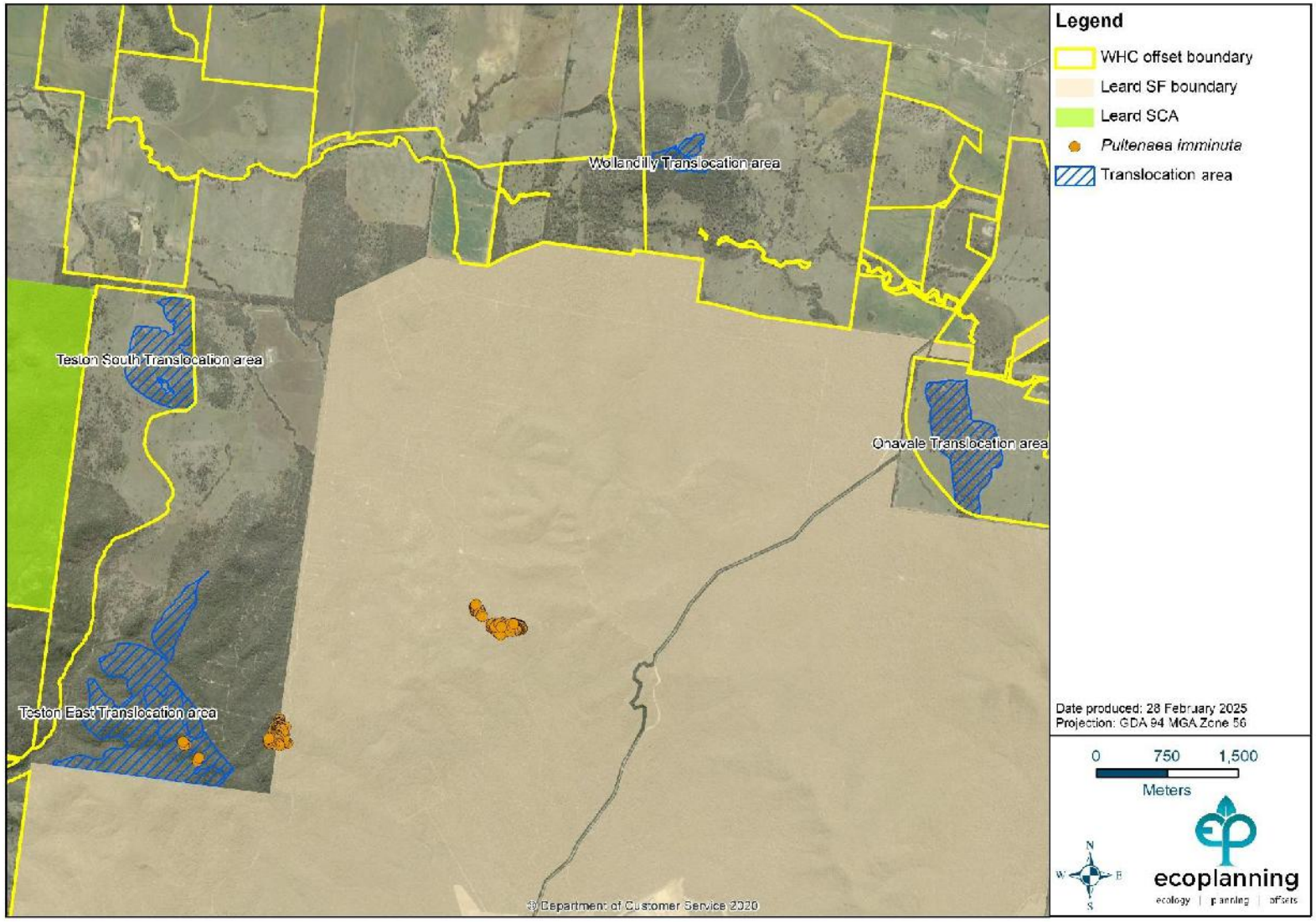


Figure 4.1: Location of the *P. imminuta* recipient sites in relation to all known records of *P. imminuta*, Leard State Forest, and the Maules Creek Coal Mine.

Table 4.1: Comparison of translocation site characteristics to descriptions of known habitat for *P. imminuta*.

Proposed recipient site	Site characteristic			
	Soil and geology	PCT	Topographic position	Figures
Known habitat	Skeletal soils with high proportion of surface stones, derived from Conglomerate in the Maules Creek Formation (Pratt 1998)	427 & 592	Mid slope with southern aspect	**Figure 1.3** and **Figure 1.2**
Onavale	Soils with high proportion of surface stones (depth uncertain), derived from Conglomerate in the Maules Creek Formation (Pratt 1998)	592	Mid slope with eastern aspect	**Figure 4.2.A** and **Figure 4.3**
Teston East	Skeletal soils with high proportion of surface stones, derived from Conglomerate in the Maules Creek Formation (Pratt 1998)	427 & 592	Mid slope with southwest aspect	**Figure 4.2.B** and **Figure 4.4**
Teston South	Skeletal soils with high proportion of surface stones, derived from Boggabri Volcanic Group and Maules Creek Formation (Pratt 1998)	592	Mid slope with southern aspect	**Figure 4.2.C** and **Figure 4.5**
Wollondilly	Soils with high proportion of surface stones (depth uncertain), derived from Conglomerate in the Maules Creek Formation (Pratt 1998)	592	Mid slope with southern aspect	**Figure 4.2.D** and **Figure 4.6**

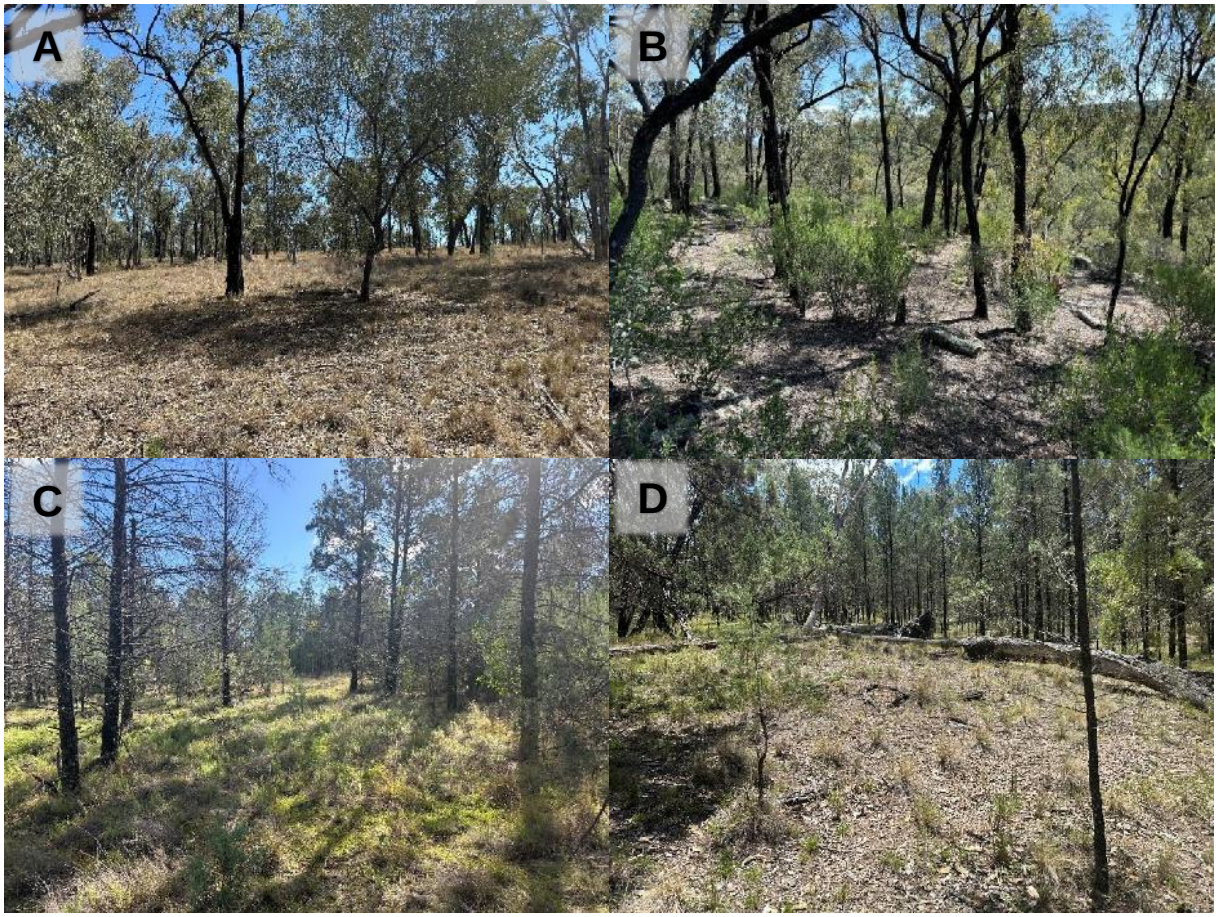


Figure 4.2: Examples of habitat from within each proposed recipient site: A) Onavale (J. Brien-Cooper; February 2025), B) Teston East (J. Brien-Cooper; October 2024), C) Teston South (J. Brien-Cooper; July 2024), and D) Wollondilly (J. Brien-Cooper; January 2025).

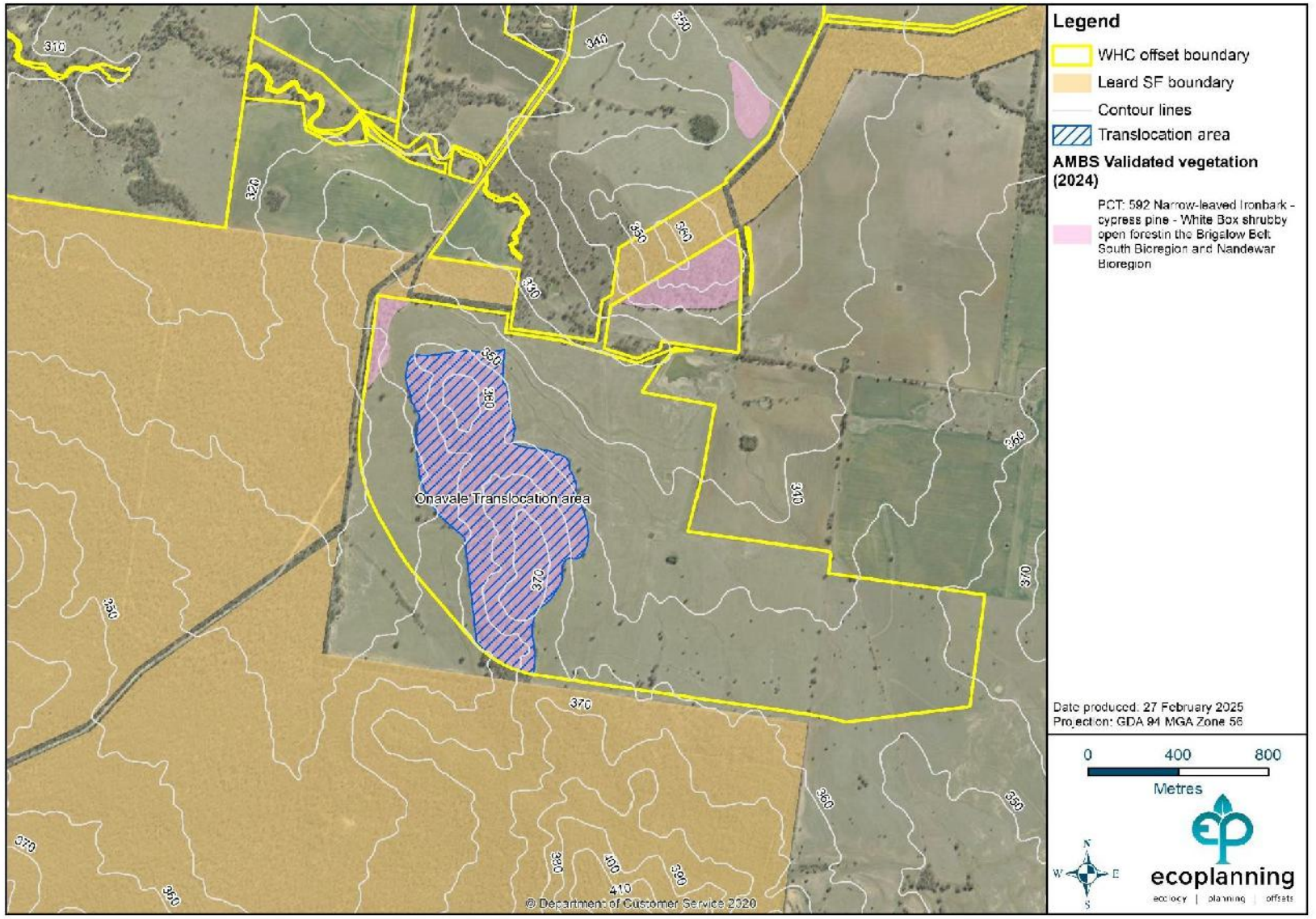


Figure 4.3: Vegetation mapping and topography of the Onavale *P. imminuta* recipient site.

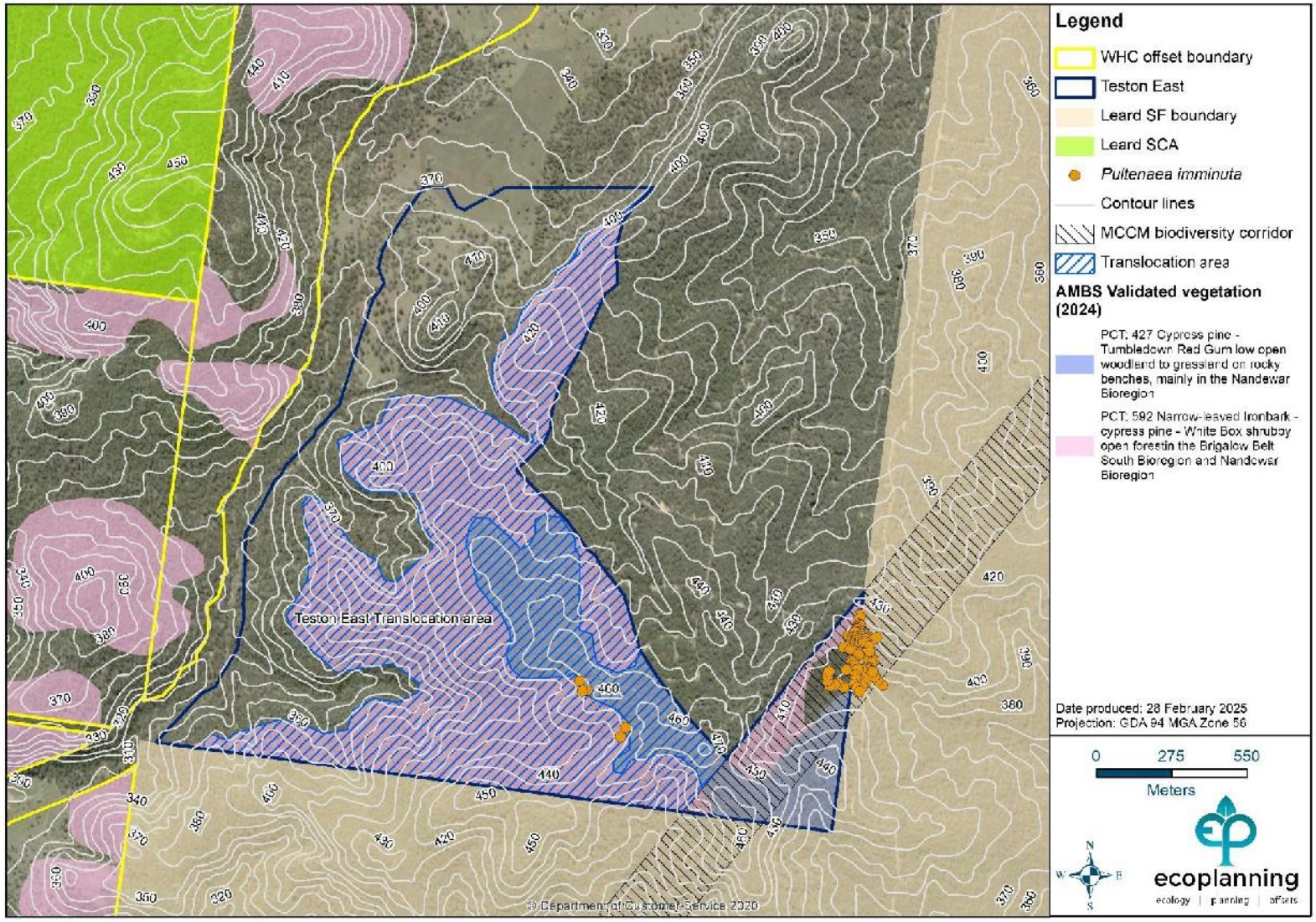


Figure 4.4: Preliminary vegetation mapping and topography of the Teston East *P. imminuta* recipient site.

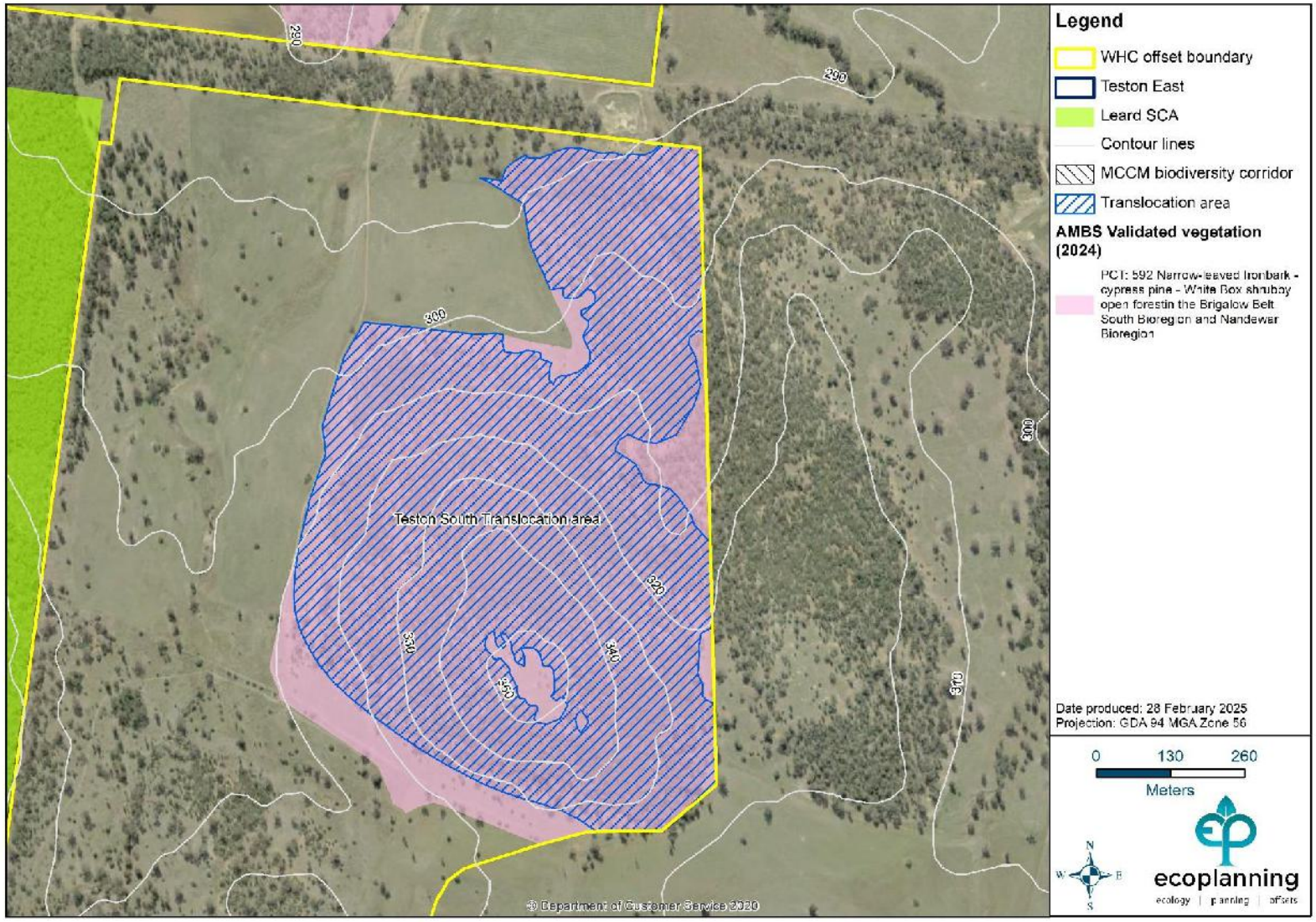


Figure 4.5: Vegetation mapping and topography at the Teston South recipient site.

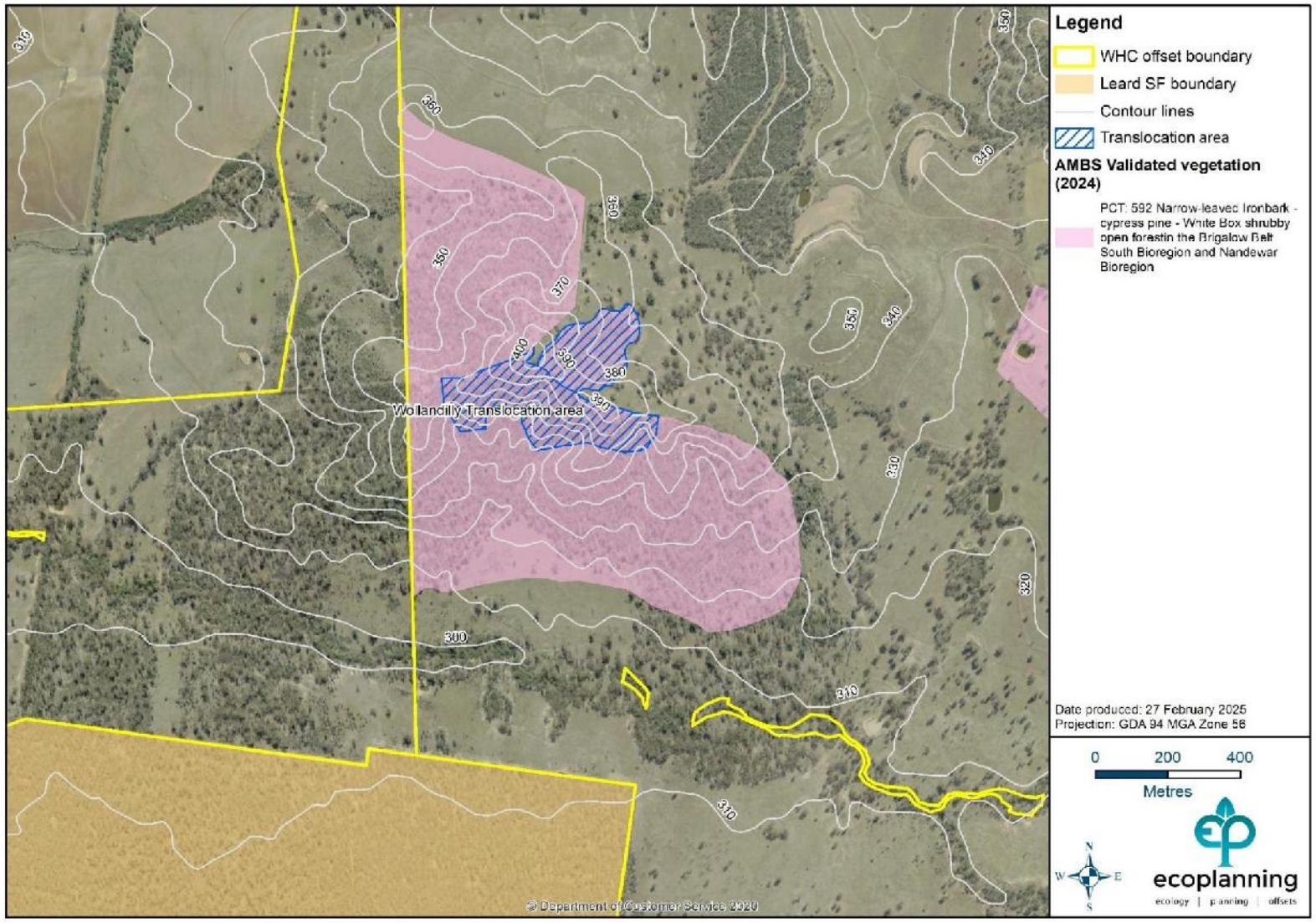


Figure 4.6: Vegetation mapping and topography at the Wollandilly recipient site.

4.3 Seed collection

The success of this translocation method would be dependent upon sufficient seed collection from *P. imminuta* populations within the MCCM surface development area and within the biodiversity corridor. Seed detected during pre-clearance surveys (as required under Sections 4.12 and 4.3 of the BMP [WHC 2017]) should be collected from *P. imminuta* in impact areas prior to disturbance. Seed storage and handling should be as detailed below.

Visual inspections of *P. imminuta* populations are to be undertaken quarterly, or in response to incidents (e.g. bushfire) with one of the aims of these inspections is to monitor seed production. Where seed production is identified during quarterly inspections, seed collection, management and storage should be undertaken in consideration of Florabank guidelines (http://www.florabank.org.au/) including bagging of selected branches prior to seed release to adequately sample between early and late seed release across each seeding production season. Specifically, seed collection from non-salvage plants is to:

- Be limited to a maximum of 20% of the capsules from each plant annually.
- Include no more than 100 individuals per year.
- Collect seed from spatially separated individuals to reduce chance of collecting seeds from related plants.
- Be fully documented so that data on the plants and locations where seed collection occurred can be tracked over time.

Opportunistic seed collection of *P. imminuta* within the 2024 surface development area occurred during pre-clearance surveys in February 2024. Seed was collected from between 50 to 100 individuals yielding a total of 0.54 grams and approximately 328 seeds. Seed germination has commenced with details to be included in future reporting. Targeted seed collection of *P. imminuta* also occurred in late October 2024 with 134g collected from the Biodiversity Corridor site. Future seed collections will consider the recommendations of Bloom-Quinn & Van Der Merwe (2024) to prioritise collections from the population within the Biodiversity Corridor.

4.4 Seed germination

Pultenaea imminuta seeds collected will be used for germination and plant propagation. Subject to actual successful seedlings propagation, propagated seedlings are proposed to be translocated to selected recipient sites to reinforce the size and diversity of existing populations, or to establish additional sub-populations (recipient site selection discussed in Section 4.2).

Key limiting factors for the translocation strategy is likely to be seed availability, seed dormancy and seed viability. A review of available literature suggests that *Pultenaea* seeds typically have high seed viability and high seed dormancy; noting that extrapolating aspects of the ecology of commonly occurring species does not necessarily mean that it will apply to threatened species that face unique challenges absent in other common species of the genus. Seed pre-treatments (e.g. scarification, stratification, after-ripening) should follow methods used to date including the time required for these treatments with details to be included in future reporting.

While the initial seeds collected will be prioritised for germination and propagation trials within nursery conditions; future seed collections will aim to enable translocation work over multiple

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years and allows for future plantings if the initial plantings/translocations fail. Generally, staggered translocations give better protection against the potential consequences of adverse stochastic events (Commander et al. 2018). When sufficient seed is collected for the purposes of staggered translocations, additional seed should be donated to the seedbank at the Australian PlantBank at Mount Annan Botanic Gardens.

The results of previous trials should be reviewed prior to future seed collection and germination. Treatments which have proved successful in previous seasons should be applied preferentially in subsequent seasons.

4.5 Stem cuttings

Species of *Pultenaea* have been successfully propagated from stem cuttings in the past for horticultural purposes (e.g. Australian Plant Society of NSW 2022); noting that extrapolating aspects of commonly occurring species does not necessarily mean that it will apply to threatened species that face unique challenges absent in other common species of the genus. Stem cuttings may be sourced from the same locations and populations as seed collection (MCCM surface development area and within the biodiversity corridor) within the Project Approval area, although stem cuttings from within the annual clearing areas will be prioritised, where identified.

Cuttings will be undertaken by suitable experienced professionals to identify the best treatments for cuttings and the likely times for collection and propagation of the species.

Some level of short-term success and early research suggests that microhabitat placement, seasonal rainfall, and access to supplementary water (irrigation) are essential for translocation success in stem cutting translocations (Commander et al. 2018). Cuttings should not be taken and planted during adverse weather conditions and during long dry periods additional water may be required.

Targeted stem cuttings of *P. imminuta* within the 2024 surface development area occurred in March 2024. Approximately 300 seedlings have struck and survived from these initial cuttings collected from greater than 100 individuals. Propagation work on the stem cuttings has commenced with details to be included in future reporting.

4.6 Translocation of propagated seedlings

Following successful seed germination, or propagation via cuttings, seedlings should be planted into the WHC managed areas (recipient site selection discussed in **Section 4.2**) in autumn/winter, with high soil moisture and low levels of heat stress. Planting should be conducted in the following manner:

1. Prepare a hole for each plant with an auger (or similar) to a depth of approximately 750 mm (or as close to that depth given subsurface conditions and constraints), and width 50% wider than the largest pot size. Rough the sides of the hole to ensure that it is not round or glazed.
2. Return the soil to the hole and pour 10-15 litres of water onto the soil (or until soil is saturated).
3. Prepare an additional hole in the same manner that will be used to monitor soil moisture.
4. Return 2-3 days later after steps 1-3 for planting.

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5. Make sure potted plants have been watered the day prior to planting.
6. Remove plant from pot and trim roots, as required.
7. When planted, the soil level of the potted plant should sit 40 mm below ground level creating a dish. Cover root ball by 40 mm.
8. Place tree guard around the plant, if required.
9. Apply approximately 5 litres of water onto each plant (or until soil is saturated).

Despite the ability of the species to naturally occur at moderate densities, it is recommended that all plants are located at least 2-3 m (no more than 1 plant/12 m^2) from other translocated plants to avoid competition during establishment. Additionally, material from the same parent plant should be planted at least 20 m from each other (Bloom-Quinn & Van Der Merwe 2024). For convenience during monitoring and maintenance of translocated plants, large gaps (>5-10 m) between translocated plants should also be avoided where possible.

4.6.1 Fencing and protection

Potential threats to populations of *P. imminuta* include herbivory by goats and ground disturbance by pigs. A fence will be erected around each recipient site as a preference over using individual tree guards. Fences should be of a type which excludes macropods and additional measures to exclude rabbits and hares may be required depending on the different sites. Where individual tree guards are utilised in addition to fencing, these guards should remain in place until plants are of a suitable size and are considered able to tolerate and survive the level of grazing pressure present within the relevant offset property or other selected recipient sites. Stakes may also be used to support the plants initially, if required.

4.6.2 Watering Schedule

All translocated plants should be marked clearly so they can be found easily for watering and monitoring. Watering during hot and/or dry periods may be beneficial during the plant establishment phase. If a site is exposed to seasonally dry conditions, Commander et al. (2018) recommend providing weekly or fortnightly water to translocated individuals during the first two dry seasons to mitigate losses during this time.

All translocated individuals should be watered during planting. Initial watering should replicate frequent, small rainfall events (10 mm max and approximately four litres per plant), and later watering should replicate infrequent, large rainfall events (>10 mm and approximately seven to eight litres per plant, or until soils are saturated). After planting follow-up watering should also occur during any extended dry periods (absence of weekly rainfall in excess of 5 mm in a single rainfall event) or if any signs of dieback are observed which may be linked to dry conditions. Ultimately, decisions regarding the watering schedule after planting will need to be made based upon the rainfall at the time and the response of planted seedlings during monitoring. Lack of post-translocation care and ongoing monitoring are factors that commonly lead to failure of translocation projects (Commander et al. 2018). Post-translocation actions including timing, frequency and amount of watering should be documented to inform decision-making for any future planting events. The watering schedule and response of translocated plants should be documented and reviewed in each annual review, including recommendations for any changes to watering schedules based upon the monitoring data (see **Section 6**).

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4.6.3 Maintaining genetic diversity of translocated populations

Future translocated populations of *P. imminuta* should aim to contain a high level of genetic diversity. To do this, *P. imminuta* translocation attempts should aim incorporate the following recommendations made by Bloom-Quinn & Van Der Merwe (2024):

- Seedlings from multiple source sites should be mixed (e.g. MCCM surface development area and the Biodiversity Corridor).
- Translocated material from the same parent plant (i.e. cuttings and propagated seed) should planted at least 20 m from each other when planted at the same site or should not be planted at the same translocated site.
- In the long-term, the pedigree of translocated plants (both propagated seed and cuttings) at the same translocation site should represent their source populations at different rates. Specifically, 30% of translocated plants should represent the population from the surface development area and 70% from the Biodiversity Corridor population. However, this ratio will be dependent on the quantity of seedlings germinated and propagated from the seed collected from the Biodiversity Corridor site.

4.7 Soil seedbank translocation

Soil seedbank translocation has been previously successfully utilised for *Pomaderris queenslandica* within the Teston South offset property. Consequently, this method is proposed as part of this strategy and generally follows the techniques applied for that species. It is noted that this technique is typically only recommended (e.g. Commander et al. 2018) where the recipient site is adjacent to the source population due to the potential to transport diseases such as dieback (e.g. *Phytophthora cinnamomi*). However, there is very low risk of *Phytophthora cinnamomi* away from the NSW Coast and Tablelands due to low annual rainfall (McDougall & Liew 2020). Nonetheless, soil translocation recipient site selection should avoid transporting soil across large distance due to the risk of disease spread.

Topsoil was collected separately around the *P. imminuta* population from the Surface Development Area and stockpiled until transported to an area adjacent to the existing *Pomaderris queenslandica* topsoil recipient site, located within the Teston South offset property (**Figure 4.7**). This topsoil recipient site was selected as it is located at the interface between previously disturbed and regenerating PCT592 grasslands and woodland areas. This location has been selected so that disturbance to existing woodland areas can be avoided during topsoil transfer while ensuring any *P. imminuta* which germinate are afforded some shading from adjacent woodland areas.

Topsoil recipient sites have been fenced as per existing management of threatened flora enclosures. These enclosures are to be inspected quarterly to identify any *P. imminuta* seedlings. Where *P. imminuta* individuals are identified, individuals are be demarcated and monitored in accordance with **Section 5**.

P. imminuta topsoil translocations following the above methods were undertaken in December 2024. Existing topsoil was retained (not removed) and topsoil was spread directly from a truck with a limited tray opening, to approximately 10 – 20 cm in depth. This avoided any need to spread any soil with machinery and potentially compact the topsoil. Ongoing monitoring of this site will occur consistent with **Section 5**.

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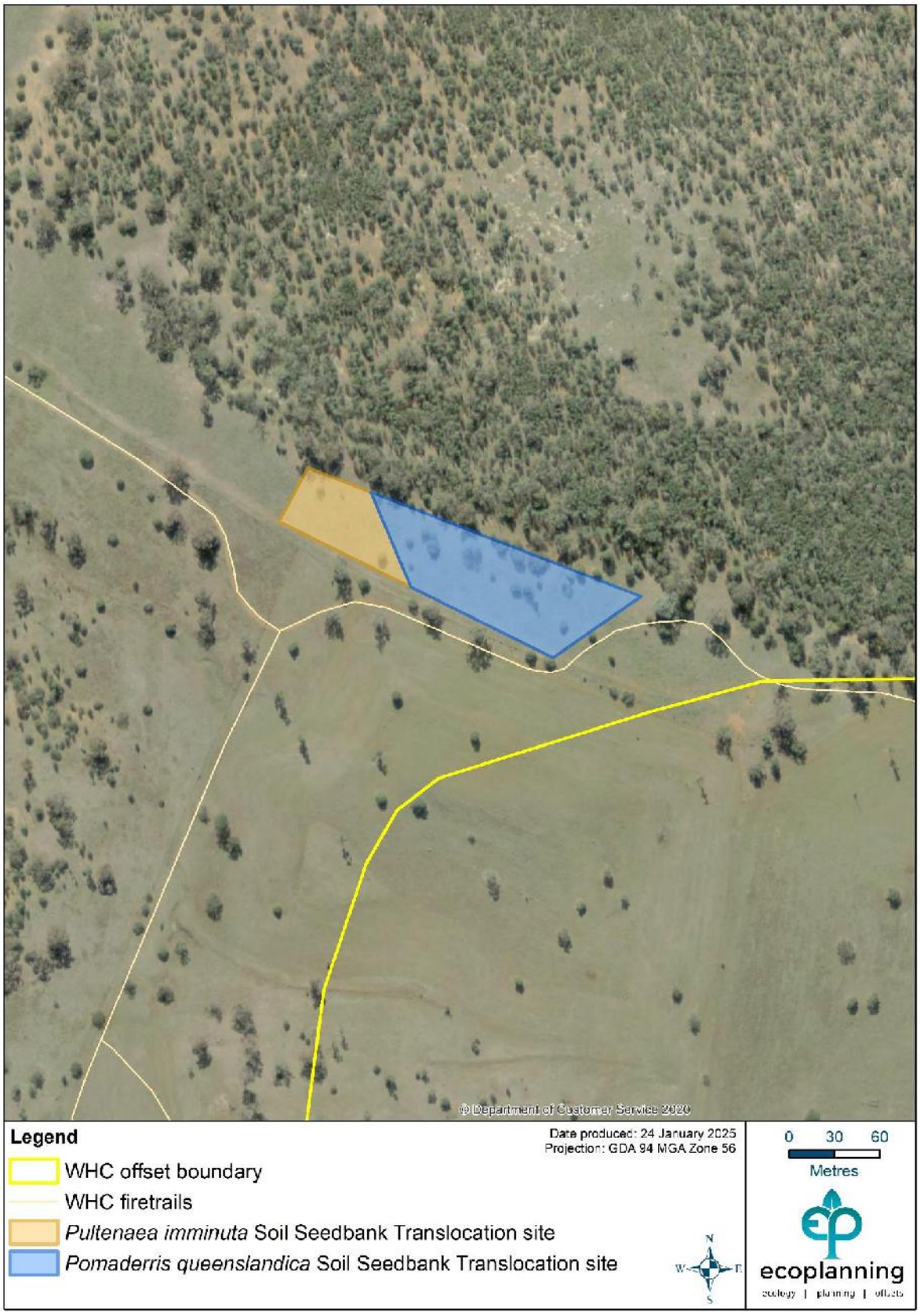


Figure 4.7: Location of the *P. imminuta* Soil Seedbank Translocation site

5 Monitoring and Maintenance

The existing monitoring of known populations of threatened flora recorded within WHC managed areas will also be applied to *P. imminuta* such as the monitoring of seed production, germination and to increase knowledge of each species' ecology and reproductive habits. In addition to these quarterly inspections, more detailed monitoring is to occur for any translocated *P. imminuta*. All translocated plants and areas of topsoil translocation must be permanently tagged, and data collected prior to planting to enable comparisons over time, between individuals and between recipient sites. All translocated plants should undergo monitoring, not only a subset. Monitoring of translocated plants is to take place monthly for the first year after a seedling is planted, quarterly for the two proceeding years and biannually after that. Monitoring should continue for a minimum of 5 years after planting, dependent on the success of the translocation program and availability of seed for collection during the preceding five years.

Reference sites/plants must also be monitored to provide benchmark data and assist in determining attrition or impacts that may be attributed to a natural event that has impacted the general population and not just translocated individuals. Natural populations of *P. imminuta* within the shared biodiversity corridor will be used as reference sites and monitored quarterly to assess rates of attrition, flowering, fruiting and natural recruitment. To monitor the natural populations of *P. imminuta*, it is recommended that permanent monitoring plots (e.g. 10 x 10 m) be established to monitor the natural populations of *P. imminuta* as a reference for the translocated populations and to increase the knowledge on the ecology of the species.

Variables to be monitored for translocated individuals and within reference plots are detailed within **Table 5.1**. Collection of this data should provide quantitative data which will guide future management actions including:

- Time to maturity (e.g. first flowering)
- Flowering / fruiting (comparisons between sites and populations).
- What proportion of plants are producing viable seed?
- Evidence of second generation and abundance.
- Any experimental micro-siting and treatment variables implemented as part of the program (e.g. fenced / unfenced, shaded / unshaded).

All aspects such a watering frequency, unusual climatic conditions and rainfall should also be considered and documented to highlight ways in which future translocations may be more effective.

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Table 5.1: Biometric data to be monitored for translocated *Pultenaea imminuta* and reference plants

Variable	Data to be recorded
Survivorship / recruitment	Number of individuals (if monitoring within plots)
Vegetative growth	Height of individual plant
Plant health / vigour	Repeatable scale of measurement as per the following: 1 Plant dead 2 Widespread dieback/damage 3 Dieback/damage observed on multiple branches 4 Minor dieback/damage evident on isolated leaves or branches 5 Healthy plant with no signs of dieback/damage
Reproductive status	Repeatable scale of measurement as per the following: 1 No. flowers (incl. buds) or fruits observed 2 Isolated flowers or fruits 3 Flowering/fruiting on 5 - 25% of branches 4 Flowering/fruiting on 25 - 75% of branches 5 Flowering/fruiting on 75 - 100% of branches

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6 Review and reporting

The outcomes of implementation of this propagation and translocation program will be reported in the MCCM Annual Review summarising the results of quarterly inspections on the various stages of the propagation and translocation program as well as any recommendations.

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7 References

Auld T.D. (1996) Ecology of the Fabaceae in the Sydney region: fire, ants and the soil seedbank. *Cunninghamia* **4(4)**, 531- 551.

Australian Plant Society of NSW (2022). Plant Database. Online database available at: https://resources.austplants.com.au/ [last accessed 15 April 2024].

Benson D. and McDougall, L. (1996) Ecology of Sydney Plant Species: Part 4 Dicotyledon family Fabaceae. *Cunninghamia* **4(4)**, 552-752.

Barrett R. L., Clugston J. A. R., Albrecht D. E., Elkan L., Hosking J. R., Jobson P. C., McCune S. F., Orme A. E., Palsson R. L., Renner M. A. M., Wardrop C. and Weston P.H. (2024) Revision of the *Pultenaea setulosa* species complex (Fabaceae: Mirbelieae) including 14 new specie. *Australian Systematic Botany* **37,** 1-105.

Bloom-Quinn, S. Y., Van Der Merwe, M (2024). Conservation genomics of Pultenaea imminuta in support of management. A report to Fields Environmental Solutions. Research Centre for Ecosystem Resilience, Botanic Gardens of Sydney.

Broadhurst L.M., Young A.G., Forrester R. (2008). Genetic and demographic responses of fragmented *Acacia dealbata* (Mimosaceae) populations in southeastern Australia. Biological Conservation 141(11), 2843-2856.

Commander, L.E., Coates, D.J., Broadhurst, C.A., Makinson, R.O. and Matthew, M. (2018). *Guidelines for the Translocation of Threatened Plants in Australia – Third Edition*. Australian Network for Plant Conservation.

Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW). *Pultenaea setulosa* Species Profile and Threats Database. Online database: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=2705 [last accessed 18 April 2024].

Ecoplanning (2021). Threatened Flora Project Plan v2.2. Unpublished report prepared for Whitehaven Coal.

Keith D.A. (2000). Sampling designs, field techniques and analytical methods for systematic plant population surveys. *Ecological Management & Restoration* **1(2)**, 125-139.

Llorens, T., Byrne, M., Yates, C., Nistelberger, H. and Coates, D. (2012). Evaluating the influence of different aspects of habitat fragmentation on mating patterns and pollen dispersal in the bird-pollinated Banksia sphaerocarpa var. caesia. *Molecular Ecology* **21(2)**, 314-328.

Llorens, T.M., Yates, C.J., Byrne, M., Nistelberger, H.M., Williams, M.R. and Coates, D.J. (2013). Complex interactions between remnant shape and the mating system strongly influence reproductive output and progeny performance in fragmented populations of a bird-pollinated shrub. *Biological Conservation* **164** (August 2013), 129-139.

NSW Department of Planning, Industry and Environment (DCCEEW) (2024). BioNet Atlas – Species Sightings Search. Accessed at: https://www.environment.nsw.gov.au/wildlifeatlas/about.htm

DRAFT

Pratt W. (1998) *Gunnedah Coalfield (north) Regional Geology 1:100 000, 1st Edition*. Geological Survey of New South Wales, Sydney.

Silcock, J.L., Simmons, C.L., Monks, L., Dillon, R., Reiter, N., Jusaitis, M., Vesk, P.A., Byrne, M. and Coates, D.J. (2019). *Biological Conservation* **236** (August 2019), 211-222.

Whitehaven Coal (WHC) (2016). *Maules Creek Coal Mine Site Rehabilitation Plan*. Available online: https://whitehavencoal.com.au/Documentations/Maules%20Creek%20Mine/-Environmental%20Management,%20Monitoring%20&%20Compliance/Environmental%20Management%20Plans,%20Strategies%20and%20Programs/MCC-Mine%20Site%20-Rehabilitation%20Management%20Plan.pdf

Whitehaven Coal (WHC) (2017). *Maules Creek Coal Mine Biodiversity Management Plan*. Available online: https://whitehavencoal.com.au/our-business/our-assets/maules-creek-mine/

Yates, C.J., Coates, D.J., Elliott, C. and Byrne, M. (2007a). Composition of the pollinator community, pollination and the mating system for a shrub in fragments of species rich kwongan in south-west Western Australia. *Biodiversity and Conservation* **16(5)**, 1379-1395.

Yates, C.J, Elliott, C., Byrne, M., Coates, D.J. and Fairman, R. (2007b). Seed production, germinability and seedling growth for a bird-pollinated shrub in fragments of kwongan in south-west Australia. *Biological Conservation* **136(2)**, 306-314.

Young, A.G. and Brown, A.H. (1999). Paternal bottlenecks in fragmented populations of the grassland daisy *Rutidosis leptorrhynchoides*. *Genetics Research* **73(2)**, 111-117.

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