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Vegetation Translocation Plan

Dunmore Hard Rock Quarry

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VEGETATION TRANSLOCATION PLAN

Prepared for Boral Dunmore Operations

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05	16 December 2024	Update following BCS comments	Cambium Group	Boral Quarries

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1 INTRODUCTION

This Vegetation Translocation Plan (Plan) is a stand-alone document for management of the soil and vegetation translocation from the proposed Modification 13 extension (disturbance area) of the Dunmore Hard Rock Quarry (the Quarry) to receiving areas within the Boral Landholdings.

1.1 Background

1.1.1 Description of Dunmore Hard Rock Quarry

The Dunmore Hard Rock Quarry is owned and operated by Boral Resources (NSW) Pty Ltd.

The Quarry is located in the Shellharbour Local Government Area at 38 Tabbita Road Dunmore, approximately 8 kilometres to the south-east of Shellharbour City Centre and 12 kilometres north-west of Kiama CBD in the Shellharbour Local Government Area. The Boral Quarry is located within an area of approximately 35 square kilometres within the Shellharbour and Kiama local government areas in which a number of hard rock quarries are in various stages of operation (see DECCW, 2011).

Vegetation in and around the site has been the subject of several previous studies, including an Environmental Impact Assessment 2003 (R.W. Corkery and Co, 2003), a Flora and Fauna Management and Rehabilitation Plan (Cumberland Ecology, 2009), an Environmental Assessment for Modification 6 (EMM, 2003), an Environmental assessment (Pact, 2014), a Rehabilitation Management Plan (Arcadis, 2016b) and Flora and Fauna Management Plans in 2016 (Arcadis, 2016a) and updated in 2019 (EMM, 2019).

The Dunmore Hard Rock Quarry is included in a Conservation Strategy prepared by DECCW (2011), which includes the following observation:

"….*The principal threat to the ecological values of the study area is the clearing of native vegetation for hard-rock quarrying. Given the close association between geology and vegetation, future quarry expansion has the potential to result in the removal of patches of TECs and their component threatened species; Melaleuca armillaris Tall Shrubland and Illawarra Zieria are particularly susceptible to further loss. Further subdivision of land and construction of roads, services and residences may also result in further loss of native vegetation and greater fragmentation. Further clearing could result in the loss of hollow-bearing trees from the study area that provide roosting habitat for the greater broad-nosed bat and eastern false pipistrelle (Gaia Research 2009). Loss of other habitat features such as rock overhangs, rock crevices and caves, as well as vegetated riparian corridors, may also affect threatened species, including the eastern bent-wing bat and large-footed myotis (Gaia Research, 2009)……".*

1.1.2 Project setting

The Quarry and surrounds occur on undulating topography on a portion of the lower slopes of the Illawarra escarpment, on two hills described locally as Looking Hill and Gooseberry Hill.

The Quarry is mostly surrounded by previously cleared land, which is now either maintained for grazing or on steep and rocky sites where self-recruited vegetation has been allowed to establish. Some of the surrounding farmland has been purchased by Boral Resources and is currently leased for grazing by cattle, sheep or horses. The adjacent parcels of land which have been purchased by Boral Resources are the potential sites for soil and vegetation translocation and are the subject of this report.

Six potential soil and vegetation translocation areas were identified during the site surveys. These areas have geology, aspect and topography suitable for receiving soil and vegetation translocated from the proposed modification 13 extension area (disturbance site). These areas are located in parts of a farm property (Rocklow) to the south of and mostly upslope of Rocklow Creek.

Figure 1 shows the site layout including the potential soil and vegetation translocation areas.

1.1.3 Geology and soils

SKM (1994) observe that "…. *The Dunmore-Kiama area is underlain by a conformable sequence of Permian sedimentary and volcanic rocks (250 - 290 million years old) that are collectively termed the Broughton Formation. The Broughton Formation overlies the Shoalhaven Group of rocks and underlies the Illawarra Coal Measures. Included in the Broughton Formation are five latite members which are interbedded with volcanogenic sandstones, tuffs and tuffaceous sandstones. One of these, the Bumbo Latite member, which has a maximum recorded thickness of 150 metres, is the material source for Dunmore quarry……..".* According to DECCW (2011), *"…..Geologically, the Dunmore – Shellharbour Hills area consists of a number of basalt flows that provide a high-quality hard-rock resource for the construction industry. Two hard-rock resource areas have been identified as containing mineral resources of State and regional significance. These two hard-rock resource areas overlap with areas of significant biodiversity value……*".

Regional-scale mapping of Soil Landscape Groups indicate the occurrence of soils derived from the Bombo Group (see Hazelton, 1992) across the Boral landholdings. The Bombo Group occurs on *"….rolling low hills with benched slopes and sea cliffs with extensive rock platforms on Bumbo Latite*….." (Hazelton 1992) Soils overlying the latite include topsoil of "…*friable reddish brown clay loam*…" or "….*hardsetting brownish black sandy loam*…." and subsoil of Reddish brown sandy clay, overlying Reddish brown light medium clay and brown strongly pedal medium clay. Soil types in and around the Boral landholding are indicated in Figure 2.

Bumbo Latite is described as *"….a fine-grained intermediate volcanic rock similar to basalt, which is crushed to produce coarse aggregates, road construction materials and fines*…" (EMM, 2019). The material above the latite is a breccia-agglomerate which is extracted for producing road pavement materials (Arcadis, 2016).

SKM (1994) observe that "…*All the soils are basaltic in appearance, formed in situ from latite parent material and accordingly, where sufficiently deep, constitute a valuable resource for recovery and eventual use in rehabilitation works. Unlike basalt soil, however, the latite derived soils are slightly acidic and have a lower fertility and higher susceptibility to erosion than is normally associated with basaltic soils*…"

Figure 3 shows geological variations within and around the Boral Landholding: The simplified bedrock geology is described as "*Permian sedimentary rocks and minor volcanics, including sandstone, Conglomerate, Shale and Coal Measures*". Bedrock within the alignments of Frazers and Rocklow Creeks are described as "*Quaternary alluvial and colluvial fan. Fluvial sand, silt, gravel and clay*".

1.1.4 Topography

The site has a maximum elevation of approximately 164mAHD, reducing to approximately 10mAHD at the eastern margin of the extraction and stockpiling area, and 2mAHD at the weighbridge and office complex (Corkery & Co, 2003). Topography in the proposed soil and vegetation translocation sites range from level to gently inclined. Aspect varies from north-east, to south-west, depending on the location of the proposed soil and vegetation translocation areas.

Tributaries of Frazers Creek flow downslope past the northern side of the quarry and tributaries of Rocklow Creek flow past the southern side. Although the creeklines have been disrupted by excavation, infilling and dam construction, there are several complete, continuous patches of riparian vegetation following some sections of creekline.

1.1.5 Vegetation

Vegetation on proposed soil and vegetation translocation areas

Vegetation on the proposed soil and vegetation translocation areas mainly consist of areas of grazed non-native grassland. The grassland patches mostly consist of a mixture of exotic grasses and forbs, especially Kikuyu (*Cenchrus clandestinus*), Clover (*Trifolium* species), Paspalum (*Paspalum dilatatum*), Paddys Lucerne (*Sida*

rhombifolia) and Plantain (*Plantago lanceolata*). Couch (*Cynodon dactylon*) and a sedge (*Carex longebrachiata*) are the most commonly occurring native species within these patches.

Vegetation on proposed disturbance site

Vegetation on the disturbance site includes a complete, continuous patch of the Critically Endangered Ecological Community *Melaleuca armillaris* Tall Shrubland in the Sydney Basin Bioregion, which is listed under the NSW *Biodiversity Conservation Act 2016* (BC Act). This patch includes populations of the Endangered plant species Illawarra Zieria (*Zierira granulate*). A small population of the Illawarra Irene (*Irenepharsus trypherus*), occurs on the southern upper slopes of the disturbance site, growing within a vegetation gradient between *Melaleuca armillaris* Tall Shrubland and the Warm Temperate Rainforest downslope. Further downslope of the disturbance site on the lower slopes and in drainage creeklines support remnant Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion an Endangered Ecological Community. The rainforest patches contain habitat for the threatened species White-flowered Wax Plant (*Cynanchum elegans*), Illawarra Socketwood (*Daphnandra johnsonii*), and the Illawarra Irene (*Irenepharsus trypherus*).

In more exposed locations, patches of the Endangered Ecological Community Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion also occur.

Several plant species of regional significance (DECCW, 2011) were recorded in or near the proposed disturbance site, including native Holly (*Alchornea ilicifolia*)*, Homalanthus stillingifolius* and Sticky Hop- bush (*Dodonaea viscosa* subsp. *Angustifolia*), in vegetation patches which occur in gradients between *Melaleuca armillaris* Tall Shrubland and Illawarra Subtropical Rainforest and *Geijera salicifolia*, *Actephila lindleyi* , Coast Canthium (*Cyclophyllum longipetalum*)*,* Oliver's Sassafras (*Cinnamomum oliveri*) and *Deeringia amaranthoides* growing in Illawarra Subtropical Rainforest.

Conservation significance

SKM (1994), written prior to current legislation, comments that "…..*The Dry Rainforest map unit is of high conservation significance due to its restricted distribution in the Illawarra area*". Mills (1988) records that Illawarra rainforests support a high number of botanically significant and rare plant species. Floyd (1990) records that this rainforest type (Subtropical Rainforest Suballiance 14)" *is inadequately conserved in the Illawarra region…"*. Melaleuca scrub dominated by *Melaleuca armillaris* is described as *"…. widespread but inadequately conserved in New South Wales…*." (Benson 1989). The occurrences in the Kiama district are of interest as they occur on latites and not coastal sands and they provide habitat for a number of plant species uncommon elsewhere in the Illawarra district. The example present on the Quarry disturbance site has been affected by past disturbance including tracks and drill sites and by a high fire frequency which has reduced species diversity over much of the area (see SKM 1994).

SKM (1994) observe that "…. *Dry Rainforest Dry Rainforest of the Fig - Whalebone Tree - Stinging Tree Olive Plum sub-alliance occurs in gullies to the north and south of the proposed quarry extension*….." According to Floyd (1990) this vegetation type conforms with the description of Dendrocnide – Ficus Alliance Sub-alliance No. 14. Floyd (1990) suggested that all patches of subtropical rainforest which occurred in the Illawarra was "….*probably logged for Toona about 150 years ago*….".

1.1.6 Approved extent of disturbance

According to EMM (2023), there will be a direct impact to 7.65 hectares of land along the north-west margins of the existing quarry, as well as indirect impacts to an estimated 1.03 ha of land downslope of the disturbance site.

A complete, continuous patch of native vegetation currently covers most of the disturbance site. The vegetation is mostly homogeneous and consists of the Critically Endangered Ecological Community *Melaleuca armillaris* Tall Shrubland in the Sydney Basin Bioregion, which is listed under the NSW *Biodiversity Conservation Act 2016* (BC Act). Immediately downslope the vegetation consists of gradients between two vegetation types which are listed as Critically Endangered Ecological Communities according to the Commonwealth EPBC Act:

- Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion; and
- Illawarra and south coast lowland forest and woodland ecological community.

Equivalents of these two vegetation types are listed as Endangered Ecological Communities, according to the NSW BC Act:

- Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion; and
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion

The patch of *Melaleuca armillaris* Tall Shrubland which is proposed for removal includes a population (1381 ramets) of the Illawarra Zieria (*Zieria granulata*), which is listed as Endangered according to the Commonwealth EPBC Act and the NSW BC Act.

1.2 Consultation

Version 3 of this VTP was provided to The NSW Department of Planning and Environment (DPE) and to the Biodiversity, Conservation and Science group of the NSW Department of NSW Department of Climate Change, Energy, the Environment and Water (BCS) for their review. Comments were received on the VTP in October 2024 and the VTP was then updated to version 4 to address the comments.

Additionally, in accordance with Condition of Approval 50B, version 4 of this Plan was provided to the Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) and again to BCS in November 2024. This version 5 of the VTP addresses comments provided by BCS on version 4 in December 2024.

Consultation with BSC and the Commonwealth was undertaken through the Major Planning Portal. As the period for comment was coming to an end (11th December 2024), follow up was undertaken with DCCEEW. DCCEEW advised that they were not able to locate the VTP issued for comment.

As of the date of publication of V5, no comments or feedback have yet been received from the Commonwealth DCCEEW.

Details of this consultation process and Boral's responses to any comments are provided in Appendix A.

1.3 Review

Unforeseen changes in the ecology of the site or changes to best current knowledge may trigger the need to make changes to the Plan in the future. This adaptive capacity between ongoing monitoring and management has been incorporated as part of this Plan. New data that may arise through ecological monitoring activities or advances in current technology or best practice management methods can be included in the ecological management of the translocation areas and adaptive measures can be formulated. The review process will be conducted in accordance with the requirements of the relevant government agencies.

1.4 Purpose of this Plan

The purpose of this Plan is to set out the locations and methods to be utilised for the translocation of vegetation (*Melaleuca armillaris* Tall Shrubland) and topsoil from the Dunmore Quarry modification 13 expansion area. This will also include the translocation of Illawarra Zieria (*Zieria granulata*).

This action is intended to act as a mitigation to the proposed works. It is not intended to act as a biodiversity offset.

The overall conservation objectives for the soil and vegetation translocation areas are:

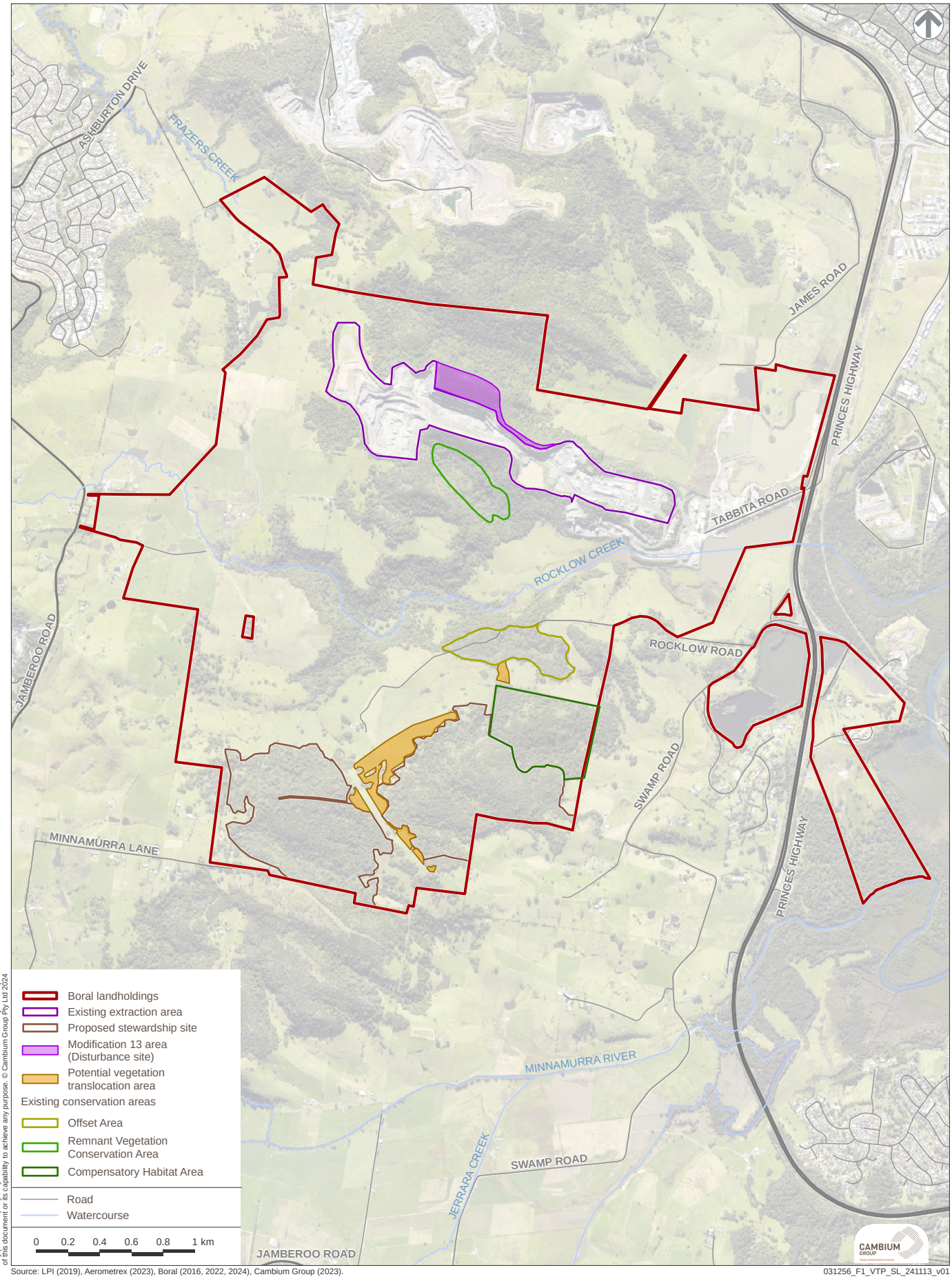
- to ensure the soil and vegetation translocation areas are revegetated with the appropriate suite of species and structure so that the original vegetation is, as far as possible, re-established as a self-

supporting ecosystem which provides shelter to the adjacent vegetation and habitat for native fauna species.

- to ensure that the existing vegetation edge as well as the new revegetation areas are not degraded by weeds or feral fauna infestations which could compromise their ecological integrity; and
- to carry out regular monitoring and maintenance works to ensure that the objectives are achieved in the long term.

Figure 1
Site layout

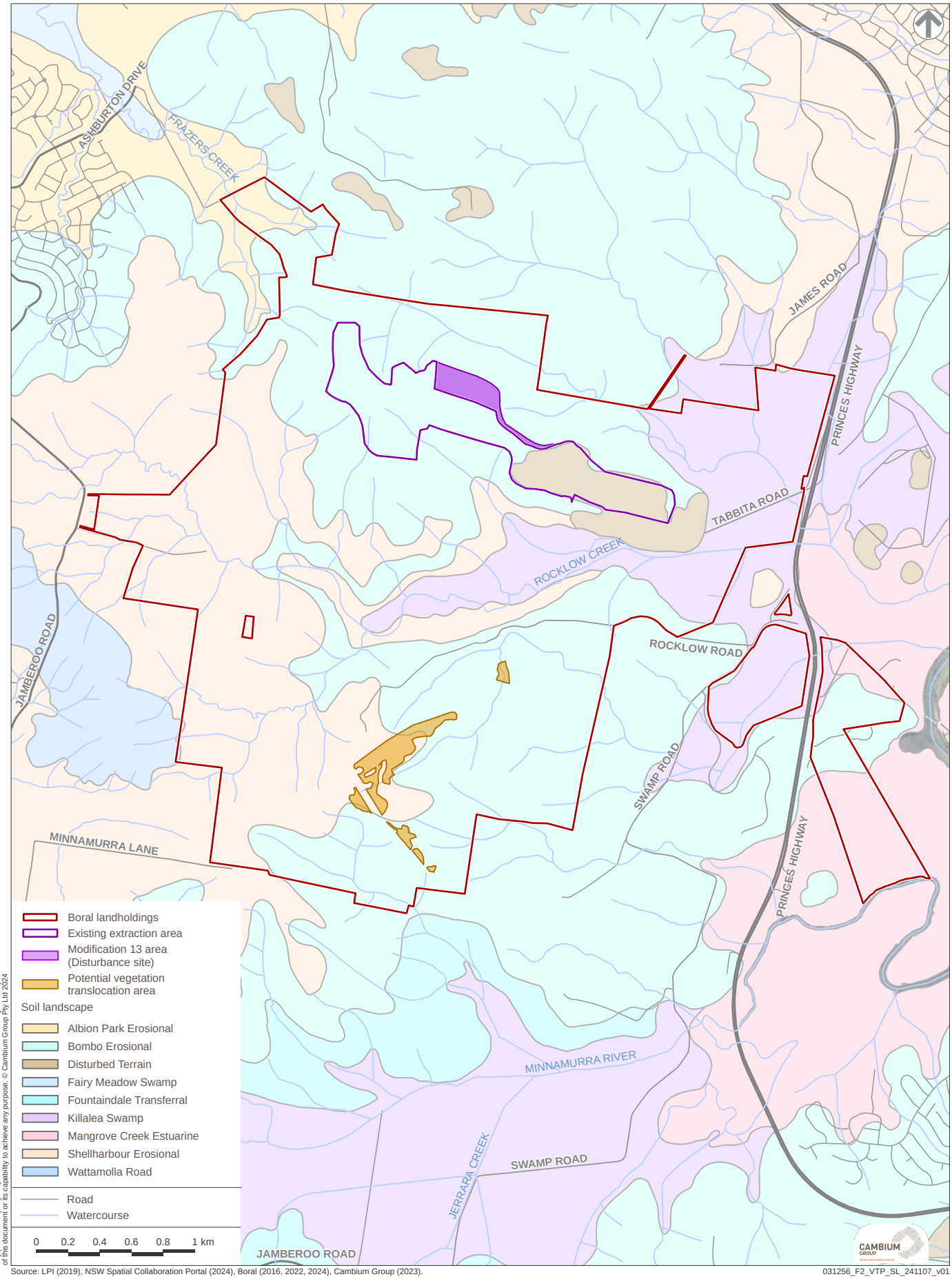
DUNMORE HARD ROCK QUARRY
VEGETATION TRANSLOCATION PLAN



Source: LPI (2019), Aerometrex (2023), Boral (2016, 2022, 2024), Cambium Group (2023).

Figure 2
Soil landscapes across the locality

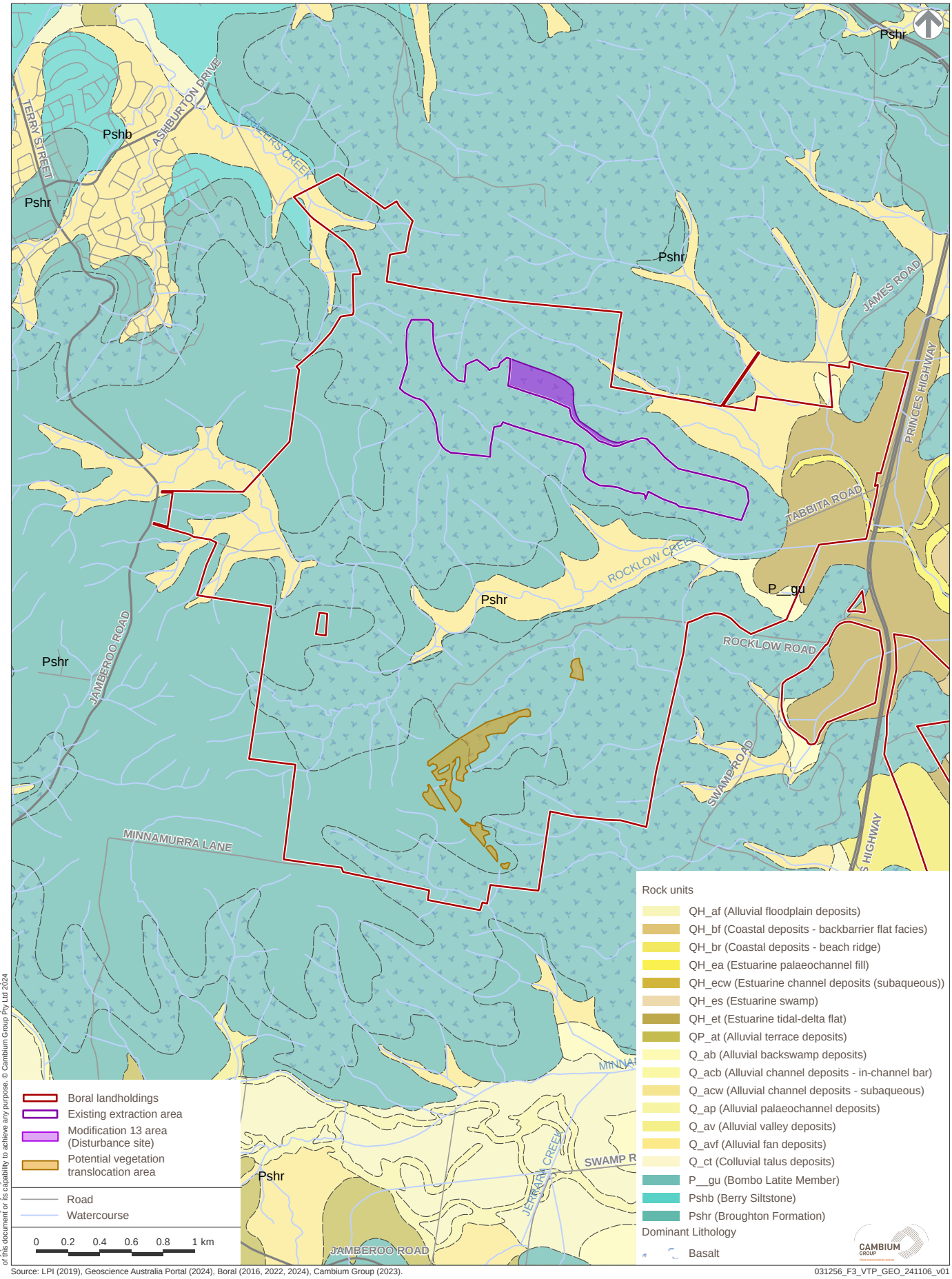
DUNMORE HARD ROCK QUARRY
VEGETATION TRANSLOCATION PLAN



Source: LPI (2019), NSW Spatial Collaboration Portal (2024), Boral (2016, 2022, 2024), Cambium Group (2023).

Figure 3
Geology across the locality

DUNMORE HARD ROCK QUARRY
VEGETATION TRANSLOCATION PLAN



Source: LPI (2019), Geoscience Australia Portal (2024), Boral (2016, 2022, 2024), Cambium Group (2023).

2 TRANSLOCATION AREAS

2.1 Site survey

Surveys were carried out in October 2023 to select appropriate translocation areas. Figure 4 shows the areas found to be suitable candidate area for the soil and vegetation translocation. The entire Boral Landholding was traversed on foot or by car to investigate suitability for receiving areas for *Melaleuca armillaris* Tall Shrubland based on:

- location currently comprising of non-native vegetation;
- evidence of previous occupation by similar vegetation; *i.e.* either occurrence of representative species, or nearby presence of *Melaleuca armillaris* Tall Shrubland, and/or Illawarra Zieria, Exposed Bumbo latite, as well as suitable topography and aspect;
- evidence of suitable soils, those derived from decomposed Bumbo Latite, and other environmental conditions;
- proximity to existing vegetation patches with representative species and also the potential to increase connectivity locally;
- consideration was also given to the logistics of moving the material from the disturbance site, where the storage and relocation effort could be minimised; and
- overall conservation benefit, where connectivity and long-term security and ecological improvements would be maximised.

2.2 Selected Translocation Areas

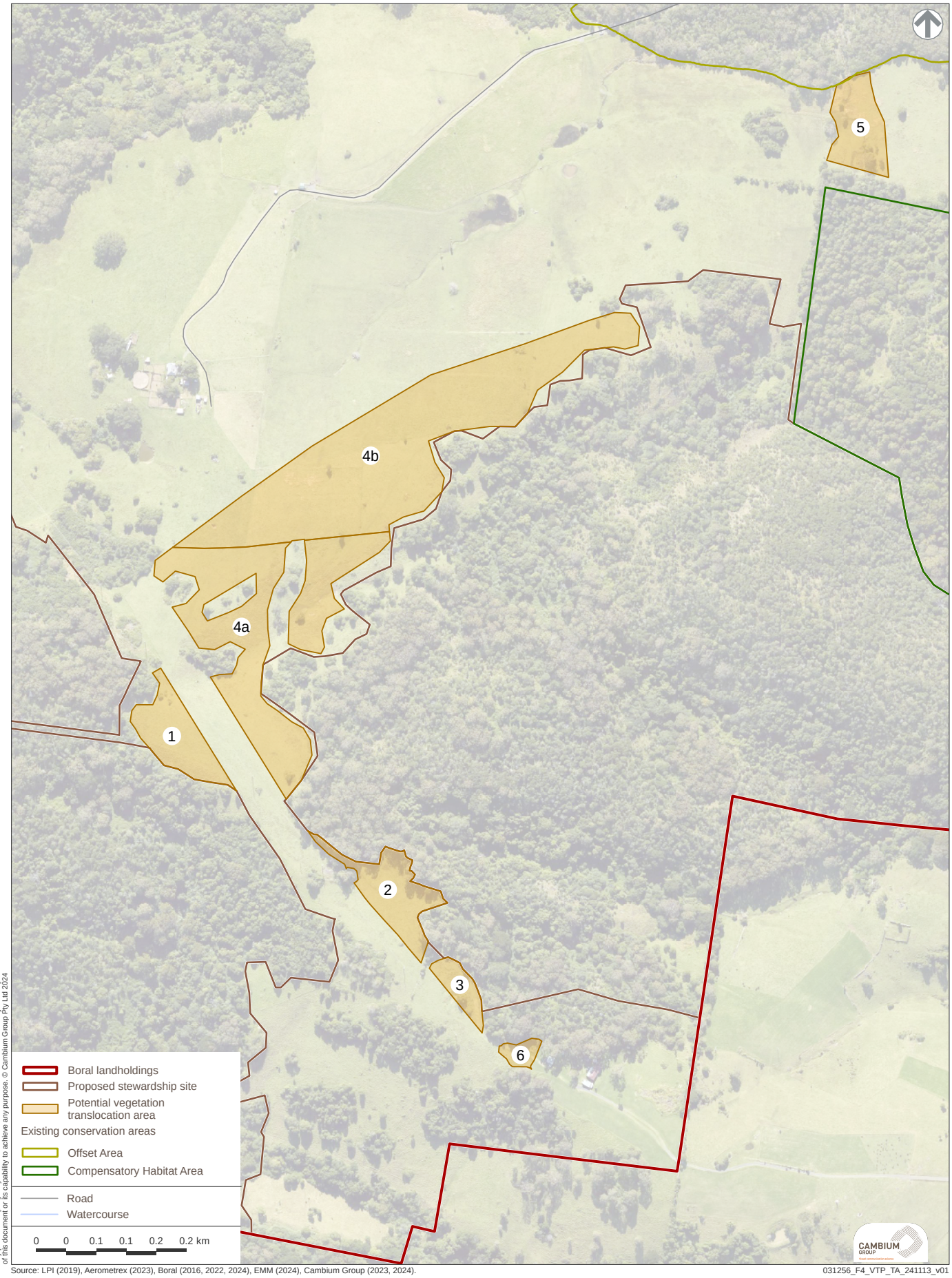
The selected translocation areas (Areas 1-6) are located 2.5 km to the south of the proposed disturbance site are directly adjacent to the proposed Biodiversity Stewardship Site. These areas potentially increase connectivity between extant vegetation as well as existing offset/conservation areas and soil and vegetation translocation areas (Figure 4).

These areas are all directly adjacent to existing *Melaleuca armillaris* Tall Shrubland and extensive populations of Illawarra Zieria, they are all located on exposed Bumbo latite, have suitable topography and aspect and are all currently non-native vegetation. The translocation areas will require road transport of the soil and vegetation material.

The translocation areas are shown in Figure 4 and the characteristics of each soil and vegetation translocation area are outlined below.

Figure 4
Translocation areas

DUNMORE HARD ROCK QUARRY
VEGETATION TRANSLOCATION PLAN



Source: LPI (2019), Aerometrex (2023), Boral (2016, 2022, 2024), EMM (2024), Cambium Group (2023, 2024).

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2.2.1 Area 1

Location: On ridgeline upslope of 'Rocklow', to the south of the powerline easement, adjacent to a fenced area with extensive patches of *Melaleuca armillaris* Tall Shrubland with populations of *Zieria granulata*.

Lot 2, DP 598671, and also includes an unformed crown road. Aspect: north-easterly

Topography: gently inclined. Exposed Bumbo latite shelves

Area 1 is approximately 0.9 hectares.

Vegetation: mostly exotic grassland/forbland. Adjacent to extensive patch of *Melaleuca armillaris* Tall Shrubland in fenced area.

Connection: existing edge would be supplemented and protected. Planting to match adjacent vegetation, mainly consisting of *Melaleuca armillaris* Tall Shrubland in various stages of regrowth.

2.2.2 Area 2

Location: On ridgeline upslope of 'Rocklow', to the south of the powerline easement, adjacent to a gradient between *Melaleuca armillaris* Tall Shrubland with populations of *Zieria granulata* close to the cliff edge and components of Redgum woodland along vegetation edges.

Lot 2, DP 598671.

Aspect: southerly

Topography: level to gently inclined. Exposed Bumbo latite shelves

Area 2 is approximately 0.9 hectares

Vegetation: mostly exotic grassland/forbland, with patches of shrubland and paddock trees. Grassland includes high representation of the native sedge *Carex longebrachiata*.

Connection: existing edge would be supplemented and protected. Planting to match adjacent vegetation, mainly consisting of *Melaleuca a*rmillaris Tall Shrubland in various stages of regrowth or Red Gum Woodland.

2.2.3 Area 3

Location: On ridgeline upslope of 'Rocklow', to the south of the powerline easement, adjacent to a gradient between *Melaleuca armillaris* Tall Shrubland with populations of *Zieria granulata* close to the cliff edge and components of Redgum woodland along vegetation edges.

Lot 2, DP 598671.

Aspect: southerly

Topography: level to gently inclined. Exposed Bumbo latite shelves

Area 3 is approximately 0.3 hectares

Vegetation: mostly exotic grassland/forbland, with patches of shrubland and paddock trees. Grassland includes high representation of the native sedge *Carex longebrachiata*.

Connection: existing edge would be supplemented and protected. Planting to match adjacent vegetation, mainly consisting of *Melaleuca armillaris* Tall Shrubland in various stages of regrowth or Red Gum Woodland.

2.2.4 Area 4

Location: South of Rocklow Creek Road, following an area with evidence of cleared Melale*uca armillaris* Tall Shrubland. Revegetation of this cleared area would link existing vegetation to north and south.

Lot 1, DP 770101; Lot 2, DP 195658; Lot 3 DP, 195658 and Lot 2, DP 598671.

Aspect: easterly

Topography: gently inclined. Exposed Bumbo latite shelves

Area 4 is approximately 9.3 hectares. This area is split into Areas 4a (approx. 3.5 ha) and 4b (approx. 5.7 ha) along an existing paddock fenceline. This split enables prioritisation of these areas for translocation while also considering existing grazing arrangements.

Vegetation: mostly exotic grassland/forbland. *Melaleuca a*rmillaris Tall Shrubland in various stages of self-recruitment to north and south.

Connection: regrowth woodland and shrubland, containing components of Mel*aleuca armillaris* Tall Shrubland at both ends of proposed Area.

2.2.5 Area 5

Location: South of Rocklow Creek Road, following an area with evidence of cleared *Melaleuca armillaris* Tall Shrubland. Revegetation of this cleared area would link existing vegetation to north and south.

Lot 5, DP 431183

Aspect: easterly

Topography: gently inclined. Exposed Bumbo latite shelves

Area 5 is approximately 0.8 hectares.

Vegetation: mostly exotic grassland/forbland. *Melaleuca armillaris* Tall shrubland in various stages of self-recruitment to north and south.

Connection: regrowth woodland and shrubland, containing components of *Melaleuca armillaris* Tall Shrubland at both ends of proposed Area.

2.2.6 Area 6

Location: On ridgeline upslope of ‘Rocklow’, to the south of the powerline easement, and near gateway entrance to adjacent property.

Lot 2, DP 598671.

Aspect: southerly

Topography: level to gently inclined. Exposed Bumbo latite shelves

Area 6 is approximately 0.1 hectares.

Vegetation: mostly exotic grassland/forbland, with Scattered mature Eucalyptus species and adjacent to a gradient between *Melaleuca armillaris* Tall Shrubland with populations of *Zieria granulata* close to the cliff edge and elements of subtropical Rainforest.

Connection: existing edge would be supplemented and protected. Planting to match adjacent vegetation, mainly consisting of *Melaleuca armillaris* Tall Shrubland in various stages of regrowth or Red Gum Woodland.

2.3 Preferred translocation areas and sequencing

It is unlikely that, given the shallow soils at the disturbance site, there will be sufficient soil and vegetation resources to translocate across all areas outlined above. The areas have therefore been numbered according to the preferred sequencing of translocation. Additionally, Area 4 has been split into Area 4a and 4b, with Area 4b being of low priority due to the likely impact on the neighbouring leaseholder.

As an initial step, Areas 1-3 will be prepared for translocation (see Section 4), followed by (depending on resource availability), Areas 4a and 5, and then Areas 4b and Area 6

3 DISTURBANCE SITE TRANSLOCATION ACTIONS

3.1 Vegetation pre-clearing

Pre-clearing surveys have been undertaken to:

- identify and map all weed species (Ecoplanning, 2024a); and
- identify key habitat features (Ecoplanning, 2024b).

Additional pre-clearing surveys will be undertaken within 48 hours prior to clearing and will involve:

- the supervisor, operator and environmental advisor are to walk the clearing footprint prior to commencing clearing; and
- the project ecologists will capture and/or remove fauna that have the potential to be disturbed as a result of clearing activities and relocate identified fauna into bushland along the southern border of the Boral landholdings.

3.2 Collection of propagules

Propagules have been collected from the disturbance site and provided to a bush regeneration nursery for propagation and use in the translocation areas.

3.2.1 Provenance

If additional propagules are required, all collected propagules must consist of local provenance stock. Provenance refers to where the propagules or seeds come from. In accordance with best practice standards, all plants (or the propagules used to grow them) need to be sourced from nearby areas that have the same plant community, landforms, soil landscapes, soil types and weather conditions (Buchanan 2009).

Groundcovers, shrubs and trees, if required, will be collected preferentially from adjacent Boral properties or other patches of similar vegetation within the latite hills to the south, west and north of the Dunmore quarry (Ideally, within a 5km radius). Native grasses typically have much larger dispersal ranges and can be collected from further away (e.g. <10 km).

3.2.2 Record keeping

Record keeping of seed collection and planting locations should follow the Flora Bank guidelines (Mortlock 2000). A Scientific Licence under part 2 of the NSW Biodiversity Conservation Act will be required for the seed collectors to undertake seed collection or bush regeneration works.

3.3 Collection of habitat items

Rocks and boulders, logs, hollow-bearing tree sections (if present) will be collected and placed without delay onto the surface of translocation areas. No hollows or nests were observed during pre-clearing surveys (Ecoplanning, 2024b).

3.4 Weeds

Any weeds and their propagules will be mechanically removed from the site, prior to vegetation clearing. Where this is not possible, bush regeneration techniques such as cutting and painting etc. will be used. This will ensure that the introduction of weed propagules into mulched plant material is minimised.

3.5 Mulching of existing vegetation

After the collection of seeds and propagules, and mechanical removal of all weeds, all the native vegetation, including *Melaleuca armillaris*, eucalypts, Illawarra Zieria and other shrubs, forbs, grasses are to be mulched, ideally with a small, tracked trittering machine (or similar), such as a skid steer manually operated or remote controlled. The mulched material will be then translocated with the soil and other material.

3.5.1 Timing of mulching

Mulching will ideally occur after flowering of the *Melaleuca armillaris* and Illawarra Ziera or late December through to March. The seed contained in capsules / pods on the trees and shrubs mulched will be therefore maximised. This timing will also maximise the fresh seed in the soil.

3.6 Treatment of topsoil

Topsoil is a valuable resource for revegetation and rehabilitation of habitats. Theoretically, the soil below native vegetation often contains propagules (seeds, rootstock) useful for revegetation areas, as well as an ecosystem of beneficial organisms, especially Vesicular-arbuscular (VA) mycorrhizal fungi (see Jasper 1995). For this this plan, the transference of seed from the threatened Illawarra Zieria is also likely to occur in the soil and other material. The ecosystem of soil micro-organisms is also valuable for its role in mineralising nutrients from soil organic matter and therefore making them available for plant uptake and growth. Tozer, Simpson, Berin, Mackenzie and Blanche (2011) comment that: "….*We conclude that topsoil translocation can play a valuable role in restoring plant species diversity to degraded sites. Propagation and planting alone would not effectively replicate the range of species establishing at our sites, nor would the selection of species take into account species only resident in the soil seed bank. Conversely, sites restored by topsoil translocation alone are unlikely to resemble reference sites in the short term without supplementary seeding or planting, and the provision of appropriate germination cues*. "

One observation by Tozer et al. (2011) is also supported by other research (see Gentili et al. 2020; Piqueray, Gilliaux, Wubs. and Mahy 2020) : "….*Restoring topsoil without delay is most likely to maximise the resemblance of restored and reference sites….".* Tozer et al. (2012) identify potential logistical constraints associated with topsoil translocation for revegetation and make the following recommendations:

- direct return of topsoil requires that stripping and restoration are occurring simultaneously in different parts of the project;
- the arrangement of topsoil in low, narrow, provenance-specific windrows requires considerably more space and planning than a typical engineering project to ensure that the correct topsoil is accessible for restoration when required; and
- poor communication and supervision can result in outcomes that are completely inappropriate for the establishment of native species, thus negating the value of topsoil as a seed source. For example, poor spreading configuration, soil compaction, and excessive use of mulch may result in very poor establishment of native species.

3.6.1 Stripping of topsoil

Topsoil is the top layer of natural surface soil with the characteristics enabling vegetation growth. The appropriate depth of topsoil proposed for translocation should include the main plant root zone, to a depth of 300 – 500mm (or as deep as possible noting that *Melaleuca armillaris* Tall Shrubland is likely to have a skeletal topsoil layer). It is likely that the subsoil, below the main area of root zone will also contain some of the physical and chemical properties of topsoil, moreover the subsoil will also contain larger soil particles and small rocks which will improve the germination conditions of the translocated topsoil (see Piqueray, Gilliaux, Wubs and Mahy 2020).

Once stripping of topsoil commences, the ideal depth of soil to be stripped will be determined by a suitably qualified staff member. It is likely that the ideal depth of topsoil will vary throughout the disturbance site.

The aims of topsoil removal and translocation includes:

- the conservation of soil resources;
- the avoidance of damage to soil structures;
- the maintenance of soil drainage;
- the reinstatement of the soil profile; and
- the preservation of soil biodiversity

3.7 Mixing of translocated material

The topsoil, mulched vegetation, logs, roots and subsoils/rock will be collected together for delivery to the translocation areas. When collected together and roughly placed at the receiving sites, mixing during the removal, transportation and placement will not only transfer the abiotic and biotic material but will likely create a suitable microclimate, with air spaces, shading etcetera to best promote the growth of the *Melaleuca armillaris* Tall Shrubland components include the threatened Illawarra Zieria.

4 PREPARATION OF THE TRANSLOCATION RECEIVING AREA(S)

A well-prepared receiving area will provide the best conditions for plant germination, survival, and growth. Translocation areas 1 to 4 were inspected on November 5, 2024, to examine the appropriate options for site preparation. Pasture grasses, especially Kikuyu (*Cenchrus clandestinus*), Clover (*Trifolium* spp.) and Paspalum (*Paspalum dilatatum*) occur, often in dense swards over most of the translocation areas. Topsoil averages 5 to 15 cm deep and is underlain by a fractured rock and subsoil derived from the bedrock. The topsoils are typical of the surrounding area are basaltic in appearance, formed in situ from latite parent material. The topsoil is slightly acidic.

4.1 Surface preparation prior to translocation

Consideration was given to the most suitable method for site preparation at the translocation areas. Methods considered included chemical weed control, topsoil scalping and topsoil ripping. The suitability of each method is outlined in Table 1, with chemical weed control recommended as the most suitable method for surface preparation at the translocation areas.

Table 1 Methods and suitability for surface preparation at the translocation areas

Method	Suitability
Chemical weed control **Recommended**	The preferred method chosen for surface preparation is chemical weed control by spaying with glyphosate. This method will kill most of the pasture and the roots within the topsoil reducing pasture weeds from the existing topsoil, therefore reducing their ability to push through the translocated material in the future. Placement of material directly following weed control will not impact the ability to plant tubestock into the area or prevent vegetation roots penetrating the original surface.
Topsoil scalping	Topsoil ripping can be beneficial on compacted soils and on steep slopes and is best used where pasture is unlikely to regenerate from the ripped surface. The translocation areas are on gentle slopes and contain soils that are not compacted. Additionally, Kikuyu and its roots are present throughout the topsoil profile and ripped Kikuyu would regenerate from the nodes creating new plants that would require control. Accordingly, no ripping of the soil in preparation for receiving material from the disturbance site is proposed.
Topsoil ripping	Topsoil scalping removes the pasture and topsoil over much of the site using a grader or similar machinery. This method is most effective where topsoils are deeper then 15cm or where subsoils are similar to the topsoil. Scalping is not a recommended method as the topsoil is shallow and is also viewed as a valuable resource to sit below the translocated material, allowing better drainage and root penetration for the potential regenerating community.

The objectives of chemical weed control are:

- to minimise, as far as possible, the presence of weeds in the timeframe available prior to translocation; and
- limit and control propagules from the prepared surface pushing through the translocated material.

This will require a staged and adaptive management approach. Weed management in the translocation areas will commence prior to translocation operations and subsequent, ongoing weed control will be important to the successful establishment of the translocated vegetation as outlined below.

4.1.1 Weed management prior to translocation

The total elimination of all weeds in any timeframe is unlikely. However, the following steps will be undertaken, at a minimum, prior to placement of translocated material in the translocation areas with the associated performance measures and timing shown in Table 2.

1. initial spray - spray translocation area with glyphosate at the manufacturer recommended rates;
2. monitor - pasture species such as grasses will be easily identified as dead or dying after 10 days from spraying, however, a further two weeks is recommended following the initial 10 day period to allow the easy identification of areas where alive plants are present;
3. respray - at 24 days from initial spraying, if living plants are present a second round of control will be applied and left for a minimum of 1 day to allow the chemical to be absorbed into plants; and
4. placement of translocated material - the translocated material including mulch will assist in smothering potential weeds.

Table 2 Weed management for site preparation – performance measures and timing

Action/performance measure	Timing
Initial control has been undertaken	Day 0
Monitoring event – RVA (see Appendix D)	Day 24 or later
Follow up application on any alive plants allowed to be absorbed into plants for 1 day.	Day 24 or later
a) Apply translocated material on areas with no living weeds; or b) on areas following follow up application	a) Day 24 or later; or b) Day 25 or later

4.1.2 Weed management after translocation

The second phase of adaptive weed management will involve monitoring weeds in the translocation area following the placement of translocated material and control using bush regeneration techniques. Appendix B provides details on weed species and control techniques to be implemented at the translocation areas and details of the monitoring program are provided in Appendix D.

Weed hygiene protocols will be implemented for vehicles and machinery entering both the disturbance site and the translocation receiving sites. This includes wash-down procedures to all plant and machinery.

Management of adjacent, conserved vegetation has been carried out (see Good Bush 2019) and will be ongoing, as a component of this Plan.

4.2 Fencing

Access to the translocation areas must be appropriately managed using perimeter fencing. Unauthorised access to ecologically sensitive areas can lead to the deliberate or accidental damage to the values of these areas. Given the location of the translocation areas within a combination of native vegetation patches, managed grazing lands and a hard rock quarry, particular attention will need to be paid to controlling access (therefore damage) from differing adjacent land uses. A number of detrimental human activities may increase their existing impact on ecological features. These are expected to include (but not be limited to):

- unauthorised vehicle access;

- rubbish dumping;
- encroachment by feral animals; and
- damage or removal of native plants and animals.

Appropriate fencing types and materials are described in Biodiversity Conservation Trust (2020). Only Wildlife Friendly Fencing should be installed *i.e.* no barbed wire on top and bottom strands and no netting.

Temporary fencing may be installed during site preparation and placement of translocation materials. Once translocation materials have been placed exclusion perimeter fencing is to be placed around the extent of land that have received translocation materials.

4.3 Translocated material

4.3.1 Stockpiling of translocated material

The translocated material will consist of a mix of topsoil, subsoil, plant material and mulch. This material will be transported to and spread on translocation areas as soon as possible. Ideally material will be translocated the same day of extraction. Stockpiling of topsoil will have a harmful impact on VA mycorrhizal fungi and other soil micro-organisms, especially if the soil is moist (see Harris, Hunter and Birch 1987; Miller, Carnes and Moorman 1985). Therefore, soil will not be stockpiled or retained/stored in trucks for any longer than 2 days.

4.3.2 Placement of translocated material

The blended material soil, subsoil , mulched vegetation and other debris from the disturbance site, will be spread at an average depth of approximately 80 to 100 mm. Deeper areas may be created to allow the surface to be uneven, so that micro-habitats are available for soil organisms. Debris collected from the proposed disturbance site, i.e. rocks, logs and branches will be spread across the surface of the translocation area as soon as possible after the translocated material has been spread. The spreading of translocated material and debris will be carried out using small machinery using methods that reduce compaction (such as a bob cat reversing and shaking the material from its bucket).

Depending on weather conditions, irrigation should be carried out after the soil translocation has been completed.

5 REVEGETATION

This section identifies actions that would assist the translocation works, should the topsoil translocation not be achieving the intended outcomes. These revegetation planting actions are ones which are to be considered if recruitment from the topsoil translocation require supplementation. However, for clarity, these actions should not be considered to be compulsory.

5.1 Revegetation by seed

Revegetation by seed and cuttings is an appropriate component of the long-term revegetation programme, although it will be necessary to purchase plants for planting in areas where revegetation is an immediate priority. Seed collection, however, may be included within the revegetation programme to provide replacement plants for planted specimens which haven't survived the first year.

5.2 Plantings

Plantings will be required during the establishment phase to supplement natural self-recruitment. The translocation areas will be monitored to determine the extent of natural self-recruitment. Additional planting will be carried out in significant gaps in plant cover, and will include suitable plant species which are typical of the vegetation type which is developing (see Table 3).

Planting of tube-stock for trees and shrub species and Hiko or Viro cells for grasses and other groundcover species is the preferred method. Planting will be done by use of a low impact method such as hand digging or hand auger. The holes dug for each tubestock should be at least 1.5x the width and 2x the depth of the root-ball.

Water crystals or wetting agents can be added to each plant hole if the season is dry. This will increase the water holding capacity of the soil and reduce watering schedules. Initial irrigation of the tubestock is not needed if plantings are undertaken before sufficient rainfall. However, in dry conditions, irrigation might need to be undertaken for at least 4-6 weeks following planting to aid establishment of the plants.

Tree guards will need to be installed on each shrub to protect seedlings from extreme weather (frosts and heat), herbivorous grazing and herbicide drift during maintenance. Bio-degradable tree guards are recommended to protect the seedlings.

Mulch is a consideration as part of any revegetation works. Mulch provides organic matter to the topsoil, improves soil structure and aeration, water infiltration, nutrient availability, and is also useful in the suppression of weed growth (Buchanan 2000). Mulch obtained from the disturbance site will be incorporated into the translocated material. If additional mulch is purchased from outside sources, it should comply with the requirements of Standards Australia (2012) Composts, Soil Conditioners and Mulch. The material must be free of weeds and pathogens.

Planting of additional species will be carried out in areas where self-recruitment of native species has not been successful. Species selection will relate to the vegetation type proposed for the translocation area (i.e. *Melaleuca armillaris* Tall Shrubland). Initial planting will be carried out in the Autumn following the commencement of translocation ooperations. Based on monitoring a second planting will be undertaken within 12 months, to supplement vegetation structure and species richness.

Irrigation will be considered when required. Ideally, the translocation areas will be irrigated whenever there are indications of the topsoil drying out.

5.3 Species list

Table 3 provides a list of species suitable for planting within the proposed soil and vegetation translocation areas *Melaleuca armillaris* Tall Shrubland, with indicative planting densities. The species listed are:

- associated with *Melaleuca armillaris* Tall Shrubland;
- expected to be available as local provenance through seed collection and propagation or tubestock; and
- likely to have good survival rates in the translocation areas under the proposed site preparation and maintenance regime.

Where the species identified in this VMP cannot be sourced, they may be substituted for other local species as identified in the species lists for *Melaleuca armillaris* Tall Shrubland.

Trees must be substituted with trees, shrubs with shrubs etc. Horticultural varieties and cultivars are not acceptable under any circumstances.

Table 3 Recommended species list for revegetation planting and seed collection

Botanical Name	Common Name	Indicative Spacing
Acacia maidenii	Maiden's Wattle	1 per 5 m^2
Alphitonia excelsa	Red Ash	
Androcalva fraseri	Brown Kurrajong	1 per 5 m^2
Celastrus australis	Staff Climber	1 per 5m^2
Commelina cyanea	Scurvy Weed	
Dodonaea viscosa subsp. angustifolia	Sticky Hop Bush	1 per 10 m^2
Glycine clandestina	Glycine	2 per 1 m^2
Glycine tabacina	Love Creeper	2 per 1 m^2
Grona varians	Slender Tick-trefoil	2 per 1 m^2
Hibiscus heterophyllus subsp. heterophyllus	Native Rosella	1 per 5 m^2
Indigofera australis	Duwabili	1 per 5 m^2
Melaleuca armillaris	Bracelet Honey-myrtle	1 per 5 m^2
Prostanthera linearis	Narrow-leaved Mintbush	1 per 5 m^2
Zieria granulata	Illawarra Zieria	1 per 5 m^2
Themeda triandra	Kangaroo Grass	2 per 5 m^2
Poa labillardierei var. labillardierei	Common Tussock-grass	2 per 5 m^2
Microlaena stipoides	Weeping Grass	2 per 5 m^2
Sporobolus creber	Slender Rat's Tail Grass	2 per 5 m^2
Rytidosperma longifolium	Long-leaved Wallaby Grass	2 per 5 m^2

6 BUSHFIRE MANAGEMENT

The proposed translocation works will result in the establishment of patches of native vegetation, most of which will be connected to existing vegetation patches. Patches of *Melaleuca armillaris* Tall Shrubland will accumulate fuel loads which may eventually increase bushfire hazard. An uncontrolled bushfire may impact translocation areas. If a bushfire occurs in the first 5 years whilst the translocation areas are in the establishment phase an assessment of impact will be undertaken. Appropriate actions to meet the translocation objectives will be implemented.

6.1 Hazard Reduction Surrounding Translocation Areas

A 25 m wide easement for electricity runs adjacent to all areas except Area 5. This easement is managed by the electricity provider to protect its electricity assets. The easement is regularly inspected and cleared of woody vegetation as required and is maintained as an exotic pasture grassland. The easement is currently grazed reducing bushfire hazard. The easement is also useful for access for fire management. The translocation areas will not intrude upon asset protection zones for infrastructure or the hazard clearance zone for the electricity line.

Hazard reduction firebreaks approximately 10 m wide will be maintained either by grazing or slashing between the translocation areas and the grassland interface to protect the translocation areas from fire extending from the grassland.

6.2 Asset protection zone

Translocation Area 6 is outside of the asset protection zone of a dwelling on south-east location (Lot2//DP598671). However, this area is close to the asset protection zone. Areas 1 to 5 are approximately 12 ha and are the first areas to undergo the translocation process (Section 2.3). Given the size of Areas 1 to 5 there may not be enough material from the disturbance site to sufficiently cover these areas. It is unlikely that Area 6 will be used for translocation. In the unlikely event that Area 6 is required, then further assessment of the interaction between vegetation in the Asset Protection Zone will be undertaken in consultation with BCS.

6.3 Responsibility

Primarily the responsibility of the bushfire management and long-term conservation of the ecology of the buffer area will be the responsibility of Boral Resources and relevant sub-contractors.

6.4 Timing

No controlled fires are proposed. However, to allow for adaptive management, minor alterations can be made to initiate a controlled fire based on the requirements for both fire safety and for ecological management objectives. The fuel loads within all vegetation patches will be monitored annually.

7 MONITORING

A monitoring programme has been designed to assess the adequacy of the management actions in achieving the stated conservation objectives (Appendix D). The monitoring programme includes various data collection techniques to monitor the vegetation development towards completion criteria, and specifies triggers and remedial actions to allow for the adaptive management in implementing this Plan.

7.1 Monitoring objectives

The objectives of the monitoring program are to:

- record and document establishment of native vegetation (*Melaleuca armillaris* Tall Shrubland) at the translocation areas through comparison with baseline and/or reference data;
- record and document changes in the structure and function of native vegetation (*Melaleuca armillaris* Tall Shrubland) at the translocation areas through time;
- monitor the integrity of existing adjacent vegetation; and
- monitor bushfire risk by monitoring changes in fuel loads.

7.2 Timing

The frequency and timing of all monitoring activities is outlined in Appendix D. To allow for adaptive management and to optimise monitoring methods, minor alterations can be made to the implementation of the monitoring.

Maintenance and monitoring of the translocation areas will continue for a minimum of five years after commencement of the translocation project and then until completion criteria have been reached.

7.3 Reporting

A report outlining (as a minimum) the methods, results, an assessment of performance and recommendations must be submitted to Boral within three months of completion of the field surveys. This will allow for adaptive management and implementation of remedial actions in accordance with Table D. to improve biodiversity outcomes.

The outcomes of the monitoring, including progress of management actions and assessment of these against their stated objectives will be documented in the Annual Review.

Any records of Illawarra Zieria (*Zieria granulata*) recruitment within the translocation areas identified during monitoring will be recorded into NSW Bionet Atlas upon (if not earlier than) finalisation of reporting.

7.4 Responsibility

Monitoring the soil and vegetation translocation areas will be the responsibility of Boral Resources Environmental Advisor.

7.5 Review

The monitoring program in Appendix D will be updated as periodically to add details on the locations of the translocation areas, location of monitoring plots (once established) and record alterations to the proposed methods.

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APPENDIX A

Evidence of consultation

APPENDIX A: EVIDENCE OF CONSULTATION

Table A.1 Evidence of consultation

Comment	Response	Section updated
Department of Planning and Environment (referencing version 3) 11 October 2024		
…submit a revised VTP that:		
• reflects the status of the VTP as a post-approval implementation document, rather than its previous inclusion in the modification report for the project		Section 1.4
• uses committed language for tasks that must be undertaken. For example, instead of "should", the task description uses "will" or "must";	Updated	Throughout
• includes a more detailed description of the monitoring program, that incorporates: i. the collection of baseline data during the establishment of the translocation areas to support the future comparison of translocation areas and the analysis of any variation in the success of each area; ii. a plan to update the VTP with monitoring locations once translocation areas are established; iii. a more frequent monitoring protocol during the first 18 months after the translocation areas are established; iv. triggers for additional monitoring outside of the proposed annual monitoring; and v. the project position responsible for monitoring;	Updated	Section 7 and Appendix D
• includes a Trigger Action Response Plan that establishes how any actions identified by monitoring will be managed, including response times, review of effectiveness and closure of responses;	Updated	Appendix D
• requires the VTP annual report to be included in the Annual Review required by condition 9 of schedule 5;	Updated	Section 7.3
• adequately addresses the agency advice provided by the Department of Climate Change, Energy, the Environment and Water – Biodiversity Conservation Science group (BCS), including: • section 4.5 – specify what methods will be used if ripping is not possible rather than deferring this to further action in the future; • section 5.2 – provide a description of dimensions, location and vegetation in asset protection zones. The VTP refers to the Bushfire Management Plan (BMP). The BMP does not provide this information;	Updated	Section 4.1 Section 6

Comment	Response	Section updated
• does not include Areas 1-4 if these proposed translocation areas will no longer be included in the VTP as site options.	Updated	Section 2
Biodiversity, Conservation and Science Group of DCCEEW (referencing version 3)		
Prior to finalising the VTP, BCS recommends the following be addressed:		
the mulch indicated in section 4.1 is specified to be no deeper than 50-100mm	Updated	Section 4.3.2
the reference to a 132 licence is amended in section 4.2.2 to reference the *Biodiversity Conservation Act 2016*	Updated	Section 3.2.2
it specifies the measures that will be used if ripping cannon be used (section 4.5)	Updated	Section 4.1
it includes further description of the dimensions, location and vegetation in the asset protection zones surrounding the Boral properties (section 5.2)	Updated	Section 6
Biodiversity, Conservation and Science Group of DCCEEW (referencing version 4) 4 December 2024		
Weed control success for surface preparation: In section 4.5 of the previous VTP (OMVI, 2023) it identified that *site preparation should begin at least twelve months before seeding or planting*. In section 4.1 of the current VTP, chemical weed control is recommended, yet we could not find guidance around when this will occur and what level of weed control success is suitable as surface preparation. As site preparation is important for the translocation success, BCS recommends that section 4 and/or Appendix B of the VTP is updated to identify a goal that indicates weed control success for the completion of the surface preparation stage and that this goal is specific, measurable, attainable, relevant, and time-bound. Ideally this is also included as a performance measure in Table D2 of Appendix D.	Updated Additional detail provided on weed control for surface preparation including timing and performance measures. Requirements for post-translocation weed management and monitoring also updated in Appendix B and Appendix D	Section 4.1
Species list for revegetation planting and seed collection: The species list in Table 2 mostly reflects the *Melaleuca armillaris* Tall Shrubland (MaTS) plant lists from either the Final Determinations or associated Plant Community Type. However, there are some groups of plants missing from the list that can be easily grown from seed and have good success in revegetation such as many of the grass & grass-like growth form group. We request that they be included. We recommend that Native Daphne (*Pittosporum undulatum*) not be replanted as, while it can occur in MaTSs, it can aggressively compete with other regeneration.	Updated	Table 3
Weed management responsibility: The VTP is unclear regarding who will undertake weed management at the translocation sites.	Updated	Appendix B (Table B.1)

Comment	Response	Section updated
BCS recommends that the VTP is updated to specify who will undertake weed management (e.g. update section 2.2 and or Appendix B). We recommend that all weed management for the translocation area is undertaken by experienced bush regenerators. We note several references to bush regeneration contractors, but this seems limited to certain works (e.g. in Appendix B, section B3, “Creepers and climbers” and “Shrubs and climbers”).		
Illawarra Zieria recruitment recorded in Bionet: BCS requests that each Illawarra Zieria (*Zieria granulata*) recruitment within the translocation areas identified during monitoring is recorded into NSW Bionet Atlas upon (if not earlier than) finalisation of reporting (as per section 7.3). Ideally, update the VTP to reflect this, e.g. section 7 monitoring objectives and in Table D.1 Monitoring methods and timing.	Updated	Section 7.3 Appendix D (Section D1:, Table D.1)
Access to Weed Management Plan: in Appendix B the timing of weed management is determined by the schedules in a Weed Management Plan (WMP). BCS does not have the details of this WMP relevant to the VTP and request a copy of the WMP to provide comment as soon as practicable. We can finalise our advice upon review of the WMP.	Updated Appendix B updated to provide a Weed Management Plan for the translocation areas including additional details on weed control techniques and an adaptive management framework.	Appendix B

APPENDIX B

Weed Management Plan

APPENDIX B: WEED MANAGEMENT PLAN

B1: Purpose and scope

This Weed Management Plan has been prepared to:

- assess and monitor the distribution and abundance of Weeds of National Significance (WoNS) and NSW priority weeds at the translocation areas and along the edges of adjoining native vegetation;
- assess and monitor other weeds that pose a threat to the successful establishment of native vegetation in the translocation areas;
- outline weed control strategies and techniques to maximise the effectiveness of weed control while ensuring conservation objectives;
- provide an adaptive management framework to optimise weed control success through monitoring and forward planning; and
- ensure Boral meet legislative weed control, reporting and compliance.

B2: Weed species

The Australian Weed Strategy 2017-2027 (Invasive Plants and Animals Committee, 2016) translates higher level policies and strategies into nationally agreed principles, goals and priorities to guide weed management. Under the Australian Weeds Strategy, 32 introduced plants have been identified as Weeds of National Significance (WoNS) based on their invasiveness, potential for spread and environmental, social and economic impacts.

Under the Biosecurity Act, priority weeds in NSW are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

WoNS and/or priority weed species that occur throughout the Boral Landholdings and either occur within proposed soil and vegetation translocation areas or which may self-recruit include:

- *Asparagus asparagoides, Asparagus aethiopicus and Asparagus plumosus;*
- *Cestrum parqui* (Green Cestrum);
- *Lantana camara* (Lantana);
- *Rubus anglocandicans* (Blackberry) and other species within the *Rubus fruticosus* species complex;
- *Nassella trichotoma* (Serrated Tussock);
- *Araujia sericifera* (Moth Vine);
- *Senecio madagascariensis* (Fire Weed);
- *Lycium ferocissimum* (African Boxthorn);
- *Olea europaea* subsp. *cuspidata* (African Olive);
- *Ligustrum sinense* and *Ligustrum lucidum* (Privet);
- *Ageratina adenophora* (Crofton Weed);
- *Ricinus communis* (Castor Oil Plant);
- *Anredera cordifolia* (Madeira Vine);

- *Cirsium vulgare* (Spear Thistle); and
- *Opuntia stricta* (Prickly Pear).

In addition to the species listed above, other exotic grasses and forbs within the translocation areas could affect the success of vegetation establishment. The dominant species in these areas include *Cenchrus clandestinus* (Kikuyu), *Trifolium* spp (Clover) and *Paspalum dilatatum* (Paspalum), which often occur in dense swards over most areas of the proposed translocation areas.

B3: Weed management approach - the Bradley method

Weed management in the translocation areas aims to prevent, eradicate and contain priority weeds and to support regenerating native vegetation. Successful weed management will control dense infestations whist also containing the smaller outlying populations to ensure they do not become uncontrollable and impenetrable.

Where appropriate, weed management will follow the Bradley Method and use other techniques to promote natural regeneration described in Buchanan (2000) and Bradley (2002), summarised below:

- Where available, refer to best practice guidelines for individual weed species and apply these to the site bearing in mind that a) these guidelines are usually written from an agricultural perspective and so may need to be adapted to a natural setting and ecological outcome b) the potential for off- target damage.
- Ensure correct plant identification – many weed species are difficult to identify because they resemble native species or typically occur in a vegetative (*i.e.* non-flowering) form.
- Limit the creation of bare patches of soil and soil disturbance in general, since this will encourage weeds to establish and grow – do not create unnecessary tracks with vehicles or other machinery. As a first option for weed control, consider methods that don't use herbicide (*e.g.* hand pulling and crowning) and which cause very little soil disturbance.
- When using herbicides, use the least toxic chemical whenever possible and always follow the instructions.
- When working on or near water, use an approved herbicide for this environment (*e.g.* RoundUp© Biactive™); Refer to Australian Pesticides and Veterinary Medicines Authority (APVMA) website (www.apvma.gov.au) for information on off-label permits.
- Apply herbicides when the plants are actively growing and prior to seed set to achieve the best results.
- Regularly monitor for new infestations.

B4: Weed control techniques - overview

An integrated weed management approach incorporates a variety of control methods and will often achieve the best results. The aims of weed control include:

- incorporate a variety of control methods;
- reduce the reliance on herbicides;
- keep un-infested areas clear of weeds; and
- control the spread of existing weed infestations.

Details of specific weed control techniques to be used such as cut and paint, scrape and paint, herbicide spraying and hand weeding are provided in Brodie (1999), Buchanan (2000) and Bradley (2002).

Mechanical control

Mechanical weed control will be used for seedlings and small plants that can be hand-pulled or dug out. Removal will preferably occur when soils are moist, or crowns may fragment on impact. To prevent regrowth ensure all roots and layered rooting stems are removed.

Chemical control

The use of herbicides in sensitive areas will be minimised and only utilised where alternative weed eradication processes are considered impractical to achieve the intended conservation outcome. Herbicide use is most effective during the active growing season for plants to encourage the chemical uptake into the plant. The selection of herbicides will also consider the type of weed and the location. Chemical spraying will be carried out by appropriately qualified operators in accordance with the *Pesticides Act 1999*.

Herbicide applicators aim to maximise the amount of herbicide reaching the target plants and minimise the likelihood of the herbicide reaching off-target areas through spray drift. In accordance with the principles outlined in *NSW Weed Control Handbook – a guide to weed control in non-crop, aquatic and bushland situations* (DPI 2018), herbicides will:

- not be sprayed in wind speeds of 10km/h or greater, causing spray to drift into non- target areas;
- not be sprayed on days when the temperature exceeds 28°C;
- not be continued to be sprayed if weather conditions change and become unsuitable;
- use the largest droplets that give adequate spray coverage; and
- use the least-volatile formulation of herbicide available.

Other requirements include:

- Only registered herbicides will be used for the control of the weed species and used in accordance with the directions on the label. Users have a legal obligation to read and follow the instructions on the label. Where appropriate, selective herbicides will be used to minimise impacts on native vegetation.
- Herbicides will not be used where they will detrimentally affect water quality, or so close to a watercourse that the herbicide can enter the water and contaminate the waterway. Only pesticides registered for use near water may be used near water.
- Herbicide Application Record Sheet must be completed.

A variety of herbicide application methods will be suitable at the translocation areas, depending on the targeted species and the size of the infestation. These may include cut and paint, basal bark application and spot spraying (see Section B5:).

Revegetation

Site revegetation is an important weed control tool. Without revegetation, newly cleared land previously occupied by one weed species will often be invaded by another weed species, creating a cycle of weed control and reinfestation. When desirable plants compete with invasive weeds, fewer resources like water, nutrients, and space are available for the growth of weeds. When incorporated into an integrated weed management strategy, revegetation can act not only to promote the reestablishment of desired plants but also actively suppress the growth and spread of weeds.

B5: Weed control strategies for targeted growth forms

Management strategies for different types of weeds are provided below.

Annual grasses

Annual grasses will be hand removed or spot sprayed where isolated or in low concentrations. Larger patches of annual grasses may be slashed/brush cut in late spring to early summer, after flowering, but prior to seed set. For most species, slashing/brush cutting prior to late spring through to early summer will promote vigorous growth and should not occur. However, some annual grasses can grow and produce seed at any time of the year dependent on climatic conditions such as high rainfall and warm temperatures. Monitoring of annual species will be undertaken and if new growth occurs, the same treatment will be applied to the new growth to prevent seed production. Individual plants should be hand removed.

Perennial grasses

Perennial grasses, such as *Paspalum dilatatum* (Paspalum) and *Cenchrus clandestinum* (Kikuyu Grass), will be hand removed where isolated or in low concentrations. Larger patches may be slashed prior to seed production in spring or summer (depending on the growth cycle of the species) and the regrowth spot-sprayed 2-3 weeks later when it is actively growing and approximately 10 cm in length. Monitoring of these species will be carried out and if new seed production occurs, the same treatment will be applied again as required. However, slashing will not reduce the presence of exotic grasses on its own and must always be combined with targeted removal to reduce densities and allow for native regeneration. Individual plants should be hand removed.

Of particular concern is the occurrence of *Nassella trichotoma* (Serrated Tussock). This invasive grass species is well established along vegetation edges adjacent to Area 4. According to NSW Weedwise:

"….*Serrated tussock is not palatable to livestock and has little feed value. Animals forced to graze serrated tussock can become malnourished and may die with a stomach full of partly digested serrated tussock.*

Serrated tussock can:

- *take over pastures and native vegetation*
- *reduce pasture quality*
- *contaminate hay and grain.*

The native vegetation communities at risk include:

- *native grasslands*
- *grassy woodlands*
- *dry forests*
- *some coastal vegetation.*

Serrated tussock can completely take over new areas within 4 years. It is similar in appearance to many native species making it difficult to identify when not in flower. Subsequently, it can go unnoticed for many years. A single plant can produce up to 140,000 seeds each season. Serrated tussock is hard to get rid of, control is costly and herbicides used to control serrated tussock impact other grasses, especially natives……"

Shrubs and woody weeds

Shrubs and woody weeds, including *Ligustrum* spp. (Privet), *Lantana camara* (Lantana) and *Rubus anglocandicans (*and other species of Blackberry) should be controlled by the cut and paint or drill and fill method using a non-selective herbicide. The most appropriate method to be used depends on the size of the individual to be removed and should be determined by the bush regeneration contractor. Primary weed control should use

techniques that will not encourage flushes of secondary weed growth. All seedlings of woody weeds will be hand pulled or spot-sprayed with a non-selective herbicide.

Creepers and climbers

The control of creepers varies depending on the species. For the most part, seedlings should be hand pulled, while mature plants can be controlled by the stem-scrape method or spot spraying using a non-selective herbicide. The precise method to be used will be determined by the bush regeneration contractor depending on the species, size and reproductive status of the individual.

Herbaceous weeds

Where individual plants of other herbaceous weeds, including *Plantago lanceolata* (Plantain), *Sida rhombifolia* (Paddy's Lucerne) *Conyza bonariensis* (Flax-leaf Fleabane) and *Verbena bonariensis* (Purpletop), are found, they will be hand pulled or chipped out prior to flowering. Where large swaths of these species occur, they will be sprayed using a non-selective herbicide. If high densities of mature stands occur, weeds may be slashed first using a brush cutter and any subsequent regrowth sprayed. Regular monitoring of these species will be required to prevent seed production. *Cirsium vulgare* (Spear Thistle) will not be hand-pulled due to its thorns and instead will be spot sprayed using a non-selective herbicide.

B6: Timing

Weed control is most successful when weeds are actively growing and before they set seed. Where appropriate, a minimum of two herbicide applications will be applied in autumn and spring, although manual removal of weeds should be used in preference to herbicide use.

Details on the timing and frequency of weed control will be guided by the Weed Management Report (Section B8:).

B7: Management of weed waste

All exotic vegetation material will be removed from site and composted at a registered green waste disposal facility. Fruiting parts and tubers will be bagged before being removed from site.

B8: Management framework

Monitoring

In order to be adaptive to changes in the distribution of weeds and the timing of seed set for various species, the translocation areas will require regular monitoring in order to schedule weed control works. Weeds will be monitored primarily via Rapid Visual Assessments (RVAs) and, once vegetation is established, Biodiversity Assessment Method (BAM) plots data will provide additional quantitative data (Appendix D:).

RVAs will be undertaken to ensure the site is systematically monitored to identify emerging threats or failures, and to capture visible changes in translocation areas and edges of adjoining native vegetation. RVAs include assessment of weeds, focusing on WoNS, priority weeds and weeds that threatened translocation success.

The first RVA will be undertaken following site preparation at the translocation areas and prior to the distribution of translocated material. The success of initial weed management within the translocation areas will be recorded along with recommendations for follow-up control if required.

Subsequent RVAs will be undertaken on a quarterly basis for the first two years with the reporting frequency reviewed thereafter (Appendix D). Outcomes of the RVA will inform forward planning for weed management activities.

Weed Management Report

A weed management report will be submitted by the weed contractor on a quarterly basis for the first two years following translocation, with the reporting frequency reviewed thereafter. This report will summarise activities undertaken during the preceding quarter as well as activities planned for the next quarter including:

- target weeds;
- target areas;
- management techniques applied; and
- chemicals used.

Forward planning for weed management will take into account the findings and recommendations of the RVA and BAM monitoring as applicable.

Table B.1 Weed monitoring and reporting schedule

Action	Frequency/timing	Responsibility
Weed management	Prior to translocation and accordance with the scheduling in the weed management report	Boral Environmental Advisor to engage a suitably qualified bush regenerator
RVA monitoring	Prior to translocation of vegetative material then quarterly for the first two years, reviewed thereafter	Boral Environmental Advisor or suitably qualified environmental contractor/consultant
Weed management summary report	Prior to translocation of vegetative material then quarterly for the first two years, reviewed thereafter	Boral Environmental Advisor or suitably qualified bush regenerator

APPENDIX C

Pathogen management

APPENDIX C: PATHOGEN MANAGEMENT

C1: Issue

The two major pathogens considered for management in the proposed translocation areas are: *Phytophthora cinnamomi* and Myrtle Rust. Infestations of these pathogens are listed as key threatening processes under the *Biodiversity Conservation Act 2016*

C2: Responsibility

Boral Resources and relevant sub-contractors should, at all relevant times, comply with, the pathogen management plan herein ('the pathogen management plan').

To allow for adaptive management, minor alterations can be made to the implementation of the pathogen management plan. Any alterations must be recorded in writing in accordance with this plan.

C3: *Phytophthora cinnamomi* management

P. cinnamomi is a soil borne pathogen that causes death in a wide range of native plant species causing floristic and structural changes in susceptible plant communities. In addition, it is a significant pathogen affecting some forest, agricultural and horticultural industries.

P. cinnamomi belongs to a primitive group of fungi-like organisms sometimes called water moulds. Water moulds were only recently taxonomically separated from the fungal kingdom when they were placed in the new kingdom of Chromista. It is not visible in the field as it grows within the roots of host plants as a very fine mycelium and the spores it releases into the soil are microscopic in size.

The spread of *P. cinnamomi* occurs through the movement by water, soil, wildlife and human activities and unfortunately few management options are available to control this spiralling disease problem. It is not currently feasible to eradicate *P. cinnamomi* from native vegetation or to locate and contain all infestations. While there is a limited capacity to reduce the impact of disease by manipulating fire and applying phosphite. However, the reliance on phosphite may also have unforeseen long-term consequences on native plant fertility. The most practical solution to managing the impact of *P. cinnamomi* is to prevent its spread and to protect areas from infection.

Action1: Prevention

This pathogen has not been identified within surveyed vegetation patches on the Quarry site; although there is potential for it to occur and to be spread by any ground disturbance works. As a consequence, the following management strategies should be undertaken:

- the introduction of outside soil resources into the buffer area will be prohibited;
- vehicle access into translocation areas is to be restricted;
- weed control equipment, feral animal control equipment, other tools and footwear will be assessed prior to entry to prevent potential spread of the disease; and
- the movementof unauthorised persons and/or vehicles wil be prevented through the installation/maintenance of perimeter fencing.

Action 2: Monitoring

Monitoring for potential infection by *P. cinnamomi* will be undertaken along with annual monitoring. If an infection of *P. cinnamomi* is recorded, the NSW Department of Planning and Environment (DPE) and the NSW Department

of Primary Industries (DPI) will be immediately consulted for confirmation of infection. Photographs and/or samples will be collected.

Action 3: Manage infections

While potentially impossible to contain, an infection will be treated where it is likely to be cost-effective and not impeded by the scale of infection, or the likelihood of rapid infections from outside the buffer area.

Any treatment of *P. cinnamomi* will be conducted in consultation with DPE/DPI, where it is likely that the treatments of infections would involve:

The collection, removal and destruction of infected material; Treatment with permitted fungicides and or phosphite.

All treatments would be conducted by suitably qualified and experienced personnel, with close liaison with DPE and DPI.

Timing

Surveys for *P. cinnamomi* will be undertaken annually. The results of the surveys will be documented in the annual report, unless recorded, which will result in immediate notification of DPE / DPI and treatment (where appropriate).

C4: Myrtle Rust management

Myrtle rust is a plant disease caused by the exotic fungus *Uredo rangelii*. It was first detected in Australia on 23 April 2010 on the NSW Central Coast. It has established in coastal NSW from the Clyde River north into Queensland. Myrtle rust is likely to spread rapidly to the extent of its biological range as the spores are dispersed readily by wind. Eradication is unfeasible (OEH 2011).

Myrtle rust affects plants in the family Myrtaceae, including the genera *Eucalyptus, Angophora, Callistemon, Rhodamnia,* and *Melaleuca*. Infection occurs on young growing shoots, leaves, flower buds and fruits. It produces masses of powdery bright yellow or orange-yellow spores on the infected areas. Leaves may become buckled and twisted and die as a result of infection. Images of myrtle rust on a range on Myrtaceae can be found at http://www.dpi.nsw.gov.au/biosecurity/plant/myrtle-rust/image-gallery.

Myrtle rust (*Uredo rangelii*) has not been identified within surveyed vegetation around the quarry although this pathogen has the potential to be present or to be introduced by numerous vectors including wind or by human or animal transfer and has been recorded in nearby properties in recent years (B. Ryan and G. Leonard *pers obs*.). Particular attention will be paid to the potential presence of this pathogen during monitoring surveys. If myrtle rust is identified as being present it will require immediate and urgent control. The best practice control for this pathogen is the use of a fungicide and will be applied by experienced personnel qualified to do so.

Action1: Prevention

As a consequence, the following prevention management strategies will be undertaken:

- the introduction of outside soil resources or potted plants into the translocation areas will be prohibited;
- vehicle access into the translocation areas will be restricted;
- weed control equipment, feral animal control equipment, other tools and footwear will be assessed prior to entry to prevent potential spread of the disease; and
- The movement of unauthorised persons and/or vehicles will be prevented through the installation/maintenance of perimeter fencing.

Action 2: Monitoring

Monitoring for Myrtle rust will be undertaken along with annual monitoring of the planted areas. The best time to survey for Myrtle Rust is in Spring and Summer.

If an infection of Myrtle rust is recorded, the Department of Primary Industries, Forest Health Research will be immediately consulted for confirmation of infection. Photographs and/or samples will be collected.

Action 3: Manage infections

While potentially not possible to contain an infection over an area, specialised treatment of individuals within the translocation areas will be treated where it is likely to be cost-effective and not impeded by the scale of infection, or the likelihood of rapid infections from outside the buffer area.

Treatments of infections would involve:

- The collection, removal and destruction of infected material;.
- Treatment with permitted fungicides. A current range of fungicides to control Myrtle Rust can be viewed at http://permits.apvma.gov.au/PER12319.pdf.

All treatments would be conducted by suitably qualified and experienced personnel, with approved permits to handle and treat Myrtle Rust infections.

Infected material should be killed with an herbicide before being buried in an approved area.

Timing

Surveys for Myrtle Rust will be undertaken annually. The results of the surveys will be documented in the annual report, unless recorded, which will result in immediate notification of DPI and treatment (where appropriate).

C5: Access and fencing

Issue

It is imperative that unauthorised access to the translocation areas is appropriately managed by the use of perimeter fencing. Unauthorised access to ecologically sensitive areas can lead to the deliberate or accidental damage to the values of these areas. Given the location of the translocation areas within a combination of native vegetation patches, managed grazing lands and a hard rock quarrya, particular attention will need to be paid to controlling access (therefore damage) from differing adjacent land uses. A number of detrimental human activities may increase their existing impact on ecological features. These are expected to include (but not be limited to):

- unauthorised vehicle access, especially recreational vehicles;
- rubbish dumping;
- dumping of garden wastes and lawn clippings;
- encroachment by feral animals; and
- damage or removal of native plants and animals.

Responsibility

Boral Resources and relevant sub-contractors will be responsible for the maintenance of all fencing surrounding the translocation areas.

Management actions

Regular monitoring of any installed fences will be undertaken and repairs completed promptly.

Timing

Maintenance will be undertaken whenever required.

APPENDIX D

Translocation Monitoring Program

APPENDIX D: TRANSLOCATION MONITORING PROGRAM

D1: Monitoring objectives

The objectives of the monitoring program are to:

- record and document establishment of native vegetation (*Melaleuca armillaris* Tall Shrubland) at the translocation areas through comparison with baseline and/or reference data;
- record and document changes in the structure and function of native vegetation (*Melaleuca armillaris* Tall Shrubland) at the translocation areas through time;
- capture any records of Illawarra Zieria (*Zieria granulata*) recruitment within the translocation areas and submit to the NSW Bionet Atlas;
- monitor the integrity of existing adjacent vegetation; and
- monitor bushfire risk by monitoring changes in fuel loads.

D2: Monitoring methods

Monitoring will comprise both visual assessment and quantitative methods. These methods are described below with further detail provided in Table D.1.

Visual monitoring

Photo point monitoring and Rapid Visual Assessments (RVA) will be undertaken on an annual basis throughout the duration of the monitoring programme. Visual monitoring will commence prior to the translocation of soil and vegetation to the receiving areas, with the first round of monitoring representing the baseline condition. These methods provide a framework for regular site inspection to observe and document translocation progress and emerging threats.

Quantitative monitoring

Quantitative data collection methods will be used to monitor the establishment and development of *Melaleuca armillaris* Tall Shrubland and *Zieria granulata* populations at the translocation areas. The type of data collected will depend on the stage of vegetation development. Initially, frequent (quarterly) monitoring will focus on recruitment and establishment of native (and threatened) species, which will help inform additional revegetation actions (Section 5). Once vegetation is established, monitoring will shift to Biodiversity Assessment Methods (BAM) monitoring to assess development of the community towards the baseline/reference condition.

Recruitment monitoring

Once translocation of soil and vegetation has occurred, recruitment monitoring will commence on a quarterly basis. This will assess native species diversity, exotic plant cover and the presence/health of *Zieria granulata* plants. This data will assist in planning for supplementary plantings and other revegetation actions.

A monitoring approach is described in Table D.1, which involves sampling 1x1 m plots every 10 m along three 50 m transects per translocation area. However, the suitability of this method will be reviewed prior to the first monitoring event and might also require refinement as regeneration progresses. The method adopted will take into account the density of regenerating plants (and threatened species) as well as the patchiness of recruitment. For example:

- if recruitment densities are low, a total count within a 20x20m plot might be better suited to estimating species densities and composition; or

- if recruitment is patchy, longer transects with larger spaces between 1x1m plots will provide better coverage of the translocation area thereby achieving a better estimate of recruitment.

Once recruitment monitoring has been undertaken for two years, the methods will be reviewed. The intent is that, after two years, recruitment monitoring will stop and BAM monitoring will commence. However, this outcome will be based on the professional recommendation of the contractor/consultant undertaking the monitoring. The recommendation will consider if:

- recruitment is progressing in accordance with performance indicators (Section D3:); and
- BAM plots will provide adequate data to support implementation of regeneration actions.

Biodiversity Assessment Method

Once vegetation is establishing, Biodiversity Assessment Method (BAM) plots will be established to track development of the vegetation towards the *Melaleuca armillaris* Tall Shrubland community and to monitor weeds. BAM plot data will be assessed against reference data, which will be derived from either:

- a minimum of three BAM plots within *Melaleuca armillaris* Tall Shrubland within the adjacent Stewardship Sites (assuming Stewardship Sites have been established and monitoring commenced); or
- data collected at the disturbance site as part of the Biodiversity Development Assessment Report (BDAR) prepared for Modification 13 (EMM, 2023).

Monitoring plots

Photo monitoring plot locations will be established prior to the translocation of soil and vegetation. Co-ordinates of the plots will be recorded and the plots will be permanently marked as soon as practicable (so as not to interfere with vehicle/machinery access during the translocation process). The plots will used for:

- photo point monitoring; and
- BAM monitoring.

The *minimum* number of plots per translocation area will be in accordance with BAM:

- Translocation Areas 1, 2, 3, 5, 6 (<2 ha) = 1 plot; and
- Translocation Area 4 (9.2 ha) = 3 plots.

Table D.1 Monitoring methods and timing

Method	Details	Purpose	Location	Frequency and timing[1]
Visual assessment				
Photo point monitoring	Photos will be captured at each photo point in five directions (north, east, south, west and ground). Photo points will be permanently marked.	To provide a visual record of: • changes to ground cover and vegetation structure; and • emerging threats such as erosion or weed infestations.	Translocation areas	Annual (Spring) From year 1 commencing prior translocation of soil and vegetation.

Rapid Visual Assessment	All areas with translocated material will be traversed by foot or vehicle and assessed for regeneration and disturbance including (but not limited to:
	• Regeneration:
	  • broad patterns in the distribution of natural recruitment and planting survival;
	  • presence of threatened species;
	  • general health of vegetation;
	  • soil moisture and the need for irrigation; and
	  • condition of plant guards and stakes (if used).
	• Disturbance:
	  • evidence of stock or native animal grazing;
	  • presence feral animal species;
	  • fence integrity;
	  • fuel loads and fire disturbance;
	  • evidence of nearby land management activities (i.e. chemical treatments, fencing, earthworks);
	  • evidence of unauthorised vehicle access;
	  • evidence of rubbish dumping; and
	  • surface stability and erosion issues.
	• Weeds:
	  • Identify and map Weeds of National Significance and priority weeds;
	  • Identify and map exotic pasture grasses and forms that are likely to limit translocation success; and
	  • make weed management recommendations for incorporation into the weed management summary report.
		Rapid assessment to:
		• provide a formal framework to broadly inspect the translocation areas on an regular basis and to document, respond and review regeneration and emerging threats;
		• complement quantitative monitoring methods;
		• identify gaps in natural regeneration or survival to identify priority locations/species for additional works;
		• identify emerging and ongoing threats to inform management actions;
		• identify risks to vegetation establishment due to weed densities allowing fast response to emerging infestations; and
		• capture any records of Illawarra Zieria (*Zieria granulata*) recruitment within the translocation areas and submit to the NSW Bionet Atlas.
			Translocation areas, fence lines and edges of adjacent native vegetation	Quarterly - first 2 years commencing prior to translocation of soil and vegetation.
				Review thereafter – likely move to annual (Spring) monitoring from year 3.

Method	Details	Purpose	Location	Frequency and timing[1]
	Any observations relating to regeneration success/failure or disturbance will be documented including: • details of the observation; • photo; • co-ordinates; and • recommended remedial action.			

Method	Details	Purpose	Location	Frequency and timing[1]
Quantitative monitoring methods				
Recruitment	Three 50 m transects will be established within each established translocation area and 1x1m plots will be sampled at 10m intervals. Native species (self-recruited and planted): • all native species within the 1x1m plots will be identified and counted; and • the percent cover of exotic plants and the dominant species will be recorded. Threatened species: Additional details will be collected on any threatened species recorded during recruitment surveys including: Plant health/vigour will be rated: 1. Plant dead; 2. Widespread dieback; 3. Dieback/damage observed on multiple branches; 4. Minor dieback/damage evident on isolated leaves or branches; or 5. Healthy plant with no signs of dieback/damage.	To collect data to: • document native species recruitment (density and richness); • determine requirements for additional regeneration actions; • record threatened species occurrences and health/vigour • capture any records of Illawarra Zieria (*Zieria granulata*) recruitment within the translocation areas and submit to the NSW Bionet Atlas	Translocation areas	Quarterly First 2 years commencing after translocation of soil and vegetation, reviewed thereafter.

Method	Details	Purpose	Location	Frequency and timing[1]
Biodiversity Assessment Method (BAM)	The BAM is described in DPIE (2020) and includes survey of a range of attributes within the 20x50 m plots. The attributes collected are then entered into the BAM calculator to generate scores for composition, structure, function and vegetation integrity. The scores are based on comparison with standard benchmarks for the relevant plant community type (PCT). Attributes measured by the BAM include: • plant species richness in each growth form; • native vegetation cover in each growth form; • fallen logs; • leaf litter cover; • high threat weed exotic cover; and • stem size classes (canopy regeneration).	To assess development of the established vegetation at the translocation areas relative to the reference condition. The outcomes will assist management identify the most appropriate species and growth forms to plant. Capture any records of Illawarra Zieria (*Zieria granulata*) recruitment within the translocation areas and submit to the NSW Bionet Atlas.	Translocation areas (and possibly 3 x reference plots in adjacent Stewardship Sites if available).	Annual (Spring) Commencing year 3 (i.e. once vegetation is established) unless recruitment monitoring recommends otherwise.

1. Year 1 refers to the year that the translocation takes place and represents baselines data from which progress is assessed.

D3: Assessment of performance and remedial actions

Specific and measurable progress indicators and completion criteria have been extrapolated from the management objectives. The presentation of monitoring results will include an assessment of rehabilitation success as measured against these completion criteria. This assessment determines if translocation management is successfully meeting the performance indicators/completion criteria and thereby attaining the translocation objectives.

If progress is not being made towards the completion criteria or it is unlikely that the criteria will be attained, remedial actions will be triggered for implementation. This will allow for adaptive management and implementation of remedial actions to improve biodiversity outcomes.

Details of performance indicators, completion criteria, triggers and responses are provided in Table D.2

D.2 Performance indicators, completion criteria, triggers and resonses

<table>
<tr><th>Conservation objective</th><th>Performance indicators</th><th>Completion criteria</th><th>Trigger</th><th>Response[1]</th></tr>
<tr><td rowspan="2">To ensure the soil and vegetation translocation areas are revegetated with the appropriate suite of species and structure so that the original vegetation is, as far as possible, re-established as a self supporting ecosystem which provides shelter to the adjacent vegetation and habitat for native fauna species.</td><td colspan="4">Vegetation Establishment</td></tr>
<tr><td>Evidence of self-recruited and/or survival of planted native species.

Floristic composition progressing towards reference condition.</td><td>Recruitment/BAM monitoring indicates native vegetation species richness has reached minimum richness recorded at BAM plots at the disturbance site (below).

<table><tr><td>Trees</td><td>0-1</td></tr><tr><td>Shrubs</td><td>4</td></tr><tr><td>Grasses</td><td>3</td></tr><tr><td>Forbs</td><td>4</td></tr><tr><td>Ferns</td><td>0-1</td></tr><tr><td>Other</td><td>1</td></tr></table>
OR

BAM monitoring indicates composition score at least 30% of the composition scores from reference condition.</td><td>Recruitment/BAM monitoring indicates native vegetation species richness has not reached minimum richness recorded at BAM plots at the disturbance site.

OR

BAM monitoring indicates composition score not progressing towards the completion criteria over two consecutive monitoring events.</td><td>Implement professional recommendations from the monitoring reports and consider:

• plant (additional) tube stock;
• establish native seed;
• investigate soil conditions that might prevent successful establishment;
• consider the need for additional land management actions to support vegetation establishment (e.g. weed management, feral animal control, fencing); and
• replace plant guards and stakes as required.</td></tr>
</table>

Conservation objective	Performance indicators	Completion criteria	Trigger	Response[1]
	Threatened plant species either self-recruited or planted in the translocation area.	*Zieria granulata* present in the translocation areas over 3 consectutive monitoring years. *Zieria granulata* plants appear healthy.	*Zieria granulata* not recorded over 3 consecutive monitoring years. Monitoring reports more than 10% of *Zieria granulata* plants showing dieback/damage on multiple branches or plant death.	
	General health of vegetation • low numbers of necrotic plants; • soil moisture adequate and irrigation not considered necessary; and • condition of plant guards and stakes maintained.	Vegetation appears healthy with little to no signs of dieback/damage. Plants not showing signs of water stress. Plant guards and stakes maintained as required.	RVA monitoring reports widespread dieback/damage. Plant guards and stakes deteriorating and not protecting plantings.	
	Vegetation Development			
	Vegetation structure and function progressing towards reference condition.	BAM monitoring indicates structure and function scores at least 30% of the structure and function scores from reference condition.	BAM monitoring indicates vegetation structure and function scores not progressing towards the completion criteria over two consecutive monitoring events.	As above

Conservation objective	Performance indicators	Completion criteria	Trigger	Response[1]
To ensure that the existing vegetation edge as well as the new revegetation areas are not degraded by weeds or feral fauna infestations which could compromise their ecological integrity	Occurrence and abundance of weed species. Condition of fences. Signs of disturbance. Evidence of feral animals.	RVA monitoring shows no new significant weed infestation. RVA monitoring shows exotic plant cover at existing vegetation edges is less than 20%. BAM monitoring indicates exotic plant cover is less than 20%. BAM monitoring indicates the total cover of high threat exotic species (HTEs) less than 5%. Fences maintained. Little evidence of feral animal activity and other disturbance.	RVA monitoring detects new significant weed infestations RVA monitoring indicates exotic plant cover at existing vegetation edges is greater than 20%. BAM monitoring indicates exotic plant cover is greater than 20%. BAM monitoring indicates the total cover of high threat exotic species (HTEs) is greater than 5%. Fences are not preventing unauthorised entry or stock movement into the translocation areas. Feral animal activity impacting the success of native vegetation establishment.	Increase weed management. Repair damaged fences. Increase feral animal control.

Conservation objective	Performance indicators	Completion criteria	Trigger	Response[1]
To carry out regular monitoring and maintenance works to ensure that the objectives are achieved in the long term.	n/a	Monitoring undertaken in accordance with this Plan. General maintenance undertaken in accordance with this Plan. Ameliorative action undertaken in accordance with this Table and as recommended in monitoring reports.	Monitoring not completed or does not meet the aims of the monitoring program. General maintenance not undertaken in accordance with the Plan. Ameliorative action not undertaken as recommended in annual monitoring reports within 12 months.	Undertake monitoring, general maintenance and ameliorative actions.

1. Remedial actions to commence (commencement includes planning actions) within one month of the trigger being identified in the monitoring reports.