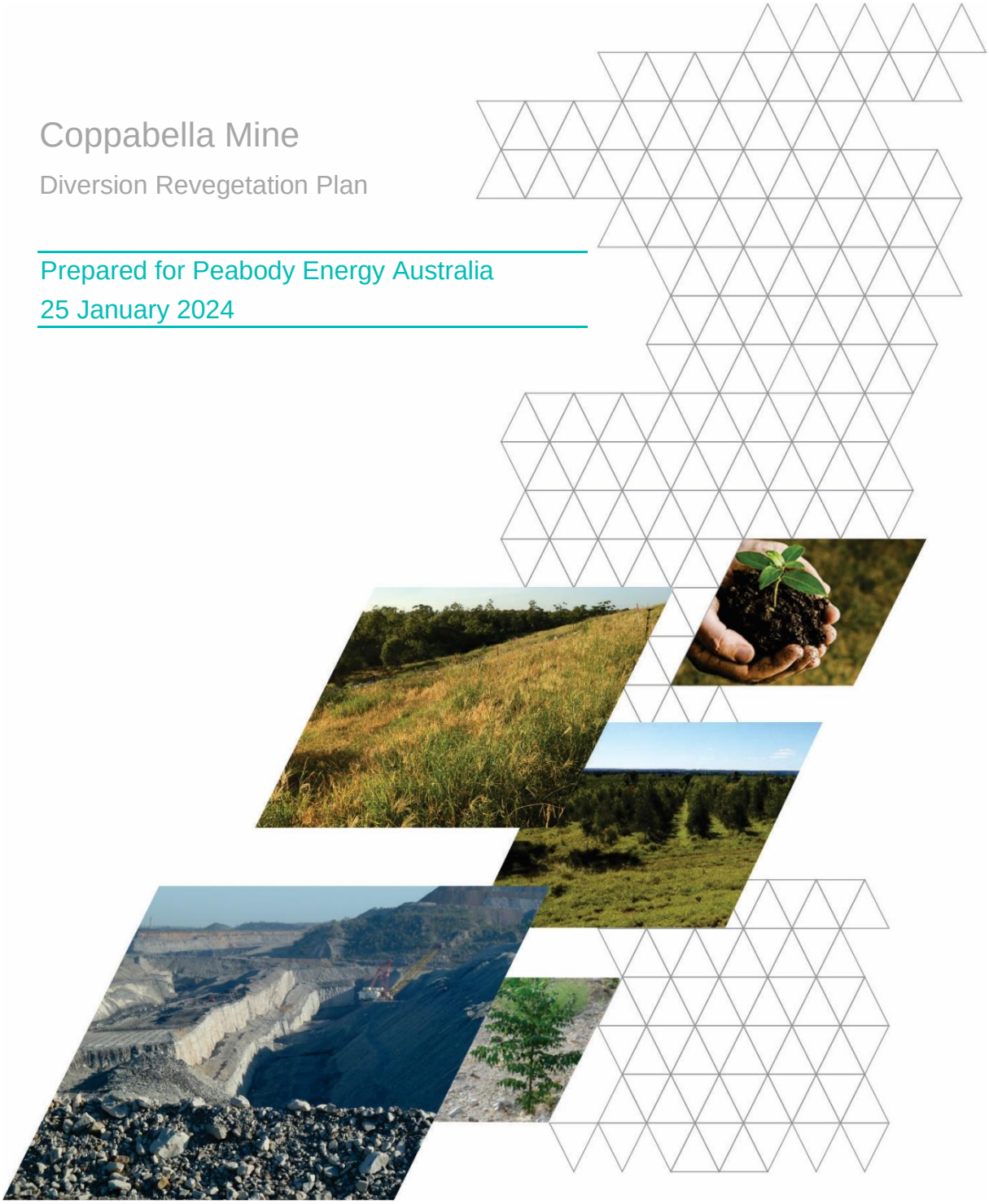
Coppabella Mine

Diversion Revegetation Plan

Prepared for Peabody Energy Australia
25 January 2024



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Distribution list

Date	Revision	Name	Title
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21 December 2023	5.0	Vanessa Warrington Bradley Cartwright	Senior Engineer Environmental Superintendent
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Table of contents

List of Tables

List of Figures

Acknowledgements

Verterra Ecological Engineering acknowledges the traditional owners of the land on which this report was written; Yuggera, Giya, Gugu-Badhun and Eora country. We also acknowledge the traditional owners of the land on which our clients for this project operate, Barada-Barna and Biri-Wiri people. Verterra actively seeks to care for country that has been subjected to resource extraction activities, and we aim to support traditional communities and their Elders, past, present, and emerging through mutually beneficial land rehabilitation, commercial and social activities.

We also wish to acknowledge the support of Peabody site and corporate staff, who have supported this work, enabling effective rehabilitation of the land to a beneficial post-mining land use, for future beneficiaries and custodians.

Glossary

Peabody	Peabody Energy Australia PCI Pty Ltd
MNES	Matter of National Environmental Significance
RE	Regional Ecosystem
DES	Queensland Department of Environment and Science
VMA	Vegetation Management Act
LNS	Local Native Species
Alluvium	Alluvium Consulting Australia
Verterra	Verterra Ecological Engineering

1. Executive Summary / Works Summary

The proposed diversion footprints at Coppabella Mine are characterised by undulating sandy soils, a mixture of sodic duplex soils and deep brown sands in the gullies and drainage lines, with varying bank steepness. The project area has relatively intact vegetation but shows signs of grazing and disturbance. Existing woody vegetation communities, including Riparian Open Forest and Mixed Eucalypt Woodland, support Thirty Mile Creek and its tributaries. The revegetation plan considers the identified vegetation communities and historical field surveys to inform species selection. Ensuring the rehabilitation and stabilisation of the diversions will contribute to the establishment of a thriving and diverse vegetation community similar to the natural upstream ecosystem.

1.1 Key Soil Analysis Results

Soil sampling and analysis was done over the diversion footprints to inform amelioration requirements and revegetation species. The results showed:

- Topsoil:
  - Lightly-textured (sand to sandy loam) with a depth from 9-19cm.
  - Neutral pH, non-saline and non-sodic.
  - Organic matter and cation exchange capacity are both very low.
  - Macronutrients (nitrogen, phosphorous, potassium and sulphur) and micronutrients (boron, copper, manganese and zinc) are deficient and require amendments.
- Subsoil:
  - Sandy clay loam to sandy clay.
  - Non-saline and moderately sodic to 0.5m, slightly saline and highly sodic at depth.
  - Highly dispersive and needs to be treated with gypsum to improve stability.

1.2 Revegetation

The approach to establishing vegetation is summarised in the following tables (Table 1 to Table 5).

Table 1: Revegetation - Humbug Gully to North Arm Diversion

Aspect	Lower Bank (Zone A)	Lower Bench (Zone B)	Mid Bank (Zone C)	Mid Bench (Zone D)	Upper Bank (Zone E)	Reference
Length (m)	1,106	1,500	1,167	1,460	1,308	Table 6
Width (m)	9.0	5.0	4.5	5.0	29.0	
Area (ha) – both banks	2.0	1.5	1.1	1.5	7.6	
Grade	1v:3.5h	1v:20h	1v:3.5h	1v:20h	1v:4h	
Soil Management (tonnes)						
Fertiliser blend 96% NPKS, 3% B, 1% Zn	1.1	0.8	0.6	0.8	4.2	Table 11
Gypsum topsoil	2.9	2.2	1.6	2.2	11.0	
Gypsum subsoil	40.0	30.0	22.0	30.0	152.0	
Total gypsum	42.9	32.2	23.6	32.2	163.0	
Organic matter (full rate)	82.8	62.1	45.5	62.1	314.2	
Organic matter (reduced rate)	12.4	9.3	6.8	9.3	47.1	
Seed Demand (kg)						
Tree - upper story	-	-	-	-	7.6	Table 21
Tree - mid story	-	1.5	1.1	1.5	7.6	
Native grass	8.0	7.5	5.5	7.5	45.6	
Sedge-Rush	4.0	-	-	-	-	
Pasture grass	20.0	15.0	11.0	15.0	76.0	
Legume	8.0	6.0	4.4	6.0	30.4	
Cover crop	40.0	30.0	22.0	30.0	152.0	
Total Seed	80.0	60.0	44.0	60.0	319.2	
Tubestock Demand						
Tree	-	1,125	825	1,125	1,308	Table 23
Sedge-Rush	1,500	-	-	-	-	

Table 2: Revegetation – North Arm to South Arm Diversion

Aspect	Lower Bank (Zone A)	Lower Bench (Zone B)	Mid Bank (Zone C)	Mid Bench (Zone D)	Upper Bank (Zone E)	Reference
Length (m)	1,589	2,000	1,589	1,920	1,774	Table 6
Width (m)	9.0	5.0	4.5	5.0	40.2	
Area (ha) – both banks	2.9	2.0	1.4	1.9	14.3	
Grade	1v:3.5h	1v:20h	1v:3.5h	1v:20h	1v:4h	
Soil Management (tonnes)						
Fertiliser blend 96% NPKS, 3% B, 1% Zn	1.4	1.0	0.7	0.9	7.1	Table 12
Gypsum topsoil	4.9	3.4	2.4	3.2	24.3	
Gypsum subsoil	69.6	48.0	33.6	45.6	343.2	
Total gypsum	74.5	51.4	36.0	48.8	367.5	
Organic matter (full rate)	158.9	109.6	76.7	104.1	783.6	
Organic matter (reduced rate)	23.8	16.4	11.5	15.6	117.3	
Seed Demand (kg)						
Tree - upper story	-	-	-	-	14.3	Table 21
Tree - mid story	-	2.0	1.4	1.9	14.3	
Native grass	11.6	10.0	7.0	9.5	85.8	
Sedge-Rush	5.8	-	-	-	-	
Pasture grass	29.0	20.0	14.0	19.0	143.0	
Legume	11.6	8.0	5.6	7.6	57.2	
Cover crop	58.0	40.0	28.0	38.0	286.0	
Total Seed	116.0	80.0	56.0	76.0	600.6	
Tubestock Demand						
Tree	-	1,500	1,050	1,425	1,774	Table 23
Sedge-Rush	2,175	-	-	-	-	

Table 3: Revegetation – South Arm to Harrybrandt Creek Diversion

Aspect	Lower Bank (Zone A)	Lower Bench (Zone B)	Mid Bank (Zone C)	Mid Bench (Zone D)	Upper Bank (Zone E)	Reference
Length (m)	1,506	1,520	1,456	1,450	1,483	Table 6
Width (m)	9.0	5.0	4.5	5.0	30.9	
Area (ha) – both banks	2.7	1.5	1.3	1.5	9.2	
Grade	1v:3.5h	1v:20h	1v:3.5h	1v:20h	1v:4h	
Soil Management (tonnes)						
Fertiliser blend 96% NPKS, 3% B, 1% Zn	1.3	0.7	0.6	0.7	4.4	Table 13
Gypsum topsoil	3.2	1.8	1.6	1.8	11.0	
Gypsum subsoil	32.4	18.0	15.6	18.0	110.4	
Total gypsum	35.6	19.8	17.2	19.8	121.4	
Organic matter (full rate)	108.0	60.0	52.0	60.0	368.0	
Organic matter (reduced rate)	16.2	9.0	7.8	9.0	55.2	
Seed Demand (kg)						
Tree - upper story	-	-	-	-	9.2	Table 21
Tree - mid story	-	1.5	1.3	1.5	9.2	
Native grass	10.8	7.5	6.5	7.5	55.2	
Sedge-Rush	5.4	-	-	-	-	
Pasture grass	27.0	15.0	13.0	15.0	92.0	
Legume	10.8	6.0	5.2	6.0	36.8	
Cover crop	54.0	30.0	26.0	30.0	184	
Total Seed	108.0	60.0	52.0	60.0	386.4	
Tubestock Demand						
Tree	-	1,125	975	1,125	1,483	Table 23
Sedge-Rush	2,025	-	-	-	-	

Table 4: Revegetation – Landforms

Aspect	Humbug Gully Plug	Landform A	Client-designed Landform	Landform B	Reference
Length (m)	-	-	-	-	Table 7
Width (m)	-	-	-	-	
Area (ha)	1.28	32.39	27.72	8.47	
Grade	-	-	-	-	
Soil Management (tonnes)					
Fertiliser blend 96% NPKS, 3% B, 1% Zn	0.7	17.8	12.9	4.2	Table 14
Gypsum topsoil	1.3	50.2	58.2	10.6	
Gypsum subsoil	25.6	712.6	498.9	152.4	
Total gypsum	27.0	762.8	557.1	163.0	
Organic matter (full rate)	90.4	1,198.5	1,457.8	395.4	
Organic matter (reduced rate)	13.6	179.8	218.7	59.3	
Seed Demand (kg)					
Tree - upper story	1.3	32.4	27.7	8.5	Table 22
Tree - mid story	1.3	32.4	27.7	8.5	
Native grass	7.7	194.4	166.3	50.8	
Sedge-Rush	-	-	-	-	
Pasture grass	12.8	323.9	277.1	84.7	
Legume	5.1	129.6	110.9	33.9	
Cover crop	25.6	647.8	554.3	169.4	
Total Seed	53.9	1,360.5	1,164.0	355.6	
Tubestock Demand					
Tree	-	-	-	-	-
Sedge-Rush	-	-	-	-	

Table 5: Revegetation – Rock Chutes and Gully Infill Areas

Aspect	Gully Infill (CH990)	Chute A and Infill (CH1400)	Chute B (CH380)	Gully Infill (CH1800)	Reference
Length (m)	-	-	-	-	Table 7
Width (m)	-	-	-	-	
Area (ha)	5.62	0.119 (0.082)[1]	0.044 (0.018)[1]	2.57	
Grade	-	-	-	-	
Soil Management (tonnes)					
Fertiliser blend 96% NPKS, 3% B, 1% Zn	2.8	0.04	0.01	1.3	Table 15
Gypsum topsoil	8.4	0.12	0.03	3.9	
Gypsum subsoil	112.5	2.38	0.88	51.4	
Total gypsum	120.9	2.50	0.91	55.3	
Organic matter (full rate)	281.2	4.10	0.90	128.5	
Organic matter (reduced rate)	42.2	0.62	0.14	19.3	
Seed Demand (kg)					
Tree - upper story	-	-	-	-	Table 22
Tree - mid story	5.6	0.08	0.02	2.6	
Native grass	28.1	0.41	0.09	12.9	
Sedge-Rush	-	-	-	-	
Pasture grass	56.2	0.82	0.18	25.7	
Legume	22.5	0.33	0.07	10.3	
Cover crop	112.5	1.64	0.36	51.4	
Total Seed	224.9	3.28	0.72	102.8	
Tubestock Demand					
Tree	4,218	62	14	1,928	Table 24
Sedge-Rush	-	-	-	-	

[1] Areas in brackets exclude the rocked section of the chutes (i.e., areas not requiring topsoil or revegetation)

1.3 Vegetation Watering Summary

Given that the diversions are high-risk regulated structures, for which successful vegetation establishment is required to hold topsoil in place, preventing erosion and costly structure failure, vegetation establishment prior to flow is essential. In summary:

- 60,000 litres per hectare immediately after sowing seed.
- 6 litres per tubestock immediately after planting.
- Establishment irrigation will be three times per week.
- Maintenance irrigation will be twice per week.
- Supplementary watering may be necessary based on monitoring observations.

1.4 Monitoring and Maintenance Summary

Monitoring and maintenance of both vegetation establishment and health as well as soil where bare areas exist is necessary. Monitoring and maintenance summary:

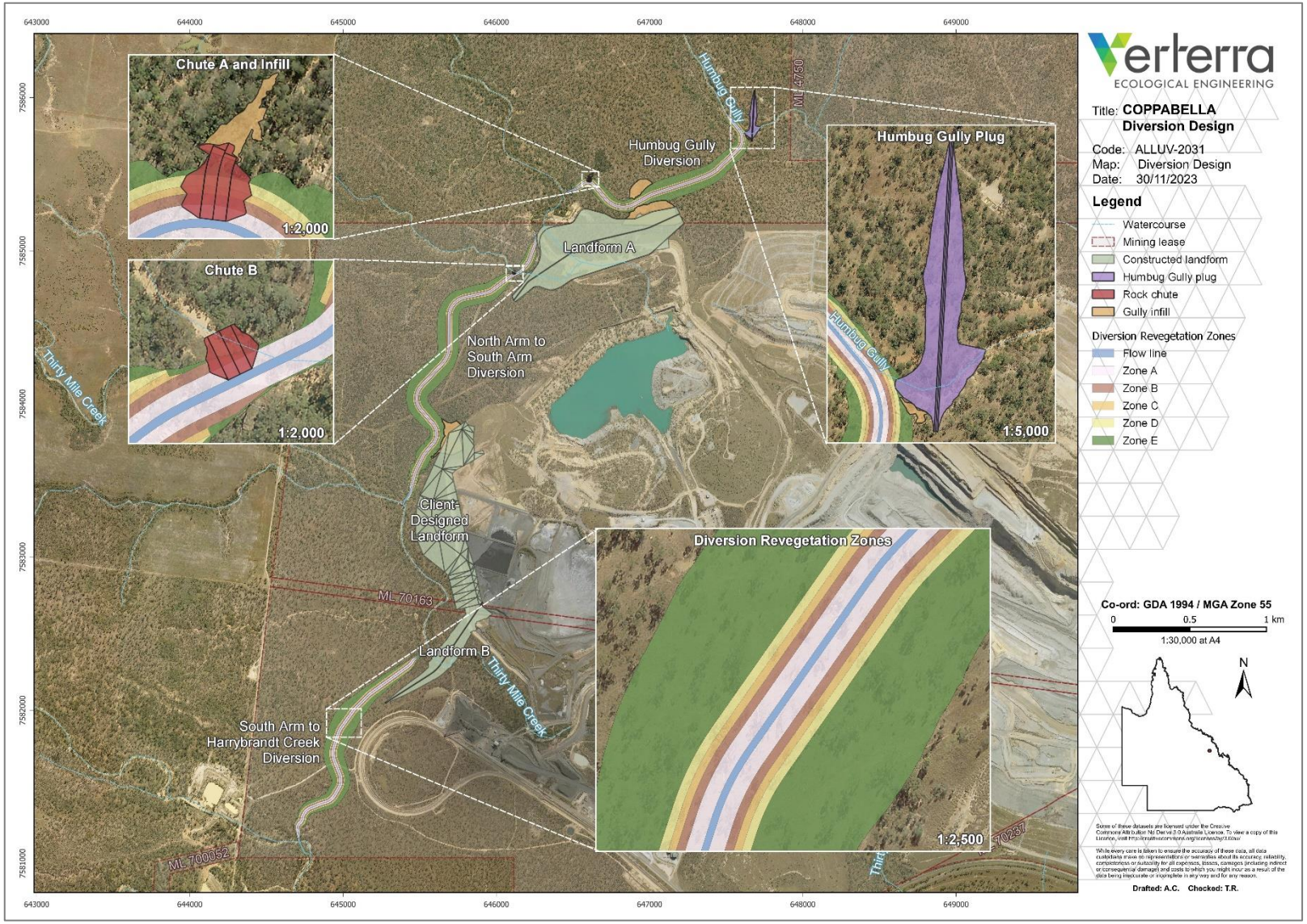
- Monitoring plots shall be established for each zone to assess percentage cover of grass, legumes, litter and bare ground.
- Remedial soil sampling is necessary where there are noticeable changes in plant growth or health, observed erosion. Remedial amelioration may be necessary based on soil sample results.
- Refill planting and seeding is necessary for bare areas greater than 10m^2.

2. Introduction

2.1 Background

Peabody Energy Australia has requested a detailed design for surface water management at Coppabella Mine. The detailed design for the diversions of Humbug Gully, North Arm and South Arm tributaries of Thirty Mile Creek and Harrybrandt Creek has been developed by Alluvium Consulting Australia. The preferred option is shown in Figure 1, below. A stable, long term and relinquishable diversion is the desired outcome. Final batters are to be 1V:4H, to reduce cut and is a technique that has proven to be successful in this area. Soils in this region are known to be problematic due to their dispersive nature, which is why a detailed soil sampling and analysis program has been undertaken. This soil geochemical data has been used to design a chemical amelioration methodology, which maximizes the chemical stability of the soil and provides an optimized germination and growth medium for vegetation, which in turn provides biogenic soil protection, helping to prevent erosion. This ecological engineering approach has been proven to support natural systems to efficiently stabilize the landform in the long-term.

Figure 1: Diversion Design



2.2 Scope

This report provides a detailed revegetation plan for the proposed diversion project, with the aim to establish a self-sustaining and low-maintenance vegetation community. The revegetation plan will be informed by topsoil and spoil characterisation and an assessment of local riparian vegetation. It will include the treatment and management of soil and spoil that will be exposed during the diversion cut and specify appropriate amelioration to ensure stability and support plant establishment and growth.

To achieve this objective, the report includes:

1. Background on the existing environment and proposed diversions (Section 3).
2. An overview of the rehabilitation strategy (Section 3).
3. The recovery, treatment and management of topsoil and spoil (Section 4).
4. Revegetation planning, species selection and planting specifications (Sections 5 to 7).
5. The design and construction of a temporary irrigation system to assist the establishment of revegetation works (Section 8).
6. A detailed monitoring program to quantify revegetation success (Section 9).
7. A maintenance program to provide a pathway for remedial actions (Section 10).

3. Project overview

3.1 Existing environment

The landforms surrounding the mine are characterised by low gradient undulating sandy soils developed on Quaternary and Tertiary overburden. The gullies and drainage lines in the region consist of a mixture of sodic duplex soils and deep brown sands.

The vegetation within the proposed diversion footprint is relatively intact but shows indicators of grazing and disturbance, such as an uneven and incomplete canopy, a lack of large trees, and the dominance of exotic Buffel Grass. Despite this, there is a reasonable amount of woody vegetation, including bands of Riparian Open Forest with occasional patches of Mixed Eucalypt Woodland that support Thirty Mile Creek and its tributaries.

Regional landform behaviour is demonstrated in photos of the existing watercourse landforms provided in the following sections (3.1.1.1–3.1.1.3). These photos show that the watercourses generally have sandy beds with varying bank steepness and groundcover levels. Proposed bank slopes and revegetation methods will help stabilise the diversion, but sediment deposition from flow events will ultimately shape it to resemble the natural riparian zone.

Seed deposition and germination along the watercourse, from both natural events and intentional seeding, will lead to the establishment of a vegetation community similar to the upstream community. Examples of natural seed deposition and revegetation through flow events can be seen in Figure 3 which shows melaleuca seedlings growing in the North Arm flow channel.

3.1.1.1 Humbug Gully

Humbug Gully is a tributary of Harrybrandt Creek with a catchment area of 24km^2. It flows in a south easterly direction around the northern side of the mine, but the proposed mining block would mine its current alignment. To address this, the gully will be diverted upstream of the proposed mining footprint to the North Arm and South Arm diversions and then into Harrybrandt Creek.

Figure 2: Humbug Gully site photos (Alluvium 2023)

Upstream at Spring Creek Road

Tributary upstream of mining lease

	
Slug of sediment from gully erosion	**Typical straight section near diversion offtake**
	
Channel impingement near offtake	**Typical straight section near offtake with sand bed**

3.1.1.2 Thirty Mile Creek North Arm

The North Arm is a tributary of Thirty Mile Creek, the main waterway traversing the mine, and flows southerly through the central parts of the mine. Its current 3.8km-long diversion is in poor condition.

The North Arm tributary has been altered by the development of two impoundment embankments. One embankment has been breached but still attenuates flood flows and enhances deposition. The second embankment, called the North Arm Levee, currently holds water and coarser sediment. Upstream, the tributary is heavily impacted by agricultural land use, leading to elevated sediment loads and gully development. The system is undergoing aggradation, resulting in a uniform sand-covered channel bed and relatively stable banks with limited potential for bank erosion. With channel aggradation, the likelihood of engagement with the floodplain, which is approximately 2m above channel invert, increases.

Figure 3: Thirty Mile Creek North Arm site photos (Alluvium 2023)

	
Under levee impoundment upstream of Creek Pit	**Failed embankment on upstream lease boundary**
	
Seedlings within the flow channel (Peabody, 2015)	**High sediment supply upstream of mine influence**

3.1.1.3 Thirty Mile Creek South Arm

The South Arm catchment, a tributary of Thirty Mile Creek, flows easterly through the west side of the mine. Its current 1.7km-long diversion is unstable and lacks vegetation.

Like the North Arm, the South Arm has a heavily aggraded single channel with a sand bed, leading to a shallow active channel and more frequent floodplain access. Bank erosion and gullies may occur where the channel impinges on a terrace.

Figure 4: Thirty Mile Creek South Arm site photos (Alluvium 2023)

	
Near Spring Creek Road	**Downstream of confluence with tributary**
	
Proposed tie-in location from North Arm	**Proposed offtake location to Harrybrandt Creek**

3.2 Proposed diversion design

3.2.1 Staged development

The three diversions will be constructed in sequence from South to North:

- Stage 1 — Construction of diversion and take-off landforms from South Arm to Harrybrandt Creek;
- Stage 2 — Construction of diversion, tributary tie-in and take-off from North Arm to South Arm, tying into Stage 1; and
- Stage 3 — Construction of diversion, tributary tie-in, gully remediation and take-off from Humbug Gully to North Arm, tying into Stage 2.

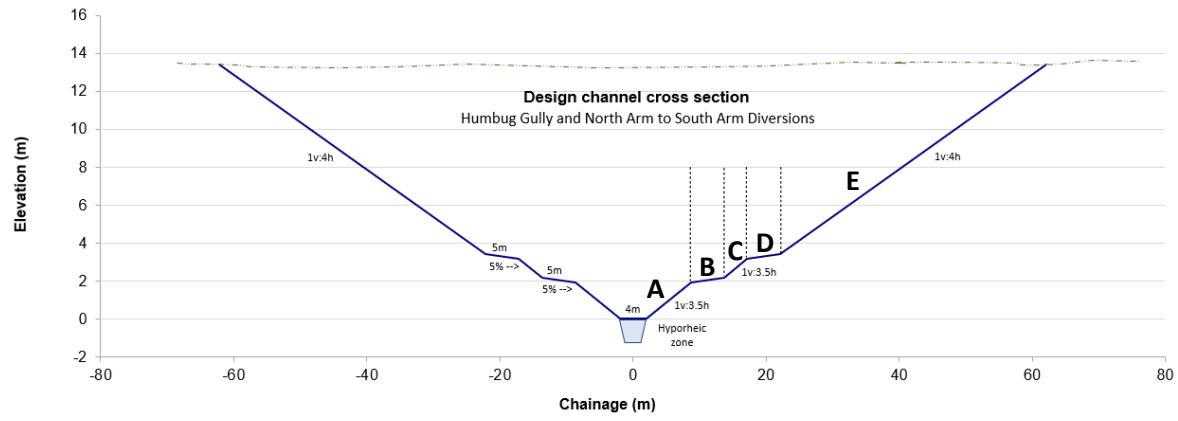
3.2.2 Revegetation zones

The diversion revegetation design has works and revegetation zones stratified by their relative position vertically on the bank. These zones are mapped in Figure 1 and the cross sections of each diversion presented in Figure 5.

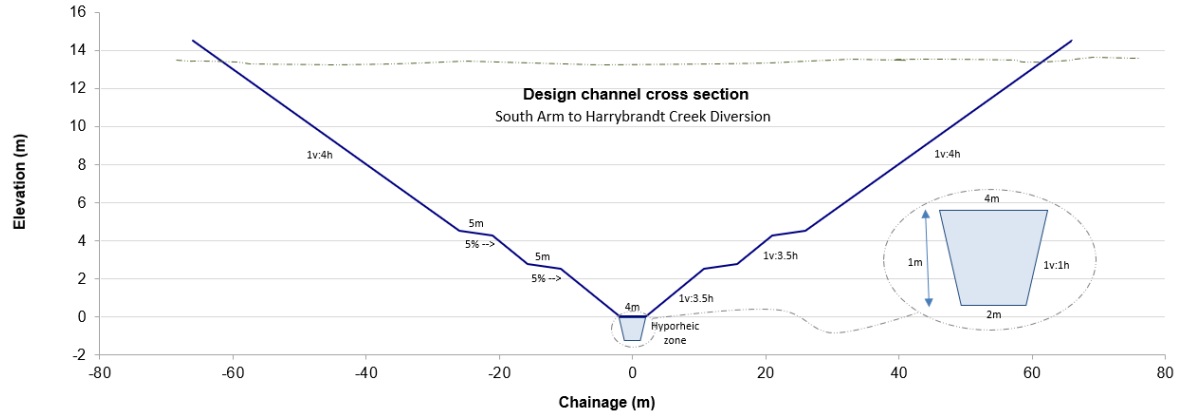
Table 6 designates the unique zones and their location within the bank profile, gradient, and treatment area.

Table 7 describes the location and treatment areas of the various landforms, rock chute and gully infill areas throughout the site.

Figure 5: Concept design – diversion cross section with slope angles (Peabody, 2015)



Typical Humbug Gully and North Arm diversion channel cross-section geometry



Typical South Arm diversion channel cross-section geometry

Table 6: Diversion revegetation zones

Zone Number	Zone Location	Grade	Treatment Area (both banks)	Approx. Length	Approx. Width
Humbug Gully Diversion					
A	Lower bank	1v:3.5h	2.0ha	1.1km	9.0m
B	Lower bench	1v:20h	1.5ha	1.5km	5.0m
C	Mid bank	1v:3.5h	1.1ha	1.2km	4.5m
D	Mid bench	1v:20h	1.5ha	1.5km	5.0m
E	Upper bank	1v:4h	7.6ha	1.3km	29.0m
North Arm to South Arm Diversion					
A	Lower bank	1v:3.5h	2.9ha	1.6km	9.0m
B	Lower bench	1v:20h	2.0ha	2.0km	5.0m
C	Mid bank	1v:3.5h	1.4ha	1.6km	4.5m
D	Mid bench	1v:20h	1.9ha	1.9km	5.0m
E	Upper bank	1v:4h	14.3ha	1.8km	40.2m
South Arm to Harrybrandt Creek Diversion					
A	Lower bank	1v:3.5h	2.7ha	1.5km	9.0m
B	Lower bench	1v:20h	1.5ha	1.5km	5.0m
C	Mid bank	1v:3.5h	1.3ha	1.5km	4.5m
D	Mid bench	1v:20h	1.5ha	1.5km	5.0m
E	Upper bank	1v:4h	9.2ha	1.5km	30.9m

Table 7: Landforms, rock chutes and gully infill areas

Name	Chainage (Diversion)	Treatment Area
Landforms		
Humbug Gully Plug	-	1.28
Landform A	-	32.39
Client-designed Landform	-	27.72
Landform B	-	8.47
Rock chutes and gully infill		
Gully Infill	CH990 (HG)	5.62
Chute A and Infill	CH1400 (HG)	0.119 (0.082)[1]
Chute B	CH380 (NA-SA)	0.044 (0.018)[1]
Gully infill	CH1800 (NA-SA)	2.57

[1] Areas in brackets exclude the rocked section of the chutes (i.e., areas not requiring topsoil or revegetation)

4. Soil management

4.1 Soil analysis

As per the Australian Soil Classification (Isbell 2021), the soil order identified across the proposed diversion footprint is Sodosol. This soil type is characterized as a duplex soil with a texture contrast between light-textured topsoil and clayey, sodic subsoil.

4.1.1 Topsoil

The topsoil has a light texture ranging from sand to sandy loam, with a predominantly neutral pH (6.4-7.5) that ranges from 5.9 to 7.8 with an average of 6.8. The soil is non-saline (electrical conductivity <2.0dS/m).

The topsoil depth varies considerably, with measured depths ranging from 9 to 19cm across the proposed diversion footprint, averaging 12.4cm (Figure 6).

The cation exchange capacity is very low (<6cmol/kg) across the proposed footprint, ranging from 1.3 to 4.9cmol/kg and averaging 2.4cmol/kg. This indicates a weak buffering effect to changes in pH, available nutrients, and soil structure. However, the soil is non-sodic (exchangeable sodium percentage <6%), suggesting that soil erosion through dispersion is unlikely.

The soil organic carbon is predominantly very low (<0.6%) across the proposed diversion footprint, ranging from 0.2 to 1.3% and averaging 0.5%. The plant-available macronutrients nitrate, phosphate, and sulphate are all deficient and will require the addition of nutrients to optimise growth conditions and stimulate early vegetation establishment. Plant-available potassium is also moderately low.

Additionally, several micronutrients important to plant growth (boron, copper, zinc, and manganese) are deficient and require fertiliser to address the deficiency.

Full laboratory analyses are presented in Appendix 1.

Figure 6: Topsoil depth

4.1.2 Subsoil

The subsoil is sandy clay loam to sandy clay, moderately sodic (ESP 6–14%) to a depth of 0.5m and highly sodic (ESP >14%) to the sampled 16.5m depth. Additionally, the subsoil is non-saline to 0.5m with slightly increased salinity with depth (average 2.5dS/m). This high sodicity and low salinity suggests a high erosion risk through dispersion and will require treatment with gypsum to stabilise the constructed landform.

4.2 Soil amelioration

4.2.1 Fertiliser blend

To address the topsoil nutrient deficiencies, the following fertiliser is recommended:

- Fertiliser blend 96% NPKS + 3% Boron + 1% Zinc
    - NPKS product approximately 14:12:12:5 (i.e., EVEREST); plus
    - Boron product with approximately 14.3% boron content; plus
    - Zinc product with approximately 33% zinc content.

Topsoil will require the addition of organic matter (to improve carbon content, soil structure, and biological activity) and gypsum (to address the calcium deficiency).

4.2.2 Gypsum calculator

Gypsum requirement is a function of sodicity, cation exchange and soil treatment depth, and soil bulk density. For most applications it is adequate to assume a soil bulk density of 1.3t/m^3. Gypsum application rates should also consider the product purity (typically 90%) and make an allowance of 67% for the sparingly soluble nature of gypsum (i.e., Gypsum should be applied at the theoretical rate for the target soil depth treated and residual ESP post treatment, multiplied by a factor of 1.5). Gypsum rates for each zone assume 90% purity and efficiency factor of 67%.

Table 9 details soil amelioration recommendations for both the topsoil and subsoil for both revegetation zones.

Throughout this document, gypsum is assumed to meet the minimum specifications as per Table 8.

Table 8: Gypsum specification

Natural mined gypsum	Reprocessed gypsum “regyp”
Minimum 19% Calcium	Minimum 22.5% Calcium
Minimum 15% Sulphur	Minimum 17% Sulphur
Maximum 12% particle size greater than 2mm	Maximum 12% particle size greater than 2 mm

*Application rates are based on natural mined gypsum.

4.2.3 Organic matter

To improve carbon, structure, and biological activity in the soil and further promote the plant growth conditions, the addition of an organic matter (OM) source is recommended. In addition to a full rate to address the organic carbon deficiencies, a reduced application rate has been provided to allow a more practicable solution to raising the organic carbon in the topsoil (Table 9). This reduced rate may be used in conjunction with site-won mulch to meet the organic carbon targets.

4.2.4 Amelioration recommendations

Individual amelioration rates have been recommended per diversion and are summarised in Table 9.

Table 9: Amelioration rates for diversions

Ameliorant	Application Rates (kg/ha) [1]		
	Humbug Gully	North Arm to South Arm	South Arm to Harrybrandt Creek
Subsoil Gypsum			
Gypsum	20,000	24,000	12,000
Topsoil Fertiliser Blend			
NPKS (approx. 14:12:12:5)	530	475	460
Boron product	15	15	15
Zinc product	5	5	5
Topsoil Organic Amendment			
Organic matter (full rate)	41,400	54,800	40,000
Organic matter (reduced rate)[2]	6,200	8,200	6,000
Topsoil Gypsum			
Gypsum[3]	1,450	1,700	1,200

[1] Requirements are based on an averaged value for each diversion footprint.

[2] A reduced organic matter rate has been provided to allow a more practicable solution to raising the soil organic carbon (see Section 4.2.3).

[3] Topsoil gypsum rates have been calculated to address Ca deficiency, as the topsoil is non-sodic.

Table 10: Amelioration rates for landforms, rock chutes and gully infill areas

Ameliorant	Application rates (kg/ha) [1]				
	Humbug Gully Plug	Landform A	Client-designed Landform	Landform B	Chutes and Gully Infill Areas
Subsoil Gypsum					
Gypsum	20,000	22,000	18,000	18,000	20,000
Topsoil Fertiliser Blend					
NPKS (approx. 14:12:12:5)	565	550	465	500	500
Boron product	15	15	15	15	15
Zinc product	5	5	5	5	5
Topsoil Organic Amendment					
Organic matter (full rate)	70,500	37,000	52,600	46,700	50,000
Organic matter (reduced rate)[2]	10,575	5,550	7,890	7,005	7,500
Topsoil Gypsum					
Gypsum[3]	1,050	1,550	2,100	1,250	1,500

[1] Rates for landforms are based on averaged values from the closest known soil samples. Rates for chutes and gully infill areas are based on averaged rates across the site.

[2] A reduced organic matter rate has been provided to allow a more practicable solution to raising the soil organic carbon (see Section 4.2.3).

[3] Topsoil gypsum rates have been calculated to address Ca deficiency, as the topsoil is non-sodic.

4.3 Ameliorant demand

Table 11, Table 12 and Table 13 detail the total ameliorant demand per diversion, based on the revegetation zone treatment areas.

Table 14 and Table 15 detail the ameliorant demand for the landforms, rock chutes and gully infill areas.

Table 11: Humbug Gully diversion – ameliorant demand

Ameliorant	Ameliorant demand (tonnes)					
	Lower bank (Zone A)	Lower bench (Zone B)	Mid bank (Zone C)	Mid bench (Zone D)	Upper Bank (Zone E)	*Total*
Area (ha)	2.0	1.5	1.1	1.5	7.6	*13.7*
Subsoil gypsum	40.0	30.0	22.0	30.0	152.0	*274.0*
Fertiliser blend	1.1	0.8	0.6	0.8	4.2	*7.5*
Organic matter (full rate)	82.8	62.1	45.5	62.1	314.2	*566.8*
Organic matter (reduced rate)	12.4	9.3	6.8	9.3	47.1	*84.9*
Topsoil gypsum	2.9	2.2	1.6	2.2	11.0	*19.9*

Table 12: North Arm to South Arm diversion – ameliorant demand

Ameliorant	Ameliorant demand (tonnes)					
	Lower bank	Lower bench	Mid bank	Mid bench	Upper & Overbank	*Total*
Area (ha)	2.9	2.0	1.4	1.9	14.3	*22.5*
Subsoil gypsum	69.6	48.0	33.6	45.6	343.2	*540.0*
Fertiliser blend	1.4	1.0	0.7	0.9	7.1	*11.1*
Organic matter (full rate)	158.9	109.6	76.7	104.1	783.6	*1,233.0*
Organic matter (reduced rate)	23.8	16.4	11.5	15.6	117.3	*184.5*
Topsoil gypsum	4.9	3.4	2.4	3.2	24.3	*38.3*

Table 13: South Arm to Harrybrandt Creek diversion – ameliorant demand

Ameliorant	Ameliorant demand (tonnes)					
	Lower bank	Lower bench	Mid bank	Mid bench	Upper & Overbank	*Total*
Area (ha)	2.7	1.5	1.3	1.5	9.2	*16.2*
Subsoil gypsum	32.4	18.0	15.6	18.0	110.4	*194.4*
Fertiliser blend	1.3	0.7	0.6	0.7	4.4	*7.7*
Organic matter (full rate)	108.0	60.0	52.0	60.0	368.0	*648.0*
Organic matter (reduced rate)	16.2	9.0	7.8	9.0	55.2	*97.2*
Topsoil gypsum	3.2	1.8	1.6	1.8	11.0	*19.4*

Table 14: Landforms – ameliorant demand

Ameliorant	Ameliorant demand (tonnes)				
	Humbug Plug	Landform A	Client designed	Landform B	*Total*
Area (ha)	1.28	32.39	27.71	8.47	*69.86*
Subsoil gypsum	25.6	712.6	498.9	152.4	*1,389.6*
Fertiliser blend	0.7	17.8	12.9	4.2	*35.7*
Organic matter (full rate)	90.4	1,198.5	1,457.8	395.4	*3,142.1*
Organic matter (reduced rate)	13.6	179.8	218.7	59.3	*471.3*
Topsoil gypsum	1.3	50.2	58.2	10.6	*120.3*

Table 15: Rock chutes and gully infill areas – ameliorant demand

Ameliorant	Ameliorant demand (tonnes)				
	Gully Infill (CH990)	Chute A and Infill (CH1400)	Chute B (CH380)	Gully Infill (CH1800)	*Total*
Area (ha)	5.62	0.119 (0.082)[1]	0.044 (0.018)[1]	2.57	*8.356 (8.293)[1]*
Subsoil gypsum	112.5	2.38	0.88	51.4	*167.12*
Fertiliser blend	2.8	0.04	0.01	1.3	*4.15*
Organic matter (full rate)	281.2	4.10	0.90	128.5	*414.65*
Organic matter (reduced rate)	42.2	0.62	0.14	19.3	*62.20*
Topsoil gypsum	8.4	0.12	0.03	3.9	*12.44*

[1] Areas in brackets exclude the rocked section of the chutes (i.e., areas not requiring topsoil or revegetation)

4.4 Topsoil management

4.4.1 Recovery and treatment

Assuming a recovery rate of 80% (to account for flow lines, erosion features and areas of shallow soil), there is approximately 104.38ha of intact topsoil within the designed disturbance footprint.

Where practical these areas will have gypsum surface applied at 1,050-2,100 kg/ha (see Table 9 and Table 10), be ripped to 100mm, stripped to 250mm, and removed to a holding stockpile for later use. The ripping and stockpiling process will incorporate the gypsum.

Ripping topsoil and stripping to an average depth of 250mm will generate around 260,946m^3 of topsoil (assuming an 80% recovery rate).

Noting, the 80% recovery rate is a conservative estimate, and the topsoil balance is subject to change. Once all zones have been topsoiled, any excess topsoil can be applied to high-risk areas or stockpiled for maintenance works. Topsoil that is to be stockpiled long-term for later use should be seeded or covered with a mulch layer to prevent erosion and nutrient loss.

Topsoil recovery, stockpiling and re-spreading is considered part of the civil earthworks work pack.

4.4.2 Demand

All available topsoil will be returned to the project area. The objective is to place gypsum treated topsoil on all diversion revegetation zones, landforms, rock chutes and gully infill areas to a minimum depth of 200mm (total of 130.47ha requiring 260,949m^3 of topsoil).

Diversion zones for topsoil spreading total 52.26ha (104,520m^3) and include:

- Zone A — 7.56ha (15,126m^3)
- Zone B — 5.03ha (10,052m^3)
- Zone C — 3.79ha (7,584m^3)
- Zone D — 4.84ha (9,676m^3)
- Zone E — 31.04ha (62,076m^3)

Landforms for topsoil spreading total 69.86ha (139,714m^3) and include:

- Humbug Gully plug — 1.28ha (2,565m^3)
- Landform A — 32.39ha (64,784m^3)
- Client-designed landform — 27.71ha (55,429m^3)
- Landform B — 8.47ha (16,935m^3)

Rock chute batters and gully infill areas for topsoil spreading total 8.29ha (16,586m^3) and include:

- Gully infill (CH990) — 5.62ha (11,246m^3)
- Chute A and infill (CH1400) — 0.082ha (164m^3)
- Chute B (CH380) — 0.018ha (36m^3)
- Gully infill (CH1800) — 2.57ha (5,140m^3)

4.5 Subsoil management

4.5.1 Gypsum treatment

The typical threshold for dispersive sodic soils is ESP 5%. Soil analysis indicates that subsoil throughout the three diversion and landform footprints is highly sodic (mean ESP 33%), requiring gypsum treatment to address the high ESP and reduce dispersivity and the risk of failure.

The objective is to get the prescribed rate of gypsum incorporated to the required depth and effectively mixed into the subsoil. Exposed subsoils will be contour ripped to 200mm and have gypsum incorporated, with the exception being the lower benches. The following approach will be applied:

- Gypsum is surface spread at the prescribed rate (Table 9).
- Gypsum incorporation is to occur as soon as practical after spreading to ensure minimal gypsum loss through wind dispersal.
- Retain a rough subsoil surface to tie in later with applied topsoil.
- Where ripping is required, it will be along the contour to avoid the potential to create channels and cracks running downslope that might lead to rilling and tunnelling.
- Ripping will not be undertaken when the sub-soil is too wet (leading to smearing). The intention of ripping activities is to leave a roughened surface but not to create large open rip furrows which will lose later applied seed.
- Ripping may need to be followed by an offset plough to achieve incorporation.

Where a batter slope precludes dozer ripping (due to slope), the zone will be scarified on the contour to 100mm – 150mm depth with an excavator bucket or equivalent. Gypsum will be topically applied, watered in and followed by topsoil spreading.

5. Revegetation strategy

The revegetation strategy comprises the following components for each zone:

- Regional ecosystem types.
- Site soil sampling and analysis.
- Soil amelioration and site preparation.
- Revegetation establishment.
- Established vegetation maintenance.
- Monitoring.

5.1 Objectives for the vegetation community

Revegetation aims to encourage the rapid establishment of a vegetation community that contributes to bank stability and is representative of the surrounding riparian community.

Revegetation works, particularly topsoil placement and soil treatments, should proceed as soon as practical after civil works are completed.

5.2 Regional Ecosystem Types

The vegetation community Regional Ecosystem Types (RET) are summarised in Table 16 with detailed descriptions of each RET provided in Appendix 3. Species associated with the RET's, coupled with historical field surveys, have informed revegetation species selection.

A flora survey of the site was conducted by WBM in 2000, which identified bands of riparian open forest and mixed eucalypt woodland. Canopy species included *Corymbia trachyphloia, Corymbia tesselaris, Eucalyptus populnea and Eucalyptus tereticornis*. Scattered small trees such as *Petalostigma pubescens* and *Bursaria incana* were also present. Although shrubs within these bands are rare, *Acacia species* and *Erythroxylon australe* were identified. The groundcover is mainly composed of grasses, with exotic *Cenchrus ciliaris* being the most prevalent.

Additionally, the *Thirty Mile Creek Diversion Revegetation Plan* (Peabody, 2015) indicated the presence of *Melaleuca leucadendra* in the riparian zone as well as *Eucalyptus tereticornis* and *Petalostigma pubescens* in the upper banks.

Table 16: Regional Ecosystem Types

Regional Ecosystem	Conservation Status	REDD Short Description
11.3.25	Vegetation Management Act Class (VMA) Class: Least concern Biodiversity Status: Of concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines
11.5.3/11.7.2		
11.5.3	Vegetation Management Act Class (VMA) Class: Least concern Biodiversity Status: No concern at present	*Eucalyptus populnea* +/- *E. melanophloia* +/- Corymbia clarksoniana woodland on Cainozoic sand plains and/or remnant surfaces
11.7.2	Vegetation Management Act Class (VMA) Class: Least concern Biodiversity Status: No concern at present	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone
11.5.3/11.3.4		
11.3.4	Vegetation Management Act Class (VMA) Class: Of concern Biodiversity Status: Of concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains

6. Revegetation establishment

6.1 Establishment period

The revegetation establishment period includes installation of the seed and tubestock and the 12-week irrigation and maintenance period after planting implementation is completion.

Performance criteria will be assessed for success at 12 weeks. Table 17 details the establishment revegetation approach.

6.2 Mulch

Vegetation material cleared for construction shall be mulched, retained, and stockpiled for use as erosion protection for areas of moderate erosion risk at the end of the construction phase. Mulch stockpiles and windrows shall be located on the downslope edge of the worksite, outside of concentrated overland flow and more than 50m from designated waterways. Mulch windrows may be used as temporary sediment filter berms for dispersed overland flow, as part of the implementation of an erosion and sediment control (ESC) plan, but lack the density required for high flow areas. Consult a Certified Professional in Erosion and Sediment Control (CPESC) for a detailed plan for suitability of mulch as a sediment filter.

As well as providing fragile soils with moderate protection from rain drop impacts, a thin layer (20mm) of mulch holds moist and shaded microclimate niches suitable for seed germination and the initial growth phase, adds carbon to the soil and provides a feedstock for microorganisms, improving soil health. This is achieved optimally when the mulch remains at the soil's surface, exposed to aerobic conditions, rather than when it is buried.

Mulch incorporated into the topsoil draw-down nitrogen, removing it from availability for vegetation growth, and release this nitrogen back over time. The quantities of fertiliser used through this project are expected to buffer nitrogen draw-down issues, however, surface mulching is the preferred option for successful vegetation establishment.

The following zones will receive mulch to a thickness of 20mm (200m^3/ha), in order of priority:

1. Long-term (i.e., >12 month) topsoil stockpiles.
2. Upper regions of the Overbank.
3. Mid bench.
4. Lower bench.

6.3 Revegetation by Zone

Subsoil amelioration, topsoil placement and amelioration and revegetation will follow completion of subgrade shaping. A summary of the revegetation method sequence and timeline for each Zone is presented in Table 17.

The detail provided below excludes the irrigation option for watering areas considered essential for rapid early establishment. The Irrigation approach is considered in Section 8 below.

Revegetation risks and controls are detailed in Appendix 2. Hold points and quality assurance steps are included in Table 17.

Table 17: Revegetation approach for each Zone

Zone	Task	Description	Rate/Frequency/Ref.
Zone A: Lower Bank	Subgrade preparation and amelioration	***No deep ripping*** shall occur within this zone due to high flow rates and consequent high erosion risks. Therefore, pathways to the highly erodible subgrade material are to be avoided to prevent failure. Ameliorants shall be spread over the subgrade material with a spreader at the correct rate. Ameliorants shall then be incorporated to a maximum depth of 100mm using a set of harrows, tines, or disks, working on the contour, with a maximum spacing of 100mm. ***[Observation Point]***	Maximum 100mm deep and 100mm spacing.
	Topsoil placement	***Either:*** Topsoil that is not contaminated by subsoil or other foreign matter shall be mixed with the ameliorants at the correct rate during the loading process at the stockpile location. The pre-mixed ameliorated topsoil shall then be transported to the placement site, tipped and spread over the entire zone to uniform thickness of 200mm. Final trim shall be with a grader to ensure that a uniform surface exists, suitable for the seeding process (if soil is ameliorated during loading, skip the amelioration section below). ***Or:*** Topsoil that is not contaminated by subsoil or other foreign matter shall be place to a minimum depth of 200mm. ***[Observation Point]***	200mm minimum

Zone	Task	Description	Rate/Frequency/Ref.
	Amelioration	Thorough treatment of unfavourable soil geochemical properties is essential. Spreading should be implemented with an agricultural spreader that can be finely calibrated to deliver uniform spreading of ameliorants across the whole area, taking care to overlap swaths. Spread ameliorants at the prescribed rate using appropriate machinery. ***[Observation Point]***	Table 9
	Seeding	Seeding should be implemented with an agricultural seeder that can be finely calibrated to deliver uniform seeding across the whole area, taking care to overlap swaths. Visual monitoring should be undertaken to ensure seed is applied uniformly to the entire area. ***[Observation Point]***	Appendix 4
	Harrowing	Immediately after seeding, a set of chain harrows with tine spacing no greater than 100mm should be used to incorporate seed and ameliorants to a depth no greater than 50mm. ***[Observation Point]***	
	Watering (seeded areas)	Check water quality to ensure it is sufficient to promote plant growth. Water seeded areas as per the irrigation schedule. ***[Observation Point]***	Apply 6mm per ha (60,000 litres/ha) at sowing, then water per irrigation schedule.
	Planting tubestock and fertilising	Sedges only to be planted in this zone. Manually dig hole of sufficient depth to allow the roots of the plant to be placed into the ground to the depth of the root collar, with	150g of organic fertiliser per plant

Zone	Task	Description	Rate/Frequency/Ref.
		sufficient space for the organic fertiliser. Incorporate organic fertiliser into each tubestock planting hole and surrounds. ***[Observation Point]***	
		Manually plant tubestock (seedlings) at prescribed stocking densities as per recommended palate. Plant sedge species on the upstream side of rock chutes, low points and other places where water is likely to pond for extended periods. Heel-in soft ground around excavated hole, to ensure good ground to root contact. ***[Observation Point]***	Appendix 4
	Watering (tubestock)	Check water quality to ensure it is sufficient to promote plant growth. Water-in tubestock immediately after planting, ensuring water is directed at the root collar at low pressure to avoid erosion and loss of water. Heel-in again as required after watering when the ground is soft, to ensure good root to soil contact. Ensure roots are not damaged by excessive pressure. ***[Observation Point]***	6 litres per plant
Zones B, C, D and E: Mid Bank, Benches and Upper Bank **Rock chutes and gully infill areas**	Ground preparation	After the subgrade is shaped, ameliorants shall be spread over the subgrade material with a spreader at the correct rate. Ameliorants shall then be incorporated to a maximum depth of 300mm using a set of tines or disks, working on the contour, with a maximum spacing of 300mm. ***[Observation Point]***	300mm maximum

Zone	Task	Description	Rate/Frequency/Ref.
	Topsoil placement	***Either:*** Topsoil that is not contaminated by subsoil or other foreign matter shall be mixed with the ameliorants at the correct rate during the loading process at the stockpile location. The pre-mixed ameliorated topsoil shall then be transported to the placement site, tipped and spread over the entire zone to uniform thickness of 200mm. Final trim shall be with a grader to ensure that a uniform surface exists, suitable for the seeding process (if soil is ameliorated during loading, skip the amelioration section below). ***Or:*** Topsoil that is not contaminated by subsoil or other foreign matter shall be place to a minimum depth of 200mm. ***[Observation Point]***	200mm minimum
	Amelioration	Thorough treatment of unfavourable soil geochemical properties is essential. Spreading should be implemented with an agricultural spreader that can be finely calibrated to deliver uniform spreading of ameliorants across the whole area, taking care to overlap swaths. Spread ameliorants at the prescribed rate using appropriate machinery. ***[Observation Point]***	Table 9 & Table 10
	Seeding	Seeding should be implemented with an agricultural seeder that can be finely calibrated to deliver uniform seeding across the whole area, taking care to overlap swaths. Visual monitoring should be	Appendix 4

Zone	Task	Description	Rate/Frequency/Ref.
		undertaken to ensure seed is applied uniformly to the entire area. ***[Observation Point]***	
	Harrowing	Immediately after seeding, a set of chain harrows with tine spacing no greater than 100mm should be used to incorporate seed and ameliorants to a depth no greater than 50mm. ***[Observation Point]***	50mm
	Mulching	Mulch shall be preferentially used on the mid bank and bench zones, spread over the seeded soil, no thicker than 20mm. This will help prevent erosion in medium risk areas, and provide soil carbon. ***[Observation Point]***	Section 6.2.
	Watering (seeded areas)	Check water quality to ensure it is sufficient to promote plant growth. Water seeded areas as per the irrigation schedule. ***[Observation Point]***	Section 8.2.
	Planting tubestock and fertilising	Manually dig hole of sufficient depth to allow the roots of the plant to be placed into the ground to the depth of the root collar, with sufficient space for the organic fertiliser. Incorporate organic fertiliser into each tubestock planting hole and surrounds. ***[Observation Point]***	150g of organic fertiliser per plant
		Manually plant tubestock (seedlings) at prescribed stocking densities as per recommended palate.	Appendix 4.

Zone	Task	Description	Rate/Frequency/Ref.
		Heel-in soft ground around excavated hole, to ensure good ground to root contact. ***[Observation Point]***	
	Watering (tubestock)	Check water quality to ensure it is sufficient to promote plant growth. Water-in tubestock immediately after planting, ensuring water is directed at the root collar at low pressure to avoid erosion and loss of water. Heel-in again as required after watering when the ground is soft, to ensure good root to soil contact. Ensure roots are not damaged by excessive pressure. **[Observation Point]**	6 litres per plant
Landforms	Ground preparation	After the landforms are shaped, ameliorants shall be spread over the benches with a spreader at the correct rate. Ameliorants shall then be incorporated to a maximum depth of 300mm using a set of tines or disks, working on the contour, with a maximum spacing of 300mm. ***[Observation Point]***	300mm maximum
	Topsoil placement	***Either:*** Topsoil that is not contaminated by subsoil or other foreign matter shall be mixed with the ameliorants at the correct rate during the loading process at the stockpile location. The pre-mixed ameliorated topsoil shall then be transported to the placement site, tipped and spread over the entire zone to uniform thickness of 200mm. Final trim shall be with a grader to ensure that a uniform surface exists, suitable for the seeding process (if soil is ameliorated during loading, skip the amelioration section below).	200mm minimum

Zone	Task	Description	Rate/Frequency/Ref.
		Or: Topsoil that is not contaminated by subsoil or other foreign matter shall be place to a minimum depth of 200mm. ***[Observation Point]***	
	Amelioration	Thorough treatment of unfavourable soil geochemical properties is essential. Spreading should be implemented with an agricultural spreader that can be finely calibrated to deliver uniform spreading of ameliorants across the whole area, taking care to overlap swaths. Spread ameliorants at the prescribed rate using appropriate machinery. ***[Observation Point]***	Table 9 & Table 10
	Seeding	Seeding should be implemented with an agricultural seeder that can be finely calibrated to deliver uniform seeding across the whole area, taking care to overlap swaths. Visual monitoring should be undertaken to ensure seed is applied uniformly to the entire area. ***[Observation Point]***	Appendix 4.
	Harrowing	Immediately after seeding, a set of chain harrows with tine spacing no greater than 100mm should be used to incorporate seed and ameliorants to a depth no greater than 50mm. ***[Observation Point]***	50mm

Zone	Task	Description	Rate/Frequency/Ref.
	Mulching	Any remaining mulch shall be spread over the seeded ground, no thicker than 20mm. This will help prevent erosion and provide coil carbon. ***[Observation Point]***	Section 6.2.
	Watering (seeded areas)	Check water quality to ensure it is sufficient to promote plant growth. Water seeded areas as per the irrigation schedule. ***[Observation Point]***	Section 8.2.

7. Revegetation palette

7.1 Species

The proposed rehabilitation species align with the pre-clear RET's of the work zones (Appendix 3) as well as the local flora noted. The proposed species suitable for revegetation at the diversion site (Table 18) have been selected to provide a successional species establishment designed to quickly stabilise the soil with a short-lived cover crop species, and slower establishing stoloniferous species with high capacity to bind the soil, plus deep-rooted legumes to contribute nitrogen and soil shear strength.

Table 18: Suite of suitable revegetation species

Species	Common name	Notes
Upper story		
Eucalyptus camaldulensis	River red gum	High priority
Eucalyptus crebra	Narrow leaved ironbark	High priority
Eucalyptus populnea	Poplar box	High priority
Eucalyptus tereticornis	Forest red gum	High priority
Casuarina cunninghamiana	River she-oak	
Corymbia clarksoniana	Clarksons Bloodwood	
Corymbia intermedia	Pink bloodwood	
Corymbia tessellaris	Moreton Bay Ash	
Eucalyptus coolabah	Coolibah	
Eucalyptus fibrosa	Broad-leaved Red Ironbark	
Eucalyptus melanophloia	Silver-leaved Ironbark	
Melaleuca bracteata	Black tea tree	
Melaleuca leucadendra	Weeping paperbark	
Mid story		
Acacia holosericea	Soapbush wattle	
Acacia salicina	Black sally wattle	
Acacia stenophylla	River myall	
Alphitonia excelsa	Soap ash	
Lysiphyllum carronii	Red bauhinia	
Melaleuca viminalis	Dawson River bottlebrush	
Sedge		
Cyperus exaltatus	Tall flat sedge	
Cyperus gracilis	Slender flat sedge	

Species	Common name	Notes
Lomandra longifolia	Spiny-head mat-rush	
Groundcover - native		
Aristida ramosa	Purple wiregrass	
Bothriochloa bladhii	Swann/Forest blue grass	
Chloris truncata	Windmill grass	
Cymbopogon referactus	Barbed wire grass	
Dichanthium sericeum	Queensland Blue grass	
Enteropogon acicularis	Curly windmill grass	
Phragmites australis	Common reed	
Themeda triandra	Kangaroo Grass	
Groundcover - pasture		
Chloris gayana (Endura)	Endura Rhodes grass	
Chloris gayana (Katambora)	Katambora Rhodes grass	
Cynodon dactylon	Green Couch or Bermuda grass	
Urochloa mosambicensis var. Nixon	Sabi grass	
Groundcover - legumes		
Desmanthus progardes	Progardes	
Stylosanthes scabra	Seca Stylo	
Cover crop species		
Echinochloa esculenta	Japanese Millet	
Panicum miliaceum	White French Millett	
Sorghum vulgare	Sugar drip sorghum	
Lolium multiflorum	Short-lived ryegrass	Winter alt.

7.2 Seed and tubestock demand

The revegetation objective is to achieve site stabilisation in the shortest practical timeframe. A combination of native grass seed, native sedge, short-lived cover crop, pasture-grass, and pasture-legume seed and tubestock will be deployed. Seed application rates and tubestock stocking rates by revegetation zone are presented in Table 19, Table 21 and Table 23, with species details in Appendix 4.

As the rock chutes and gully infill areas can be considered ‘high risk’ areas similar to the diversions, it is recommended they follow a similar revegetation approach as Zones-B-D (i.e., seeding and tubestock). The landforms are lower risk and will require only seeding, no tubestock.

Seed application rates and tubestock stocking rates for landforms, rock chutes and gully infill areas are in Table 20, Table 22 and Table 24.

Native seed procurement is a long lead time item, given the variabilities of nature. Seed ordering or collection and storage should begin immediately after contract award. Placing a priority on seed acquisition will guarantee supply quantities.

Table 19: Seed application rates by diversion revegetation zone

Species (kg/ha)	Lower Bank (Zone A)	Lower Bench (Zone B)	Mid Bank (Zone C)	Mid Bench (Zone D)	Upper Bank (Zone E)
Tree – Upper	-	-	-	-	1.0
Tree - Midstory	-	1.0	1.0	1.0	1.0
Native grass	4.0	5.0	5.0	5.0	6.0
Sedge	2.0	-	-	-	-
Pasture grass	10.0	10.0	10.0	10.0	10.0
Legume	4.0	4.0	4.0	4.0	4.0
Cover crop	20.0	20.0	20.0	20.0	20.0
TOTAL	*40.0*	*40.0*	*40.0*	*40.0*	*42.0*

Table 20: Seed application rates for landforms, rock chutes and gully infill areas

Species (kg/ha)	Landforms	Rock chutes and gully infill areas
Tree – Upper	1.0	-
Tree - Midstory	1.0	1.0
Native grass	6.0	5.0
Pasture grass	10.0	10.0
Legume	4.0	4.0
Cover crop	20.0	20.0
TOTAL	*42.0*	*40.0*

Table 21: Seed demand (kg) by lifeform for each diversion and revegetation zone

Div.	Humbug Gully			North Arm to South Arm			South Arm to Harrybrandt Creek		
Reveg. Zone	Lower Bank (Zone A)	Mid Bank & Benches (Zones B-D)	Upper Bank (Zone E)	Lower Bank (Zone A)	Mid Bank & Benches (Zones B-D)	Upper Bank (Zone E)	Lower Bank (Zone A)	Mid Bank & Benches (Zones B-D)	Upper Bank (Zone E)
Area	2.0	4.1	7.6	2.9	5.3	14.3	2.7	4.3	9.2
Tree (upper)	-	-	7.6	-	-	14.3	-	-	9.2
Tree (mid)	-	4.1	7.6	-	5.3	14.3	-	4.3	9.2
Native grass	8.0	20.5	45.6	11.6	26.5	85.8	10.8	21.5	55.2
Sedge	4.0	-	-	5.8	-	-	5.4	-	-
Pasture grass	20.0	41.0	76.0	29.0	53.0	143.0	27.0	43.0	92.0
Legume	8.0	16.4	30.4	11.6	21.2	57.2	10.8	17.2	36.8
Cover crop	40.0	82.0	152.0	58.0	106.0	286.0	54.0	86.0	184.0
TOTAL (kg)	**80.0**	**164**	**319.2**	**116.0**	**212.0**	**600.6**	**108.0**	**172.0**	**386.4**

Table 22: Seed demand (kg) by lifeform for each landform, rock chute and gully infill area

Species	Landforms				Rock chutes and gully infill areas			
	Humbug Plug	Landform A	Client designed	Landform B	Gully Infill (CH990)	Chute A and Infill (CH1400)	Chute B (CH380)	Gully Infill (CH1800)
Area	1.282	32.392	27.715	8.468	5.623	0.082	0.018	2.570
Tree (upper)	1.3	32.4	27.7	8.5	-	-	-	-
Tree (mid)	1.3	32.4	27.7	8.5	5.62	0.08	0.02	2.57
Native grass	7.7	194.4	166.3	50.8	28.12	0.41	0.09	12.85
Pasture grass	12.8	323.9	277.1	84.7	56.23	0.82	0.18	25.70
Legume	5.1	129.6	110.9	33.9	22.49	0.33	0.07	10.28
Cover crop	25.6	647.8	554.3	169.4	112.46	1.64	0.36	51.40
TOTAL (kg)	**53.9**	**1360.5**	**1164.0**	**355.6**	**224.92**	**3.28**	**0.72**	**102.80**

Table 23 summarises the number of seedlings required for each zone. It is recommended that the Upper Bank (Zone E) be irrigated along the crest and along the toe (i.e., the interface with the mid bench. As such, the stocking rates presented in Table 23 are linear rates along the proposed irrigation drip lines rather than a per hectare rate. Recommended species are presented in Appendix 4.

Table 23: Tubestock requirements for diversions

Stratum	Lower Bank: Zone A (7.6ha)		Mid Bank and Benches: Zones B–D (13.7ha)		Upper Bank: Zone E (18,260m)		Tubestock Demand
	Stocking	Tubes	Stocking	Tubes	Stocking	Tubes	
Tree	-	-	750	**10,275**	1stem/4m	**4,565**	*14,840*
Sedge-Rush	750	**5,700**	-	-	-	-	*5,700*

Table 24: Tubestock requirements for rock chutes and gully infill areas

Stratum	Stocking (spha)	Tubes				Tubestock Demand
		Gully Infill (CH990)	Chute A and Infill (CH1400)	Chute B (CH380)	Gully Infill (CH1800)	
Tree	750	4,218	62	14	1,928	6,222
Sedge-Rush	-	-	-	-	-	-

Seeds should be sourced from, or provided to, an industry accredited nursery for germination to supply Project tubestock. As far as practical all seed and seedlings will be sourced from known local provenances.

7.3 Tubestock management

7.3.1 Tubestock procurement

Tubestock will be procured from Nursery Industry Accreditation Scheme Australia (NIASA) registered nurseries using Central Queensland region species provenances where available and practical. Seedlings are a long-lead time item and will need to be ordered well in advance of the required planting date. The typical nursery production time for Eucalypts is four months. Where Central Queensland seed provenances cannot be sourced suitable substitutions may be approved from Appendix 4.

7.3.2 Seedling container type

Seedling pot type options include:

- Hyco V93 tray (40 cells) with root trainers and provision for air-pruning; or
- 50 mm x 50 mm Queensland native tubes.

Seedlings will be dispatched in nursery trays.

7.3.3 Seedling contingency

An allowance should be made for a 10% contingency for refills.

7.3.4 Seedling specifications

Appendix 5 details the acceptable tubestock specification.

7.3.5 Seedling production quality assurance

Nursery site inspections are recommended to verify that the seedlings are progressing and meet the seedling specification. Seedlings will be drought hardened in the nursery during the last six weeks of their grow out period.

Nursery visits to be conducted at Week 6 and Week 12.

7.3.6 Field nursery management

A secure temporary holding area should be established. The site should be located under available tree canopy shade and an irrigation sprinkler system installed. Sufficient seedlings for one weeks' planting can be held onsite. Seedlings should not be carried over on temporary holding arrangements for more than two weeks.

Seedling trays will be stored above ground level and watered three times per day. Watering duration will be until run-off is observed.

7.3.7 Seedling planting technique

Seedlings should be procured as container stock and maintained in a field holding area.

All seedlings should be manually planted with an individual tree fertiliser application.

Table 25 details the approach to seedling establishment.

Table 25: Planting technique

Step	Task	Specification
Planting spots	If grass germination is present, spot spray a planting spot two weeks prior to planting.	0.3m diameter with glyphosate or approved herbicide at label rates.
Seedling plug watering	All seedling plugs to be dipped into a reputable water. Liquid fertiliser can be included at this step and mixed in with the water.	Plugs saturated before deployment to field.
Row & Seedling spacing	Seedlings should be planted in a row-line format unless directed by the Site Manager. (row-line formation simplifies subsequent maintenance works)	750spha = ~4.0m x 3.3m
Planting depth	Manual excavation of planting hole to allow placement of organic fertiliser and coverage of the root collar .	
Nutrition	Place 50% fertiliser into planting hole base. Balance will be placed at ground level following planting.	150g organic fertiliser.
Planting	Place seedling into hole and backfill.	
Compression	Lightly compact the soil around the seedling by stepping either side of the seedling leaving a depression.	
Establishment watering	Use a water spear or similar to inject 6 litres of water into the soil adjacent to the seedling plug.	6 litres water per seedling.

7.4 Direct seeding

For the risk assessment to be applied to direct seeding see Appendix 2.

7.4.1 Seed sowing and depth

7.4.1.1 Mechanical seeding

A range of tractor drawn, and dozer mounted seeding equipment is available to sow seed.

Site slope and roughness will determine the final site preparation and equipment configuration.

Prepared beds that have become crusted must have the surface broken up by scarifiers, coulter discs, or equivalent.

Seed sowing delivery options include:

- Direct drill air-seeders.
- Drum seeders.
- Surface spreaders.

All options should be integrated with scarifiers, harrows or tracking chains, which will assist with seed incorporation.

Equipment will be capable of adjustment to:

- Place seed within 1 cm depth increments; and
- Achieve required application rate (kg/ha).

7.4.1.2 Manual seeding

Where infrastructure such as pile fields limit the use of machinery, manual seeding may be required.

To apply seed manually, ensure the receiving surface has been roughened.

Apply seed mix at prescribed rate (Table 19), noting that the rate per square metre (kg/m^2) is equivalent to kg/ha/10,000.

Broadcast seed over site.

Rake the receiving surface to incorporate seed to 1cm.

Water at 6mm per hectare ensuring surface runoff does not occur.

7.4.2 Direct seeding sowing timing

To provide a maximum chance of germination and plant survival, consider the following:

- As a guide direct seeding should be avoided when soil temperature exceeds 40°C in the upper 10mm to 30mm.
- Ideally seed is best sown immediately in advance of a period when reliable rain and mild temperatures can be expected.
- Sowing should ensure that vegetation is established to protect soil from erosion prior to the onset of heavy seasonal rainfalls (wet season). The preferred windows for direct seeding are:
    - Late February / Early March
    - September / October.

8. Irrigation system

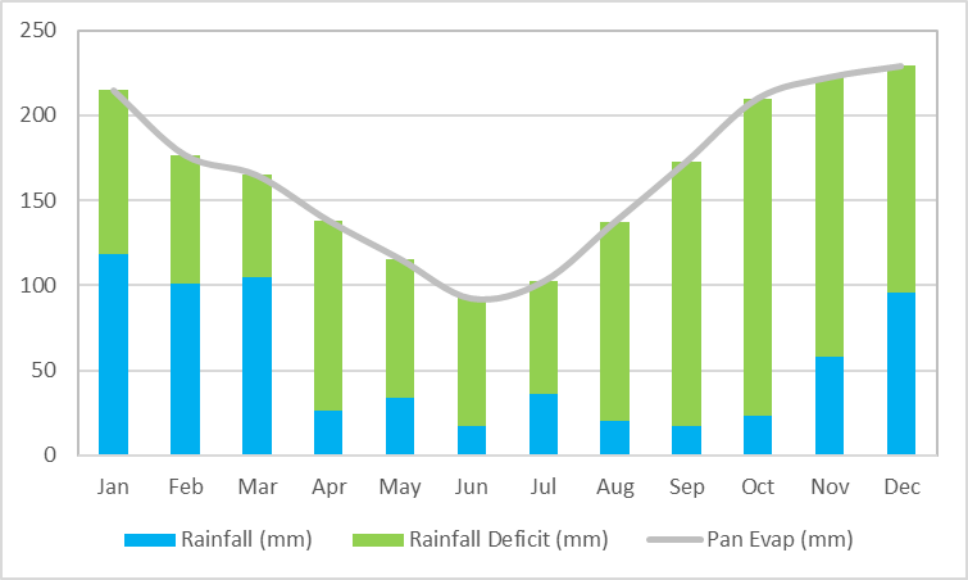
The establishment of a self-sustaining and robust vegetation cover is crucial for the long-term success of the revegetation efforts and for reducing ongoing maintenance costs. To achieve this goal, we highly recommend utilizing an irrigation system in the early stages of the project, which would remove the risks associated with reliance on climatic conditions. By establishing vegetation through irrigation, we can achieve a self-sustaining and low-maintenance revegetation outcome, which will reduce the need for ongoing maintenance and ensure the long-term success of the project.

Irrigation assists in three principal ways. Firstly, by improving establishment of vegetation that binds the soil and increases surface roughness, secondly, by facilitating exchange of gypsum with sodium in the soil, and thirdly, by consolidation of the spread soil. The likelihood or risk of rehabilitation failure decreases with the use of irrigation, particularly in highly dispersive soils.

8.1 Irrigation rate

Nebo average daily evapotranspiration (ET) rate is 5.4mm per day with summer maximums up to 8.3mm per day. The area experiences moderate, summer rainfall averaging 650mm per year. Therefore, the greatest rainfall deficits are during the spring and early summer months, September to December, with a mean 5.3mm deficit per day (Figure 7). The rainfall deficits for the remainder of the year average 2.9mm per day.

Figure 7: Rain and evaporation patterns (Nebo, QLD)



The irrigation system will require detailed design by suitable irrigation specialists. Nominally, each dripper emitter should provide a minimum of 2.5 litres per hour. A 2.4-hour irrigation event will be required to deliver 6 litres per event (equivalent to 6mm/m^2) in the spring period (September to December). A 1.2-hour irrigation event will be required to deliver 3L per event (~3mm/m^2).

8.2 Irrigation frequency

Table 26 proposes an irrigation schedule to achieve rapid early establishment.

Table 26: Irrigation Frequency

Establishment Irrigation	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
Frequency (events/week)	3	3	3	3	2	2	2	2	2	2	2	2
Maintenance Irrigation	**Month**											
	3	4	5	6	7	8	9	10	11	12	13	-
Frequency (events/month)	2	2	2	2	1	1	1	1	1	1	Review	-

Irrigation is planned for the 12-week establishment period and follow-on maintenance until 12 months.

Irrigation frequency may be adjusted by the Project Manager to fit prevailing drought and moisture conditions.

8.2.1 Supplementary watering events

The irrigation design and schedule address a portion of the revegetation zones that are considered higher risk.

Seasonal conditions may dictate that underperforming areas within the project may require supplementary watering events.

9. Monitoring and performance

9.1 Monitoring program

The aim of the monitoring program is to assess the effectiveness of revegetation efforts and determine if they meet set key performance indicators (KPIs). The program will be implemented for a minimum of two years and is designed to quantify success and identify any remedial actions that need to be taken. The results will be used to inform timely mitigation interventions to ensure the success of the revegetation project.

Table 27 defines monitoring terms used in the following sections and for the purpose of monitoring records.

Table 27: Monitoring terms

Term	Definition
Groundcover	All grass, shrub, legume, and pasture less than 1m height.
Seedlings	Planted native tree and shrub species 0-6m.
Trees	Native species greater than 6m.
Weeds	All species listed in the *Biosecurity Act 2014* plus local environmental weeds.
Litter	Any dead "on-ground" vegetation matter (including spread mulch).
Rock	Observed surface stone, gravel, or rock.
Bare ground	Land that is free of live vegetation and includes Rock and Litter.

9.1.1 Monitoring plots

Monitoring will consider each Zone independently, with varying monitoring plot configurations implemented to accommodate the configuration and planting geometry of the different zones.

Seedling Stocking rate for each 100m transect is (Seedling Count x 25) = stocking per ha.

Photos are to be taken in North, East, South and West directions at each timber picket. A picket reference number should be included in the photo centre.

Ground cover percentage will be the average of:

- Grass & Pasture%;
- Legume%;
- Litter%; and
- Bare ground %.

9.1.2 Refill planting and seeding

Independent of any monitoring survey outcomes, seedling refill and seed re-sow will be required on all planted areas up to the end of Revegetation Maintenance Year 1 (Week 1 to Month 12) within any Zone when the following conditions exist:

- Any bare area greater than $10m^2$;
- Any contiguous area of $20m^2$ with less than 50% groundcover; or
- Any row length of planted seedlings greater than 15m where seedlings have failed.

If these requirements are not met, it will be considered failed, and should undergo remedial revegetation to achieve:

- A minimum ground cover of 50%; and
- A minimum tree survival in line with Table 29.

The above thresholds provide guidance for vegetation management on all Zones. Remedial irrigation as per the irrigation schedule is necessary for any areas that have been re-seeded or re-planted with tubestock.

9.1.3 Remedial soil and spoil sampling

The objective of remedial soil and spoil sampling is to identify and assess any soil and spoil factors that are potentially causing poor plant growth or stability issues. Remedial amelioration may be necessary based on soil sample results.

The following criteria will be used to determine the need for remedial soil and spoil sampling:

- Changes in plant growth — there are noticeable changes in plant growth or health (i.e., plant mortality, stunted growth or discolouration);
- Observed erosion — there is significant erosion (i.e., rilling) occurring over an area; or
- Monitoring performance criteria — revegetation is not developing as per the KPIs (Table 29).

Sampling will be done using the following procedures:

- Sampling locations will be identified based on monitoring data and conducted at various depths within the soil profile.
- The number of samples will be chosen as required based on monitoring data and collected using a hand auger or hydraulic soil corer.
- Samples will be sent to a NATA accredited laboratory for analysis and tested for a standard fertility and erodibility suite.
- If soil and / or spoil characteristics are found to be contributing to poor plant growth and health, then a remedial action plan will be developed to provide amelioration recommendations.

Table 28: Ground Cover Percentage (example shown)

	Quadrat1	Quadrat2	Quadrat3	Average%
Grass & Pasture%	55%	75%	60%	63%
Legume%	10%	5%	0%	5%
Litter%	10%	5%	10%	8%
Weeds%	5%	5%	20%	10%
Rock%	5%	0%	0%	2%
Bare ground%	15%	10%	10%	12%
Total	100%	100%	100%	-
Ground Cover%	**75%**	**85%**	**70%**	**76%**

9.1.3.1 Zones A and E

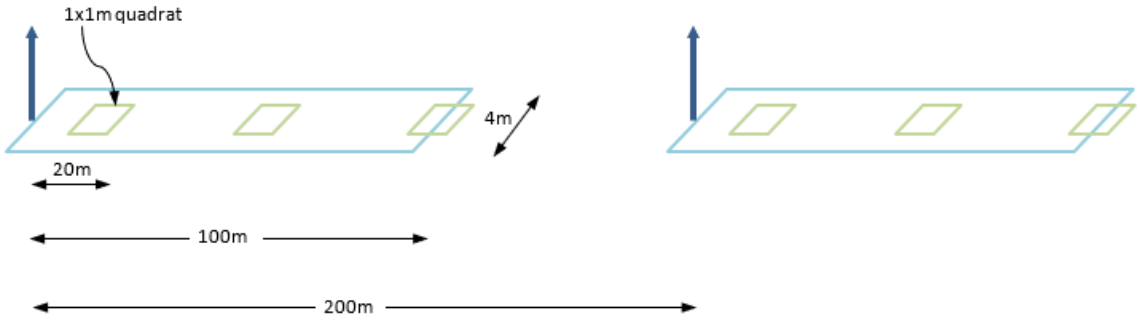
Zone A is the Lower Bank, which is a narrow linear shape by design and includes a single irrigated seedling row. Zone E consists of the Upper and Over Banks, which is wider and includes two distinct irrigated rows. A basic transect sampling approach will be adopted for both of these Zones.

Timber pickets will be installed every 200m along the irrigated rows, with a GPS location recorded for each picket.

Commencing from the picket at 0m:

1. Walk 20m along the transect, recording each planted seedling 2m either side of the centreline.
2. At 20m, assess a temporary 1m x 1m quadrat for ground cover percentage of all vegetation <1m high.
3. Repeat the process for successive 20m sections, until 100m is completed. Walk up to the next timber picket and repeat the procedure until the Zone has been traversed. Figure 8 demonstrates the linear sample format.

Figure 8: Linear plot sampling approach (Zones A and E)



9.1.3.2 Zones B, C and D

Zones B, C and D comprise the Mid Bank and the two Benches. Each of these zones are a narrow linear shape and include two irrigated rows. Monitoring of these zones will be combined using a staggered transect approach.

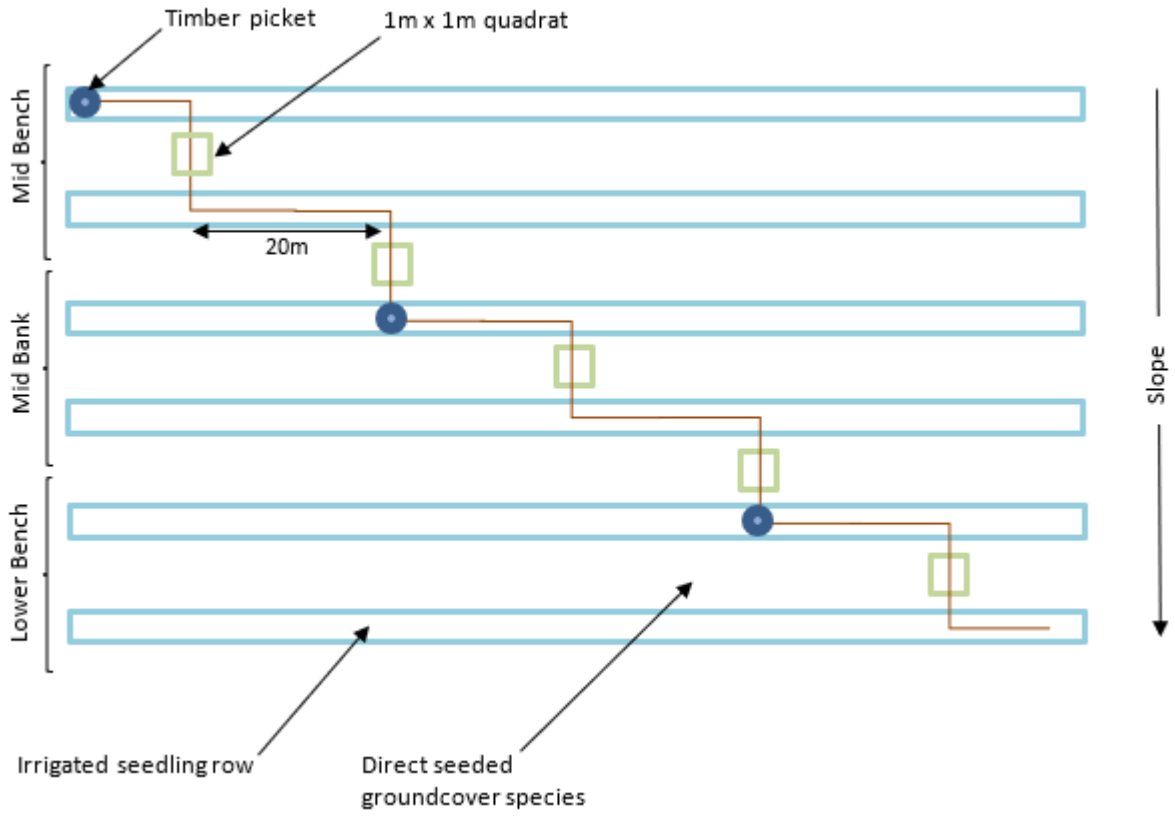
Timber pickets will be installed in a staggered pattern, in every second row (as shown in Figure 9), with GPS locations recorded for each picket.

Commencing from the Upper Bench picket at 0m:

1. Record each planted seedling for 20m along row.
2. Step downslope into the inter-row and assess a 1m x 1m quadrat for ground cover percentage.
3. Step downslope into the next row and record each planted seedling for 20m along row.
4. Repeat until all six rows have been assessed.

Each of the staggered transects equate to 120m traverse.

Figure 9: Staggered plot sampling approach (Zones B, C and D)



9.1.3.3 Incidental monitoring

In addition to the designated monitoring plots, it is important to conduct incidental monitoring of any areas outside these plots that exhibit significant erosion or signs of poor plant health. These observations can be done during the scheduled monitoring events and are crucial in identifying potential issues that may be overlooked during the routine monitoring of established plots.

By incorporating incidental monitoring into the overall monitoring plan, the project team can proactively identify and address areas of concern. This approach enables swift intervention and necessary adjustments, preventing further damage and promoting the overall success of the project.

During incidental monitoring, attention should be given to the following aspects:

1. Erosion:
    a. Examine areas exhibiting signs of erosion (i.e., rilling, incisions, or exposed subsoil).
    b. Assess the extent and severity of erosion, noting changes or new erosion features.
    c. Identify contributing factors, (i.e., inadequate vegetation cover, improper drainage, soil dispersion or high-intensity rainfall events).
2. Plant health:
    a. Observe the overall health of vegetation within the project area, paying attention to signs of stress, decline, or disease.
    b. Document any areas where plant growth appears stunted (i.e., sparse foliage, discoloration, or dieback).
    c. Note any invasive species or weed encroachment that may be negatively impacting the revegetation community.

3. Documentation and reporting:
    a. Record detailed observations, including precise location coordinates, photographs, and descriptive notes of the identified areas of concern.
    b. Include the findings in the next scheduled monitoring report.

9.1.3.4 Alternate approach

Contractors may have an alternate approach to sampling. Application of satellite data, UAV (Drone) NDVI and UAV photogrammetry are potential approaches. These methods have many advantages, including:

- comprehensive, repeatable and accurate measurement of the site
- removal of sampling bias
- increased safety and cost savings
- measurable, geo-located data

The project manager may approve an alternate approach where the method can demonstrate that it meets the performance criteria.

9.1.3.5 Plot layout and location

For each diversion, it is recommended to assess a minimum of four monitoring areas, totalling 12 areas. Each monitoring area should have a length of 100-120m and comprise the following:

- Zone A — 100m linear plot (one timber picket);
- Zones B, C & D — 120m staggered plot (three timber pickets); and
- Zone E — 100m linear plot (one timber picket).

To ensure sufficient coverage, consecutive monitoring areas should alternate sides of the diversion. An example monitoring layout is provided in Figure 10.

9.1.3.6 Landforms, rock chutes and gully infill areas

Each of the landforms, rock chutes and gully infill areas should be continually monitored as per the incidental monitoring approach and at a minimum frequency as outlined in Table 29.

9.2 Monitoring schedule and reporting

Monitoring events will occur at the frequency described in Table 29 and will continue for five years. The KPIs in Table 29 must be achieved for satisfactory completion of revegetation works.

A monitoring report will be prepared for each scheduled event. These reports will include:

- Previous and current photo records;
- Observed changes;
- Management risk issues (soil, water, irrigation and vegetation); and
- Recommended remedial actions.

Additionally, annual reports will include:

- Diversity;
- Abundance; and
- Tree height.

Figure 10: Example monitoring areas

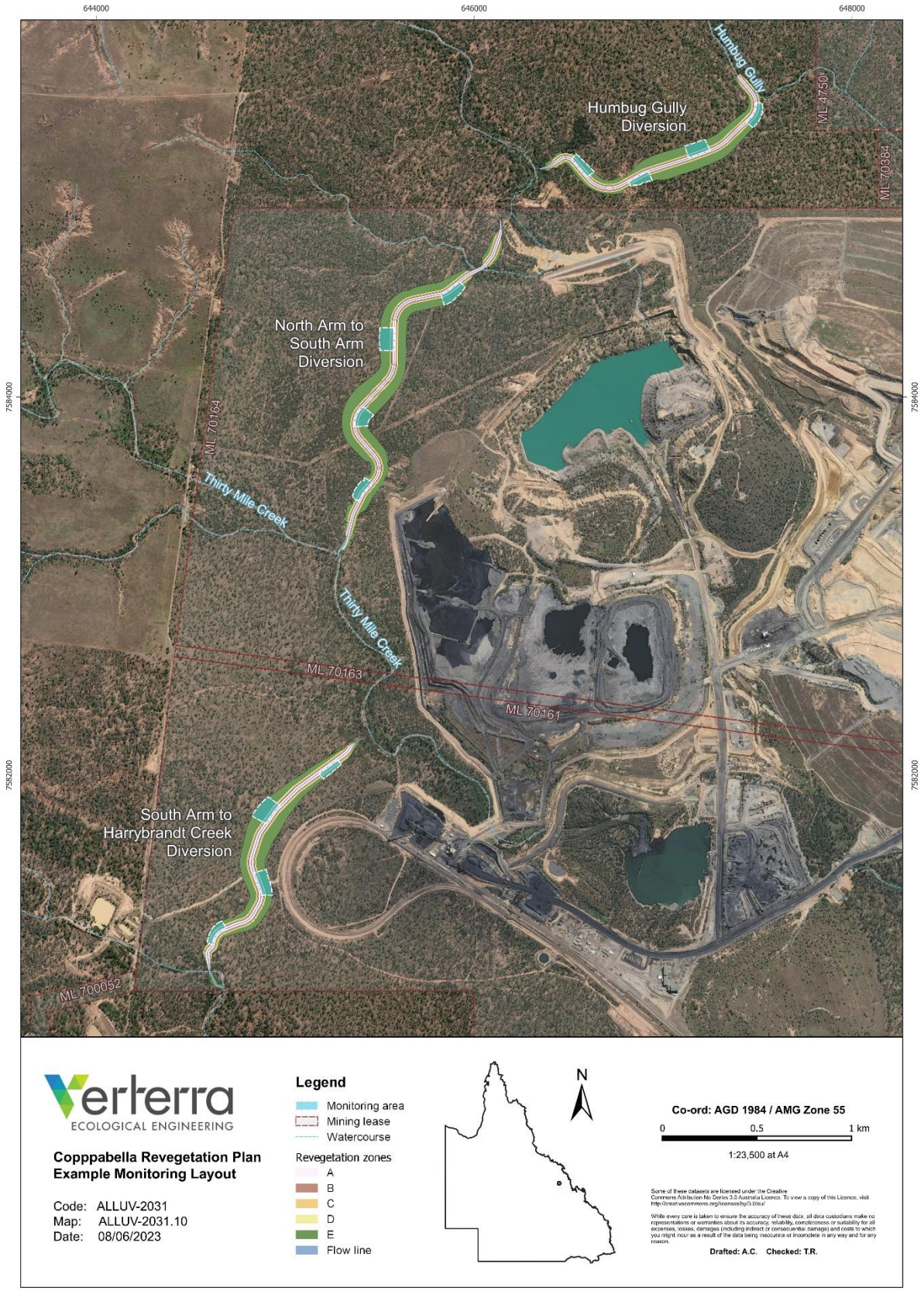


Table 29: Monitoring Schedule

Task	KPI	Zone A Lower Bank (7.56 ha)	Zone B Lower Bench (5.03 ha)	Zone C Mid Bank (3.79 ha)	Zone D Mid Bench (4.84 ha)	Zone E Upper Bank (31.04 ha)	Frequency
Establishment Monitoring — Week 1-12							
Install and map monitoring plots (timber picket)	Installed	12 linear plots 4 plots per diversion	12 staggered plots (36 timber pickets) 4 plots per diversion			12 linear plots 4 plots per diversion	Once at Week 1
Photo monitoring points (Photos) / Establishment survival count (Survival)	100% seedling 100% sowing	✓ ✓	✓ ✓			✓ ✓	Once at Week 1
Survival	100% seedling 100% sowing	✓ ✓	✓ ✓			✓ ✓	Once at Week 3
Diversion Opening Threshold	75% ground cover achieved	-	-			-	-
Photos / Survival	90% seedling 75% ground cover	✓ ✓	✓ ✓			✓ ✓	Once at Week 12
Year 1							
Photos / Survival	85% seedling 80% ground cover	✓ ✓	✓ ✓			✓ ✓	Once at Month 6
Photos / Survival Height Diversity Cover	85% seedling 50% seedlings >0.5m height Minimum of 12 LNS present on diversion 75% ground cover	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓			✓ ✓ ✓ ✓	Once at Month 12
Years 2-5							
Photos / Survival	75% seedling 75% ground cover	✓ ✓	✓ ✓			✓ ✓	Every 6 months
Photos / Survival Height Diversity Cover	75% seedling 50% seedlings >0.5m height Minimum of 12 LNS present on diversion 75% ground cover	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓			✓ ✓ ✓ ✓	Every 12 months

10. Maintenance program

10.1 Establishment maintenance

The establishment maintenance period is assumed to be 12 weeks from installation.

During the 12-week post establishment maintenance period the Contractor will be responsible for the site maintenance tasks and task frequencies detailed in Table 30.

Table 30: Establishment maintenance task frequency

All Zone Establishment maintenance (12 weeks)	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
Weed Control			X			X			X			X
Supplementary Watering	*As directed*											
Minor erosion rectification	*As directed*											
Infill/Refill												X
Irrigation Schedule	Refer to Section 8.2											
Irrigation Maintenance	X	X	X	X	X	X	X	X	X	X	X	X

10.1.1 Weed control

Emerging weeds should be monitored, and spot sprayed or mechanically removed at the earliest opportunity.

Provision has been made for four site treatments during establishment maintenance. Agreed selective herbicides should be used to undertake manual spot spraying with the aim of controlling weeds while avoiding preferred sown germinants and seedlings.

10.1.2 Supplementary watering (as directed)

Supplementary water events may be directed by the Project Manager. The Contractor should monitor the drought tolerance condition of emerging grasses, pasture, legumes, and tubestock and apply water via a truck mounted water cannon or similar to deliver at least 6mm per ha at each event. Caution should be exercised to ensure overland flow does not occur.

10.1.3 Re-sow / Refill

A monitoring program is detailed in Section 9 above. Prior to the commencement of Week 12 the Contractor shall (where necessary):

- Apply and incorporate additional seed mix; and
- Plant additional seedlings.

This is to ensure that the Week 12 required ground cover percentage and planted seedling stocktake rates for each Zone are achieved. The monitoring program specifies re-sowing and refilling triggers.

10.1.4 Irrigation maintenance

The Contractor shall provide a suitable pump for irrigation water delivery, ensure that tank water levels are maintained, and the irrigation system is operational (Drippers functional).

10.1.5 Minor erosion rectification

During the establishment maintenance phase, the Contractor will undertake minor erosion rectification works by employing the following strategies:

- Controlling the source of the erosion (e.g., concentrated flows)
- Adding topsoil, and (if necessary) mulch.
- Straw mulch bales
- Additional seed sowing or fertilisers
- Erosion control geofabrics (if necessary)

The Contractor shall adopt the approaches outlined in the IECA Best Practice Erosion and Sediment Control Guidelines when implementing any temporary or permanent erosion and sediment controls. Major soil loss arising from flooding or major storm events will be dealt with separately.

10.2 Revegetation Maintenance

If required, the Contractor will maintain the site for a further 21 months after Establishment Maintenance completion. (Aggregate 24 months).

During the 21-month post establishment maintenance period the Contractor is responsible for the site maintenance tasks and task frequencies detailed in Table 31.

Table 31: Revegetation maintenance task frequency

All Zone revegetation maintenance	Month											
Year 1	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**			
Weed Control		X		X		X			X			
Supplementary Watering	*As directed*											
Minor erosion rectification	*As directed*											
Infill/Refill									X			
Irrigation Schedule	Refer to Section 8.2											
Irrigation Maintenance	X	X	X	X	X	X	X	X	X			
Year 2	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Weed Control		X		X				X				X
Supplementary Watering	*As directed*											
Minor erosion rectification	*As directed*											
Infill/Refill	*As directed*											
Irrigation Schedule	*As directed*											
Irrigation Maintenance		X		X		X		X		X		X

The maintenance program is dependent on the success of the direct seeding and tubestock planting programs, and their resulting density and complexity. The better the initial germination/survival, the less the impact that introduced weeds will have.

If grasses become a problem within the planted trees and shrubs, the use of the herbicides such as Verdict or Fusilade™ is recommended as a spot spray (1m radial) to remove grass competition. Verdict can be applied over the top of seedlings if necessary. Note that herbicide should be used sparingly to minimise consequential impacts on ground cover.

Other woody weeds should be controlled on a regular basis. Control should be aimed at occurring prior to the emergent weeds setting seed.

10.3 Maintenance and repair records

A record of all maintenance and repair works will be kept assessing the frequency and cost of maintenance activities. The data will be analysed to assess the success of the revegetation efforts in reducing ongoing maintenance requirements.

11. References

11.1 General references

ANZECC (Australian and New Zealand Environment and Conservation Council) (2000) *Australian and New Zealand guidelines for fresh and marine water quality.* ANZECC, Canberra

DNR (Department of Natural Resources, Queensland) (1997) *Salinity Management Handbook*. Scientific Publishing, Resource Sciences Centre #222.

Isbell, R.F. (2023). *The Australian Soil Classification – Third Edition*. National Committee on Soils and Terrain. CSIRO Publishing. Melbourne, Australia.

Northcote, K.H. and Skene, J.K.M. (1972). *Australian soils with saline and sodic properties*. CSIRO Publication No. 27. CSIRO, Melbourne, Australia

Quirk JP and Schofield RK (1955) *The effect of electrolyte concentration on soil permeability*. Australian Journal of Soil Research 6: 163-178

Sumner ME (1993) *Sodic soils: a new perspective.* Australia Journal of Soil Research 31: 683-750

11.2 Online references

11.2.1 Erosion control

International Erosion Control Association (Australia)

Best Practice Erosion and Sediment Control (BPESC)

https://www.austieca.com.au/publications/best-practice-erosion-and-sediment-control-bpesc-document

11.2.2 Seed collection and storage

Commander LE (Ed) (2021) 'Florabank Guidelines – best practice guidelines for native seed collection and use (2nd edn)' (Florabank Consortium Australia).

https://www.florabank.org.au/guidelines/

Seed collection: https://www.florabank.org.au/guidelines/?link=Module6

Seed storage: https://www.florabank.org.au/guidelines?link=Module9

11.2.3 Chemicals to control grasses in revegetation

Fusilade Forte™

http://www.herbiguide.com.au/Labels/FLU128_58521-0806.PDF

11.2.4 Biosecurity

Biosecurity Queensland (2013) (DAF) Vehicle Machinery Inspection Procedure.

https://www.daf.qld.gov.au/__data/assets/pdf_file/0016/64006/IPA-Inspection-Procedures.pdf

Biosecurity Queensland (2019) (DAF) Vehicle and machinery cleandown procedures.

https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/58178/cleandown-procedures.pdf

Appendix 1: Soil analysis

Table 32: Humbug Gully topsoil laboratory analyses

Soil Test	Method	Units	Very Low	Low	Moderate	High	Very High	Humbug Gully							
			Very Low	Low	Moderate	High	Very High	Cop18	Cop19	Cop20	Cop21	Cop22	Cop23	Cop24	Cop25
1. Salinity, pH and texture															
Field Texture	Field	na	na	na	na	na	na	Sand	Loamy Sand	Loamy Sand	Sandy Loam	Loamy Sand	Loamy Sand	Sand	Loamy sand
pH (water)	R&L 4A1	pH	0 to 5	5 to 6.5	6.5 to 7.5	7.5 to 8.6	>8.6	6.7	6.8	7.2	6.9	6.6	6.7	7.1	6.9
pH (CaCl)	R&L 4B4	pH	0 to 4	4 to 5.5	5.5 to 6.5	6.5 to 7.6	>7.6	5.5	6.1	6.3	6.0	5.5	5.6	6.3	6.2
Conductivity EC1:5	R&L 3A1	dS/m	.					0.01	0.03	0.02	0.02	0.02	0.01	0.02	0.02
Texture Factor	Calc	na	-	-	-	-	-	*23.0*	*23.0*	*23.0*	*14.0*	*23.0*	*23.0*	*23.0*	*23.0*
Conductivity ECe (calc)	Calc	dS/m	0 to 2	2 to 4	4 to 8	8 to 16	>16	*0.2*	*0.7*	*0.5*	*0.3*	*0.5*	*0.2*	*0.5*	*0.5*
% Sand	Hygrometer	%	-	-	-	-	-	89	88	87	76	88	90	90	89
% Silt	Hygrometer	%	-	-	-	-	-	4	6	6	7	5	5	4	5
% Clay	Hygrometer	%	-	-	-	-	-	7	6	6	16	6	5	6	6
% Gravel	Hygrometer	%	-	-	-	-	-	2.3	1.7	1.3	2.8	3.3	2.2	1.2	
Mineralogy	Calc	na	-	-	-	-	-	*MM*	*MM+M*	*MM+M*	*MM*	*MM+M*	*K+I*	*MM+M*	*MM*
2. Exchangeable Cations															
Sodium (Na)	R&L 15E2	cmol/kg	0 to 0.1	0.1 to 0.3	0.3 to 0.7	0.7 to 2	>2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Potassium (K)	R&L 15E2	cmol/kg	0 to 0.2	0.2 to 0.3	0.3 to 0.7	0.7 to 2	>2	0.10	0.24	0.19	0.39	0.28	0.14	0.20	0.14
Magnesium (Mg)	R&L 15E2	cmol/kg	0 to 0.3	0.3 to 1	1 to 3	3 to 8	>8	0.4	0.5	0.6	1.3	0.9	0.4	0.5	0.5
Calcium (Ca)	R&L 15E2	cmol/kg	0 to 2	2 to 5	5 to 10	10 to 20	>20	0.8	2.1	2.3	3.1	2.2	1.1	1.6	1.4
Aluminium (Al)		cmol/kg	.					0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cation Exchange Capacity	R&L 15E2	cmol/kg	0 to 6	6 to 12	12 to 25	25 to 40	>40	*1.4*	*2.9*	*3.2*	*4.9*	*3.4*	*1.7*	*2.4*	*2.1*
ESP (calc)	Calc	%	0 to 0	0 to 0	0 to 0.06	0.06 to 0.14	>0.14	*0.7%*	*0.3%*	*0.3%*	*0.2%*	*0.3%*	*0.6%*	*0.4%*	*0.5%*
Ca:Mg ratio	Calc	ratio	0 to 1	1 to 4	4 to 6	6 to 10	>10	*2.0*	*4.2*	*3.8*	*2.4*	*2.4*	*2.8*	*3.2*	*2.8*
CEC to Clay Ratio (CCR)	Calc	Nil	-	-	-	-	-	*0.54*	*0.58*	*0.63*	*0.39*	*0.69*	*0.34*	*0.94*	*0.42*
Gypsum req. Method 2	Calc	t/ha	-	-	-	-	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
3. Anions															
Chloride	TBA	mg/kg	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5
4. Organic Carbon															
Organic Carbon	R&L 6A1	%	0 to 0.6	0.6 to 1	1 to 1.74	1.74 to 3	>3	0.2	0.6	0.6	0.8	0.8	0.3	0.4	0.5
Organic Matter	Calc	%	0 to 1	1 to 1.7	1.7 to 3	3 to 5.15	>5.15	*0.34*	*1.03*	*1.03*	*1.38*	*1.38*	*0.52*	*0.69*	*0.86*
5. Major Nutrients															
Ammonium	R&L 7C2b	mg/kg	0 to 0.8	0.8 to 3	3 to 5	5 to 10	>10	0.9	1.0	1.4	1.9	1.6	0.9	1.1	1.1
Nitrate Nitrogen (N)	R&L 7B1 / 7C2b	mg/kg	0 to 8	8 to 30	30 to 50	50 to 100	>100	1.4	0.6	3.4	0.7	1.1	1.1	1.1	2.1
Total Nitrogen	R&L 7A5(LECO)	mg/kg	0 to 500	500 to 1500	1500 to 2500	2500 to 5000	>5000	250	250	250	250	700	900	250	250
Avail. Phosphorus (Colwell P) R&L 18A1	Sandy Loam >11.75	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	5	5	5	5	5	5	5	<5
Avail. Phosphorus (Colwell P) R&L 18A1	Loam 9.05-11.75	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-	-	-	-	-
Avail. Phosphorus (Colwell P) R&L 18A1	Clay Loam 8.05-9.05	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-	-	-	-	-
Avail. Phosphorus (Colwell P) R&L 18A1	Heavy clay <8.05	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-	-	-	-	-

Soil Test	Method	Units	Very Low	Low	Moderate	High	Very High	Humbug Gully							
			Very Low	Low	Moderate	High	Very High	Cop18	Cop19	Cop20	Cop21	Cop22	Cop23	Cop24	Cop25
Available Potassium (Colwell K)	R&L 18A1	mg/kg	0 to 78	78 to 117	117 to 273	273 to 780	>780	87	120	100	240	170	97	120	100
Available Sulphur (S)	R&L 10D1 / 10B3	mg/kg	0 to 4	4 to 8	8 to 12	12 to 20	>20	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
C:N Ratio	Calc		0 to 10	10 to 12	12 to 15	15 to 25	>25	*8.0*	*24.0*	*24.0*	*11.4*	*8.9*	*12.0*	*16.0*	*20.0*
6. Trace Elements															
Boron (B)	R&L 12C1/C2	mg/kg	0 to 0.5	0.5 to 1	1 to 2	2 to 5	>5	0.1	0.2	0.1	0.4	0.1	0.1	0.1	0.1
Available Zinc (Zn) pH >= 7	R&L 12A1	mg/kg	0 to 0.3	0.3 to 0.8	0.8 to 5	5 to 15	>15	-	-	0.20	-	-	-	0.11	-
Available Zinc (Zn) pH < 7	R&L 12A1	mg/kg	0 to 0.2	0.2 to 0.5	0.5 to 5	5 to 15	>15	0.06	0.17	-	0.22	0.38	0.10	-	0.22
Iron (Fe)	R&L 12A1	mg/kg	-	-	-	-	-	7.8	24	14	15	31	11	18	15
Copper (Cu)	R&L 12A1	mg/kg	0 to 0.1	0.1 to 0.3	0.3 to 5	5 to 15	>15	0.20	0.21	0.23	0.53	0.18	0.15	0.17	0.09
Manganese (Mn)	R&L 12A1	mg/kg	0 to 1	1 to 2	2 to 50	50 to 500	>500	11	13	18	40	8	12	14	9

Table 33: North arm to south arm topsoil laboratory analyses

Soil Test	Method	Units	Very Low	Low	Moderate	High	Very High	North Arm to South Arm			
			Very Low	Low	Moderate	High	Very High	Cop10	Cop11	Cop14	Cop26
1. Salinity, pH and texture											
Field Texture	Field	na	na	na	na	na	na	Sandy Loam	Sandy Loam	Sand	Loamy sand
pH (water)	R&L 4A1	pH	0 to 5	5 to 6.5	6.5 to 7.5	7.5 to 8.6	>8.6	7.8	6.9	6.5	6.6
pH (CaCl)	R&L 4B4	pH	0 to 4	4 to 5.5	5.5 to 6.5	6.5 to 7.6	>7.6	6.8	6.0	5.5	5.7
Conductivity EC1:5	R&L 3A1	dS/m	.					0.03	0.02	0.02	0.02
Texture Factor	Calc	na	-	-	-	-	-	*14.0*	*14.0*	*23.0*	*23.0*
Conductivity ECe (calc)	Calc	dS/m	0 to 2	2 to 4	4 to 8	8 to 16	>16	*0.4*	*0.3*	*0.5*	*0.5*
% Sand	Hygrometer	%	-	-	-	-	-	85	86	90	88
% Silt	Hygrometer	%	-	-	-	-	-	1	3	2	5
% Clay	Hygrometer	%	-	-	-	-	-	14	11	7	6
% Gravel	Hygrometer	%	-	-	-	-	-	6.3	1.7	0.3	
Mineralogy	Calc	na	-	-	-	-	-	*K+I*	*K+I*	*MM+M*	*MM*
2. Exchangeable Cations											
Sodium (Na)	R&L 15E2	cmol/kg	0 to 0.1	0.1 to 0.3	0.3 to 0.7	0.7 to 2	>2	0.12	0.01	0.01	0.01
Potassium (K)	R&L 15E2	cmol/kg	0 to 0.2	0.2 to 0.3	0.3 to 0.7	0.7 to 2	>2	0.18	0.14	0.14	0.19
Magnesium (Mg)	R&L 15E2	cmol/kg	0 to 0.3	0.3 to 1	1 to 3	3 to 8	>8	2.2	0.6	0.4	0.6
Calcium (Ca)	R&L 15E2	cmol/kg	0 to 2	2 to 5	5 to 10	10 to 20	>20	1.5	2.1	0.8	1.5
Aluminium (Al)		cmol/kg						0.05	0.05	0.05	0.05
Cation Exchange Capacity	R&L 15E2	cmol/kg	0 to 6	6 to 12	12 to 25	25 to 40	>40	*4.1*	*2.9*	*1.4*	*2.4*
ESP (calc)	Calc	%	0 to 0	0 to 0	0 to 0.06	0.06 to 0.14	>0.14	*3.0%*	*0.3%*	*0.7%*	*0.4%*
Ca:Mg ratio	Calc	ratio	0 to 1	1 to 4	4 to 6	6 to 10	>10	*0.7*	*3.5*	*2.0*	*2.5*
CEC to Clay Ratio (CCR)	Calc	Nil	-	-	-	-	-	*0.32*	*0.23*	*0.56*	*0.47*
Gypsum req. Method 2	Calc	t/ha	-	-	-	-	-	*0.0*	*0.0*	*0.0*	*0.0*
3. Anions											
Chloride	TBA	mg/kg	-	-	-	-	-	5	15	5	5
4. Organic Carbon											
Organic Carbon	R&L 6A1	%	0 to 0.6	0.6 to 1	1 to 1.74	1.74 to 3	>3	0.2	0.6	0.3	0.4
Organic Matter	Calc	%	0 to 1	1 to 1.7	1.7 to 3	3 to 5.15	>5.15	*0.34*	*1.03*	*0.52*	*0.69*
5. Major Nutrients											
Ammonium	R&L 7C2b	mg/kg	0 to 0.8	0.8 to 3	3 to 5	5 to 10	>10	1.8	1.6	1.2	0.8
Nitrate Nitrogen (N)	R&L 7B1 / 7C2b	mg/kg	0 to 8	8 to 30	30 to 50	50 to 100	>100	5.5	6.8	3.9	1.3
Total Nitrogen	R&L 7A5(LECO)	mg/kg	0 to 500	500 to 1500	1500 to 2500	2500 to 5000	>5000	250	250	250	250
Avail. Phosphorus (Colwell P) R&L 18A1	Sandy Loam >11.75	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	7	6	10	5
Avail. Phosphorus (Colwell P) R&L 18A1	Loam 9.05-11.75	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-
Avail. Phosphorus (Colwell P) R&L 18A1	Clay Loam 8.05-9.05	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-
Avail. Phosphorus (Colwell P) R&L 18A1	Heavy clay <8.05	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-

Soil Test	Method	Units	Very Low	Low	Moderate	High	Very High	North Arm to South Arm			
			Very Low	Low	Moderate	High	Very High	Cop10	Cop11	Cop14	Cop26
Available Potassium (Colwell K)	R&L 18A1	mg/kg	0 to 78	78 to 117	117 to 273	273 to 780	>780	92	88	94	120
Available Sulphur (S)	R&L 10D1 / 10B3	mg/kg	0 to 4	4 to 8	8 to 12	12 to 20	>20	0.5	0.5	0.5	0.5
C:N Ratio	Calc		0 to 10	10 to 12	12 to 15	15 to 25	>25	*8.0*	*24.0*	*12.0*	*16.0*
6. Trace Elements											
Boron (B)	R&L 12C1/C2	mg/kg	0 to 0.5	0.5 to 1	1 to 2	2 to 5	>5	0.2	0.2	0.1	0.1
Available Zinc (Zn) pH >= 7	R&L 12A1	mg/kg	0 to 0.3	0.3 to 0.8	0.8 to 5	5 to 15	>15	0.49	-	-	-
Available Zinc (Zn) pH < 7	R&L 12A1	mg/kg	0 to 0.2	0.2 to 0.5	0.5 to 5	5 to 15	>15	-	0.17	0.91	0.38
Iron (Fe)	R&L 12A1	mg/kg	-	-	-	-	-	7.5	15	25	20
Copper (Cu)	R&L 12A1	mg/kg	0 to 0.1	0.1 to 0.3	0.3 to 5	5 to 15	>15	0.29	0.17	0.18	0.17
Manganese (Mn)	R&L 12A1	mg/kg	0 to 1	1 to 2	2 to 50	50 to 500	>500	8.3	16	8.6	16

Table 34: South arm to Harrybrandt Creek laboratory analyses

Soil Test	Method	Units	Very Low	Low	Moderate	High	Very High	South Arm to Harrybrandt Creek								
			Very Low	Low	Moderate	High	Very High	Cop1	Cop2	Cop3	Cop4	Cop5	Cop6	Cop7	Cop8	Cop9
1. Salinity, pH and texture																
Field Texture	Field	na	na	na	na	na	na	Sand	Loamy Sand	Sand	Sand	Sand	Sand	Sandy Loam	Sand	Sand
pH (water)	R&L 4A1	pH	0 to 5	5 to 6.5	6.5 to 7.5	7.5 to 8.6	>8.6	7.0	5.9	7.1	6.5	6.4	6.6	6.6	6.6	6.8
pH (CaCl)	R&L 4B4	pH	0 to 4	4 to 5.5	5.5 to 6.5	6.5 to 7.6	>7.6	6.0	4.9	6.4	5.4	5.0	5.6	5.6	5.8	5.7
Conductivity EC1:5	R&L 3A1	dS/m	.					0.02	0.02	0.05	0.02	0.01	0.02	0.02	0.02	0.02
Texture Factor	Calc	na	-	-	-	-	-	*23.0*	*23.0*	*23.0*	*23.0*	*23.0*	*23.0*	*14.0*	*23.0*	*23.0*
Conductivity ECe (calc)	TBA	dS/m	0 to 2	2 to 4	4 to 8	8 to 16	>16	*0.5*	*0.5*	*1.2*	*0.5*	*0.2*	*0.5*	*0.3*	*0.5*	*0.5*
% Sand	Hygrometer	%	-	-	-	-	-	89	87	92	91	93	90	89	90	89
% Silt	Hygrometer	%	-	-	-	-	-	4	5	1	3	1	3	3	3	4
% Clay	Hygrometer	%	-	-	-	-	-	7	8	6	6	6	8	9	8	7
% Gravel	Hygrometer	%	-	-	-	-	-	2.4	0.3	0	1	0.9	1.3	1.7	0	2
Mineralogy	Calc	na	-	-	-	-	-	*MM+M*	*K+I*	*M+F*	*MM*	*MM*	*MM+M*	*K*	*MM+M*	*M+F*
2. Exchangeable Cations																
Sodium (Na)	R&L 15E2	cmol/kg	0 to 0.1	0.1 to 0.3	0.3 to 0.7	0.7 to 2	>2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Potassium (K)	R&L 15E2	cmol/kg	0 to 0.2	0.2 to 0.3	0.3 to 0.7	0.7 to 2	>2	0.20	0.13	0.18	0.17	0.15	0.21	0.19	0.18	0.13
Magnesium (Mg)	R&L 15E2	cmol/kg	0 to 0.3	0.3 to 1	1 to 3	3 to 8	>8	0.6	0.4	0.8	0.4	0.4	0.5	0.3	0.4	0.5
Calcium (Ca)	R&L 15E2	cmol/kg	0 to 2	2 to 5	5 to 10	10 to 20	>20	0.9	0.8	2.6	0.6	0.7	1.0	0.8	0.9	1.8
Aluminium (Al)		cmol/kg						0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cation Exchange Capacity	R&L 15E2	cmol/kg	0 to 6	6 to 12	12 to 25	25 to 40	>40	*1.8*	*1.4*	*3.6*	*1.2*	*1.3*	*1.8*	*1.4*	*1.5*	*2.5*
ESP (calc)	Calc	%	0 to 0	0 to 0	0 to 0.06	0.06 to 0.14	>0.14	*0.6%*	*0.7%*	*0.3%*	*0.8%*	*0.8%*	*0.6%*	*0.7%*	*0.6%*	*0.4%*
Ca:Mg ratio	Calc	ratio	0 to 1	1 to 4	4 to 6	6 to 10	>10	*1.5*	*2.0*	*3.3*	*1.5*	*1.8*	*2.0*	*2.7*	*2.3*	*3.6*
CEC to Clay Ratio (CCR)	Calc	Nil	-	-	-	-	-	*0.70*	*0.28*	*1.46*	*0.49*	*0.52*	*0.71*	*0.11*	*0.62*	*1.00*
Gypsum req. Method 2	Calc	t/ha	-	-	-	-	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
3. Anions																
Chloride	TBA	mg/kg	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	15	<5
4. Organic Carbon																
Organic Carbon	R&L 6A1	%	0 to 0.6	0.6 to 1	1 to 1.74	1.74 to 3	>3	0.3	0.6	0.8	1.3	0.3	0.5	0.4	0.5	0.5
Organic Matter	Calc	%	0 to 1	1 to 1.7	1.7 to 3	3 to 5.15	>5.15	*0.52*	*1.03*	*1.38*	*2.24*	*0.52*	*0.86*	*0.69*	*0.86*	*0.86*
5. Major Nutrients																
Ammonium	R&L 7C2b	mg/kg	0 to 0.8	0.8 to 3	3 to 5	5 to 10	>10	1.1	1.0	1.8	1.1	1.8	1.9	2.1	1.9	0.7
Nitrate Nitrogen (N)	R&L 7B1 / 7C2b	mg/kg	0 to 8	8 to 30	30 to 50	50 to 100	>100	2.5	5.7	13	3.0	2.6	5.6	3.7	5.4	3.7
Total Nitrogen	R&L 7A5(LECO)	mg/kg	0 to 500	500 to 1500	1500 to 2500	2500 to 5000	>5000	250	600	700	250	250	250	250	250	250
Avail. Phosphorus (Colwell P) R&L 18A1	Sandy Loam >11.75	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	9	9	6	9	7	6	6	7	7
Avail. Phosphorus (Colwell P) R&L 18A1	Loam 9.05-11.75	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-	-	-	-	-	-
Avail. Phosphorus (Colwell P) R&L 18A1	Clay Loam 8.05-9.05	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-	-	-	-	-	-
Avail. Phosphorus (Colwell P) R&L 18A1	Heavy clay <8.05	mg/kg	0 to 14	14 to 20	20 to 40	40 to 80	>80	-	-	-	-	-	-	-	-	-

Soil Test	Method	Units	Very Low	Low	Moderate	High	Very High	South Arm to Harrybrandt Creek								
			Very Low	Low	Moderate	High	Very High	Cop1	Cop2	Cop3	Cop4	Cop5	Cop6	Cop7	Cop8	Cop9
Available Potassium (Colwell K)	R&L 18A1	mg/kg	0 to 78	78 to 117	117 to 273	273 to 780	>780	120	79	100	110	88	120	110	100	79
Available Sulphur (S)	R&L 10D1 / 10B3	mg/kg	0 to 4	4 to 8	8 to 12	12 to 20	>20	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5
C:N Ratio	Calc		0 to 10	10 to 12	12 to 15	15 to 25	>25	*12.0*	*10.0*	*11.4*	*52.0*	*12.0*	*20.0*	*16.0*	*20.0*	*20.0*
6. Trace Elements																
Boron (B)	R&L 12C1/C2	mg/kg	0 to 0.5	0.5 to 1	1 to 2	2 to 5	>5	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1
Available Zinc (Zn) pH >= 7	R&L 12A1	mg/kg	0 to 0.3	0.3 to 0.8	0.8 to 5	5 to 15	>15	2.2	-	0.3	-	-	-	-	-	-
Available Zinc (Zn) pH < 7	R&L 12A1	mg/kg	0 to 0.2	0.2 to 0.5	0.5 to 5	5 to 15	>15	-	1.40	-	0.88	0.57	0.82	0.55	0.70	0.25
Iron (Fe)	R&L 12A1	mg/kg	-	-	-	-	-	19	43	37	22	23	26	17	40	14
Copper (Cu)	R&L 12A1	mg/kg	0 to 0.1	0.1 to 0.3	0.3 to 5	5 to 15	>15	0.24	0.22	0.12	0.16	0.19	0.21	0.22	0.26	0.23
Manganese (Mn)	R&L 12A1	mg/kg	0 to 1	1 to 2	2 to 50	50 to 500	>500	25	9.7	13	8.3	13	12	18	7.5	16

Appendix 2: Revegetation risk assessment

Item	Risk Issue	Mitigation	Responsible agent
Initial establishment			
Site preparation	Topsoil not available to cover to desired depth.	Review most important zones requiring stability and apply to these areas first. If available, use a mulch to cover sites without topsoil. Modify species seeding rates for sites with little soil cover.	Project / Site Manager.
	Site is infested with invasive weeds prior to seeding.	Chemically control weeds. Repeat, if necessary, after 2-3 weeks.	Project / Site Manager.
	Water erosion has occurred pre seeding.	Reworking soil/re-ripping and/or mechanical replacement of soils required. Remediate source of the erosion.	Project / Site Manager.
Seed quality / quantity	Introduction of weeds.	Seed certificates to be provided with supplied seed. Purity testing must show no presence of weeds. Consult with Verterra on seed requirements.	Contractor.
	Not all seeds are available.	Maintain seed review process from the start of the project. Review seed list of species and quantities. Purchase seeds from alternate sources. Reduce risk by engaging more than one seed collection group. Use only species from within the approved species groups. Consult with Verterra on seed requirements.	Contractor following approval to amend from the Project Manager.
	Viability.	Manage seed on a just in time basis to avoid prolonged field storage. Review seed storage site so it meets with Australian guidelines. Ensure experienced seed collectors are engaged.	Project Manager.

Item	Risk Issue	Mitigation	Responsible agent
Initial cover crop	Drought conditions.	Consider either pressurised line irrigation, or watering trucks for watering seeded areas until germination occurs, and natural rainfall is sufficient for ongoing growth.	Project Manager.
	Seed did not germinate.	Native seed germination testing for nominated species.	Contractor to provide test certificates.
	Soil erosion hazard	Consider adding additional mulches sample risk areas. Modify soil treatment. Identify and remediate source.	Site Manager.
	Grazing.	Ensure new fencing is erected prior to seeding/planting Remove all stock from the area.	Site Manager.
Refill areas (Hand seeding)			
Site preparation	High level of weeds on refill site.	Use a low persistent / aggressive cover crop species. Spot spray areas 2 weeks prior to seeding by hand. Use strip sprays for machine seeding.	Site Manager.
Seeding	Drought conditions	Water-treat seeds prior to hand seeding. Increase seeding depth of large-coated seeds.	Site Manager.
	Seed did not germinate.	Native seed germination testing is essential. Review seed storage processes. Review seed treatment methods. Seed at correct depths. Use equipment designed for native seed establishment. Review controls of weeds prior to seeding. Re seed when conditions are more favourable.	Project Manager.
	Slow growth of seed.	Add additional fertiliser to site. Review soil tests and apply additional materials if required.	Site Manager.

Appendix 3: Regional Ecosystem Types

Regional Ecosystem Type ID	REDD Description
11.5.3/11.7.2	
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* +/- *C. dallachiana* and occasionally *E. cambageana* or *E. brownii* woodland. Localised areas may be dominated by *E. melanophloia*, occasionally *E. crebra* and other canopy species. There is typically a secondary tree layer, including *Eremophila mitchellii, Geijera parviflora, Archidendropsis basaltica, Erythroxylum australe, Cassia brewsteri, Ventilago viminalis, Allocasuarina luehmannii* and *Callitris glaucophylla*. A low shrub layer of *Carissa ovata, Erythroxylum australe, Capparis lasiantha* commonly occurs. Occurs on flat to gently undulating plains formed from Cainozoic sediments. Associated soils are generally deep texture contrast with thick sandy surface horizons with some deep red earths. (BVG1M: 17a)
11.7.2	Monospecific stands of *Acacia* spp. forest/woodland on Cainozoic lateritic duricrusts. *Acacia shirleyi* and/or *Acacia catenulata* usually predominate the woodland to low woodland to low open forest tree canopy (7-12m high). Other *Acacia* spp. That commonly occur and occasionally dominate the tree layer include *A. rhodoxylon, A. burrowii, A. sparsiflora, A. crassa* and *A. blakei*. Emergent eucalypt species such as *Eucalyptus thozetiana, E. crebra, E. decorticans and E. exserta* may be present. A low shrub layer is sometimes present and dominated by species such as *Acalypha eremorum, Croton phebalioides* and *Carissa ovata*. The ground layer is extremely sparse and dominated by grasses such as *Aristida caput-medusae, Paspalidium rarum, Urochloa foliosa*. Forbs are usually rare although *Sida* sp. (Musselbrook M.B.Thomas+ MRS437) may be conspicuous. Occurs on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts. The soils are shallow to very shallow lithosols with surface stone and boulders. The vegetation is often growing in pockets of shallow lithosol soil between bare rock. (BVG1M: 24a)
11.5.3/11.3.4	
11.3.4	*Eucalyptus tereticornis* woodland to open forest. Other tree species that may be present include *E. camaldulensis, Corymbia tessellaris, C. clarksoniana, E. melanophloia, E. platyphylla* or *Angophora floribunda. E. crebra* and *Lophostemon suaveolens* may be locally common. A shrub layer is usually absent, and a grassy ground layer is prominent, and may include any of *Bothriochloa bladhii subsp. bladhii, Aristida* spp., *Heteropogon contortus, Dichanthium* spp. and *Themeda triandra*. Occurs on Cainozoic alluvial plains and terraces. Occurs on variety of soils, including deep cracking clays, medium to fine textured soils, and deep texture-contrast soils. (BVG1M: 16c)
11.3.25	
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland to open forest. Other tree species, including *Casuarina cunninghamiana, E. coolabah, Melaleuca bracteata, Melaleuca viminalis, Livistona* spp. (in north), *Melaleuca* spp. *and Angophora floribunda*, may occur. A tall shrub layer may occur, including *Acacia salicina, A. stenophylla* and *Lysiphyllum carronii*. Low shrubs are present, but rarely form a conspicuous layer. The ground layer is open to sparse and dominated by perennial grasses, sedges or forbs. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast. These are usually moderately deep to deep, soft or firm, acid, neutral or alkaline brown sands, loams or black cracking or non-cracking clays, and may be sodic at depth (Burgess 2003). (BVG1M: 16a)

Appendix 4: Species, tubestock, and seed requirements

- Direct Seed requirements by zone / area (refer to Table 19 to Table 22, Section 7.2)
- Tubestock requirements by zone / area (refer to Table 23 and Table 24, Section 7.2).

Table 35: Seed species demand by revegetation zone (all diversions)

Scientific Name	Common Name	Recommended application	Recommended weight	Target species
Lower Bank	***7.6ha assumed***	***(40kg/ha)***		
Native grass species				
Bothriochloa bladhii	Swann/Forest blue grass	4.0kg/ha	30.40kg	2 – 4 species
Cymbopogon referactus	Barbed wiregrass			
Dichanthium sericeum	Queensland blue grass			
Enteropogon acicularis	Curly windmill grass			
Phragmites australis	Common reed			
Sedge species				
Cyperus exaltatus	Tall flatsedge	2.0kg/ha	15.20kg	1 – 2 species
Cyperus gracilis	Slender flat sedge			
Lomandra longifolia	Lomandra			
Pasture grass species				
Chloris gayana (Endura)	Endura Rhodes grass	10.0kg/ha	76.00kg	1 – 2 species
Chloris gayana (Katambora)	Katambora Rhodes grass			
Cynodon dactylon	Green Couch			
Urochloa mosambicensis	Sabi grass			
Legume species				
Desmanthus progardes	Progardes	4.0kg/ha	30.40kg	1 species
Stylosanthes scabra	Seca stylo			
Cover crop species				
Echinochloa esculenta	Japanese Millet	20.0kg/ha	152.00kg	1 species
Panicum miliaceum	White French Millett			
Sorghum vulgare	Sugar drip sorghum			
Lolium multiflorum	Short-lived ryegrass	(20.0kg/ha)		Winter alt.
Mid Bank and Benches	***13.7ha assumed***	***(40kg/ha)***		
Tree species – midstory				
Lysiphyllum carronii	Red bauhinia	1.0kg/ha	13.70kg	2 – 4 species
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			
Native grass species				
Botriochloa bladhii	Forest blue grass	5.0kg/ha	68.50kg	2 – 4 species
Chloris truncata	Windmill grass			
Cymbopogon refractus	Barbed wire grass			
Dischanthium sericeum	Queensland blue grass			
Enteropogon acicularis	Curly windmill grass			
Themeda triandra	Kangaroo grass			
Legume species				
Desmanthus progardes	Progardes	4.0kg/ha	52.80kg	1 species
Stylosanthes scabra	Seca stylo			

Scientific Name	Common Name	Recommended application	Recommended weight	Target species
Pasture grass species				
Chloris gayana (Endura)	Endura Rhodes grass	10.0kg/ha	137.00kg	1 – 2 species
Chloris gayana (Katambora)	Katambora Rhodes grass			
Cynodon dactylon	Green Couch			
Urochloa mosambicensis	Sabi grass			
Cover crop species				
Echinochloa esculenta	Japanese Millet	20.0kg/ha	137.00kg	1 species
Panicum miliaceum	White French Millett			
Sorghum vulgare	Sugar drip sorghum			
Lolium multiflorum	Short-lived ryegrass	(20.0kg/ha)		Winter alt.
Upper Bank	***31.1ha assumed***	***(42kg/ha)***		
Tree species – upper story				
Eucalyptus camaldulensis	**River red gum**	0.5kg/ha	15.55kg	2 – 4 species
Eucalyptus crebra	**Narrow leaved ironbark**			
Eucalyptus populnea	**Poplar box**			
Eucalyptus tereticornis	**Forest red gum**			
Casuarina cunninghamiana	River she-oak	0.5kg/ha	15.55kg	2 – 4 species
Corymbia clarksoniana	Clarksons Bloodwood			
Corymbia intermedia	Pink bloodwood			
Corymbia tessellaris	Moreton Bay Ash			
Eucalyptus coolabah	Coolibah			
Eucalyptus fibrosa	Broad-leaved Red Ironbark			
Eucalyptus melanophloia	Silver-leaved Ironbark			
Tree species – midstory				
Acacia holosericea	Soapbush wattle	1.0kg/ha	31.10kg	4 – 6 species
Acacia salicina	Black sally wattle			
Acacia stenophylla	River myall			
Alphitonia excelsa	Soap ash			
Lysiphyllum carronii	Red bauhinia			
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			
Native grass species				
Aristida ramosa	Purple wiregrass	6.0kg/ha	186.60kg	2 – 4 species
Botriochloa bladhii	Forest blue grass			
Chloris truncata	Windmill grass			
Dischanthium sericeum	Queensland blue grass			
Enteropogon acicularis	Curly windmill grass			
Themeda triandra	Kangaroo grass			
Pasture grass species				
Chloris gayana (Endura)	Endura Rhodes grass	10.0kg/ha	311.00kg	1 – 2 species
Chloris gayana (Katambora)	Katambora Rhodes grass			
Cynodon dactylon	Green Couch			
Urochloa mosambicensis	Sabi grass			
Legume species				
Desmanthus progardes	Progardes	4.0kg/ha	124.40kg	1 species
Stylosanthes scabra	Seca stylo			
Cover crop species				

Scientific Name	Common Name	Recommended application	Recommended weight	Target species
Echinochloa esculenta	Japanese Millet	20.0kg/ha	622.00kg	1 species
Panicum miliaceum	White French Millett			
Sorghum vulgare	Sugar drip sorghum			
Lolium multiflorum	Short-lived ryegrass	(20.0kg/ha)		Winter alt.

Table 36: Seed species demand for landforms, rock chutes and gully infill areas

Scientific Name	Common Name	Recommended application	Recommended weight	Target species
Rock chutes and gully infill	***8.29ha assumed***	***(40kg/ha)***		
Tree species – midstory				
Lysiphyllum carronii	Red bauhinia	1.0kg/ha	8.29kg	2 – 4 species
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			
Native grass species				
Botriochloa bladhii	Forest blue grass	5.0kg/ha	41.46kg	2 – 4 species
Chloris truncata	Windmill grass			
Cymbopogon refractus	Barbed wire grass			
Dischanthium sericeum	Queensland blue grass			
Enteropogon acicularis	Curly windmill grass			
Themeda triandra	Kangaroo grass			
Legume species				
Desmanthus progardes	Progardes	4.0kg/ha	33.17kg	1 species
Stylosanthes scabra	Seca stylo			
Pasture grass species				
Chloris gayana (Endura)	Endura Rhodes grass	10.0kg/ha	82.93kg	1 – 2 species
Chloris gayana (Katambora)	Katambora Rhodes grass			
Cynodon dactylon	Green Couch			
Urochloa mosambicensis	Sabi grass			
Cover crop species				
Echinochloa esculenta	Japanese Millet	20.0kg/ha	165.85kg	1 species
Panicum miliaceum	White French Millett			
Sorghum vulgare	Sugar drip sorghum			
Lolium multiflorum	Short-lived ryegrass	(20.0kg/ha)		Winter alt.
Landforms	***69.86ha assumed***	***(42kg/ha)***		
Tree species – upper story				
Eucalyptus camaldulensis	**River red gum**	0.5kg/ha	34.93kg	2 – 4 species
Eucalyptus crebra	**Narrow leaved ironbark**			
Eucalyptus populnea	**Poplar box**			
Eucalyptus tereticornis	**Forest red gum**			
Casuarina cunninghamiana	River she-oak	0.5kg/ha	34.93kg	2 – 4 species
Corymbia clarksoniana	Clarksons Bloodwood			
Corymbia intermedia	Pink bloodwood			
Corymbia tessellaris	Moreton Bay Ash			
Eucalyptus coolabah	Coolibah			
Eucalyptus fibrosa	Broad-leaved Red Ironbark			

Scientific Name	Common Name	Recommended application	Recommended weight	Target species
Eucalyptus melanophloia	Silver-leaved Ironbark			
Tree species – midstory				
Acacia holosericea	Soapbush wattle	1.0kg/ha	69.86kg	4 – 6 species
Acacia salicina	Black sally wattle			
Acacia stenophylla	River myall			
Alphitonia excelsa	Soap ash			
Lysiphyllum carronii	Red bauhinia			
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			
Native grass species				
Aristida ramosa	Purple wiregrass	6.0kg/ha	419.14kg	2 – 4 species
Botriochloa bladhii	Forest blue grass			
Chloris truncata	Windmill grass			
Dischanthium sericeum	Queensland blue grass			
Enteropogon acicularis	Curly windmill grass			
Themeda triandra	Kangaroo grass			
Pasture grass species				
Chloris gayana (Endura)	Endura Rhodes grass	10.0kg/ha	698.57kg	1 – 2 species
Chloris gayana (Katambora)	Katambora Rhodes grass			
Cynodon dactylon	Green Couch			
Urochloa mosambicensis	Sabi grass			
Legume species				
Desmanthus progardes	Progardes	4.0kg/ha	279.43kg	1 species
Stylosanthes scabra	Seca stylo			
Cover crop species				
Echinochloa esculenta	Japanese Millet	20.0kg/ha	1,397.14kg	1 species
Panicum miliaceum	White French Millett			
Sorghum vulgare	Sugar drip sorghum			
Lolium multiflorum	Short-lived ryegrass	(20.0kg/ha)		Winter alt.

Table 37: Tubestock species demand by revegetation zone (all diversions)

Scientific Name	Common Name	Recommended stocking	Recommended stems	Target species
Lower Bank	***7.6ha assumed***	***(750spha)***		
Cyperus exaltatus	Tall flatsedge	750spha	5,700	1 - 2 species
Cyperus gracilis	Slender flat sedge			
Lomandra longifolia	Lomandra			
Mid Bank and Benches	***13.7ha assumed***	***(750spha)***		
Eucalyptus camaldulensis	**River red gum**	750spha	10,275	2 - 4 species
Casuarina cunninghamiana	River she-oak			
Corymbia intermedia	Pink bloodwood			
Lysiphyllum carronii	Red bauhinia			
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			

Scientific Name	Common Name	Recommended stocking	Recommended stems	Target species
Upper Bank	***18,260m assumed***	***(1 stem / 4m)***		
Eucalyptus camaldulensis	River red gum	1 stem / 8m	2,282	4 - 6 species
Eucalyptus crebra	Narrow leaved ironbark			
Eucalyptus populnea	Poplar box			
Eucalyptus tereticornis	Forest red gum			
Casuarina cunninghamiana	River she-oak			
Corymbia clarksoniana	Clarksons Bloodwood			
Corymbia intermedia	Pink bloodwood			
Corymbia tessellaris	Moreton Bay Ash			
Eucalyptus coolabah	Coolibah			
Eucalyptus fibrosa	Broad-leaved Red Ironbark			
Eucalyptus melanophloia	Silver-leaved Ironbark			
Acacia holosericea	Soapbush wattle	1 stem / 8m	2,283	2 - 4 species
Acacia salicina	Black sally wattle			
Acacia stenophylla	River myall			
Alphitonia excelsa	Soap ash			
Lysiphyllum carronii	Red bauhinia			
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			

Table 38: Tubestock species demand for rock chutes and gully infill areas

Scientific Name	Common Name	Recommended stocking	Recommended stems	Target species
Rock chutes and gully infill	***8.29ha assumed***	***(750spha)***		
Eucalyptus camaldulensis	**River red gum**	750spha	6,222	2 - 4 species
Casuarina cunninghamiana	River she-oak			
Corymbia intermedia	Pink bloodwood			
Lysiphyllum carronii	Red bauhinia			
Melaleuca bracteata	Black tea tree			
Melaleuca leucadendra	Weeping paperbark			
Melaleuca viminalis	Dawson River bottlebrush			

Appendix 5: Tubestock specifications

Attribute	Seedling Nursery Acceptance Specification
Stem Height and Collar Diameter	Min 200 mm, > 2 mm collar Max 350 mm, > 3.5 mm collar.
Stem Straightness	One vertical single-leader with max one bend for length of stem.
Growing media	Non-soil potting media containing a base peat-vermiculite mix.
Germination	Seed will preferably be sown directly into the final grow-out tray to avoid the risk of J-rooting. Alternatively, seed may be germinated in a plug tray and effective plugs transplanted into agreed seedling grow out trays.
Dibbling	Dibbling bare root germinates into seedling trays isn't permitted.
Container type	Hyco V93 trays with root trainers and open base preferred. Alternatively, 50 mm x 50 mm native tubes may be accepted.
Air pruning	Seedlings are to be grown in containers on raised nursery benches to promote air-pruning and avoid contact with soil.
Root Plug Condition	Roots will not be J-rooted, will fill and bind the plug volume, and will display actively growing white roots at dispatch.
Disease	Seedlings will be maintained free of disease and insect pests, in particular myrtle rust *Puccinia psidii*. A hygiene declaration may be required at the point of dispatch for seedlings grown in known myrtle rust zones.
Drought Tolerance	Nursery irrigation will be managed to encourage a cycle of induced drought stress and rejuvenation. Drought stress applied after Week 12 of the grow out period. Seedlings will be drought tolerant and sun-hardened at dispatch.
Physical Damage	Seedlings will not be damaged, and the growing tip will be intact.
Dispatch	Containers will be bulked up so that at least 95% of cells in each tray have seedlings meeting specification.
Communication	The Nursery will contact the Contractor when any crop losses, setbacks or delays are experienced.
Inspection	The Contactors representative will inspect the seedlings at four points in the production cycle: immediately after germination, six weeks, 12 weeks and immediately prior to dispatch.
Delivery acceptance	Plants not meeting specifications at delivery will not be accepted.
Field nursery	Delivered seedlings will be held in a field nursery that includes: Capacity to hold trays on raised benches or wires to prevent roots growing into the soil. Capacity to provide daily watering. Protection from desiccating winds and cattle.

ALLUV-2031

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