BOONANARRING

MINERAL SANDS PROJECT

SPRING 2022

GROUNDWATER DEPENDENT

VEGETATION MONITORING

Prepared for Image Resources NL

by

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EXECUTIVE SUMMARY

Image Resources NL is mining mineral sands along the eastern side of the Swan Coastal Plain in the Boonanarring area, about 20 kilometres north of Gingin in Western Australia. Overburden removal commenced in May 2018, the processing plant was commissioned and in full production from the 1st December 2018 and a pump was installed to allow dewatering of Pit C from December 2018 to November 2019 and Pit B from March to July 2020. Top soil/subsoil clearing of Pit D (adjacent to Boonanarring Nature Reserve) commenced in September 2021, with overburden removal starting in December 2021.

A Vegetation Monitoring Program for terrestrial and wetland (potential) groundwater dependent vegetation (GDV) in Bartlett's Well NR and Boonanarring NR and for Collard's Wetland, was required for approval of the mining project. An element of the Vegetation Monitoring Programs were pre-mining (baseline) surveys that were to include:

- One Spring monitoring of all monitoring variables;
- One Autumn monitoring of canopy condition.

Pre-mining tree crown assessment monitoring was conducted in Spring 2015 and Autumn 2016 (excepting for a burnt transect in Boonanarring NR). Other pre-mining monitoring surveys were subsequently conducted in some of the GDV areas in Spring 2017 and Spring 2018.

The Spring 2022 survey is the eighth monitoring survey since commencement of mining and was undertaken between the 22nd and 29th of November 2022. Active mining in Pit A (the northern most pit and adjacent to Bartlett's Well NR) ceased in July 2021 and following two additional rounds of monitoring, no further monitoring is required and the Bartlett's Well NR sites were not included in the Spring 2022 survey.

Analysis showed that the mean Crown Assessment Index (CAI) of trees increased from Spring 2021 to Spring 2022 at the Boonanarring NR treatment and Control sites. No new *Banksia* tree deaths were recorded at the Boonanarring NR sites in the Spring 2022 monitoring. Trees that had died previously (CAI=0) remain in the analised data set and so the mean tree CAI recorded in Spring 2022 significantly understates the mean CAI of the remaining live trees. *Banksia attenuata* and *Banksia menziesii* trees at Boonanarring NR GDV sites, on average, remained moderately healthy over that period.

At Collard's Wetland, mean CAI for 'all trees' increased from Spring 2021 to Spring 2022 (and no significant difference in tree mean CAI between pre-mining Spring 2017 and Spring 2022 surveys). *Melaleuca rhaphiophylla* crowns at Collard's Wetland sites were 'very healthy' and their CAI had not changed significantly since Spring 2017 (mean CAI of *M. rhaphiophylla* trees has actually increased since Spring 2017). Mean CAI of *Eucalyptus rudis* (Flooded Gum) and *Corymbia calophylla* (Marri) trees increased between Spring 2021 and Spring 2022. Overall, canopy condition of *Eucalyptus rudis* and *Corymbia calophylla* trees has improved since Spring 2019, in part because of maturing, healthy epicormic foliage. Mean CAI of *Melaleuca preissiana* trees has slowly declined at Collard's sites since Spring 2017, with overshadowing from the taller *Eucalyptus rudis* and *Corymbia calophylla* trees considered a significant factor.

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1.0 INTRODUCTION

1.1 Background

Image Resources NL is mining mineral sands along the eastern side of the Swan Coastal Plain in the Boonanarring area, about 20 kilometres north of Gingin, Western Australia. The first area where mining operations commenced was on farmland south of Wannamal Rd West and adjacent to the scarp to the east (Pit C). Preparation for mining began in May 2018 with the removal of overburden. The processing plant was constructed and commissioned during 2018. Commissioning was completed by the 1st of December 2018. A pump was installed in the Pit C in December 2018 for tails return water and for dewatering. No dewatering took place prior to December 2018 (in the 'pre-mining' period). The next areas mined after the commencement of mining at Pit C were north of Wannamal Rd West (Pit B (adjacent to Wannamal Rd West) and Pit A (northern most pit)) (Figure 1). Mining of Pit A (adjacent to Bartlett's Well NR) finished in July 2021 and the pit is now being back-filled and progressively rehabilitated with 'waste' soil and top soil/sub-soil. Top soil/subsoil clearing of Pit D (southern-most pit and adjacent and east of Boonanarring NR) commenced in September 2021, with overburden removal starting in December 2021.

In February 2013, groundwater dependent vegetation (GDV) mapping was undertaken in Bartlett's Well Nature Reserve (here after Bartlett's Well NR) and in a small area of Boonanarring Nature Reserve (here after Boonanarring NR) (adjacent to and on the eastern side of the proposed mine envelope) as part of the proposed mine approvals process (360 Environmental, 2013). *Banksia attenuata-Banksia menziesii* low woodlands and low open woodlands were mapped as potential Terrestrial GDV in the surveyed areas. Extensive dead *Banksia attenuata* and *Banksia menziesii* trees were noted in parts of the *Banksia* woodlands in Bartlett's Well NR and in Boonanarring NR and were considered to be most likely due to drought (360 Environmental, 2013). Vegetation units associated with a *Melaleuca preissiana* low woodland seasonal dampland in Bartlett's Well NR were also mapped as potential Wetland GDV.

The report and recommendations of the Environmental Protection Authority for the Boonanarring Mineral Sands Mine (EPA, 2014) set out conditions for approval of the mining project in Ministerial Statement 981 (MS981) that included, as part of Condition 6-1, that "The proponent shall ensure that the groundwater dewatering and abstraction associated with the activities does not cause any loss or degradation of defined environmental values within Bartlett's Well and Boonanaring Nature Reserves ...". A 'Nature Reserve Vegetation and Ground Water Monitoring and

Response Plan' (NRVGMRP) was prepared to address Condition 6 of the EPA document (COOE, 2015) and address requirements from the Department of Biodiversity, Conservation and Attractions (DBCA), as part of the site's Water Operating Strategy, approved by the Department of Water and Environmental Regulation (DWER). Included in the NRVGMRP was a Vegetation Monitoring Program for terrestrial and wetland (potential) GDV in Bartlett's Well NR and Boonanarring NR, that outlined monitoring methodology, frequency and timing and listed indicative monitoring site locations (Appendix B in COOE, 2015).

Ministerial Statement 981 also set out Condition 7-1 for approval of the mining project, that "The proponent shall ensure that the groundwater dewatering and abstraction associated with the activities does not cause any loss or degredation of defined environmental values with Collard wetland…". Collard wetland (here after referred to as 'Collard's Wetland') lies some 3km to the west of Boonanarring NR and west of the proposed mining area (Figure 1). A 'Groundwater Monitoring Plan' (GMP) was prepared to address Condition 7 of the EPA document (Appendix A in COOE, 2015) and address requirements as part of the site's Water Operating Strategy, subject to approval by the DWER. Included in the GMP was a Vegetation Monitoring Program for Collard's Wetland that outlined monitoring methodology, frequency and timing. These used the same methodology as that proposed for the GDV monitoring in the Nature Reserves. Indicative monitoring site locations in Collard's Wetland were also listed in the document.

An element of the Vegetation Monitoring Programs for the nature reserves and for Collard's Wetland was pre-mining (baseline) surveys that were to include:

- One Spring monitoring of all monitoring variables;
- One Autumn monitoring of canopy condition.

Ministerial Statement 981 (MS981) conditions 6-4 and 7-4 required that "Prior to the commencement of groundwater dewatering and/or abstraction associated with the proposal, the proponent shall provide the baseline data results required by condition .... ['6-2(4) and 6-3' and '7-2(2) and 7-3' respectively]... to the CEO" (EPA, 2014). Pre-mining baseline surveys were conducted in Spring 2015 (all sites, excluding sites along one transect burnt in Boonanarring NR in October 2015), Autumn 2016 (all sites excluding the burnt transect in Boonanarring NR), Spring 2017 (excluding one burnt transect in Boonanarring NR and the wetland GDV sites in Bartlett's Well NR) and Spring 2018 (only Boonanarring NR sites, including a first sample of the transect

sites burnt in Spring 2015). All pre-mining baseline survey data has been reported (Morgan, 2019).

Monitoring after commencement of mining, began with the Autumn 2019 monitoring survey. The GDV monitoring requirements have since been amended as set out in the updated 'Nature Reserve Vegetation and Ground Water Monitoring and Response Plan' (NRVGMRP) (Image Resources, 2021). The updated monitoring requirements removed the need for more detailed annual Spring monitoring elements that were in addition to a tree canopy condition assessment, bringing the Spring monitoring into alignment with the Autumn monitoring requirements. The monitoring schedule was also revised to require two rounds of monitoring at Bartlett's Well NR after the cessation of mining/excavation and dewatering from Pit A and Pit B. As mining and dewatering ceased in July 2021, the Autumn 2022 survey was the final survey for Bartlett's Well NR.

Another element of the 'Nature Reserve Vegetation and Ground Water Monitoring and Response Plan' (NRVGMRP) (Image Resources, 2021) and Ground Water Monitoring Plan (Image Resources, 2020) is the requirement for ground water monitoring. Numerous bores were installed at locations around Pit C, Collard's Wetland, Bartlett's Well NR and Boonanarring NR, for the purpose of monitoring depth to the Superficial and deeper aquifer groundwater (Simonne Grimes, Image Resources, *pers. comm*.). The bore locations are shown in Figures 1 to 3. Depth to ground water is recorded manually monthly or quarterly (where there is also an installed groundwater logger) at the bore locations.

1.2 Purpose of the Spring 2022 GDVM survey

The Spring 2022 survey was undertaken to satisfy the GDV monitoring requirements set out in the updated, current Water Operating Strategy (Image Resources, 2022) and EPA implementation conditions (condition 7-3, EPA, 2014) for annual Autumn and Spring GDV monitoring surveys during the period of mining. The Spring 2022 survey was a canopy condition assessment and is the fourth Spring GDV monitoring event undertaken after commencement of mining and associated dewatering at Boonanarring.

1.3 The survey area

The location of GDV monitoring quadrats in Boonanarring NR and Collard's Wetland are shown Figure 1.

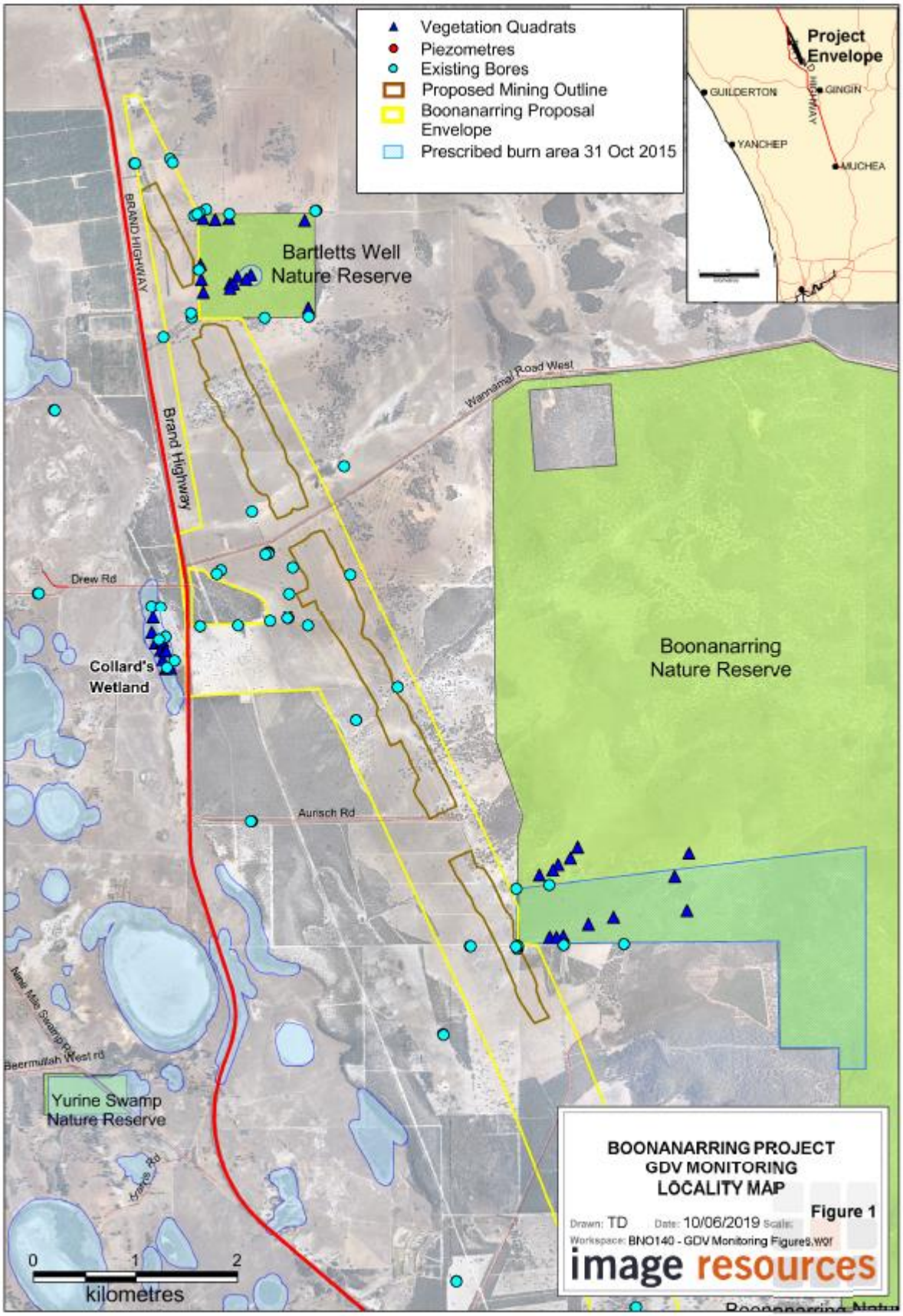
Vegetation Quadrats
Piezometres
Existing Bores
Proposed Mining Outline
Boonanarring Proposal Envelope
Prescribed burn area 31 Oct 2015
Project Envelope
GUILDERTON
GINGIN
YANCHEP
MUCHEA
Bartletts Well Nature Reserve
BRAND HIGHWAY
Brand Highway
Wannamal Road West
Drew Rd
Collard's Wetland
Boonanarring Nature Reserve
Aurisch Rd
Beermullah West rd
Yurine Swamp Nature Reserve
Tyrrie Rd
0
1
2
kilometres
BOONANARRING PROJECT
GDV MONITORING
LOCALITY MAP
Figure 1
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image resources

2.0 BACKGROUND INFORMATION TO BOONANARRING GDV MONITORING

2.1 Location of GDV monitoring sites

A total of 14 terrestrial and 18 wetland GDV monitoring sites were established and sampled in Spring 2015 (see Table 1; Figures 2, 3 and 4). Seven other sites were planned for monitoring in Boonanarring NR in 2015, but were in an area that was subsequently burnt in October 2015 and were finally established and recorded in Spring 2018 (pre-mining) (Figure 2).

'Treatment' sites were located in transects which, where possible, were orientated perpendicularly to the proposed mining envelope and to the shallowest ground water point near the mining envelop (that is, orientated upslope, from low elevation to high elevation to try and get a gradient of DTGW) and gradient of distance from drawdown area. 'Control' sites were located at points high in the landscape and far from the drawdown areas.

2.2 Pre-mining (baseline) monitoring

GDV monitoring surveys prior to December 2018 (when the processing plant was commissioned and pumps were installed for pit dewatering) are considered, for the purposes of this report, to be pre-mining monitoring. The following monitoring was conducted in the pre-mining period.

Spring 2015 GDV survey

Terrestrial GDV sites (excluding Bonanarring NR Transect 2 (T2) sites, which had been burnt just prior to set-up):

- 20x20m quadrats – tree counts and tree canopy condition assessment;
- 10x10m quadrat (nested) – a complete list of species and canopy covers. Species lists updated with a second early spring visit to sites in Spring 2016.

Wetland GDV sites:

- 10x10m quadrats – tree counts, tree covers and tree canopy condition assessment;
- Two nested 5x5m quadrats – complete species list with species canopy cover. Species lists updated with a second early spring visit to sites in Spring 2016.

Autumn 2016 GDV survey

Terrestrial GDV sites (except Boonanarring NR T2 sites) and Wetland GDV sites:

- tree canopy condition assessment;

Spring 2017 GDV survey

Terrestrial GDV sites (except Boonanarring NR T2 sites):

- tree canopy condition assessment; tree counts

Wetland GDV sites (Collard's Wetland sites, but not the Bartlett's Well NR wetland sites):

- tree canopy condition assessment, tree counts.

Spring 2018 GDV survey

Terrestrial GDV sites (Boonanarring NR only)

- Transect T2: established 5 new quadrats (BNR07, BNR08, BNR09, BNR10, BNR11) and sampled along with 2 T2 sites already established (BNR12, BNR13):
    - 20x20 quadrat - tree counts and canopy condition assessment;
    - 10x10 quadrat (nested) - complete species list with species canopy cover.
- Transect T1 sites (established 2015: BNR01, BNR02, BNR03, BNR04, BNR05, BNR06):
    - tree canopy condition assessment;

2.3 GDV monitoring after commencement of mining/dewatering

The first GDV monitoring undertaken for the Boonanarring project after commencement of mining was the Autumn 2019 GDV survey. Since then there have been surveys in Spring 2019, Autumn 2020, Spring 2020, Autumn 2021, Spring 2021 and Autumn 2022.

Autumn 2019, Autumn 2020, Autumn 2021 and Autumn 2022 GDV surveys

Terrestrial GDV sites:

- tree canopy condition assessment;

Wetland GDV sites:

- tree canopy condition assessment.

Spring 2019 GDV survey

Terrestrial GDV sites:

- 20x20m quadrats – tree counts and tree canopy condition assessment;

        - 10x10m quadrat (nested) – a list of perennial species list and their covers.
    - Wetland GDV sites:
        - 10x10m quadrats – tree counts, tree covers and tree canopy condition assessment;
        - Two nested 5x5m quadrats – complete list of all species, with covers.

Spring 2020, Spring 2021 GDV survey

Terrestrial GDV sites:

- tree canopy condition assessment;

Wetland GDV sites:

- tree canopy condition assessment.

2.4 Cessation of monitoring in Bartlett's Well NR

As noted in section 1.1 above, following the completion of mining and dewatering in July 2021, the Spring 2021 and Autumn 2022 surveys werel the final surveys for Bartlett's Well NR. Consequently no monitoring was undertaken in Bartlett's Well NR for the Spring 2022 surey.

2.5 Depth to groundwater monitoring

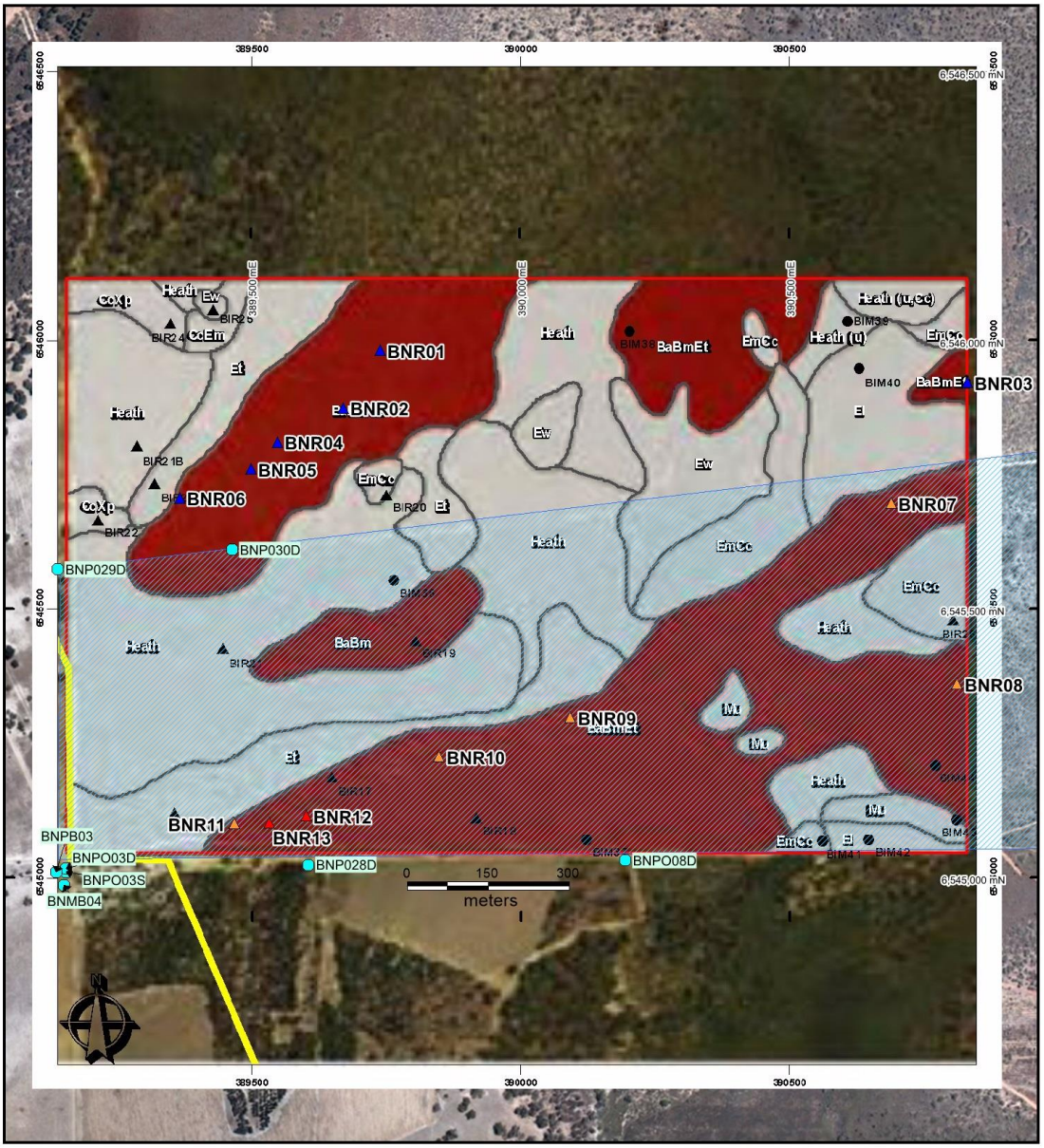
The most recent available historical depth to ground water (DTGW) data for bores at or adjacent to Boonanarring NR and Collard's Wetland are shown in Figures 4a, b.

Table 1. GDV monitoring sites (quadrats) in Boonanarring NR, Bartlett's Well NR and Collard's Wetland and site properties.

Site Nos	Location	GDV Type	Mapped Vegtn	Site Class[b]	Comments
BNR01	Boonanarring NR	Terrestrial	BaBmEt	T1	
BNR02	Boonanarring NR	Terrestrial	BaBmEt	T1	
BNR03	Boonanarring NR	Terrestrial	BaBmEt	C	
BNR04	Boonanarring NR	Terrestrial	BaBmEt	T1	
BNR05	Boonanarring NR	Terrestrial	BaBmEt	T1	
BNR06	Boonanarring NR	Terrestrial	BaBmEt	T1	
BNR07	Boonanarring NR	Terrestrial	BaBmEt	C	Established Nov 2018 (Area burnt Oct 2015)
BNR08	Boonanarring NR	Terrestrial	BaBmEt	C	Established Nov 2018 (Area burnt Oct 2015)
BNR09	Boonanarring NR	Terrestrial	BaBmEt	T2	Established Nov 2018 (Area burnt Oct 2015)
BNR10	Boonanarring NR	Terrestrial	BaBmEt	T2	Established Nov 2018 (Area burnt Oct 2015)
BNR11	Boonanarring NR	Terrestrial	BaBmEt	T2	Established Nov 2018 (Area burnt Oct 2015)
BNR12	Boonanarring NR	Terrestrial	BaBmEt	T2	Site burnt October 2015 (DBCA control burn).[a]
BNR13	Boonanarring NR	Terrestrial	BaBmEt	T2	Site burnt October 2015 (DBCA control burn). [a]
BWNR01	Bartlett's Well NR	Terrestrial	BaBmEt	T4	Autumn 2021 was last monitoring event
BWNR02	Bartlett's Well NR	Terrestrial	BaBmEt	T4	Autumn 2021 was last monitoring event
BWNR03	Bartlett's Well NR	Terrestrial	BaBmEt	T4	Autumn 2021 was last monitoring event
BWNR04	Bartlett's Well NR	Terrestrial	BaBmEt	C1	Autumn 2021 was last monitoring event
BWNR05	Bartlett's Well NR	Terrestrial	BaBmEt	T3	Autumn 2021 was last monitoring event
BWNR06	Bartlett's Well NR	Terrestrial	BaBmEt	T3	Autumn 2021 was last monitoring event
BWNR07	Bartlett's Well NR	Wetland	CcMpCa	bCcMp	Autumn 2021 was last monitoring event
BWNR08	Bartlett's Well NR	Wetland	Mp	bMp	Autumn 2021 was last monitoring event
BWNR09	Bartlett's Well NR	Wetland	Mp	bMp	Autumn 2021 was last monitoring event
BWNR10	Bartlett's Well NR	Wetland	Mp	bMp	Autumn 2021 was last monitoring event
BWNR11	Bartlett's Well NR	Wetland	MpMl	bMpMl	Autumn 2021 was last monitoring event
BWNR12	Bartlett's Well NR	Wetland	Mp	bMp	Autumn 2021 was last monitoring event
BWNR13	Bartlett's Well NR	Terrestrial	BaBmEt	T3	Autumn 2021 was last monitoring event
BWNR14	Bartlett's Well NR	Terrestrial	BaBmEt	C1	Autumn 2021 was last monitoring event
CW01	Collard's Wetland	Wetland	Mp	cMp	
CW02	Collard's Wetland	Wetland	ErMr	cMr	
CW03	Collard's Wetland	Wetland	ErMr	cMr	
CW04	Collard's Wetland	Wetland	ErMp	cErMp	
CW05	Collard's Wetland	Wetland	CcErLl	cCcEr	
CW06	Collard's Wetland	Wetland	Mr	cMr	
CW07	Collard's Wetland	Wetland	Mr	cMr	
CW08	Collard's Wetland	Wetland	ErMp	cErMp	
CW09	Collard's Wetland	Wetland	CcErLl	cCcEr	
CW10	Collard's Wetland	Wetland	ErMr	cMr	
CW11	Collard's Wetland	Wetland	ErMp	cErMp	
CW12	Collard's Wetland	Wetland	CcErLl	cCcEr	

[a] Sites pegged, but only scored for canopy condition

[b] T: transects; C: control sites; bxxx: Bartlett's Well wetland vegetation groupings; cxxx: Collard's Wetland vegetation groupings.



Boonanarring Proposal Envelope

Groundwater Dependent Vegetation Survey Area

Flora Sampling Locations

Mapping Note

Releve

Potential Groundwater Sensitive Vegetation

Terrestrial

Wetland

Existng Bores

Prescribed burn area 31 Oct 2015

Vegetation Quadrats

Established Oct 2015

Established Oct 2015, burnt Nov 2015

Established Oct 2018

BOONANARRING PROJECT
BOONANARRING NATURE RESERVE
GDV MONITORING QUADRAT LOCATIONS & VEGETATION UNITS
Figure 2

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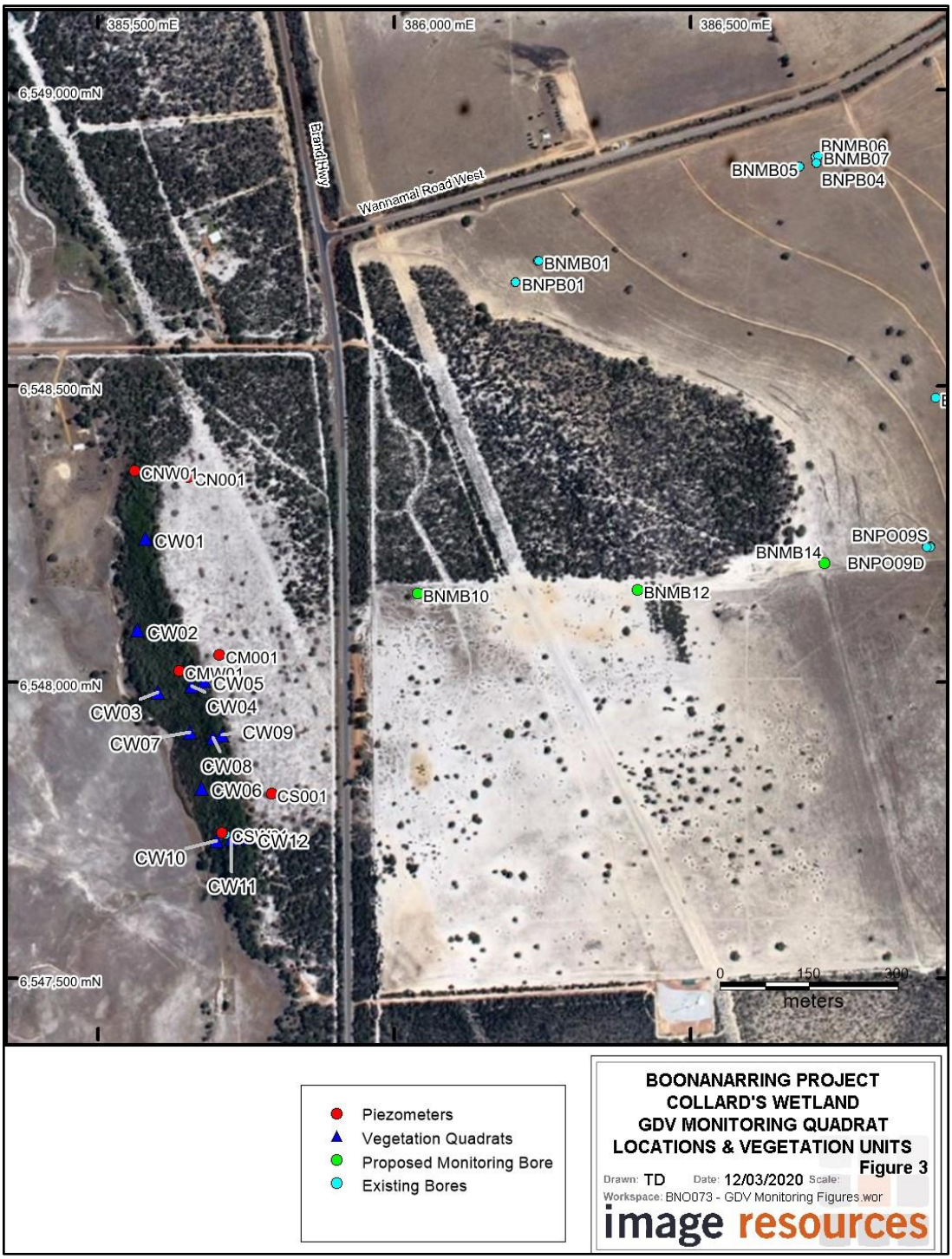
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386,500 mE
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6,547,500 mN
Bruce Hwy
Wannamal Road West
BNMB06
BNMB07
BNMB05
BNPB04
BNMB01
BNPB01
CNW01
CN001
CW01
BNPO09S
BNMB14
BNPO09D
BNMB10
BNMB12
CW02
CM001
CMW01
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Vegetation Quadrats
Proposed Monitoring Bore
Existing Bores
BOONANARRING PROJECT
COLLARD'S WETLAND
GDV MONITORING QUADRAT
LOCATIONS & VEGETATION UNITS
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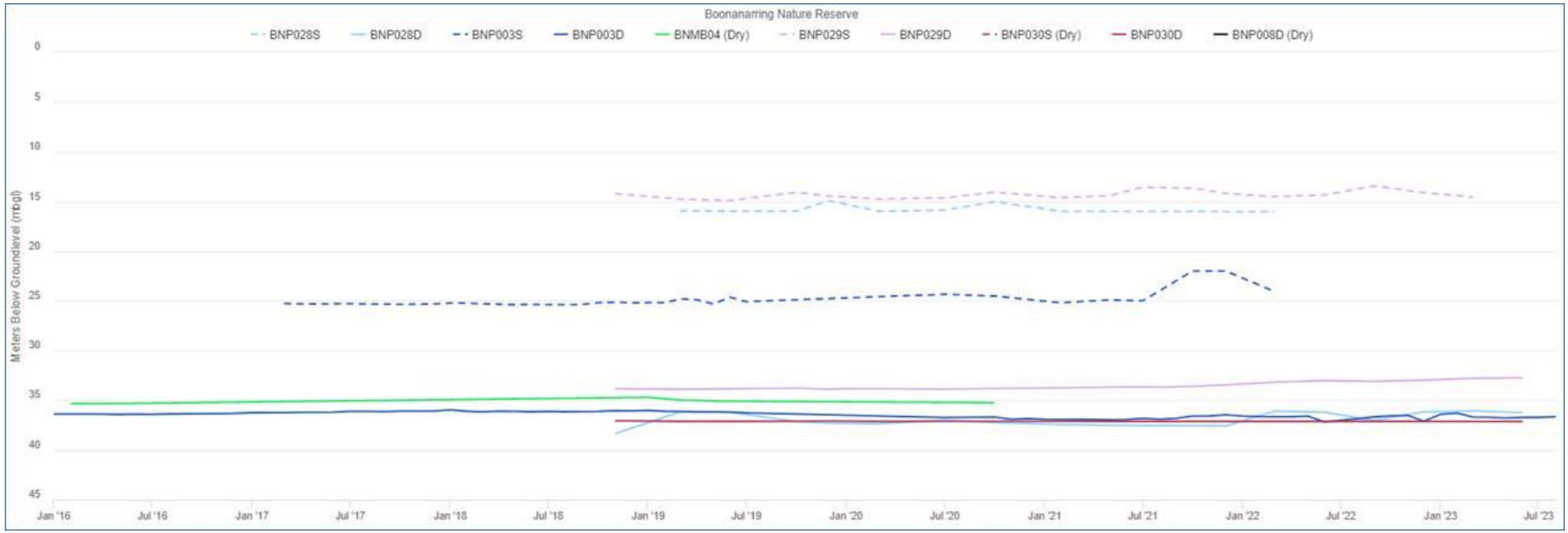

Figure 4a. Depth to Ground Water for bores at Boonanarring NR (see Fig 2 for bore locations).

Figure 4b. Depth to Ground Water for bores at Collard's Wetland (see Fig 3 for bore locations).

3.0 METHODS AND LIMITATIONS

3.1 Timing of the survey

The Spring 2022 survey was undertaken at the end of Spring, between the 22nd and 29th of November 2022.

3.2 Survey methods

3.2.1 Site records

When each quadrat (site) was visited, a photo was taken of the quadrat from the north or north-west corner. Some basic notes were made about the general vegetation health in the quadrat. Sample trees were photographed (all trees at sites in Boonanarring NR, but not in Collard's Wetland due to the much greater height and density of trees, making tree crown photos ineffective). Sample trees were then scored for crown assessment and foliage health. Where tree tags had become detached, they were refastened or replaced.

Where some sample trees had died and there was concern for future sample numbers at a site, new sample trees were selected, tagged and scored for potential inclusion in future monitoring analysis.

3.2.2 Canopy condition assessment

Canopy condition assessment was undertaken in the Spring 2022 survey as described for previous surveys (Morgan, 2019). For each surveyed tree crown, 'crown density' (1 to 9), 'proportion of dead branches' (1 to 9) and 'degree of epicormic growth' (1 to 5) were scored using the 'Crown Assessment Procedure diagrams' supplied by DWER (Appendix 1). For each tree, the scores of these three elements of canopy condition were subsequently totalled to give a '3 point canopy assessment index', or 'crown assessment index' score for each tree (3 point scale; Ladd, 1996; cited by R. Loomes, *pers. comm.*). Because it is scored out of a smaller range of values. the addition of the three elements of canopy condition effectively gives less weight to 'degree of epicormic growth' than to the other two elements of canopy condition. The lesser weighting of 'degree of epicormic growth' in the index was made because it was argued that epicormic growth is not always an indicator of poor canopy condition or tree stress (R. Loomes (DWER), *pers. comm.*).

For the Boonanarring GDV monitoring surveys, 'Dead Branches' were scored for the outer part of the tree canopy, since branches in the inner part of the canopy had often

died back due to factors such as competition for sunlight (shading) and nutrients, factors unrelated to groundwater access and the general health of the tree. This was particularly noticeable for trees with dense canopies, such as *Melaleuca preissiana* and, more generally, for sites with high tree density and high overall canopy cover (a number of the Collard's Wetland sites). Another problem in canopy assessment arose when one or more of the main crown branches had died. In this case, 'dead branches' and 'crown density' assessment took into account the entire crown including the dead branches, but 'foliage health' (see below) focused on the foliage remaining on the live branches.

3.2.3 Foliage health assessment

Since the canopy condition 3 point assessment method did not include a direct assessment of foliage health, it was decided to include a simple assessment of crown foliage health for the sampled trees. A simple scale for foliage health was developed during the initial field survey and is shown in Table 2 below. It was designed to give an approximate and broad rating to tree foliage health. It should be noted that foliage health, like the three surveyed crown condition elements, could be affected by many factors other than detrimental changes in ground water access for GDV plant species, such as insect herbivory. The foliage health assessment focused on the foliage in the outer crown of trees to avoid foliage symptoms that occur in the inner canopy due to factors such as shading by the outer canopy.

Table 2. Foliage health Index (applied to the outer crown canopy of sampled trees).

Index	Foliage health description	Foliage health symptoms
5	Healthy	Leaves green and abundant; very little leaf yellowing (some yellowing, leaf drop or other deterioration restricted to older leaves/branches lower in canopy (inside the crown canopy)).
4	Signs of some stress	Some leaves yellowing, mostly healthy green.
3	Significant stress	Leaf yellowing widespread, some defoliation (leaf drop) and leaf necrosis.
2	Serious stress	Leaf yellowing widespread; leaf necrosis may be significant in parts of crown.
1	Seriously stressed/diseased tree; near death	Extensive leaf necrosis and defoliation in outer canopy

3.3 Limitations of the GDV monitoring survey

The subjective nature of canopy condition assessments was a limitation for the survey, although this was mitigated to some extent by regular reference to the crown assessment procedure diagrams. This limitation of the assessment applied both within any one season of sampling between sites and also in comparing data from different seasons. Photos of trees from previous surveys were used as a reference when making crown assessments.

Rules on the parts of canopies used to assess 'dead branches' and foliage health and on the assessment of major dead branches in ongoing surveys helped with consistency during the survey.

Another limitation of the monitoring survey was that the crown assessment index and foliage health index may not always reflect tree stress or tree health. Fire was disruptive to tree assessment at one transect of sites in Boonanarring NR (transect T2, Table 1; Figure 2), which was burnt in October 2015. Tree crowns at these sites were fire damaged to various extents, resulting in dead branches, scorched foliage and subsequent growth of epicormics shoots. At other sites, overshadowing by neighbouring trees also impacted crown assessment factors.

3.4 Data analysis

Descriptive statistics, means and standard deviations, were calculated for the Spring 2022 GDV data set. The Excel spreadsheet 'Pivot Table' function was used to calculate the descriptive statistics.

When monitoring trees died they scored a 'zero' for the three elements of canopy condition assessment and for the foliage health assessment. Dead trees were retained in the data sets if they were alive and scored in the pre-mining monitoring event used for a particular Location/GDV Type area. For example, if data collected in Spring 2017 was used for a Location/GDV Type area, trees that died after the Spring 2017 survey were scored '0' when dead and left in the data set, but trees that may have been recorded as dead in surveys prior to the Spring 2017 survey were excluded from that dataset (redundancy). New trees that were added into the monitoring after the initial Spring 2015 survey, but before or during the Spring 2017 survey, were included in the Spring 2017 data set for analysis. This was consistent with previous Spring GDV monitoring reports, but differs from the Autumn GDV report treatments, which used Autumn seasonal data comparisons (see Morgan, 2020a, 2020b, 2021a, 2021b).

For some analyses, data was grouped into 'site classes'. In the Wetland GDV areas, sites could be grouped by vegetation type 'site classes' (see Table 1). In the Terrestrial GDV areas, sites could be grouped by 'treatment' class ('treatment' and 'control' sites), where the unquantified 'distance from mining envelope' was effectively the 'treatment'.

Table 3. Pre-mining datasets used for Spring 2022 analysis for each Location/GDV Type (most recent pre-mining monitoring dataset collected at each particular Location/GDV Type).

Location/GDV Type	Pre-mining monitoring data collected	Pre-mining dataset used for analysis with Spring 2022 data
Boonanarring NR Terrestrial GDV sites – Transect 1 (T1)	Spring 2015 Autumn 2015 Spring 2017 Spring 2018	Spring 2018
Boonanarring NR Terrestrial GDV sites – Transect 2 (T2)	Spring 2018	Spring 2018
Collard's Wetland/ Wetland GDV sites	Spring 2015 Autumn 2015 Spring 2017	Spring 2017

StatPlus Pro V7 computer package (AnalystSoft, 2018) was used to run a comparison of means paired sample t-test to compare the selected 'same season' pre-mining dataset with Spring 2021 (post commencement of mining/de-watering) crown assessment index scores and foliage health index scores to test for significant differences of the paired means. The comparison of paired means t-test was run separately for each of the four monitoring locations/GDV Types (Table 3) and included the pre-mining monitoring event data for the particular Location/GDV Type area as per Table 3 above. The null hypothesis was 'sample means are equal' and the null hypothesis was accepted if the 't' Statistic value was less than the Critical Value (for a confidence limit of 5%; two-tailed hypothesis). The results of the StatPlus Pro V7 comparison of paired means t-test were stated for the 'alternative hypothesis'.

The same data set was used for the comparison of paired means t-test as was used for the descriptive statistics (see detailed description in section 3.4 above).

4.0 RESULTS OF THE SPRING 2022 GDV MONITORING

4.1 General observations on site vegetation

Photographs of the vegetation at all of the monitoring sites were taken for the Spring 2022 survey and are presented in the Plates section (Plates 1 to 50) along with paired pre-mining site photographs from the following surveys:

- Spring 2017 (Collard's Wetland sites), and
- Spring 2018 (Boonanarring NR sites).

The general vegetation at the Boonanarring NR Terrestrial GDV sites at the time of the Spring 2022 survey was green and healthy (Plates 1-26). No new tree deaths were recorded during the Spring 2022 monitoring survey (Table 4).

The general vegetation at Collard's Wetland GDV sites also appeared healthy (Plates 27-50). Sites closer to the margins of the wetland were healthiest. Collard's Wetland central transect sites (CW11, CW10, CW08 and CW04) continued to be very wet (inundated) and boggy, as they have been from the commencement of monitoring in 2015. Sites along the western side of Collard's (CW10, CW06, CW07, CW03 and CW02) were noted to be wetter than usual and had surface water present (inundated). Drier sites along the eastern side of Collard's were noted to be heavily grazed (CW05 and CW09) or trampled (CW12). Fern cover at CW08 has become extensive and was noted to be greater than 75% cover in the 10 x 10 metre quadrat. As noted previously, CW04 continues to be boggy and wet, with high and increasing **Isolepis prolifera* cover.

4.2 Tree crown assessment and foliage health

4.2.1 Observations and trends in mean Canopy Assessment Index (CAI) and Foliage Health Index (FHI)

While there was a total of 219 trees scored in the Spring 2022 GDV survey (including trees added to the GDV monitoring after the Spring 2015 survey), a total of 201 trees were included in the tree crown assessment descriptive statistics:

- 105 trees in Boonanarring NR Terrestrial GDV sites (1 additional tree included that was mistakenly excluded in the Spring 2019 report); and
- 96 trees in Collard's Wetland GDV sites.

Tree canopy condition assessment data and 'crown assessment index' scores for each tree for pre-mining and post-commencement of mining surveys, including Spring 2022 data, are presented in Appendices 2 and 3. A crown assessment index score of about 14 or 15 could be considered to represent a moderately healthy crown

(moderate number of dead branchlets (5), average crown foliage density (5) and none or occasional epicormic branchlettes (4 to 5)). A foliar health index value of about '4' would also indicate a moderately healthy tree crown. A crown assessment index score of about 17 to 21 could be considered to represent a very healthy/vigorous crown (none or very sparse small dead branches (7 to 9), no epicormics growth (5) and a crown with average to dense foliage (5 to 7)). Finally, a crown assessment index score of about 9 or less would indicate a tree with signs of significant stress (large and/or small branches dead (3), epicormic branchlettes in moderate abundance over most of the crown (3) and a crown of sparse, poorly spread clumps of foliage (3)).

Table 4. *Banksia* spp. deaths at Boonanarring NR GDV sites included in the data analysis. (Deaths first recorded prior to or during pre-mining Spring data used in analysis are redundant data and not included in this table).

Site	First Spring survey in which *Banksia* spp. deaths recorded					Total
	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	
Boonanarring NR sites:						
BNR01 (T1)				1		1
BNR02 (T1)				2		2
BNR03 (C)		1		1		2
BNR04 (T1)				1		1
BNR05 (T1)				1		1
BNR06 (T1)				2		2
BNR07 (C)				1		1
BNR10 (T2)			1			1
BNR011 (T2)				1		1
BNR013 (T2)				3		3
BNR Total		1	1	13		**15**

a: Of the 4 *Banksia* trees deaths at site BWNR01 shown as first recorded in Spring 2020, 3 of the deaths occurred between the Spring 2018 monitoring and Autumn 2020 monitoring. No dewtatering had occurred in the adjacent mining pit prior to the Spring 2020 monitoring and DTGW in the area of BWNR01 was quite consistent (steady) between March 2016 and December 2020.

Mean Crown Assessment Index (CAI) and Foliage Health Index (FHI) values are shown by tree species, 'Treatments' and GDV Type in Tables 5 and 6. The trends can be summarized as follows:

Boonanarring NR (Terrestrial GDV)

Mean CAI of the Boonanarring NR treatment sites declined from Spring 2018, but remained at 'moderately healthy' levels. This compared to mean CAI of the control sites which were several points lower, mainly due to declining tree health at site BNR03 and the recovering burnt canopies of BNR07 and BNR08 (Table 6). The mean CAI of *Banksia* trees in the two treatment transects (T1 and T2) had declined significantly between the Spring 2020 and 2021 surveys (from 15.0 to 13.1; Table 5), with the greatest decline in the T1 transect trees (Table 6). This was mostly due to a large number of tree deaths (11 deaths) recorded at the Boonanarring NR treatment sites (T1 and T2) during that period (recording during the Autumn 2021 survey, Table 4).

No new deaths of *Banksia* trees were recorded in Boonanarring NR in the Spring 2022 survey (Table 4) and mean CAI increased from Spring 2021 to Spring 2022 (Table 5).

Similar trends occurred in the Mean FHI at Boonanarring NR sites.

Collard's Wetland

Mean CAI for 'all trees' at Collard's Wetland sites, having declined from the 'moderately healthy' level of 14.6 in Spring 2017 to 13.5 in Spring 2021, has since improved moderately to be 14.0 in Spring 2022 (Table 5). The CAI for three of the four tree species increased from Spring 2021 to Spring 2022, with only *Melaleuca preissiana* tree mean CAI declining slightly over that time (13.1 to 12.9; Table 5).

Melaleuca rhaphiophylla trees have the healthiest canopy condition (mean CAI of 18.1 in Spring 2022; Table 5) and have remained 'very healthy' since pre-mining Spring 2017, with a modest increase in CAI since Spring 2017. *Melaleuca preissiana* tree mean CAI has declined moderately from 'moderately healthy' levels in pre-mining Spring 2017 to be modestly lower in Spring 2022 (14.3 to 12.9, Table 5). Overshadowing from the taller tree species, *Corymbia calophylla* ('Cc') and *Eucalyptus rudis* ('Er'), is a significant factor contributing to necrosis in parts of *Melaleuca preissiana* tree crowns. A large decline in canopy condition (mean CAI) from pre-mining 2017 survey levels were recorded in *Corymbia calophylla* trees in Spring 2019 (12.3 to 10.9; Table 5) and mean CAI has since remained at a low level

until a significant improvement was recorded in Spring 2022 (to 12.0). A large decline in mean CAI also occurred in *Eucalyptus rudis* trees between Spring 2017 and Spring 2019 (13.3 to 9.87; Table 5), but has improved since to reach 12.1 in Spring 2022.

These trends in mean CAI in the tree species at Collard's Wetland are also reflected in the vegetation types (Table 6).

As in other recent Boonanarring monitoring surveys, *Eucalyptus rudis* tree crowns were assessed as 'significantly stressed' in Spring 2019 at four of the eight Collard's Wetland sites in which they were monitored (CW03 and CW11, CW04 and CW10; Appendix 5). *Eucalyptus rudis* tree crowns at one of those sites, CW03, had been assessed as 'significantly stressed' at the start of monitoring in Spring 2015 and CAI remains at similar levels in those trees. While 'Er' mean CAI has largely recovered at CW04 and CW10 since Spring 2019, recoveries in 'Er' crown condition since Spring 2019 has been modest at sites CW03 and CW11 (Appendix 5). Growth (maturing) of prolific Spring 2019 epicormics has contributed to the rising mean CAI levels.

4.2.2 Results of the comparison of means paired t-test analysis

The detailed results of the comparison of paired means t-test analysis are shown in Appendix 4. The results were:

- Boonanarring NR sites : The mean CAI of trees at the treatment transect sites increased from Spring 2021 to Spring 2022 such that, while mean CAI had declined from pre-mining levels (Spring 2018), it had recovered sufficiently such that the decline from Spring 2018 to Spring 2022 was not significantly different. Nor was there a significant difference in mean CAI at the Control sites between Spring 2018 and Spring 2022, with the mean CAI actually increasing over that time. FHI of the treatment site trees declined significantly from pre-mining Spring 2018 to Spring 2022, but was not significantly different for the Control site trees over that period.
- Collard's Wetland sites: The increasing mean CAI of many Collard Wetland trees between Spring 2021 and Spring 2022 was such that what was a significant difference (decline) in mean CAI of 'all tree species' reported in Spring 2021 (Morgan, 2022) became a 'not significantly different' mean CAI in Spring 2022. While there was 'no significant difference in mean CAI between Spring 2017 and Spring 2022 for *Corymbia calophylla* and *Eucalyptus rudis* trees and a significant difference (improvement) in mean CAI of *Melaleuca rhaphiophylla* trees across the same period, there was a

significant decline in mean CAI of *Melaleuca preissiana* trees since Spring 2017. FHI for 'all trees' and all individual species at Collard's was found to be not significantly different between pre-mining Spring 2017 and Spring 2022.

4.3 Depth to groundwater and tree crown assessment

Of the most relevant bores at Boonanarring NR, they were either dry (BNP030S) or had a depth to groundwater (DTGW) greater than 10 metres (bores BNP029S, BNP003S and BNP028S) in December 2021 (Figure 4a). It is generally considered that *Banksia attenuata* and *Banksia menziesii* trees don't access groundwater at depths greater than 10 metres (Froend *et al*., 2004). DTGW has been consistent in the four bores since monitoring began in 2017 to 2018 (Figure 4a).

Bores CMW01 (near monitoring site CW04) and CSW01 (near site CW11) were located in the wetter central part of Collard's Wetland and, until about November 2020, had DTGW levels that had tracked closely together and decreased some 11 cm from May 2016 to be at about saturated profile levels in November 2020 (Figure 4b). In December 2022 the DTGW was shallow at both those bores and was at about saturated profile levels. The water level at bore CNW01 in the central north area of Collard's Wetland was well north of the northern most monitoring point and the DTGW there was a little greater (25cm in May 2016) and fluctuated more than the DTGW at the other Collard's bores (Figure 4b). DTGW has steadily decreased at CNW01 to be close to the surface in Spring 2022, making a wetter profile. The DTGW trends in the Collard's Wetland bores suggest that the wetland has become slightly wetter since May 2016. Figure 5b also shows that the DTGW was greater at Bores CN001, CM001 and CS001, which are located in the dry and more elevated paddock adjacent to and just east of Collard's Wetland (Figure 4b).

Table 5. Mean crown assessment index and foliar health index values by tree species by GDV type by location. (Data is shown for Spring 2019, 2020, 2021 and 2022 (mining period) and the most recent pre-mining survey for each Location/GDV Type, as this pre-mining data was the best available to approximate the tree canopy condition immediately prior to the commencement of mining. The dataset for each Location/GDV Type was edited to include dead trees only if the tree died after the time of the pre-mining data used for each particular Location/GDV Type. Data for trees added to the monitoring program after Spring 2015 was included if the tree was monitored during the particular pre-mining survey used for that Location/GDV Type (see Appendices 2&3)).

Tree species[a] by 'site class'	Nos trees	Crown Assessment Index										Foliar Health Index									
		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Boonanarring NR	**105**																				
Terrestrial GDV Sites[b]	105					14.4	3.8	14.6	3.8	15.0	4.1					4.6	0.5	4.4	0.7	4.4	0.8
Ba[b]	61					14.1	3.8	14.2	4.1	14.4	4.6					4.6	0.6	4.4	0.8	4.3	1.0
Bm[b]	44					14.9	3.9	15.2	3.3	15.8	3.2					4.6	0.5	4.4	0.5	4.5	0.5
Collard's Wetland	**96**																				
Wetland GDV Sites	96			14.6	3.6			13.3	4.3	13.5	4.4			4.6	0.6			4.5	0.7	4.6	0.7
Cc	9			12.3	3.2			10.9	3.8	10.9	3.3			4.3	0.5			4.4	0.5	4.3	0.5
Er	26			13.3	3.3			9.8	3.6	10.9	4.2			4.4	0.7			4.0	0.8	4.7	1.0
Mp	36			14.3	4.1			13.8	4.0	13.1	4.1			4.6	0.6			4.6	0.6	4.4	0.7
Mr	25			17.0	1.4			17.0	1.5	17.6	1.7			5.0	0.2			5.0	0.0	5.0	0.0

[a] Ba: *Banksia attenuata*; Bm: *Banksia menziesii*; Cc: *Corymbia calophylla*; Er: *Eucalyptus rudis* subsp. *rudis*; Et: *Eucalyptus todtiana*; Mp: *Melaleuca preissiana*; Mr: *Melaleuca rhaphiophylla*

[b] Includes Transect T2 data that was only monitored Pre-mining in Spring 2018.

Table 5 (cont). Mean crown assessment index and foliar health index values by tree species by GDV type by location.

Tree species[a] by 'site class'	Nos trees	Crown Assessment Index										Foliar Health Index									
		Spring 2021		Spring 2022								Spring 2021		Spring 2022							
		Mean	SD	Mean	SD							Mean	SD	Mean	SD						
Boonanarring NR	**105**																				
Terrestrial GDV Sites[b]	105	13.1	6.1	13.9	6.4							4.2	1.8	4.2	1.8						
Ba[b]	61	12.1	6.5	13.0	6.8							4.0	1.9	4.1	1.9						
Bm[b]	44	14.4	5.4	15.1	5.6							4.3	1.5	4.5	1.5						
Collard's Wetland	**96**																				
Wetland GDV Sites	96	13.5	4.1	14.0	4.6							4.4	0.8	4.7	0.8						
Cc	9	11.0	3.5	12.0	4.6							4.4	0.5	4.3	0.5						
Er	26	11.3	4.1	12.1	4.9							4.2	1.3	4.3	1.4						
Mp	36	13.1	3.5	12.9	4.1							4.4	0.6	4.8	0.5						
Mr	25	17.4	2.1	18.1	1.7							4.8	0.4	5.0	0.0						

[a] Ba: *Banksia attenuata*; Bm: *Banksia menziesii*; Cc: *Corymbia calophylla*; Er: *Eucalyptus rudis* subsp. *rudis*; Et: *Eucalyptus todtiana*; Mp: *Melaleuca preissiana*; Mr: *Melaleuca rhaphiophylla*

[b] Includes Transect T2 data that was only monitored Pre-mining in Spring 2018.

Table 6. Mean crown assessment index and foliar health index values by tree species by 'Treatment' by 'site class'. (Data is shown for Spring 2019, 2020, 2021 and 2022 (mining period) and the most recent pre-mining survey for each Location/GDV Type. The dataset for each Location/GDV Type was edited to include dead trees only if the tree died after the pre-mining data period used for each particular Location/GDV Type. Trees added to monitoring surveys after the first monitoring survey, were included if the tree was monitored during the particular pre-mining survey period used for that Location/GDV Type (see Appendices 2&3)).

Tree species[a] by 'Treatment' by 'site class'[b]	Nos of trees	Crown Assessment Index										Foliar Health Index									
		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Boonanarring NR	**105**																				
Terrestrial GDV Sites	105					14.4	3.8	14.6	3.8	15.0	4.1					4.6	0.5	4.4	0.7	4.4	0.8
C	27					11.8	5.1	12.0	4.7	12.2	4.3					4.4	0.6	4.3	1.0	4.6	1.0
Ba	14					11.2	5.0	11.1	5.1	11.4	5.1					4.4	0.7	4.2	1.3	4.4	1.3
Bm	13					12.5	5.3	13.0	4.1	13.1	3.2					4.5	0.5	4.3	0.6	4.8	0.4
T1	38					15.9	2.8	16.3	2.6	16.4	2.9					4.6	0.5	4.4	0.5	4.5	0.6
Ba	24					15.5	2.8	15.8	2.5	16.0	2.8					4.7	0.5	4.5	0.5	4.6	0.6
Bm	14					16.6	2.9	17.1	2.6	17.2	3.1					4.4	0.5	4.4	0.5	4.4	0.6
T2	40					14.8	2.7	14.7	3.1	15.5	4.1					4.7	0.5	4.5	0.6	4.2	0.9
Ba	23					14.3	2.9	14.2	3.8	14.5	5.0					4.6	0.5	4.5	0.6	4.0	1.1
Bm	17					15.4	2.3	15.2	2.0	16.8	1.9					4.8	0.4	4.4	0.5	4.4	0.5
Collard's Wetland																					
Wetland GDV Sites	96			14.6	3.6			13.3	4.3	13.5	4.4			4.6	0.6			4.5	0.7	4.6	0.7
cCcEr	23			12.0	3.4			11.3	3.7	11.3	3.6			4.3	0.6			4.3	0.7	4.3	0.7
Cc	9			12.3	3.2			10.9	3.8	10.9	3.3			4.3	0.5			4.4	0.5	4.3	0.5
Er	1			15.0	na			14.0	na	14.0	na			5.0	na			4.0	na	5.0	na
Mp	13			11.6	3.7			11.4	3.9	11.3	3.9			4.3	0.6			4.3	0.9	4.2	0.8
cErMp	31			14.0	2.5			11.6	3.4	11.3	3.5			4.6	0.6			4.4	0.7	4.5	1.0
Er	15			14.0	2.6			9.7	3.6	10.4	4.3			4.6	0.5			4.1	0.7	4.5	1.3
Mp	15			13.9	2.5			13.3	2.1	11.9	2.3			4.7	0.7			4.7	0.5	4.4	0.6
Mr	1			14.0	na			14.0	na	17.0	na			5.0	na			5.0	na	5.0	na
cMp	8			19.5	1.8			18.9	1.7	18.5	1.6			5.0	0.0			5.0	0.0	4.9	0.4
Mp	8			19.5	1.8			18.9	1.7	18.5	1.6			5.0	0.0			5.0	0.0	4.9	0.4
cMr	34			15.6	3.3			14.9	4.2	15.8	3.9			4.7	0.6			4.6	0.8	4.9	0.2
Er	10			12.2	4.1			9.6	3.8	11.4	4.2			4.0	0.8			3.7	0.9	4.8	0.4
Mr	24			17.1	1.2			17.1	1.4	17.6	1.7			5.0	0.2			5.0	0.0	5.0	0.0

[a] Ba: *Banksia attenuata*; Bm: *Banksia menziesii*; Cc: *Corymbia calophylla*; Er: *Eucalyptus rudis* subsp. *rudis*; Et: *Eucalyptus todtiana*; Mp: *Melaleuca preissiana*; Mr: *Melaleuca rhaphiophylla*

[b] 'Treatments'. T: transects; C: control sites; bxxx: Bartlett's Well wetland vegetation groupings; cxxx: Collard's Wetland vegetation groupings.

Table 6 (cont). Mean crown assessment index and foliar health index values by tree species by 'Treatment' by 'site class'. .

Tree species[a] by 'Treatment' by 'site class'[b]	Nos of Trees	Crown Assessment Index				Foliar Health Index			
		Spring 2021		Spring 2022		Spring 2021		Spring 2022	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Boonanarring NR	**105**								
Terrestrial GDV Sites	105	13.1	6.1	13.9	6.4	4.2	1.8	4.2	1.8
C	27	11.6	5.1	12.7	5.3	4.4	1.6	4.4	1.6
Ba	14	11.6	4.7	12.9	4.8	4.6	1.3	4.6	1.3
Bm	13	11.5	5.7	12.4	6.0	4.2	1.9	4.2	1.9
T1	38	13.4	6.9	14.2	7.2	3.9	1.9	4.1	2.0
Ba	24	11.5	7.8	12.0	8.1	3.5	2.3	3.5	2.3
Bm	14	16.8	3.0	17.8	3.0	4.6	0.5	5.0	0.0
T2	40	13.7	6.0	14.4	6.2	4.2	1.7	4.3	1.7
Ba	23	13.1	6.1	13.9	6.4	4.2	1.7	4.3	1.7
Bm	17	14.5	6.0	15.0	6.0	4.2	1.8	4.3	1.6
Collard's Wetland									
Wetland GDV Sites	96	13.5	4.1	14.0	4.6	4.4	0.8	4.7	0.8
cCcEr	23	11.3	3.2	11.5	4.2	4.3	0.6	4.5	0.7
Cc	9	11.0	3.5	12.0	4.6	4.4	0.5	4.3	0.5
Er	1	15.0	na	17.0	na	5.0	na	5.0	na
Mp	13	11.3	3.0	10.7	3.8	4.2	0.6	4.6	0.8
cErMp	31	11.6	2.9	12.0	3.5	4.2	1.0	4.6	1.0
Er	15	10.9	3.5	11.6	4.3	4.1	1.2	4.4	1.3
Mp	15	11.9	1.7	12.0	2.4	4.3	0.6	4.9	0.4
Mr	1	17.0	na	17.0	na	5.0	na	5.0	na
cMp	8	18.1	1.8	18.4	1.4	4.8	0.5	4.9	0.4
Mp	8	18.1	1.8	18.4	1.4	4.8	0.5	4.9	0.4
cMr	34	15.7	4.2	16.4	4.3	4.6	0.9	4.8	0.9
Er	10	11.6	5.1	12.4	5.8	4.2	1.5	4.2	1.5
Mr	24	17.5	2.1	18.1	1.7	4.8	0.4	5.0	0.0

[a] Ba: *Banksia attenuata*; Bm: *Banksia menziesii*; Cc: *Corymbia calophylla*; Er: *Eucalyptus rudis* subsp. *rudis*; Et: *Eucalyptus todtiana*; Mp: *Melaleuca preissiana*; Mr: *Melaleuca rhaphiophylla*

[b] 'Treatments'. T: transects; C: control sites; bxxx: Bartlett's Well wetland vegetation groupings; cxxx: Collard's Wetland vegetation groupings.

5.0 SUMMARY AND DISCUSSION

Banksia attenuata and *Banksia menziesii* trees at Boonanarring NR GDV sites were moderately healthy at Spring 2022 with a mean CAI of 13.9 (even while including dead trees (CAI=0) in the statistics). While mean canopy health improved from Spring 2021 to Spring 2022, the mean tree CAI and FHI at Boonanarring NR GDV sites has declined since Spring 2018, mostly due to a large number of *Banksia* tree deaths between Spring 2020 and Spring 2021. This has been partly offset by the improving tree crown health in transect T2 as those trees recover from fire damage in Spring 2015. No new *Banksia* tree deaths were recorded during the Spring 2022 survey.

Many dead *Banksia* trees were observed in Boonanarring NR prior to commencement of monitoring with the deaths considered to be due to drought effects (360 Environmental, 2013). *Banksia* spp. deaths were also documented in the two reserves during the pre-mining monitoring period (Morgan, 2019). A survey for *Phytophthora cinnamomi* at and around the proposed monitoring sites in 2015 did not find that fungus to be present.

At Collard's Wetland, the overall vegetation at all sites appeared healthy in Spring 2022. *Melaleuca rhaphiophylla* trees remained at 'very healthy' levels. Tree canopy health continues to improve in *Corymbia calophylla* and *Eucalyptus rudis* trees, following significant declines between Spring 2017 and Spring 2019. Higher crown assessments resulting from maturation of the extensive epicormics of several years ago, is contributing to the higher mean CAI values. Canopy health of *Melaleuca preissiana* trees remained near 'moderately healthy' levels, but has been slowly declining since Spring 2017. Overshadowing from the taller *Corymbia calophylla* and *Eucalyptus rudis* trees is a significant contributor to this process.

Collard's Wetland sites in the wetter parts appear to be getting 'wetter'. Previously reported decline in the *Eucalyptus rudis* tree crowns at Collard's Wetland has been discussed in previous monitoring reports (Morgan, 2019) as being perhaps related to a wetter regime and perhaps increasing periods of inundation in parts of the wetland (making those sites more marginal for *Eucalyptus rudis* trees). Associated with the apparent increasing 'wettness' at Collard's has been the observed increase in cover of fern species and the weed **Isolepis prolifera*.

At the time of the Spring 2022 survey, mining operations were resulting in a net addition of water to the water table in Pit B , north of Wannamal Rd West (about 3 kilometres east of Collard's Wetland). This was due to Pit B being used for deposition of codisposal (a slurry of sand and clay tailings) from processing operationssouthof Wannamal Rd. Excess processing water from Pit B is recycled through to the plant and reused in the co-disposal process. The water table has risen immediately adjacent to Pit C and also at bore BNMB14. Further west and nearer to Collard's Wetland, at monitoring bores BNMB12 and BNMB10, DTGW has been fairly steady or has risen slightly (William de Koning, Environmental Advisor, Image Resources; *pers. comm.*; see bore locations in Figures 2, 3 and 4).

6.0 ACKNOWLEDGEMENTS

Mr William de Koning (Image Resources) coordinated land access with DBCA and surrounding land holders during the surveys and assisted with the field survey. He also provided updated depth to ground water monitoring charts.

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PLATES

(Order of quadrat photos (Plates 1 to 50):
Boonanarring NR (quadrats BNR01- BNR13);
Collard's Wetland (quadrats CW01-CW12).

Pre-mining site photos are the site photos from the pre-mining monitoring event closest to the commencement of mining.

Plate 1. Quadrat BNR01, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 2. Quadrat BNR01, Boonanarring NR (Spring 2022 GDVM).

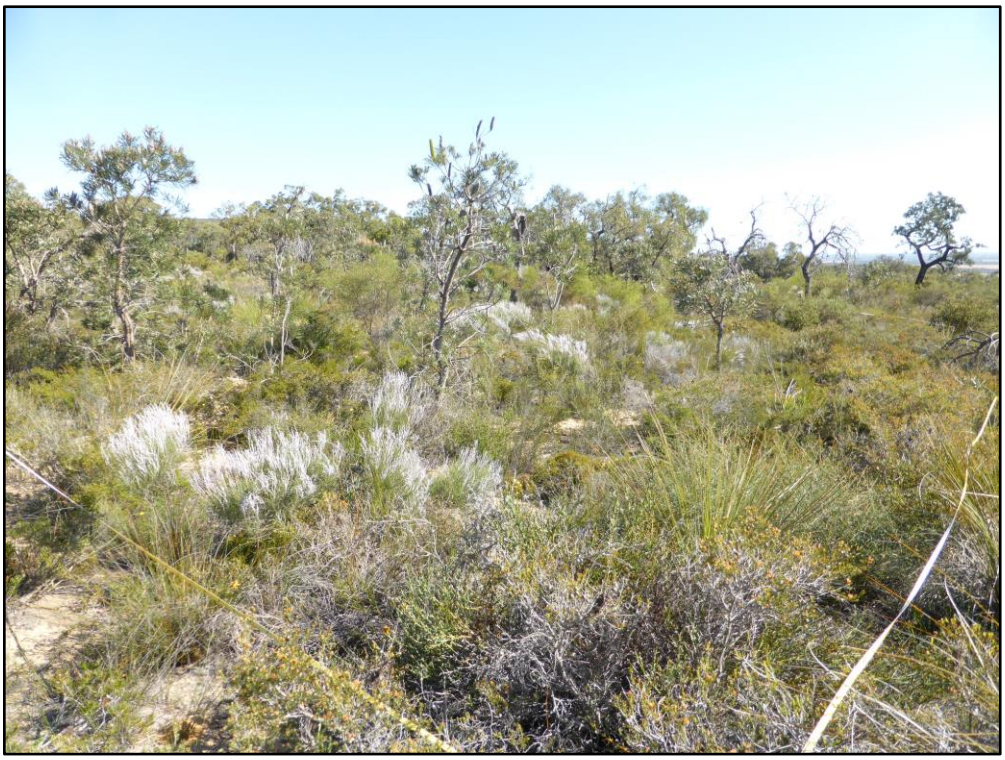


Plate 3. Quadrat BNR02, Boonanarring NR (Spring 2018 GDVM, pre-mining).

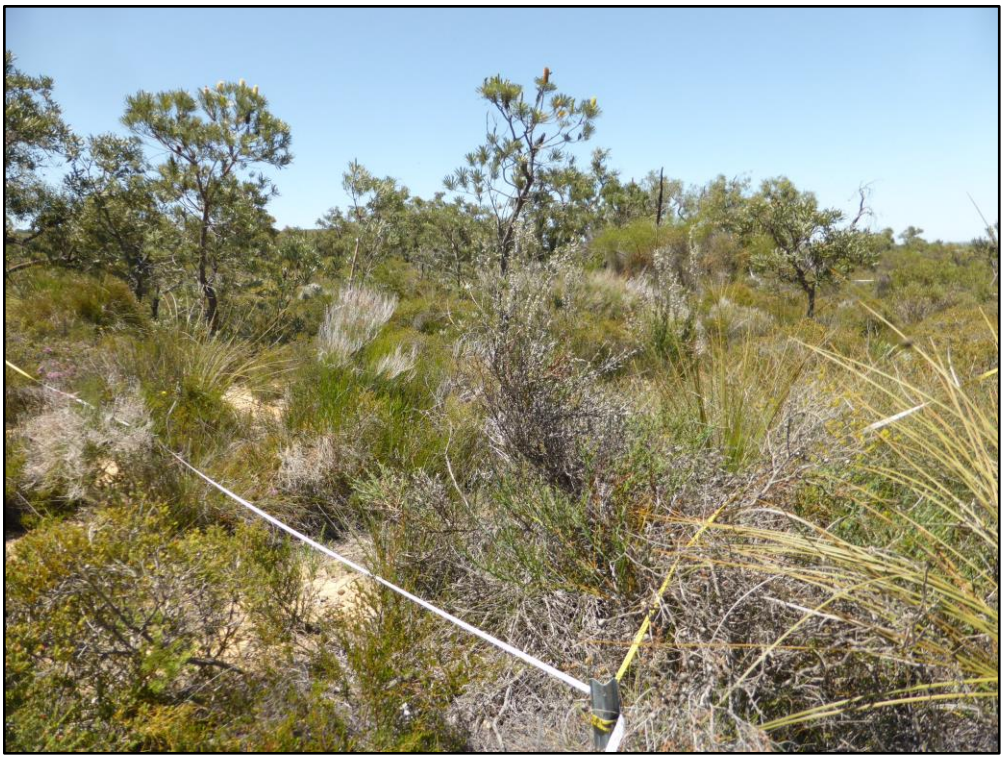


Plate 4. Quadrat BNR02, Boonanarring NR (Spring 2022 GDVM).

Plate 5. Quadrat BNR03 (Terrestrial 'Control' site), Boonanarring NR (Spring 2017 GDVM, pre-mining). (No site photo available from the Spring 2018 monitoring survey).

Plate 6. Quadrat BNR03 (Terrestrial 'Control' site), Boonanarring NR (Spring 2022 GDVM).

Plate 7. Quadrat BNR04, Boonanarring NR (Spring 2018 GDVM, pre-mining).

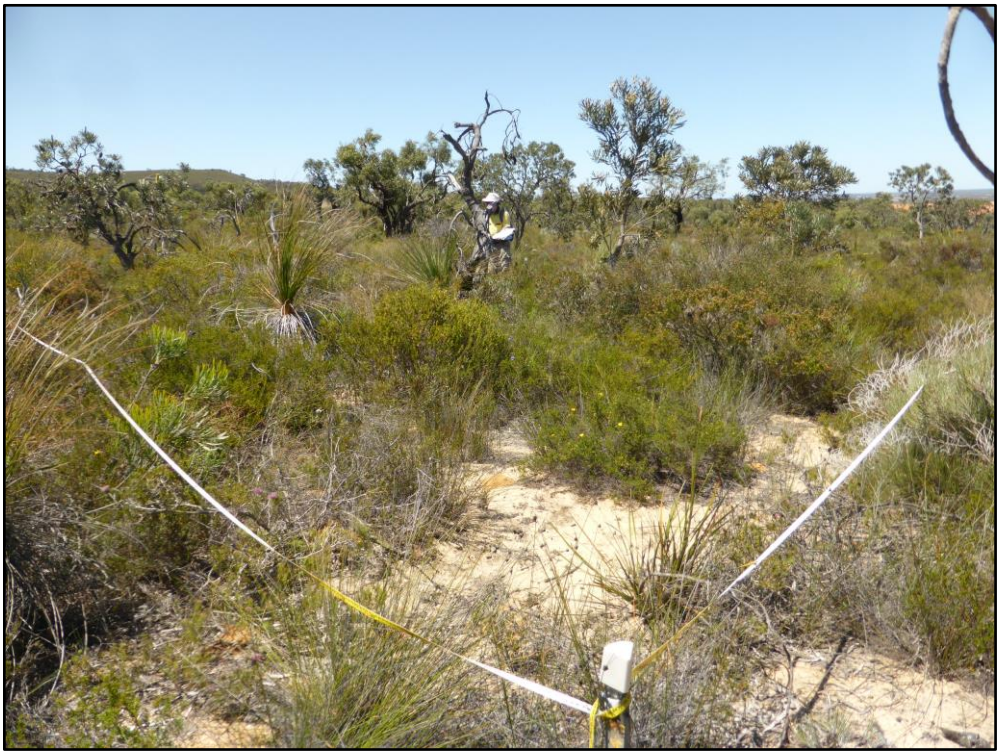


Plate 8. Quadrat BNR04, Boonanarring NR (Spring 2022 GDVM).

Plate 9. Quadrat BNR05, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 10. Quadrat BNR05, Boonanarring NR (Spring 2022 GDVM).

Plate 11. Quadrat BNR06, Boonanarring NR (Spring 2018 GDVM, pre-mining).

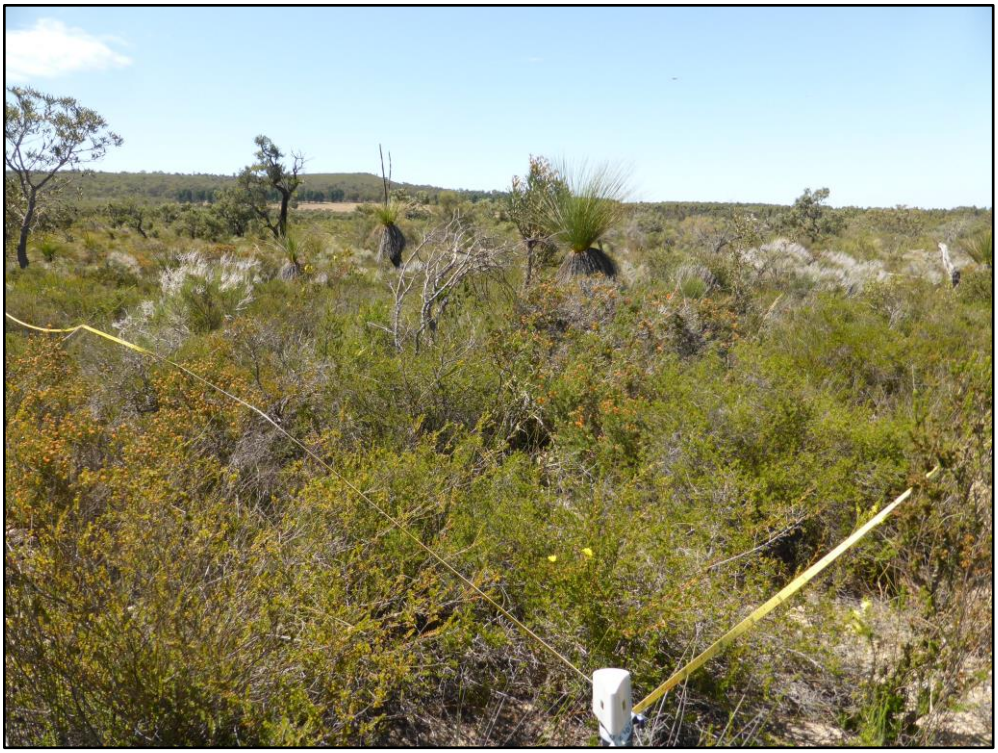


Plate 12. Quadrat BNR06, Boonanarring NR (Spring 2022 GDVM).

Plate 13. Quadrat BNR07 (Terrestrial 'Control' site), Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 14. Quadrat BNR07 (Terrestrial 'Control' site), Boonanarring NR (Spring 2022 GDVM).

Plate 15. Quadrat BNR08 (Terrestrial 'Control' site), Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 16. Quadrat BNR08 (Terrestrial 'Control' site), Boonanarring NR (Spring 2022 GDVM).

Plate 17. Quadrat BNR09, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 18. Quadrat BNR09, Boonanarring NR (Spring 2022 GDVM).

Plate 19. Quadrat BNR10, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 20. Quadrat BNR10, Boonanarring NR (Spring 2022 GDVM).

Plate 21. Quadrat BNR11, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 22. Quadrat BNR11 (tree Ba02), Boonanarring NR (Spring 2022 GDVM).

Plate 23. Quadrat BNR12, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 24. Quadrat BNR12, Boonanarring NR (Spring 2022 GDVM).

Plate 25. Quadrat BNR13, Boonanarring NR (Spring 2018 GDVM, pre-mining).

Plate 26. Quadrat BNR13, Boonanarring NR (Spring 2022 GDVM).

Plate 27. Quadrat CW01, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 28. Quadrat CW01, Collard's Wetland (Spring 2022 GDVM).

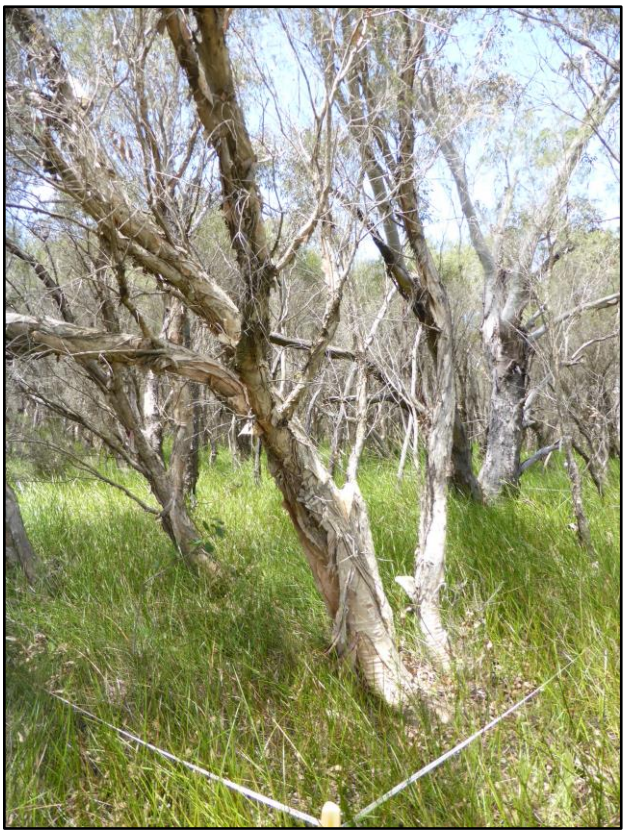


Plate 29. Quadrat CW02, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 30. Quadrat CW02, Collard's Wetland (Spring 2022 GDVM).

Plate 31. Quadrat CW03, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 32. Quadrat CW03, Collard's Wetland (Spring 2022 GDVM).

Plate 33. Quadrat CW04, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 34. Quadrat CW04, Collard's Wetland (Spring 2022 GDVM).

Plate 35. Quadrat CW05, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 36. Quadrat CW05, Collard's Wetland (Spring 2022 GDVM).

Plate 37. Quadrat CW06, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 38. Quadrat CW06, Collard's Wetland (Spring 2022 GDVM).

Plate 39. Quadrat CW07, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 40. Quadrat CW07, Collard's Wetland (Spring 2022 GDVM).

Plate 41. Quadrat CW08, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 42. Quadrat CW08, Collard's Wetland (Spring 2022 GDVM).

Plate 43. Quadrat CW09, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 44. Quadrat CW09, Collard's Wetland (Spring 2022 GDVM).

Plate 45. Quadrat CW10, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 46. Quadrat CW10, Collard's Wetland (Spring 2022 GDVM).

Plate 47. Quadrat CW11, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 48. Quadrat CW11, Collard's Wetland (Spring 2022 GDVM).

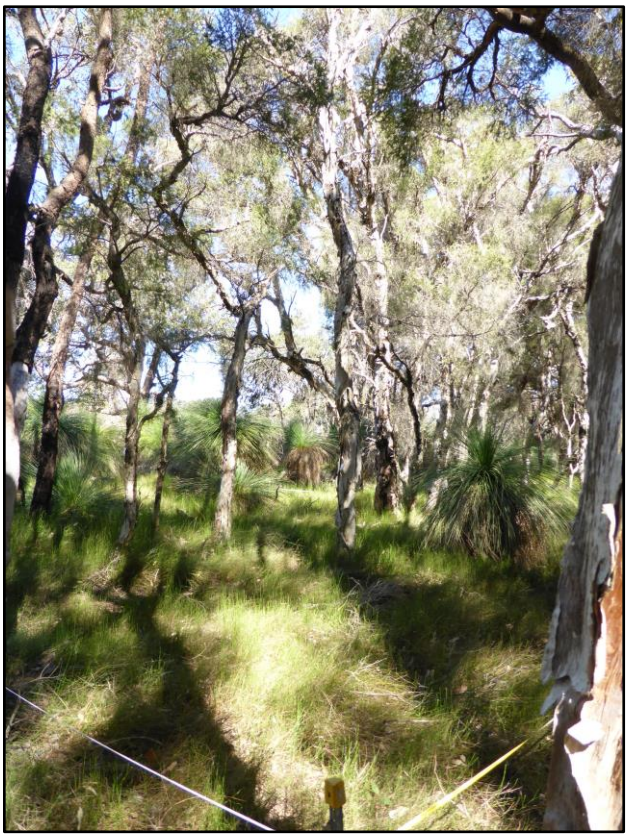


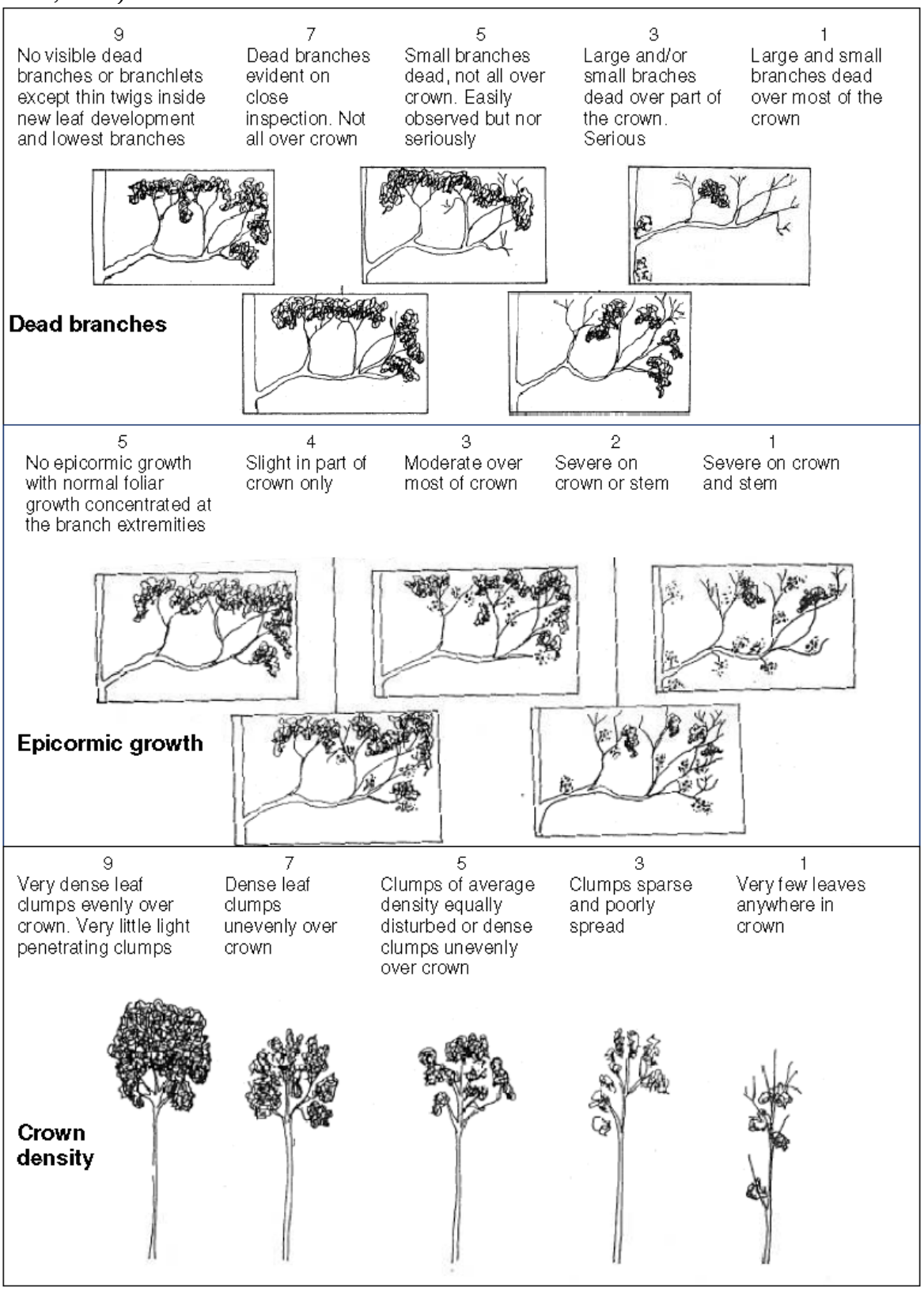
Plate 49. Quadrat CW12, Collard's Wetland (Spring 2017 GDVM, pre-mining).

Plate 50. Quadrat CW12, Collard's Wetland (Spring 2022 GDVM).

APPENDICES

APPENDIX ONE. The Crown Assessment Procedure diagrams.

(Assessment classifications provided by R. Loomes, Department ofWater and referenced to Ladd, 1996).



APPENDIX TWO Pre-mining tree canopy condition assessment data.

I. Collard's Wetland sites.

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
CW01	Wet	cMp	Mp01	850	9	9	9		5	4	5		5	5	5		19	18	19		5	5	5	
CW01	Wet	cMp	Mp02	850	9	9	9		5	5	5		7	7	7		21	21	21		5	5	5	
CW01	Wet	cMp	Mp03		9	9	9		5	5	5		5	5	5		19	19	19		5	5	5	
CW01	Wet	cMp	Mp04	850	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW01	Wet	cMp	Mp05	850	9	9	9		5	5	5		7	7	7		21	21	21		5	5	5	
CW01	Wet	cMp	Mp06		9	9	9		5	5	5		7	7	7		21	21	21		5	5	5	
CW01	Wet	cMp	Mp07		9	9	9		5	5	5		5	7	7		19	21	21		5	5	5	
CW01	Wet	cMp	Mp08	850	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW02	Wet	cMr	Er01	900	7	7	7		4	4	5		5	5	5		16	16	17		5	5	4	
CW02	Wet	cMr	Er02	950	3	7	3		3	3	3		5	5	3		11	15	9		5	5	5	
CW02	Wet	cMr	Er03	860	3	3	5		4	4	4		3	5	5		10	12	14		5	5	4	
CW02	Wet	cMr	Mr01	600	9	7	7		5	4	5		5	5	5		19	16	17		5	5	5	
CW02	Wet	cMr	Mr02	600	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	
CW02	Wet	cMr	Mr03	650	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	
CW02	Wet	cMr	Mr04	600	9	9	9		5	5	5		5	5	5		19	19	19		5	5	5	
CW02	Wet	cMr	Mr05	490	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW03	Wet	cMr	Er01		3	3	3		3	3	3		3	3	3		9	9	9		5	5	5	
CW03	Wet	cMr	Er02	1000	3	3	3		2	2	2		3	3	3		8	8	8		5	5	4	
CW03	Wet	cMr	Er03X	330	5	5	3		2	2	1		5	5	1		12	12	5		5	4	2	
CW03	Wet	cMr	Mr01	750	7	7	7		5	5	5		7	7	7		19	19	19		5	5	5	
CW03	Wet	cMr	Mr02	960	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

I. Collard's Wetland sites (cont).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
CW03	Wet	cMr	Mr03	1200	7	5	5		5	4	4		5	5	5		17	14	14		5	5	5	
CW03	Wet	cMr	Mr04	500	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	
CW03	Wet	cMr	Mr05	800	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW04	Wet	cErMp	Er01	900	7	5	5		4	4	4		5	5	5		16	14	14		5	4	4	
CW04	Wet	cErMp	Er02	600	5	5	5		4	3	3		3	3	3		12	11	11		4	4	4	
CW04	Wet	cErMp	Er03	1000	3	3	3		4	4	4		3	3	3		10	10	10		4	4	4	
CW04	Wet	cErMp	Er04	950	5	5	3		5	5	4		5	5	3		15	15	10		4	4	4	
CW04	Wet	cErMp	Er05	900	7	7	7		5	5	5		5	5	5		17	17	17		4	5	5	
CW04	Wet	cErMp	Mp01	700	3	3	3		4	4	4		3	3	3		10	10	10		5	5	5	
CW04	Wet	cErMp	Mp02	700	5	5	5		5	4	4		5	5	5		15	14	14		5	5	5	
CW04	Wet	cErMp	Mp03	850	7	3	3		5	5	5		5	5	5		17	13	13		4	4	5	
CW04	Wet	cErMp	Mp04	600	5	7	5		5	4	4		5	5	5		15	16	14		5	5	5	
CW04	Wet	cErMp	Mp05	750	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW04	Wet	cErMp	Mr01	600	7	7	5		5	4	4		5	5	5		17	16	14		5	5	5	
CW05	Wet	cCcEr	Cc01	1100	5	5	5		4	3	3		5	5	5		14	13	13		5	5	5	
CW05	Wet	cCcEr	Cc02	600	3	3	3		4	3	3		3	3	3		10	9	9		5	5	5	
CW05	Wet	cCcEr	Cc03X	800	3	3	1		4	4	4		1	1	1		8	8	6		4	4	4	
CW05	Wet	cCcEr	Cc04X	1600			5				4				5				14				5	
CW05	Wet	cCcEr	Mp01	1000	7	7	7		4	4	4		5	5	5		16	16	16		5	5	5	
CW05	Wet	cCcEr	Mp02	800	7	7	7		5	4	4		7	7	7		19	18	18		5	5	5	
CW05	Wet	cCcEr	Mp03X	600	5	3	3		4	4	4		3	3	3		12	10	10		5	5	5	
CW06	Wet	cMr	Mr01	550	9	7	7		5	5	5		5	5	5		19	17	17		5	4	4	
CW06	Wet	cMr	Mr08	670	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	
CW06	Wet	cMr	Mr12	500	9	9	9		5	5	5		5	5	5		19	19	19		5	5	5	
CW06	Wet	cMr	Mr16	530	9	7	7		5	5	5		5	5	5		19	17	17		5	5	5	
CW06	Wet	cMr	Mr28	600	9	9	9		5	5	5		5	5	5		19	19	19		5	5	5	

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

I. Collard's Wetland sites (cont.).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
CW07	Wet	cMr	Er01	450	5	5	5		5	4	4		5	5	5		15	14	14		5	4	4	
CW07	Wet	cMr	Mr19	700	3	3	5		5	5	5		5	5	5		13	13	15		5	5	5	
CW07	Wet	cMr	Mr21	500	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW07	Wet	cMr	Mr18	580	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	
CW07	Wet	cMr	Mr13	460	9	9	9		5	5	5		5	5	5		19	19	19		5	5	5	
CW07	Wet	cMr	Mr07	480	9	9	7		4	4	4		5	5	5		18	18	16		5	5	5	
CW07	Wet	cMr	Mr01	430	9	9	7		5	5	5		5	5	5		19	19	17		5	5	5	
CW08	Wet	cErMp	Er01	1000	7	7	7		4	4	5		5	5	5		16	16	17		5	5	5	
CW08	Wet	cErMp	Er02	1000	7	7	7		5	4	4		5	5	5		17	16	16		5	5	5	
CW08	Wet	cErMp	Er03	900	7	7	7		5	4	4		5	5	5		17	16	16		5	5	5	
CW08	Wet	cErMp	Er04	1000	7	7	7		5	4	4		3	5	5		15	16	16		5	5	5	
CW08	Wet	cErMp	Er05	1000	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW08	Wet	cErMp	Mp01	850	5	5	5		5	4	5		5	5	5		15	14	15		5	5	5	
CW08	Wet	cErMp	Mp09	600	5	5	3		5	5	5		3	5	3		13	15	11		5	5	5	
CW08	Wet	cErMp	Mp15	700	7	5	5		5	5	5		5	5	5		17	15	15		5	5	5	
CW08	Wet	cErMp	Mp19	800	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW08	Wet	cErMp	Mp26	800	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW09	Wet	cCcEr	Cc01	1000	5	5	5		5	4	4		5	5	5		15	14	14		4	5	4	
CW09	Wet	cCcEr	Cc02	800	3	3	3		5	4	4		3	3	3		11	10	10		5	4	4	
CW09	Wet	cCcEr	Cc03X	1000	5	5	5		5	4	5		5	5	5		15	14	15		4	4	4	
CW09	Wet	cCcEr	Er01	950	5	7	5		5	5	5		5	5	5		15	17	15		5	5	5	
CW09	Wet	cCcEr	Mp01	730	3	3	3		5	4	4		3	3	3		11	10	10		5	4	4	
CW09	Wet	cCcEr	Mp02	400	3	3	3		5	5	4		5	5	3		13	13	10		5	4	4	
CW09	Wet	cCcEr	Mp03	260	5	5	5		5	5	5		5	5	5		15	15	15		5	4	4	
CW09	Wet	cCcEr	Mp04	550	5	5	3		5	4	4		5	5	3		15	14	10		4	4	4	
CW10	Wet	cMr	Er01X	800	7	5	5		5	4	4		5	5	5		17	14	14		5	4	4	

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

I. Collard's Wetland sites (cont.).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
CW10	Wet	cMr	Er02X	680	7	7	7		5	5	5		5	5	5		17	17	17		5	5	4	
CW10	Wet	cMr	Er03X	680	5	5	5		5	4	5		5	5	5		15	14	15		4	4	4	
CW10	Wet	cMr	Mr01	800	7	7	7		5	5	4		5	5	5		17	17	16		5	5	5	
CW10	Wet	cMr	Mr02	750	7	5	7		4	4	4		7	5	5		18	14	16		5	5	5	
CW10	Wet	cMr	Mr03X	800	7	7	7		5	5	5		5	5	5		17	17	17		5	5	5	
CW11	Wet	cErMp	Er01		5	5	5		4	4	5		5	5	3		14	14	13		4	4	4	
CW11	Wet	cErMp	Er02		5	5	5		5	5	5		5	5	5		15	15	15		5	5	5	
CW11	Wet	cErMp	Er03		5	5	5		5	4	4		5	5	5		15	14	14		5	5	5	
CW11	Wet	cErMp	Er04		5	5	5		4	4	4		5	5	5		14	14	14		4	4	5	
CW11	Wet	cErMp	Er05	550	5	3	3		4	4	4		3	3	3		12	10	10		4	4	4	
CW11	Wet	cErMp	Mp03		7	7	7		4	4	4		5	5	5		16	16	16		5	5	5	
CW11	Wet	cErMp	Mp05		5	3	3		5	5	5		5	3	3		15	11	11		3	4	3	
CW11	Wet	cErMp	Mp06		5	5	5		4	4	4		5	5	5		14	14	14		4	4	4	
CW11	Wet	cErMp	Mp07	600	5	3	3		4	4	4		3	3	3		12	10	10		5	4	3	
CW11	Wet	cErMp	Mp10	750	5	5	5		5	5	5		5	5	5		15	15	15		5	5	5	
CW12	Wet	cCcEr	Cc01		5	5	5		5	5	5		5	5	5		15	15	15		4	5	4	
CW12	Wet	cCcEr	Cc02		5	5	5		4	4	5		5	5	5		14	14	15		4	4	4	
CW12	Wet	cCcEr	Mp01		3	3	3		5	5	5		5	3	3		13	11	11		4	4	5	
CW12	Wet	cCcEr	Mp02		3	3	3		4	4	2		3	3	2		10	10	7		3	4	3	
CW12	Wet	cCcEr	Mp03	700	3	3	3		5	5	5		3	3	3		11	11	11		4	5	4	
CW12	Wet	cCcEr	Mp04	300-500	5	3	2		5	4	2		3	3	1		13	10	5		4	4	4	
CW12	Wet	cCcEr	Mp05		5	5	5		4	4	5		5	5	5		14	14	15		4	4	4	
CW12	Wet	cCcEr	Mp06	1100	5	3	3		5	5	5		5	5	5		15	13	13		5	5	5	

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

II. Boonanarring NR.

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
BNR01	Ter	T1	Ba01	430	5	5	7	7	5	5	5	5	5	5	5	5	15	15	17	17	5	5	5	5
BNR01	Ter	T1	Ba02	205	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	5	4	4	4
BNR01	Ter	T1	Ba03	260	9	9	9	9	5	5	5	5	7	7	7	5	21	21	21	19	5	5	4	5
BNR01	Ter	T1	Ba04	330	7	7	7	7	5	5	5	3	5	5	5	5	17	17	17	15	5	5	5	5
BNR01	Ter	T1	Ba05	440	5	5	5	5	3	3	3	3	5	5	5	5	13	13	13	13	5	4	4	5
BNR01	Ter	T1	Bm01	330	5	3	3	3	5	4	3	3	5	5	3	3	15	12	9	9	4	2	3	4
BNR02	Ter	T1	Ba01	280	5	5	5	5	5	5	5	5	5	5	5	5	15	15	15	15	5	5	5	5
BNR02	Ter	T1	Ba02	320	7	9	9	9	5	5	5	5	5	5	5	5	17	19	19	19	5	5	5	5
BNR02	Ter	T1	Ba03	210	9	9	9	9	5	5	5	5	5	5	5	5	19	19	19	19	5	5	5	5
BNR02	Ter	T1	Ba04	350	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	5	4	4	5
BNR02	Ter	T1	Ba05	210	9	9	9	9	5	5	5	5	5	5	5	5	19	19	19	19	5	5	4	4
BNR02	Ter	T1	Ba06	440	5	5	5	5	5	5	4	4	5	5	5	5	15	15	14	14	5	5	5	5
BNR02	Ter	T1	Ba07	220	5	5	5	5	5	5	5	5	5	5	5	5	15	15	15	15	5	4	4	4
BNR02	Ter	T1	Bm01	260	7	7	7	9	4	4	4	4	5	5	5	5	16	16	16	18	5	4	4	4
BNR02	Ter	T1	Bm02	260	7	9	9	9	5	5	5	5	5	5	5	5	17	19	19	19	5	4	4	5
BNR02	Ter	T1	Bm03	720	5	5	5	5	4	4	5	5	5	5	5	5	14	14	15	15	5	5	4	5
BNR02	Ter	T1	Bm04	250	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	4	4	4	5
BNR03	Ter	C	Ba01	400	5	3	3	3	2	2	2	2	3	3	3	3	10	8	8	8	4	4	4	4
BNR03	Ter	C	Ba02	650	5	5	5	5	4	3	4	4	5	5	5	3	14	13	14	12	5	4	4	3
BNR03	Ter	C	Ba03	550	5	5	5	3	4	4	5	3	5	5	5	3	14	14	15	9	4	4	4	3
BNR03	Ter	C	Ba04	600	3	0	0	0	5	0	0	0	5	0	0	0	13	0	0	0	3	0	0	0
BNR03	Ter	C	Ba05	600	5	5	5	5	5	5	5	5	5	5	5	5	15	15	15	15	4	4	4	4
BNR03	Ter	C	Ba06	450		5	5	5		5	5	5		5	5	5		15	15	15		5	4	4
BNR03	Ter	C	Bm01	350	5	0	0	0	4	0	0	0	3	0	0	0	12	0	0	0	3	0	0	0
BNR03	Ter	C	Bm02	320	5	0	0	0	5	0	0	0	5	0	0	0	15	0	0	0	4	0	0	0

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

II. Boonanarring NR (cont).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
BNR03	Ter	C	Bm03X	300	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	5	4	4	4
BNR03	Ter	C	Bm04X	400		5	5	7		4	5	5		3	5	5		12	15	17		5	4	4
BNR03	Ter	C	Bm05X	450		5	5	5		5	5	5		5	5	5		15	15	15		4	4	4
BNR04	Ter	T1	Ba01	280	3	3	3	3	3	3	3	3	3	3	3	5	9	9	9	11	4	4	4	5
BNR04	Ter	T1	Ba02	530	5	5	7	5	5	5	5	5	5	5	5	5	15	15	17	15	4	4	4	4
BNR04	Ter	T1	Ba03X	280	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	5	5	5	5
BNR04	Ter	T1	Bm01	400	5	0	0	0	5	0	0	0	5	0	0	0	15	0	0	0	4	0	0	0
BNR04	Ter	T1	Bm02	280	7	7	7	7	5	5	5	4	7	7	5	5	19	19	17	16	5	5	4	5
BNR04	Ter	T1	Bm03X	400	5	5	5	3	5	5	5	5	5	5	5	5	15	15	15	13	4	4	4	4
BNR04	Ter	T1	Bm04X	260			9	9			5	5			5	5			19	19			4	4
BNR05	Ter	T1	Ba01	380	3	3	3	3	5	5	5	5	4	3	3	3	12	11	11	11	4	4	4	4
BNR05	Ter	T1	Ba02	250	9	7	7	7	5	5	5	5	5	5	5	5	19	17	17	17	5	5	5	5
BNR05	Ter	T1	Ba03	280	9	9	9	9	5	5	5	5	7	7	7	5	21	21	21	19	5	5	5	5
BNR05	Ter	T1	Ba04	460	3	3	3	0	5	5	5	0	4	3	3	0	12	11	11	0	4	3	3	0
BNR05	Ter	T1	Ba05	380	3	3	3	3	5	5	5	5	5	5	5	3	13	13	13	11	5	5	4	5
BNR05	Ter	T1	Ba06X	260				7				5				5				17				5
BNR05	Ter	T1	Bm01X	250	9	9	9	9	5	5	5	5	5	5	5	5	19	19	19	19	4	4	4	4
BNR05	Ter	T1	Bm02X	250	7	7	7	9	5	5	5	5	5	5	5	5	17	17	17	19	5	5	4	4
BNR06	Ter	T1	Ba01	180	7	0	0	0	5	0	0	0	5	0	0	0	17	0	0	0	5	0	0	0
BNR06	Ter	T1	Ba02	350	5	5	4	3	3	3	3	3	5	5	5	5	13	13	12	11	4	4	4	4
BNR06	Ter	T1	Ba03X	330	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	5	5	5	4
BNR06	Ter	T1	Ba04X				5	5			5	5			5	5			15	15			5	5
BNR06	Ter	T1	Ba05X				5	5			5	5			3	3			13	13			4	4
BNR06	Ter	T1	Bm01	400	5	7	5	7	5	5	5	5	5	4	5	5	15	16	15	17	4	4	4	4
BNR06	Ter	T1	Bm02X	330	5	7	5	5	5	5	5	5	5	5	5	5	15	17	15	15	4	4	4	4
BNR06	Ter	T1	Bm03X	380	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	5	5	5	4

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

II. Boonanarring NR (cont).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
BNR07	Ter	C	Ba01	210				9				5				5				19				5
BNR07	Ter	C	Ba02	280				5				4				5				14				4
BNR07	Ter	C	Ba03	300				6				5				5				16				5
BNR07	Ter	C	Ba04	500				5				2				5				12				5
BNR07	Ter	C	Ba05	210				7				5				5				17				4
BNR07	Ter	C	Bm01	700				4				5				5				14				4
BNR07	Ter	C	Bm02	400				7				5				5				17				5
BNR07	Ter	C	Bm03	550				5				5				5				15				4
BNR07	Ter	C	Bm04	330				5				5				5				15				5
BNR07	Ter	C	Bm05	520				5				5				5				15				5
BNR07	Ter	C	Bm06	400				7				5				5				17				4
BNR08	Ter	C	Ba01	380				1				1				3				5				5
BNR08	Ter	C	Ba02	500				1				1				3				5				5
BNR08	Ter	C	Ba03	430				1				1				3				5				5
BNR08	Ter	C	Ba04X	400				1				1				3				5				5
BNR08	Ter	C	Bm01	450				1				1				3				5				5
BNR08	Ter	C	Bm02	400				1				1				3				5				5
BNR08	Ter	C	Bm03	270				1				1				3				5				5
BNR08	Ter	C	Bm04X	250				1				1				3				5				5
BNR09	Ter	T2	Ba01	400				5				2				5				12				5
BNR09	Ter	T2	Ba02	450				5				2				5				12				5
BNR09	Ter	T2	Ba03	350				5				1				5				11				5
BNR09	Ter	T2	Ba04	530				3				2				5				10				5
BNR09	Ter	T2	Bm01	300				5				1				7				13				5
BNR09	Ter	T2	Bm02	290				5				2				7				14				5

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

II. Boonanarring NR (cont).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
BNR09	Ter	T2	Bm03X	550				5				3				3				11				5
BNR10	Ter	T2	Ba01	530				7				4				5				16				4
BNR10	Ter	T2	Ba02	350				5				2				5				12				4
BNR10	Ter	T2	Ba03	380				5				2				5				12				5
BNR10	Ter	T2	Ba04	530				5				5				5				15				4
BNR10	Ter	T2	Ba05	400				9				3				5				17				5
BNR10	Ter	T2	Ba06	500				5				2				5				12				5
BNR10	Ter	T2	Ba07	440				3				2				5				10				4
BNR10	Ter	T2	Ba08	400				5				2				5				12				5
BNR10	Ter	T2	Bm01	420				7				5				5				17				5
BNR10	Ter	T2	Bm02	250				9				2				5				16				5
BNR10	Ter	T2	Bm03X	?				7				3				5				15				5
BNR11	Ter	T2	Ba01	300				9				5				5				19				5
BNR11	Ter	T2	Ba02	330				9				5				5				19				4
BNR11	Ter	T2	Ba03	270				9				4				5				18				5
BNR11	Ter	T2	Bm01	210				9				5				5				19				5
BNR11	Ter	T2	Bm02	320				9				5				5				19				5
BNR11	Ter	T2	Bm03	300				7				4				5				16				4
BNR11	Ter	T2	Bm04	320				9				3				5				17				5
BNR11	Ter	T2	Bm05	350				7				3				5				15				5
BNR11	Ter	T2	Bm06	260				7				3				5				15				4
BNR12	Ter	T2	Ba01	250	7	7	7	7	5	5	5	5	5	5	5	5	17	17	17	17	4	4	4	5
BNR12	Ter	T2	Ba02	300	9	5	5	7	5	3	3	3	5	5	5	5	19	13	13	15	3	4	4	5
BNR12	Ter	T2	Ba03X	450	7	7	5	5	5	4	4	4	5	5	5	5	17	16	14	14	4	4	4	4

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX TWO Pre-mining tree canopy condition assessment data (cont).

II. Boonanarring NR (cont).

Orange shading: trees that have died since first sample; Green shading: new trees sampled since Spring 2015 survey

Site[a]	GDV Type[b]	Site Class	Tree Nos	Hgt	Proportion of Dead Branches Index (1 to 9)				Degree of Epicormic Growth Index (1 to 5)				Crown density (foliage density) Index (1 to 9)				Crown Assessment Index (3 to 23)				Foliage Health Index (5 to 1)			
					SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018	SPG 2015	AUT 2016	SPG 2017	SPG 2018
BNR12	Ter	T2	Ba04	205				9				4				5				18				5
BNR12	Ter	T2	Bm01	330	7	7	7	7	5	4	4	4	5	5	5	5	17	16	16	16	4	4	4	4
BNR13	Ter	T2	Ba01	430	7	5	5	5	4	4	4	4	5	5	5	5	16	14	14	14	3	4	4	5
BNR13	Ter	T2	Ba02	250	7	5	5	7	5	5	5	5	5	5	5	5	17	15	15	17	4	4	5	5
BNR13	Ter	T2	Ba03	290	7	7	7	7	5	4	5	5	5	5	5	5	17	16	17	17	4	4	4	4
BNR13	Ter	T2	Ba04	180	9	5	5	5	5	2	3	3	5	3	3	5	19	10	11	13	2	2	4	4
BNR13	Ter	T2	Bm01	440	7	5	5	3	5	4	4	3	5	3	5	5	17	12	14	11	2	3	4	4
BNR13	Ter	T2	Bm02	270	9	7	7	7	4	4	4	4	5	5	5	5	18	16	16	16	4	4	4	5
BNR13	Ter	T2	Bm03	480	7	5	5	5	5	5	5	5	5	5	5	4	17	15	15	14	4	4	4	5
BNR13	Ter	T2	Bm04	270	9	5	7	9	4	4	4	4	5	5	5	5	18	14	16	18	3	3	4	5

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE 'Post commencement of mining' tree canopy condition assessment data: AUT2019 to AUT2021.

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
CW01	Mp01	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
CW01	Mp02	9	9	9	9	9	5	5	5	5	5	7	7	7	7	7	21	21	21	21	21	5	5	5	5	5
CW01	Mp03	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
CW01	Mp04	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
CW01	Mp05	9	9	9	7	9	4	4	5	4	4	7	7	7	7	7	20	20	21	18	20	5	5	5	5	5
CW01	Mp06	9	9	9	9	9	5	5	5	4	4	7	7	7	7	7	21	21	21	20	20	5	5	5	5	5
CW01	Mp07	7	7	7	7	7	5	5	5	4	4	5	5	5	7	5	17	17	17	18	16	5	5	5	4	5
CW01	Mp08	7	7	7	7	7	5	5	5	4	5	5	5	5	5	5	17	17	17	16	17	5	5	5	5	5
CW02	Er01	5	5	7	7	7	3	3	4	4	5	4	4	5	5	5	12	12	16	16	17	4	4	5	5	5
CW02	Er02	3	3	4	4	5	3	3	3	3	4	3	3	5	5	5	9	9	12	12	14	5	5	5	5	5
CW02	Er03	5	5	5	7	7	4	4	4	4	5	5	5	5	5	5	14	14	14	16	17	4	4	5	5	5
CW02	Mr01	7	7	9	9	9	5	5	5	5	5	5	5	5	5	5	17	17	19	19	19	5	5	5	5	5
CW02	Mr02	7	7	7	7	9	5	5	5	5	5	5	5	5	5	5	17	17	17	17	19	5	5	5	5	5
CW02	Mr03	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
CW02	Mr04	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
CW02	Mr05	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
CW03	Er01	3	3	2	3	3	3	3	2	3	4	3	3	2	3	3	9	9	6	9	10	4	4	5	5	5
CW03	Er02	5	5	3	5	5	4	4	2	3	4	5		3	3	3	14	9	8	11	12	5	5	5	5	5
CW03	Er03X	1	1	1	1	0	1	1	1	2	0	1	1	1	1	0	3	3	3	4	0	2	2	3	4	0
CW03	Er04X			5	5	5			4	4	5			5	5	5			14	14	15			5	5	5
CW03	Er05X			3	3	3			2	3	3			2	2	4			7	8	10			4	4	5
CW03	Er06X			4	3	4			2	3	3			4	4	4			10	10	11			5	5	5
CW03	Mr01	7	7	9	9	9	5	5	5	5	5	7	7	7	7	7	19	19	21	21	21	5	5	5	5	5
CW03	Mr02	7	7	9	7	7	5	5	5	5	5	5	5	5	5	5	17	17	19	17	17	5	5	5	5	5
CW03	Mr03	5	5	5	5	7	4	4	4	4	5	5	5	5	5	5	14	14	14	14	17	5	5	5	5	5
CW03	Mr04	9	7	7	7	7	5	5	5	5	5	5	5	5	5	5	19	17	17	17	17	5	5	5	5	5

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
CW03	Mr05	7	7	9	9	9	4	4	4	5	5	5	5	5	5	5	16	16	18	19	19	5	5	5	5	5
CW04	Er01	4	4	5	5	3	3	3	3	3	3	4	4	4	4	3	11	11	12	12	9	5	5	5	5	4
CW04	Er02	3	3	3	3	4	1	1	1	1	2	3	1	1	1	3	7	5	5	5	9	4	4	5	5	5
CW04	Er03	3	3	3	4	4	3	2	3	3	2	3	3	3	3	5	9	8	9	10	11	4	4	5	5	5
CW04	Er04	3	3	3	4	4	3	2	2	3	2	3	2	2	2	3	9	7	7	9	9	4	4	4	5	4
CW04	Er05	3	4	5	5	7	3	3	3	3	3	3	2	3	3	5	9	9	11	11	15	4	4	5	5	5
CW04	Mp01	5	4	4	4	4	4	4	4	4	4	5	4	4	4	3	14	12	12	12	11	5	5	4	5	5
CW04	Mp02	5	4	4	4	4	4	4	4	3	3	5	4	3	3	3	14	12	11	10	10	5	5	5	4	5
CW04	Mp03	3	3	3	4	4	5	5	4	4	4	5	5	4	5	5	13	13	11	13	13	5	5	5	4	5
CW04	Mp04	5	5	5	5	5	4	4	4	4	4	5	5	5	4	4	14	14	14	13	13	5	4	5	4	5
CW04	Mp05	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	15	15	15	15	14	5	5	5	4	5
CW04	Mr01	5	5	7	7	7	4	4	5	5	5	5	5	5	5	5	14	14	17	17	17	5	5	5	5	5
CW05	Cc01	4	4	5	4	4	2	2	2	3	3	5	5	5	5	5	11	11	12	12	12	4	4	5	4	4
CW05	Cc02	3	2	2	2	1	2	2	2	2	1	3	3	3	3	1	8	7	7	7	3	4	4	5	4	4
CW05	Cc03X	1	1	1	1	1	2	3	1	2	2	1	1	1	1	2	4	5	3	4	5	4	4	4	4	4
CW05	Cc04X	4	7	7	4	5	3	4	4	4	4	5	5	5	5	5	12	16	16	13	14	5	5	5	5	5
CW05	Cc05X	5	7	5	5	5	4	4	3	3	3	5	5	5	5	5	14	16	13	13	13	4	5	5	5	5
CW05	Cc06X	7	7	6	6	6	4	4	4	4	4	5	5	5	5	5	16	16	15	15	15	4	5	5	5	5
CW05	Mp01	5	7	5	7	7	4	4	4	5	4	5	5	5	5	5	14	16	14	17	16	5	5	5	5	5
CW05	Mp02	7	7	7	7	7	4	4	4	4	4	7	7	7	7	5	18	18	18	18	16	5	5	5	5	5
CW05	Mp03X	3	3	3	3	3	4	4	4	4	5	3	3	3	3	3	10	10	10	10	11	5	5	5	5	5
CW06	Mr01	7	7	9	9	7	5	5	5	5	5	5	5	5	5	5	17	17	19	19	17	5	5	5	5	5
CW06	Mr08	7	9	9	9	9	5	5	5	5	5	5	5	5	5	5	17	19	19	19	19	5	5	5	5	5
CW06	Mr12	7	7	9	9	9	5	5	5	5	5	5	5	5	5	5	17	17	19	19	19	5	5	5	5	5
CW06	Mr16	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
CW06	Mr28	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
CW07	Er01	5	5	5	7	7	4	5	5	5	5	5	5	5	5	5	14	15	15	17	17	5	4	5	5	5

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
CW07	Er02		9	9	9	9		5	5	5	5		5	5	5	5		19	19	19	19		5	5	5	5
CW07	Er03X		7	7	7	7		5	5	5	5		5	5	5	5		17	17	17	17		5	4	4	4
CW07	Mr19	7	5	5	5	5	5	4	4	4	4	5	5	5	5	5	17	14	14	14	14	5	5	5	5	5
CW07	Mr21	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
CW07	Mr18	7	7	9	9	9	5	5	5	5	5	5	5	5	5	5	17	17	19	19	19	5	5	5	5	5
CW07	Mr13	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
CW07	Mr07	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
CW07	Mr01	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
CW08	Er01	5	4	4	5	4	3	3	3	3	3	5	4	4	5	5	13	11	11	13	12	5	4	5	5	5
CW08	Er02	5	5	5	5	5	4	4	4	4	4	5	5	5	5	5	14	14	14	14	14	5	4	5	5	5
CW08	Er03	5	5	5	7	7	3	3	4	4	4	5	5	5	5	5	13	13	14	16	16	5	5	5	5	5
CW08	Er04	7	7	7	5	5	4	4	4	4	4	5	5	5	5	5	16	16	16	14	14	5	5	5	5	4
CW08	Er05	7	7	7	7	8	4	3	4	4	4	5	4	5	5	6	16	14	16	16	18	5	5	5	5	5
CW08	Mp01	5	4	4	4	5	5	5	5	5	4	5	5	5	5	5	15	14	14	14	14	5	5	5	5	5
CW08	Mp09	3	3	3	3	3	4	3	3	3	3	3	4	2	2	2	10	10	8	8	8	5	5	5	5	4
CW08	Mp15	5	4	4	3	4	4	4	4	3	4	5	4	4	3	3	14	12	12	9	11	5	5	5	5	4
CW08	Mp19	7	7	5	3	5	5	5	5	3	4	5	5	5	3	5	17	17	15	9	14	5	5	5	5	5
CW08	Mp26	5	5	5	5	3	5	5	4	4	3	5	5	5	5	3	15	15	14	14	9	5	5	5	5	3
CW09	Cc01	5	6	5	5	5	4	4	3	3	3	5	5	5	5	5	14	15	13	13	13	5	5	5	5	4
CW09	Cc02	3	3	3	3	4	4	4	4	4	4	3	3	3	3	5	10	10	10	10	13	5	5	5	5	5
CW09	Cc03X	5	4	4	4	4	5	5	4	4	4	5	5	5	5	5	15	14	13	13	13	5	4	4	4	4
CW09	Er01	5	5	5	5	5	5	4	4	4	4	5	5	5	5	5	15	14	14	14	14	5	4	5	5	5
CW09	Mp01	3	3	3	3	3	4	4	4	4	4	3	4	4	4	4	10	11	11	11	11	5	5	5	4	4
CW09	Mp02	3	3	3	3	4	4	4	4	4	4	3	3	3	3	4	10	10	10	10	12	4	4	4	4	4
CW09	Mp03	3	3	3	3	3	4	4	4	4	4	5	4	3	3	2	12	11	10	10	9	3	4	4	4	4
CW09	Mp04	5	3	4	4	4	4	3	4	4	4	5	3	5	5	5	14	9	13	13	13	4	4	4	4	4
CW09	Mp05X			7	7	5			4	4	5			5	7	7			16	18	17			5	4	5

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
CW09	Mp06X			4	5	6			4	4	4			5	5	5			13	14	15			5	5	5
CW10	Er01X	1	1	2	2	2	2	2	2	2	3	3	2	3	3	2	6	5	7	7	7	4	3	4	4	4
CW10	Er02X	4	4	4	4	5	4	4	4	4	4	5	4	5	5	5	13	12	13	13	14	3	3	5	5	5
CW10	Er03X	4	3	3	3	3	2	2	3	3	3	3	3	3	3	2	9	8	9	9	8	3	3	5	5	4
CW10	Mr01	7	7	7	7	7	4	4	4	4	4	5	5	5	5	5	16	16	16	16	16	5	5	5	5	5
CW10	Mr02	7	7	7	7	7	4	4	4	4	4	5	5	5	5	5	16	16	16	16	16	5	5	5	5	5
CW10	Mr03X	7	7	7	7	7	5	5	5	4	4	5	5	5	5	5	17	17	17	16	16	5	5	5	5	5
CW11	Er01	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	10	10	10	10	10	4	4	5	5	4
CW11	Er02	3	3	3	3	3	2	2	2	2	3	5	2	3	3	4	10	7	8	8	10	4	4	4	4	4
CW11	Er03	2	2	2	2	3	2	2	2	2	3	3	3	1	3	3	7	7	5	7	9	4	4	5	4	4
CW11	Er04	4	4	4	4	4	2	2	2	2	2	5	5	5	5	5	11	11	11	11	11	4	4	5	5	5
CW11	Er05	3	1	0	0	0	3	1	0	0	0	3	1	0	0	0	9	3	0	0	0	2	2	0	0	0
CW11	Mp03	7	7	7	5	5	4	4	4	5	5	5	5	5	5	5	16	16	16	15	15	5	4	5	5	4
CW11	Mp05	3	3	3	3	3	5	5	5	5	5	3	3	3	3	3	11	11	11	11	11	4	4	4	4	4
CW11	Mp06	5	5	5	5	5	4	3	3	3	4	5	5	5	5	5	14	13	13	13	14	5	4	5	4	5
CW11	Mp07	4	4	4	4	4	4	3	2	3	3	3	3	3	3	3	11	10	9	10	10	4	4	5	4	4
CW11	Mp10	5	5	5	4	4	5	5	5	4	5	5	5	5	4	5	15	15	15	12	14	5	5	4	3	4
CW12	Cc01	4	3	4	4	4	5	2	5	5	4	5	3	3	3	3	14	8	12	12	11	4	5	4	4	5
CW12	Cc02	5	4	5	5	4	4	4	4	4	4	5	4	5	5	5	14	12	14	14	13	4	4	5	4	4
CW12	Cc03X	7	7	5	5	5	5	5	5	5	5	5	5	5	5	5	17	17	15	15	15	5	5	5	5	5
CW12	Mp01	3	3	3	3	3	5	4	5	4	5	3	3	3	3	3	11	10	11	10	11	5	4	5	5	5
CW12	Mp02	3	3	3	3	3	2	3	3	2	2	3	3	3	2	2	8	9	9	7	7	4	4	4	2	3
CW12	Mp03	3	3	3	3	3	5	5	5	3	4	3	3	3	3	4	11	11	11	9	11	4	5	5	4	5
CW12	Mp04	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	3	3	3	4	4	2	2	3	4	4
CW12	Mp05	5	5	5	5	5	5	5	4	4	4	7	7	7	7	7	17	17	16	16	16	4	4	5	4	5
CW12	Mp06	5	5	4	4	3	4	4	4	4	3	5	4	4	4	3	14	13	12	12	9	5	5	4	4	4

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

II. Boonanarring NR.

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
BNR01	Ba01	7	7	7	7	5	5	5	5	5	4	5	5	5	5	5	17	17	17	17	14	4	4	4	5	4
BNR01	Ba02	7	7	9	7	0	5	5	5	5	0	5	5	5	5	0	17	17	19	17	0	4	4	5	5	0
BNR01	Ba03	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
BNR01	Ba04	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	4	5	5	5	5
BNR01	Ba05	5	5	7	7	7	3	3	4	4	4	5	5	5	5	5	13	13	16	16	16	5	4	5	5	5
BNR01	Bm01	3	3	3	3	3	5	5	4	4	4	3	3	3	2	3	11	11	10	9	10	4	4	4	4	4
BNR02	Ba01	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	15	15	15	15	14	4	4	5	5	4
BNR02	Ba02	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	4	5	5	5	5
BNR02	Ba03	9	9	9	9	9	5	4	5	5	5	5	5	5	5	5	19	18	19	19	19	5	5	5	5	5
BNR02	Ba04	7	7	7	9	0	5	5	5	5	0	5	5	5	5	0	17	17	17	19	0	5	5	5	5	0
BNR02	Ba05	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	4	4	4	5	5
BNR02	Ba06	5	5	7	7	7	4	4	4	4	4	5	5	5	5	5	14	14	16	16	16	4	5	5	5	5
BNR02	Ba07	5	4	4	5	0	5	5	5	5	0	5	5	5	5	0	15	14	14	15	0	4	4	4	5	0
BNR02	Bm01	7	7	7	9	9	5	5	5	5	5	5	5	5	5	5	17	17	17	19	19	4	4	4	5	4
BNR02	Bm02	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	4	4	4	5	4
BNR02	Bm03	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	15	15	15	15	14	5	5	4	5	4
BNR02	Bm04	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
BNR03	Ba01	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3	8	8	8	8	9	4	4	4	5	5
BNR03	Ba02	5	5	5	4	4	4	4	4	4	4	3	4	4	3	3	12	13	13	11	11	3	4	4	4	3
BNR03	Ba03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR03	Ba04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR03	Ba05	5	5	5	4	4	5	5	5	5	4	5	5	5	5	5	15	15	15	14	13	4	4	4	4	4
BNR03	Ba06	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	15	14	15	15	15	4	4	5	4	4
BNR03	Ba07	5	7	7	5	5	4	5	5	4	4	5	5	5	5	4	14	17	17	14	13	4	5	5	5	4
BNR03	Bm01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
BNR03	Bm02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR03	Bm03X	7	7	7	7	5	5	5	5	5	5	5	5	5	5	5	17	17	17	17	15	4	4	4	5	4
BNR03	Bm04X	7	7	7	7	5	5	5	5	5	5	5	5	5	5	5	17	17	17	17	15	4	4	4	5	4
BNR03	Bm05X	5	7	7	5	0	5	5	5	5	0	5	5	5	5	0	15	17	17	15	0	4	4	4	4	0
BNR04	Ba01	3	3	3	3	3	3	5	4	5	5	3	3	3	3	3	9	11	10	11	11	4	4	4	4	4
BNR04	Ba02	5	5	7	5	7	5	4	5	5	5	5	5	5	5	5	15	14	17	15	17	4	4	4	4	4
BNR04	Ba03X	7	7	7	7	0	5	5	5	5	0	5	5	5	5	0	17	17	17	17	0	5	5	5	5	0
BNR04	Ba04X					7					5					5					17					5
BNR04	Bm01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR04	Bm02	7	7	7	9	9	4	5	5	5	5	4	7	7	7	7	16	19	19	21	21	4	4	5	4	5
BNR04	Bm03X	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	14	14	14	14	15	4	4	4	3	4
BNR04	Bm04X	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	4	5	5	4	5
BNR04	Bm05X	9	9	9	9	9	5	5	5	5	5	5	7	5	5	5	19	21	19	19	19	5	5	5	5	5
BNR05	Ba01	3	3	3	3	0	5	5	5	4	0	5	3	3	3	0	11	11	11	10	0	4	4	4	3	0
BNR05	Ba02	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	5	5	5	5
BNR05	Ba03	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	5	5
BNR05	Ba04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR05	Ba05	3	4	3	3	3	5	5	5	5	5	5	4	3	3	3	11	13	11		11	5	5	5	4	5
BNR05	Ba06X	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	5	4	4	4	4
BNR05	Bm01X	9	9	9	7	9	5	5	5	5	5	5	5	5	5	5	19	19	19	17	19	4	4	5	4	5
BNR05	Bm02X	9	9	9	9	9	5	5	5	5	5	5	5	6	7	7	19	19	20	21	21	5	5	5	5	5
BNR06	Ba01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR06	Ba02	4	5	5	5	0	3	4	4	4	0	3	5	5	5	0	12	14	14	14	0	4	4	4	4	0
BNR06	Ba03X	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	4	4	5	4	4
BNR06	Ba04X	6	7	7	7	5	5	5	5	5	5	5	5	5	5	5	16	17	17	17	15	5	5	4	4	4

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
BNR06	Ba05X	4	5	4	3	0	5	5	5	5	0	5	3	3	3	0	12	13	12	11	0	4	4	4	4	0
BNR06	Bm01	7	7	7	7	5	5	5	5	5	5	5	5	5	5	5	17	17	17	17	15	4	4	4	4	4
BNR06	Bm02X	6	6	7	7	5	5	5	5	5	5	5	5	5	5	5	16	16	17	17	15	4	4	5	4	4
BNR06	Bm03X	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	4	5	5	4	4
BNR07	Ba01	9	7	7	7	7	5	5	5	5	5	5	5	5	5	5	19	17	17	17	17	5	5	5	5	5
BNR07	Ba02	5	5	5	5	5	4	5	5	5	5	5	5	5	5	4	14	15	15	15	14	4	4	4	4	4
BNR07	Ba03	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5	16	16	16	16	15	5	4	4	5	4
BNR07	Ba04	5	5	5	5	5	2	2	2	2	3	5	5	5	5	5	12	12	12	12	13	5	5	5	5	5
BNR07	Ba05	7	7	7	9	9	5	5	5	5	5	5	5	5	5	5	17	17	17	19	19	4	5	4	5	4
BNR07	Bm01	4	4	4	4	4	5	4	4	4	4	5	3	4	4	3	14	11	12	12	11	4	4	4	4	3
BNR07	Bm02	7	7	7	7	5	5	5	5	5	5	5	5	5	5	5	17	17	17	17	15	5	4	5	5	4
BNR07	Bm03	3	3	2	2	0	5	5	4	4	0	3	2	2	2	0	11	10	8	8	0	4	3	4	5	0
BNR07	Bm04	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	15	15	15	15	5	5	4	5	4
BNR07	Bm05	5	5	5	5	5	5	4	4	4	4	5	5	5	5	5	15	14	14	14	14	5	4	4	5	4
BNR07	Bm06	7	7	7	3	4	5	5	5	5	5	5	5	5	2	2	17	17	17	10	11	4	4	5	5	5
BNR08	Ba01	1	3	4	3	3	1	1	2	2	2	3	3	3	3	2	5	7	9	8	7	5	5	5	5	5
BNR08	Ba02	1	3	3	3	3	1	1	2	1	2	3	3	3	3	3	5	7	8	7	8	5	5	5	5	5
BNR08	Ba03	1	3	3	3	3	1	1	2	1	2	3	3	4	3	3	5	7	9	7	8	5	5	5	5	5
BNR08	Ba04X	1	3	4	4	4	1	1	2	2	3	3	3	4	4	5	5	7	10	10	12	5	5	5	5	5
BNR08	Bm01	1	1	3	3	3	1	1	2	2	2	3	3	3	3	2	5	5	8	8	7	5	5	5	4	4
BNR08	Bm02	3	5	5	5	5	1	1	2	3	3	5	5	5	5	5	9	11	12	13	13	5	5	5	5	4
BNR08	Bm03X	1	5	5	5	5	1	1	2	3	3	3	5	5	5	5	5	11	12	13	13	5	5	5	5	5
BNR08	Bm04X	3	3	4	4	5	1	1	2	2	3	3	3	5	5	5	7	7	11	11	13	5	5	5	5	5
BNR09	Ba01	5	5	5	7	7	2	2	3	4	4	5	5	5	5	5	12	12	13	16	16	5	5	5	5	5
BNR09	Ba02	3	3	4	4	5	2	2	2	3	3	3	4	4	4	5	8	9	10	11	13	5	5	4	5	5
											0															

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021 (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
BNR09	Ba03	5	7	7	9	9	1	1	2	3	4	5	5	5	5	5	11	13	14	17	18	5	4	4	5	5
BNR09	Ba04	3	3	3	3	3	2	2	2	2	3	5	3	3	3	3	10	8	8	8	9	5	5	4	4	4
BNR09	Bm01	5	5	5	5	5	1	2	3	4	4	5	5	5	5	5	11	12	13	14	14	5	5	5	5	4
BNR09	Bm02	5	5	7	9	9	2	2	3	3	4	7	7	7	7	7	14	14	17	19	20	5	5	5	5	5
BNR09	Bm03X	5	5	5	5	5	3	3	3	4	4	3	4	4	5	5	11	12	12	14	14	4	4	5	4	4
BNR10	Ba01	7	7	7	7	7	5	4	5	5	4	5	5	5	5	5	17	16	17	17	16	4	4	4	4	4
BNR10	Ba02	5	5	2	2	2	2	2	3	1	2	5	5	3	1	1	12	12	8	4	5	4	4	3	2	5
BNR10	Ba03	5	4	5	4	4	2	2	2	2	3	5	3	4	5	5	12	9	11	11	12	5	4	4	5	4
BNR10	Ba04	5	5	7	5	5	5	5	5	5	5	5	5	5	5	4	15	15	17	15	14	4	4	4	4	4
BNR10	Ba05	7	7	7	7	7	3	3	4	4	4	5	6	5	5	5	15	16	16	16	16	5	5	4	5	5
BNR10	Ba06	5	5	7	7	7	2	2	3	4	4	5	5	5	5	5	12	12	15	16	16	5	5	4	4	4
BNR10	Ba07	3	3	3	0	0	2	2	3	0	0	5	3	3	0	0	10	8	9	0	0	4	3	3	0	0
BNR10	Ba08	5	5	5	5	5	2	2	2	3	4	5	5	5	5	5	12	12	12	13	14	5	5	5	4	5
BNR10	Bm01	7	7	7	7	9	5	5	5	5	5	5	5	5	5	5	17	17	17	17	19	5	5	5	4	5
BNR10	Bm02	7	7	7	7	7	4	4	4	4	4	5	5	5	5	5	16	16	16	16	16	4	4	4	4	4
BNR10	Bm03X	7	5	7	7	7	3	4	4	4	5	5	4	5	5	5	15	13	16	16	17	4	4	4	4	4
BNR11	Ba01	9	9	7	7	0	5	5	5	5	0	7	7	5	7	0	21	21	17	19	0	4	4	4	4	0
BNR11	Ba02	9	9	9	9	9	5	5	5	5	5	5	5	5	5	5	19	19	19	19	19	5	5	5	4	5
BNR11	Ba03	9	9	9	9	9	4	4	5	5	5	7	7	7	7	7	20	20	21	21	21	4	5	4	4	4
BNR11	Bm01	9	9	9	9	9	4	4	5	5	5	5	5	5	5	5	18	18	19	19	19	5	4	5	4	4
BNR11	Bm02	9	9	7	7	9	5	4	5	5	5	5	5	5	5	5	19	18	17	17	19	4	4	4	4	4
BNR11	Bm03	7	7	7	9	7	4	4	5	5	5	5	5	5	5	5	16	16	17	19	17	4	4	4	4	4

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : AUT2019 to AUT2021(cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021	AUT 2019	SPG 2019	AUT 2020	SPG 2020	AUT 2021
BNR11	Bm04	9	9	9	9	9	3	3	4	4	4	5	5	5	5	5	17	17	18	18	18	4	4	4	4	4
BNR11	Bm05	7	9	9	9	9	3	3	4	4	4	5	5	5	5	5	15	17	18	18	18	5	4	5	5	4
BNR11	Bm06	7	7	7	7	9	3	3	4	4	4	5	5	5	5	5	15	15	16	16	18	4	5	5	4	5
BNR12	Ba01	7	7	7	7	7	5	5	5	5	5	5	6	5	5	5	17	18	17	17	17	4	4	4	4	4
BNR12	Ba02	5	7	7	7	7	3	4	4	3	3	5	5	5	5	5	13	16	16	15	15	5	5	5	4	4
BNR12	Ba03X	5	5	5	5	5	4	4	4	4	4	5	5	5	5	5	14	14	14	14	14	5	5	4	4	4
BNR12	Ba04	9	9	9	9	7	4	5	4	4	5	5	6	5	5	5	18	20	18	18	17	4	4	4	4	4
BNR12	Bm01	7	7	7	7	7	4	4	4	4	4	5	5	5	5	5	16	16	16	16	16	4	4	4	4	4
BNR13	Ba01	5	5	7	7	7	4	4	5	4	4	5	6	5	5	5	14	15	17	16	16	5	5	5	5	5
BNR13	Ba02	7	7	9	9	0	5	5	5	5	0	5	5	5	5	0	17	17	19	19	0	4	5	5	4	0
BNR13	Ba03	7	7	7	7	7	5	5	5	5	5	5	5	5	5	5	17	17	17	17	17	4	4	5	5	4
BNR13	Ba04	5	5	5	5	5	3	4	4	4	4	5	5	5	5	5	13	14	14	14	14	4	4	5	4	4
BNR13	Bm01	3	5	5	5	4	3	3	4	4	4	5	4	4	4	3	11	12	13	13	11	4	4	4	4	4
BNR13	Bm02	7	7	7	9	0	4	4	5	5	0	5	5	5	5	0	16	16	17	19	0	5	5	5	5	0
BNR13	Bm03	5	5	7	7	0	5	5	5	5	0	4	4	4	5	0	14	14	16	17	0	5	5	5	5	0
BNR13	Bm04	7	7	7	7	7	4	4	5	5	5	5	5	5	5	5	16	16	17	17	17	5	5	5	5	5

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE (cont) 'Post commencement of mining' tree canopy condition assessment data: SPG2021 onwards.

I. Collard's Wetland sites. Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
CW01	Mp01	9	7	7			5	5	5			5	5	7			19	17	19			5	5	5		
CW01	Mp02	9	9	9			5	4	5			7	7	7			21	20	21			5	5	5		
CW01	Mp03	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW01	Mp04	5	7	7			5	5	5			5	5	5			15	17	17			5	5	5		
CW01	Mp05	9	9	9			4	5	5			6	6	5			19	20	19			5	5	4		
CW01	Mp06	9	9	9			4	4	4			5	5	5			18	18	18			5	5	5		
CW01	Mp07	7	7	7			4	4	4			6	5	6			17	16	17			4	5	5		
CW01	Mp08	7	7	7			5	4	5			5	5	5			17	16	17			4	5	5		
CW02	Er01	7	7	7			5	5	5			5	5	5			17	17	17			5	5	5		
CW02	Er02	5	7	7			4	4	4			5	5	5			14	16	16			5	5	5		
CW02	Er03	7	7	7			5	5	4			5	5	5			17	17	16			5	5	5		
CW02	Mr01	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW02	Mr02	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW02	Mr03	9	9	9			4	4	4			5	5	5			18	18	18			5	5	5		
CW02	Mr04	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW02	Mr05	7	7	9			5	5	5			5	5	5			17	17	19			5	5	5		
CW03	Er01	3	4	4			4	4	4			3	3	4			10	11	12			5	5	5		
CW03	Er02	5	3	3			4	3	3			3	3	3			12	9	9			5	4	5		
CW03	Er03X	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
CW03	Er04X	5	5	5			5	4	4			5	4	3			15	13	12			5	5	5		
CW03	Er05X	3	3	4			4	4	3			2	2	4			9	9	11			5	5	5		
CW03	Er06X	5	4	5			4	4	4			5	4	5			14	12	14			5	5	5		
CW03	Mr01	9	9	9			5	5	5			8	7	7			22	21	21			5	5	5		
CW03	Mr02	7	7	9			5	5	5			6	6	6			18	18	20			5	5	5		
CW03	Mr03	5	5	5			4	4	4			5	5	5			14	14	14			5	5	5		
CW03	Mr04	7	9	7			4	4	5			5	5	5			16	18	17			5	5	5		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
CW03	Mr05	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW04	Er01	3	3	3			4	3	3			3	3	3			10	9	9			4	4	5		
CW04	Er02	4	4	5			4	4	4			2	4	5			10	12	14			4	5	5		
CW04	Er03	3	4	5			4	3	4			3	3	4			10	10	13			5	5	5		
CW04	Er04	4	4	3			3	3	3			3	3	3			10	10	9			4	5	5		
CW04	Er05	5	5	5			4	4	4			5	5	5			14	14	14			4	4	5		
CW04	Mp01	4	4	4			4	4	4			4	4	4			12	12	12			5	5	4		
CW04	Mp02	5	5	5			3	4	4			3	4	5			11	13	14			4	5	5		
CW04	Mp03	5	5	4			4	4	4			5	5	5			14	14	13			5	5	5		
CW04	Mp04	5	5	5			4	4	4			4	4	4			13	13	13			5	5	5		
CW04	Mp05	5	5	5			4	4	4			4	4	4			13	13	13			5	5	4		
CW04	Mr01	7	7	7			5	4	5			5	5	5			17	16	17			5	5	5		
CW05	Cc01	4	5	5			3	3	3			4	5	5			11	13	13			5	5	5		
CW05	Cc02	1	1	1			1	1	1			1	1	1			3	3	3			4	4	4		
CW05	Cc03X	2	2	2			4	4	3			2	2	2			8	8	7			4	4	4		
CW05	Cc04X	4	4	5			3	4	4			5	5	5			12	13	14			4	4	4		
CW05	Cc05X	5	5	5			4	4	4			5	5	5			14	14	14			4	5	4		
CW05	Cc06X	5	5	7			4	4	5			5	6	6			14	15	18			5	5	5		
CW05	Mp01	5	7	7			4	4	4			5	5	5			14	16	16			5	5	5		
CW05	Mp02	5	7	7			4	4	4			5	5	5			14	16	16			5	5	4		
CW05	Mp03X	4	4	4			4	4	4			3	3	4			11	11	12			5	5	5		
CW06	Mr01	7	9	9			5	5	5			5	5	5			17	19	19			4	5	5		
CW06	Mr08	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW06	Mr12	9	7	9			5	5	5			5	5	5			19	17	19			4	5	5		
CW06	Mr16	9	7	9			5	4	5			5	4	5			19	15	19			5	5	5		
CW06	Mr28	9	9	9			5	5	4			4	5	5			18	19	18			5	5	5		
CW07	Er01	4	7	7			5	5	5			4	4	4			13	16	16			4	5	4		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland .

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
CW07	Er02	9	7	7			5	5	5			5	5	5			19	17	17			5	5	5		
CW07	Er03X	7	7	5			5	5	5			5	5	5			17	17	15			5	5	4		
CW07	Mr19	5	5	5			4	4	5			5	5	5			14	14	15			5	5	5		
CW07	Mr21	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
CW07	Mr18	7	9	9			5	5	5			5	5	5			17	19	19			5	5	5		
CW07	Mr13	9	9	9			5	5	5			5	5	5			19	19	19			4	5	5		
CW07	Mr07	7	7	7			4	4	5			5	5	5			16	16	17			4	5	5		
CW07	Mr01	9	9	9			4	4	5			5	5	5			18	18	19			5	5	5		
CW08	Er01	4	4	4			4	4	4			5	4	4			13	12	12			5	5	5		
CW08	Er02	4	5	5			4	4	4			4	4	4			12	13	13			5	5	5		
CW08	Er03	5	7	7			4	5	4			5	5	5			14	17	16			5	5	5		
CW08	Er04	5	5	5			4	4	5			5	5	6			14	14	16			5	5	5		
CW08	Er05	6	7	9			4	4	4			5	5	5			15	16	18			5	5	5		
CW08	Mp01	5	4	4			4	4	4			5	5	5			14	13	13			4	5	5		
CW08	Mp09	2	2	2			4	3	3			2	2	1			8	7	6			3	5	5		
CW08	Mp15	3	4	4			4	4	4			3	3	3			10	11	11			4	5	5		
CW08	Mp19	5	5	5			4	4	4			5	5	5			14	14	14			4	5	5		
CW08	Mp26	4	2	2			3	3	3			3	2	2			10	7	7			4	5	5		
CW09	Cc01	5	5	7			4	4	4			5	6	6			14	15	17			5	5	5		
CW09	Cc02	4	4	5			4	5	5			5	5	5			13	14	15			5	5	4		
CW09	Cc03X	5	5	5			4	4	4			5	5	7			14	14	16			5	5	5		
CW09	Er01	5	5	7			5	5	5			5	5	5			15	15	17			5	5	5		
CW09	Mp01	3	3	4			4	3	3			4	3	3			11	9	10			4	5	5		
CW09	Mp02	4	3	3			4	3	3			4	2	2			12	8	8			4	5	5		
CW09	Mp03	3	3	1			4	3	2			3	2	2			10	8	5			4	5	5		
CW09	Mp04	4	4	4			4	3	3			4	3	3			12	10	10			4	5	5		
CW09	Mp05X	5	7	7			4	4	4			7	7	7			16	18	18			4	5	5		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

I. Collard's Wetland sites (cont.). Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
CW09	Mp06X	6	5	6			4	4	4			5	5	5			15	14	15			4	5	4		
CW10	Er01X	3	5	5			5	5	5			2	4	4			10	14	14			4	4	4		
CW10	Er02X	5	7	7			5	5	5			5	6	6			15	18	18			5	5	5		
CW10	Er03X	2	2	2			4	3	2			2	2	2			8	7	6			4	5	4		
CW10	Mr01	5	7	7			4	4	4			5	5	5			14	16	16			5	5	5		
CW10	Mr02	7	7	7			4	4	4			5	5	5			16	16	16			5	5	5		
CW10	Mr03X	5	7	7			3	4	4			5	5	5			13	16	16			5	5	5		
CW11	Er01	4	3	3			3	3	3			3	2	2			10	8	8			4	4	4		
CW11	Er02	3	3	4			4	4	4			4	4	4			11	11	12			4	4	4		
CW11	Er03	3	3	3			4	4	3			4	3	3			11	10	9			4	4	4		
CW11	Er04	4	4	4			3	3	3			3	4	4			10	11	11			4	4	4		
CW11	Er05	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
CW11	Mp03	3	4	5			4	4	4			5	4	5			12	12	14			4	5	5		
CW11	Mp05	3	4	4			5	5	5			4	4	3			12	13	12			4	5	5		
CW11	Mp06	5	4	5			3	3	3			4	4	4			12	11	12			5	5	5		
CW11	Mp07	4	4	4			3	4	4			4	4	4			11	12	12			4	5	5		
CW11	Mp10	4	5	5			4	4	4			4	5	5			12	14	14			4	5	5		
CW12	Cc01	4	4	4			4	4	3			3	3	3			11	11	10			4	4	4		
CW12	Cc02	4	4	4			4	4	4			5	5	5			13	13	13			4	4	4		
CW12	Cc03X	5	5	5			5	5	5			5	5	5			15	15	15			4	5	4		
CW12	Mp01	3	4	3			5	5	5			4	4	4			12	13	12			4	5	5		
CW12	Mp02	3	3	3			3	3	3			2	2	2			8	8	8			3	5	3		
CW12	Mp03	3	3	3			4	4	4			3	4	4			10	11	11			4	4	5		
CW12	Mp04	2	2	2			4	4	3			1	1	1			7	7	6			4	5	3		
CW12	Mp05	7	7	7			4	4	3			7	7	7			18	18	17			5	5	5		
CW12	Mp06	3	3	3			3	3	2			2	2	3			8	8	8			4	5	5		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

II. Boonanarring NR.

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
BNR01	Ba01	5	5	7			5	5	5			5	5	5			15	15	17			5	5	5		
BNR01	Ba02	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR01	Ba03	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR01	Ba04	7	7	9			5	4	5			5	5	5			17	16	19			5	5	5		
BNR01	Ba05	7	7	9			5	4	4			5	5	5			17	16	18			5	5	5		
BNR01	Bm01	3	3	3			4	4	4			3	3	3			10	10	10			4	4	5		
BNR02	Ba01	5	5	5			4	4	4			4	4	5			13	13	14			5	5	5		
BNR02	Ba02	9	7	9			5	5	5			5	5	5			19	17	19			5	5	5		
BNR02	Ba03	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR02	Ba04	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR02	Ba05	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR02	Ba06	5	7	7			5	5	5			5	5	5			15	17	17			5	5	5		
BNR02	Ba07	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR02	Bm01	7	9	9			5	5	5			5	5	5			17	19	19			4	5	5		
BNR02	Bm02	9	9	9			5	5	5			5	5	5			19	19	19			4	5	5		
BNR02	Bm03	4	5	5			5	4	5			5	5	5			14	14	15			4	5	5		
BNR02	Bm04	9	7	9			5	5	5			5	5	7			19	17	21			5	5	5		
BNR03	Ba01	3	3	3			3	4	4			3	3	3			9	10	10			5	5	5		
BNR03	Ba02	4	4	5			5	4	4			3	3	3			12	11	12			4	4	5		
BNR03	Ba03	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR03	Ba04	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR03	Ba05	4	5	5			5	5	5			4	4	4			13	14	14			5	4	4		
BNR03	Ba06	4	5	5			5	5	4			4	5	5			13	15	14			5	5	5		
BNR03	Ba07	5	5	5			5	5	5			4	5	5			14	15	15			5	5	5		
BNR03	Bm01	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
BNR03	Bm02	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR03	Bm03X	7	7	7			4	5	5			5	5	5			16	17	17			5	5	5		
BNR03	Bm04X	5	7	7			5	5	5			5	5	5			15	17	17			5	5	5		
BNR03	Bm05X	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR04	Ba01	3	3	3			5	5	5			4	4	5			12	12	13			5	5	5		
BNR04	Ba02	5	5	7			5	5	5			5	5	5			15	15	17			5	5	5		
BNR04	Ba03X	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR04	Ba04X	7	7	9			5	5	5			5	5	5			17	17	19			5	5	5		
BNR04	Bm01	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR04	Bm02	7	9	9			5	5	5			7	7	7			19	21	21			5	5	5		
BNR04	Bm03X	4	4	5			5	5	5			5	5	5			14	14	15			4	4	5		
BNR04	Bm04X	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR04	Bm05X	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR05	Ba01	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR05	Ba02	7	7	7			5	5	5			5	5	5			17	17	17			5	5	5		
BNR05	Ba03	9	9	9			5	5	5			6	6	6			20	20	20			5	5	5		
BNR05	Ba04	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR05	Ba05	3	3	3			5	5	5			3	3	3			11	11	11			5	5	5		
BNR05	Ba06X	7	7	7			4	4	5			5	5	5			16	16	17			5	5	5		
BNR05	Bm01X	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR05	Bm02X	9	9	9			5	5	5			7	7	7			21	21	21			5	5	5		
BNR06	Ba01	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR06	Ba02	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR06	Ba03X	7	7	7			5	5	5			5	5	5			17	17	17			5	5	5		
BNR06	Ba04X	5	5	7			5	5	4			5	5	5			15	15	16			5	5	5		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
BNR06	Ba05X	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR06	Bm01	5	7	7			5	5	5			5	5	5			15	17	17			4	5	5		
BNR06	Bm02X	5	7	7			5	5	5			5	5	5			15	17	17			5	5	5		
BNR06	Bm03X	5	7	7			5	5	5			5	5	5			15	17	17			5	5	5		
BNR07	Ba01	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR07	Ba02	5	5	5			4	5	5			4	4	4			13	14	14			5	5	5		
BNR07	Ba03	7	7	7			4	5	5			5	5	5			16	17	17			5	4	5		
BNR07	Ba04	5	5	7			4	4	4			5	5	5			14	14	16			5	5	5		
BNR07	Ba05	7	7	9			4	5	5			5	5	5			16	17	19			5	5	5		
BNR07	Bm01	4	3	3			4	4	5			3	3	3			11	10	11			4	4	4		
BNR07	Bm02	7	5	7			5	5	5			5	5	5			17	15	17			5	5	5		
BNR07	Bm03	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR07	Bm04	5	5	5			5	5	5			5	5	5			15	15	15			5	5	5		
BNR07	Bm05	5	5	4			4	4	5			5	5	4			14	14	13			5	4	5		
BNR07	Bm06	4	4	7			5	4	5			4	4	4			13	12	16			5	5	5		
BNR08	Ba01	3	3	3			2	2	3			2	3	3			7	8	9			5	5	5		
BNR08	Ba02	3	3	4			3	3	4			3	3	3			9	9	11			5	5	5		
BNR08	Ba03	4	4	4			2	3	3			3	4	5			9	11	12			5	5	5		
BNR08	Ba04X	4	5	5			4	4	4			5	5	5			13	14	14			5	5	5		
BNR08	Bm01	3	3	3			2	2	3			2	2	3			7	7	9			5	5	5		
BNR08	Bm02	5	5	5			4	4	4			5	5	5			14	14	14			5	5	5		
BNR08	Bm03X	5	5	7			4	4	4			5	5	5			14	14	16			5	5	5		
BNR08	Bm04X	5	5	7			4	4	4			5	5	5			14	14	16			5	5	5		
BNR09	Ba01	7	7	9			4	4	4			5	5	5			16	16	18			5	5	5		
BNR09	Ba02	5	5	5			4	4	4			5	5	5			14	14	14			5	5	5		
											0															

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
BNR09	Ba03	9	9	9			4	4	4			5	5	5			18	18	18			5	5	5		
BNR09	Ba04	3	4	4			3	3	3			4	4	3			10	11	10			5	5	5		
BNR09	Bm01	5	7	7			5	5	4			5	5	5			15	17	16			5	5	5		
BNR09	Bm02	7	7	9			4	4	4			7	5	5			18	16	18			5	5	5		
BNR09	Bm03X	5	5	5			4	5	4			5	5	5			14	15	14			5	5	5		
BNR10	Ba01	5	5	6			4	4	5			5	5	5			14	14	16			5	5	5		
BNR10	Ba02	2	2	2			2	2	3			1	1	1			5	5	6			3	3	5		
BNR10	Ba03	5	5	5			3	3	3			5	4	5			13	12	13			5	4	5		
BNR10	Ba04	5	5	5			5	5	5			5	4	4			15	14	14			4	5	5		
BNR10	Ba05	7	7	7			4	4	5			5	5	5			16	16	17			5	5	5		
BNR10	Ba06	7	7	7			4	4	4			5	5	5			16	16	16			5	5	5		
BNR10	Ba07	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR10	Ba08	5	5	5			4	4	4			5	5	5			14	14	14			5	5	5		
BNR10	Bm01	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR10	Bm02	7	7	7			5	4	5			5	5	5			17	16	17			5	5	5		
BNR10	Bm03X	5	3	5			5	5	5			5	2	5			15	10	15			5	5	5		
BNR11	Ba01	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR11	Ba02	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		
BNR11	Ba03	9	9	9			5	5	5			7	7	7			21	21	21			5	5	5		
BNR11	Bm01	9	9	9			5	4	5			5	5	5			19	18	19			5	5	5		
BNR11	Bm02	7	7	9			5	5	5			5	5	5			17	17	19			5	5	5		
BNR11	Bm03	9	9	9			5	5	5			5	5	5			19	19	19			5	5	5		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX THREE Post-commencement of mining tree canopy condition assessment data : SPG2021 onwards (cont).

II. Boonanarring NR (cont).

Orange shading: trees died since first sample; Green shading: new trees included in sampling after Spring 2015 survey.

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

Site[a]	Tree Nos	Proportion of Dead Branches Index (1 to 9)					Degree of Epicormic Growth Index (1 to 5)					Crown density (foliage density) Index (1 to 9)					Crown Assessment Index (3 to 23)					Foliage Health Index (5 to 1)				
		SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022			SPG 2021	AUT 2022	SPG 2022		
BNR11	Bm04	9	9	9			4	4	4			5	5	5			18	18	18			5	5	5		
BNR11	Bm05	9	9	9			4	4	4			5	5	5			18	18	18			5	5	5		
BNR11	Bm06	9	9	9			4	4	4			5	5	5			18	18	18			5	5	5		
BNR12	Ba01	7	7	9			5	5	5			5	5	5			17	17	19			5	5	5		
BNR12	Ba02	5	7	7			3	4	4			5	5	5			13	16	16			5	4	5		
BNR12	Ba03X	5	7	7			4	4	5			5	5	5			14	16	17			5	5	5		
BNR12	Ba04	7	9	9			5	5	5			5	5	5			17	19	19			5	5	5		
BNR12	Bm01	4	4	4			4	4	4			4	4	5			12	12	13			2	3	4		
BNR13	Ba01	7	7	7			5	5	5			5	5	5			17	17	17			5	5	5		
BNR13	Ba02	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR13	Ba03	7	7	9			5	5	5			5	5	5			17	17	19			5	5	5		
BNR13	Ba04	7	7	7			4	4	5			5	5	5			16	16	17			5	5	5		
BNR13	Bm01	4	5	5			3	3	4			4	4	4			11	12	13			5	5	4		
BNR13	Bm02	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR13	Bm03	0	0	0			0	0	0			0	0	0			0	0	0			0	0	0		
BNR13	Bm04	7	7	9			5	5	5			5	5				17	17	19			5	5	5		

[a] BWNR: Bartlett's Well Nature Reserve; BNR: Boonanarring Nature Reserve; CW: Collard's Wetland. [b] Ter: Terrestrial; Wet: Wetland (see Table 1).

APPENDIX FOUR. Comparison of means paired two-sample t-test of pre-mining Spring and Spring 2022 GDVM tree canopy assessment index and foliage health index scores

Data set :

- Pre-mining Spring GDVM data used in paired t-test analysis with the Spring 2022 data was the most recent monitoring 'prior to commencement of mining' that was available and varied between the 4 locations/GDV Types.
  i) Boonanarring NR/Terrestrial: Spring 2018 GDVM data
  ii) Collard's Wetland/Wetland: Spring 2017 GDVM data.
- For each of the two locations/GDV Types listed above, dead trees that died after the pre-mining GDVM data collection event used in the particular analysis were included in the analysis and scored '0' when dead. Trees that were monitored in Spring 2015 but had died before the pre-mining survey used in a particular analysis, were redundant (scored '0' in both periods) and excluded from the analysis; and
- Trees introduced into the GDV monitoring after the Spring 2015 GDVM survey were included in the analysis if, for a particular locations/GDV Type, they were monitored in the Spring pre-mining data event used in the analysis. Trees introduced into the monitoring after the Spring pre-mining data event used in the analysis were excluded from the analysis as they had not been scored in both the monitoring events analysed.

I. Boonanarring NR: Terrestrial GDV Sites

1. (i) Boonanarring NR: Terrestrial GDV Sites: crown assessment index

(Comparison of Means : Spg2018 (pre-mining) and Spg2022 monitoring data)

(a) Boonanarring NR Treatment sites (Transects T1 and T2)

Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG18 (1)	78	15.3718	2.7826	7.7431
CAI SPG22 (2)	78	14.2692	6.6678	44.4590

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG18 (1)	15.3718	14.7444	15.9992
CAI SPG22 (2)	14.2692	12.7659	15.7726
Mean Difference (1-2)	1.1026	-0.3064	2.5116

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	1.1026
Variance	26.1011
Pearson R	0.3543
Test Statistic	1.5582
Degrees of Freedom	77

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)
t Critical Value (5%) 1.9913 p-value 0.1233 H1 (5%) Rejected

CONCLUSION: |t|<1.9913 ($t_{0.05(2),\,77}$). Therefore, there was no significant difference in the mean crown assessment index at Boonanarring NR treatment sites between Spring 2018 and Spring 2022

(b) Boonanarring NR Treatment sites (Transect T1 only)

Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG18 (1)	38	15.9211	2.8033	7.8585
CAI SPG22 (2)	38	14.1579	7.2280	52.2447

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG18 (1)	15.9211	14.9996	16.8425
CAI SPG22 (2)	14.1579	11.7821	16.5337
Mean Difference (1-2)	1.7632	-0.3303	3.8566

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	1.7632
Variance	30.0516
Pearson R	0.4822
Test Statistic	1.7065
Degrees of Freedom	37

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)
t Critical Value (5%) 2.0262 p-value 0.0963 H1 (5%) Rejected

CONCLUSION: |t|<1.9913 ($t_{0.05(2),\,37}$). Therefore, there was no significant difference in the mean crown assessment index at Boonanarring NR T1 treatment sites between Spring 2018 and Spring 2022

(c) Boonanarring NR Treatment sites (Transect T2 only)
Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG18 (1)	40	14.8500	2.6942	7.2590
CAI SPG22 (2)	40	14.3750	6.1797	38.1891

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG18 (1)	14.8500	13.9883	15.7117
CAI SPG22 (2)	14.3750	12.3986	16.3514
Mean Difference (1-2)	0.4750	-1.4911	2.4411

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.4750
Variance	22.7240
Pearson R	0.2298
Test Statistic	0.4887
Degrees of Freedom	39

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0227	p-value	0.6278	H1 (5%)	Rejected

<u>CONCLUSION</u>: |t|<2.0227 ($t_{0.05(2),\ 39}$). Therefore, there was no significant difference in the mean crown assessment index at Boonanarring NR T1 treatment sites between Spring 2018 and Spring 2022.

<u>(c) Boonanarring NR Control sites</u>

Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG18 (1)	27	11.8148	5.0690	25.6952
CAI SPG22 (2)	27	12.6667	5.3205	28.3077

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG18 (1)	11.8148	9.8096	13.8201
CAI SPG22 (2)	12.6667	10.5619	14.7714
Mean Difference (1-2)	-0.8519	-1.6899	3.3936

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	-0.8519
Variance	27.0014
Pearson R	0.2358
Test Statistic	0.6889
Degrees of Freedom	26

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0555	p-value	0.4970	H1 (5%)	Rejected

<u>CONCLUSION</u>: |t|<2.0555 ($t_{0.05(2),\ 26}$). Therefore, there was no <u>significant difference</u> in the mean crown assessment index at Boonanarring NR control sites between Spring 2018 and Spring 2022.

1 (ii). Boonanarring NR: Terrestrial GDV Sites: foliage health index

<u>(a) Boonanarring NR Treatment sites (Transects T1 and T2)</u>

Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
FH SPG18 (1)	78	4.6282	0.4864	0.2366

FH SPG22 (2)	78	4.2051	1.8116	3.2821

Means Report

VAR	Mean	95% LCL	95% UCL
FH SPG18 (1)	4.6282	4.5185	4.7379
FH SPG22 (2)	4.2051	3.7967	4.6136
Mean Difference (1-2)	0.4231	0.0144	0.8318

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.4231
Variance	1.7593
Pearson R	0.1319
Test Statistic	2.0612
Degrees of Freedom	77

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	1.9913	p-value	0.0427	H1 (5%)	Accepted

<u>CONCLUSION</u>: |t|>1.9913 ($t_{0.05(2),\,77}$). Therefore, there was a significant difference in the mean foliage health index at Boonanarring NR treatment sites between Spring 2018 and Spring 2022 (significantly lower mean foliage health index in 2022).

<u>(b) Boonanarring NR Control sites</u>

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
FH SPG18 (1)	27	4.4444	0.6405	0.4103
FH SPG22 (2)	27	4.3704	1.5968	2.5499

Means Report

VAR	Mean	95% LCL	95% UCL
FH SPG18 (1)	4.4444	4.1911	4.6978
FH SPG22 (2)	4.3704	3.7387	5.0021
Mean Difference (1-2)	0.0741	-0.4846	0.6327

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.0741
Variance	1.4801
Pearson R	0.4721
Test Statistic	0.2726
Degrees of Freedom	26

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0555	p-value	0.7873	H1 (5%)	Rejected

<u>CONCLUSION</u>: |t|<2.0555 ($t_{0.05(2),\,26}$) Therefore, there was <u>no significant difference</u> in the mean foliage health index at Boonanarring NR control sites between Spring 2018 and Spring 2022.

2. Collard's Wetland Sites

2 (i) Collard's Wetland Sites : crown assessment index (CAI)

(Comparison of means : Spring2017 (pre-mining) and Spring2022 monitoring data)

(a) Collard's Wetland sites: All tree species

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	
CAI SPG17 (1)	96	14.5625	3.5713	12.7539
CAI SPG22 (2)	96	13.9688	4.5848	21.0201

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG17 (1)	14.5625	13.8389	15.2861
CAI SPG22 (2)	13.9688	13.0398	14.8977
Mean Difference (1-2)	0.5938	-0.0399	1.2274

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.5938
Variance	16.8870
Pearson R	0.7327
Test Statistic	1.8602
Degrees of Freedom	95

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	1.9853	p-value	0.0660	H1 (5%)	Rejected

CONCLUSION: $|t|<1.9853$ ($t_{0.05(2),\,95}$). Therefore, there was no significant difference in the mean crown assessment index for all tree species at all Collard's Wetland sites between Spring 2017 and Spring 2022.

(b) Collard's Wetland sites: *Melaleuca preissiana*

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG17 (1)	36	14.3333	4.0708	16.5714
CAI SPG22 (2)	36	12.9444	4.0984	16.7968

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG17 (1)	14.3333	12.9560	15.7107
CAI SPG22 (2)	12.9444	11.5577	14.3311
Mean Difference (1-2)	1.3889	0.4107	2.3671

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	1.3889
Variance	16.6841

Pearson R	0.7495
Test Statistic	2.8824
Degrees of Freedom	35

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0301	p-value	0.0067	H1 (5%)	Accepted

CONCLUSION: |t|>2.0301 ($t_{0.05(2),\,35}$). Therefore there is a significant difference in the mean CAI for *Melaleuca preissiana* trees at Collard's Wetland sites between Spring 2017 and Spring 2022 (significantly lower mean CAI in 2022).

(c) Collard's Wetland sites: *Melaleuca rhaphiophylla*

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG17 (1)	25	16.9600	1.3687	1.8733
CAI SPG22 (2)	25	18.0800	1.6563	2.7433

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG17 (1)	16.9600	16.3950	17.5250
CAI SPG22 (2)	18.0800	17.3963	18.7637
Mean Difference (1-2)	-1.1200	0.6241	1.6159

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	-1.1200
Variance	2.3083
Pearson R	0.6999
Test Statistic	4.6613
Degrees of Freedom	24

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0639	p-value	9.8262E-5	H1 (5%)	Accepted

CONCLUSION: |t|>2.0639 ($t_{0.05(2),\,24}$). Therefore there is a significant difference in the mean CAI for *Melaleuca rhaphiophylla* trees at Collard's Wetland sites between Spring 2017 and Spring 2022 (significantly HIGHER mean CAI in 2022).

(d) Collard's Wetland sites: *Corymbia calophylla*

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG17 (1)	9	12.3333	3.2404	10.5000
CAI SPG22 (2)	9	12.0000	4.5552	20.7500

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG17 (1)	12.3333	9.8426	14.8241
CAI SPG22 (2)	12.0000	8.4986	15.5014
Mean Difference (1-2)	0.3333	-2.3843	3.0510

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.3333
Variance	15.6250
Pearson R	0.6351
Test Statistic	0.2828
Degrees of Freedom	8

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.3060	p-value	0.7845	H1 (5%)	Rejected

<u>CONCLUSION</u>: |t|<2.3060 ($t_{0.05(2),\,8}$). Therefore, there was <u>no significant difference</u> in the mean CAI for *Corymbia calophylla* trees at Collard's Wetland sites between Spring 2017 and Spring 2022.

<u>(e) Collard's Wetland sites: *Eucalyptus rudis*</u>

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
CAI SPG17 (1)	26	13.3462	3.3099	10.9554
CAI SPG22 (2)	26	12.1154	4.8689	23.7062

Means Report

VAR	Mean	95% LCL	95% UCL
CAI SPG17 (1)	13.3462	12.0093	14.6830
CAI SPG22 (2)	12.1154	10.1488	14.0820
Mean Difference (1-2)	1.2308	-0.3740	2.8355

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	1.2308
Variance	17.3308
Pearson R	0.5857
Test Statistic	1.5796
Degrees of Freedom	25

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0595	p-value	0.1268	H1 (5%)	Rejected

<u>CONCLUSION</u>: |t|<2.0595 ($t_{0.05(2),\,25}$). Therefore, there was <u>no significant difference</u> in the mean CAI for *Eucalyptus rudis* trees at Collard's Wetland sites between Spring 2017 and Spring 2022.

2 (ii) Collard's Wetland Sites : Foliage Health Index (FHI)

(Compare Means : Spring2017 (pre-mining) and Spring2022 monitoring data)

(a) Collard's Wetland sites: All tree species

Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
FH SPG17 (1)	96	4.6146	0.6047	0.3657
FH SPG22 (2)	96	4.6771	0.8271	0.6841

Means Report

VAR	Mean	95% LCL	95% UCL
FH SPG17 (1)	4.6146	4.4921	4.7371
FH SPG22 (2)	4.6771	4.5095	4.8447
Mean Difference (1-2)	-0.0625	-0.0925	0.2175

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	-0.0625
Variance	0.5249
Pearson R	0.4641
Test Statistic	0.8003
Degrees of Freedom	95

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	1.9853	p-value	0.4255	H1 (5%)	Rejected

CONCLUSION: |t|<1.9853 ($t_{0.05(2),\,95}$) Therefore, there was no significant difference in the FHI for all tree species at all Collard's Wetland sites between Spring 2017 and Spring 2022.

(b) Collard's Wetland sites: *Melaleuca preissiana*

Compare Means
Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
FH SPG17 (1)	36	4.6111	0.6449	0.4159
FH SPG22 (2)	36	4.7778	0.5404	0.2921

Means Report

VAR	Mean	95% LCL	95% UCL
FH SPG17 (1)	4.6111	4.3929	4.8293
FH SPG22 (2)	4.7778	4.5949	4.9606
Mean Difference (1-2)	-0.1667	-0.0826	0.4160

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	-0.1667
Variance	0.3540
Pearson R	0.2368

Test Statistic	1.3572
Degrees of Freedom	35

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0301	p-value	0.1834	H1 (5%)	Rejected

CONCLUSION: |t|<2.0301 ($t_{0.05(2),35}$). Therefore, there was no significant difference in *Melaleuca preissiana* FHI at all Collard's between Spring 2017 and Spring 2022.

(c) Collard's Wetland sites: *Melaleuca rhaphiophylla*

Paired t-test couldn't be run because SD of 2022 FHI for *Melaleuca rhaphiophylla* was 0.

CONCLUSION: Mean FHI for *Melaleuca rhaphiophylla* in Spring 2022 was '5'. That was slightly higher than the FHI mean for *Melaleuca rhaphiophylla* in Spring 2017. **Therefore, there was no significant difference in *Melaleuca rhaphiophylla* FHI at Collard's between Spring 2017 and Spring 2022.**

(d) Collard's Wetland sites: *Corymbia calophylla*

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
FH SPG17 (1)	9	4.3333	0.5000	0.2500
FH SPG22 (2)	9	4.3333	0.5000	0.2500

Means Report

VAR	Mean	95% LCL	95% UCL
FH SPG17 (1)	4.3333	3.9490	4.7177
FH SPG22 (2)	4.3333	3.9490	4.7177
Mean Difference (1-2)	0.0000	-0.5435	0.5435

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.0000
Variance	0.2500
Pearson R	0.0000
Test Statistic	0.0000
Degrees of Freedom	8

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.3060	p-value	1.0000	H1 (5%)	Rejected

CONCLUSION: |t| <2.3060 ($t_{0.05(2),8}$). Therefore no significant difference in *Corymbia calophylla* FHI between Spring 2017 and Spring 2022.

(e) Collard's Wetland sites: *Eucalyptus rudis*

Compare Means

Descriptive Statistics

VAR	N	Mean	Std Dev	Variance
FH SPG17 (1)	26	4.3846	0.6972	0.4862
FH SPG22 (2)	26	4.3462	1.3548	1.8354

Means Report

VAR	Mean	95% LCL	95% UCL
FH SPG17 (1)	4.3846	4.1030	4.6662
FH SPG22 (2)	4.3462	3.7990	4.8934
Mean Difference (1-2)	0.0385	-0.4110	0.4880

Paired two-sample t-test

Hypothesized Mean Difference	0.0000
Mean Difference	0.0385
Variance	1.1608
Pearson R	0.5733
Test Statistic	0.1762
Degrees of Freedom	25

H1: Mu1 - Mu2 ≠ 0 / Not equal (two-tailed)

t Critical Value (5%)	2.0595	p-value	0.8615	H1 (5%)	Rejected

<u>CONCLUSION</u>: |t| <2.0595($t_{0.05(2),\,25}$). Therefore there is <u>no significant difference</u> in *Eucalyptus rudis* FHI between Spring 2017 and Spring 2022.

APPENDIX FIVE. Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species.

(Data is shown for Spring 2019, 2020, 2021 and 2022 (mining period) and the most recent pre-mining survey for each Location/GDV Type, as this pre-mining data was the best available to approximate the tree canopy condition immediately prior to the commencement of mining. The dataset for each Location/GDV Type was edited to include dead trees only if the tree died after the time of the pre-mining data used for each particular Location/GDV Type. Data for trees added to the monitoring program after Spring 2015 was included if the tree was monitored during the particular pre-mining survey used for that Location/GDV Type (see Appendices 3&4)).

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
BNR01	6					15.0	3.6	15.7	3.0	15.8	3.5					4.7	0.5	4.3	0.5	4.8	0.4
Ba	5					16.2	2.3	16.6	2.2	17.2	1.1					4.8	0.4	4.4	0.5	5.0	0.0
Bm	1					9.0	na	11.0	na	9.0	na					4.0	na	4.0	na	4.0	na
BNR02	11					17.0	1.9	16.7	2.0	17.5	1.9					4.7	0.5	4.5	0.5	5.0	0.0
Ba	7					16.9	2.2	16.6	2.2	17.4	2.0					4.7	0.5	4.6	0.5	5.0	0.0
Bm	4					17.3	1.7	17.0	1.6	17.5	1.9					4.8	0.5	4.5	0.6	5.0	0.0
BNR03	8					13.5	3.5	12.6	5.9	12.1	5.8					3.8	0.5	3.5	1.4	3.9	1.6
Ba	5					11.8	3.3	10.0	6.2	9.6	6.0					3.6	0.5	3.2	1.8	3.4	1.9
Bm	3					16.3	1.2	17.0	0	16.3	1.2					4.0	0	4.0	0	4.7	0.6
BNR04	7					15.7	3.0	16.4	3.6	16.6	3.5					4.6	0.5	4.4	0.5	4.1	0.7
Ba	3					14.3	3.1	14.0	3.0	14.3	3.1					4.7	0.6	4.3	0.6	4.3	0.6
Bm	4					16.8	2.9	18.3	3.0	18.3	3.0					4.5	0.6	4.5	0.6	4.0	0.8
BNR05	7					16.1	3.6	16.4	3.2	16.0	4.0					4.6	0.5	4.6	0.5	4.3	0.8
Ba	5					15.0	3.7	15.4	3.3	14.8	4.0					4.8	0.4	4.6	0.5	4.2	0.8
Bm	2					19.0	0	19.0	0	19.0	2.8					4.0	0	4.5	0.7	4.5	0.7
BNR06	7					15.0	2.3	15.9	1.7	15.7	2.4					4.1	0.4	4.3	0.5	4.0	0.0
Ba	4					14.0	2.6	15.3	2.1	14.8	2.9					4.3	0.5	4.3	0.5	4.0	0.0
Bm	3					16.3	1.2	16.7	0.6	17.0	0.0					4.0	0	4.3	0.6	4.0	0.0
BNR07	11					15.5	1.9	14.6	2.6	14.1	3.3					4.5	0.5	4.3	0.6	4.8	0.4
Ba	5					15.6	2.7	15.4	2.1	15.8	2.6					4.6	0.5	4.6	0.5	4.8	0.4
Bm	6					15.5	1.2	14.0	3.0	12.7	3.3					4.5	0.5	4.0	0.6	4.8	0.4

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2021		Spring 2022								Spring 2021		Spring 2022							
		Mean	SD	Mean	SD							Mean	SD	Mean	SD						
BNR01	6	13.0	7.1	13.8	7.6							4.0	2.0	4.2	2.0						
Ba	5	13.6	7.7	14.6	8.2							4.0	2.2	4.0	2.2						
Bm	1	10.0	na	10.0	na							4.0	na	5.0	na						
BNR02	11	14.0	7.3	14.7	7.6							3.8	1.9	4.1	2.0						
Ba	7	12.1	8.6	12.6	8.8							3.6	2.4	3.6	2.4						
Bm	4	17.3	2.4	18.5	2.5							4.3	0.5	5.0	0.0						
BNR03	8	9.8	6.4	10.5	6.9							3.6	2.3	3.6	2.3						
Ba	5	9.4	5.5	10.0	5.8							3.8	2.2	3.8	2.2						
Bm	3	10.3	9.0	11.3	9.8							3.3	2.9	3.3	2.9						
BNR04	7	14.0	6.8	14.9	7.1							4.1	1.9	4.3	1.9						
Ba	3	9.0	7.9	10.0	8.9							3.3	2.9	3.3	2.9						
Bm	4	17.8	2.5	18.5	2.5							4.8	0.5	5.0	0.0						
BNR05	7	14.9	7.3	15.0	7.4							4.3	1.9	4.3	1.9						
Ba	5	12.8	7.9	13.0	8.0							4.0	2.2	4.0	2.2						
Bm	2	20.0	1.4	20.0	1.4							5.0	0.0	5.0	0.0						
BNR06	7	11.0	7.5	12.0	8.2							3.4	2.4	3.6	2.4						
Ba	4	8.0	9.3	8.3	9.5							2.5	2.9	2.5	2.9						
Bm	3	15.0	0.0	17.0	0.0							4.7	0.6	5.0	0.0						
BNR07	11	13.5	5.0	14.3	5.3							4.5	1.5	4.5	1.5						
Ba	5	15.6	2.3	17.0	2.1							5.0	0.0	5.0	0.0						
Bm	6	11.7	6.1	12.0	6.3							4.0	2.0	4.0	2.0						

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
BNR08	8					5.0	0	7.8	2.1	9.6	2.5					5	0	5.0	0	4.9	0.4
Ba	4					5.0	0	7.0	0	8.0	1.4					5	0	5.0	0	5.0	0.0
Bm	4					5.0	0	8.5	3.0	11.3	2.4					5	0	5.0	0	4.8	0.5
BNR09	7					11.9	1.3	11.4	2.1	14.1	3.7					5	0	4.7	0.5	4.7	0.5
Ba	4					11.3	1.0	10.5	2.4	13.0	4.2					5	0	4.8	0.5	4.8	0.5
Bm	3					12.7	1.5	12.7	1.2	15.7	2.9					5	0	4.7	0.6	4.7	0.6
BNR10	11					14.0	2.4	13.3	3.0	12.8	5.7					4.6	0.5	4.3	0.6	3.6	1.4
Ba	8					13.3	2.4	12.5	3.0	11.5	6.3					4.5	0.5	4.3	0.7	3.5	1.7
Bm	3					16.0	1.0	15.3	2.1	16.3	0.6					5.0	0	4.3	0.6	4.0	0.0
BNR11	9					17.4	1.7	17.9	1.9	18.4	1.4					4.7	0.5	4.3	0.5	4.1	0.3
Ba	3					18.7	0.6	20.0	1.0	19.7	1.2					4.7	0.6	4.7	0.6	4.0	0.0
Bm	6					16.8	1.8	16.8	1.2	17.8	1.2					4.7	0.5	4.2	0.4	4.2	0.4
BNR12	5					16.0	1.6	16.8	2.3	16.0	1.6					4.6	0.5	4.4	0.5	4.0	0.0
Ba	4					16.0	1.8	17.0	2.6	16.0	1.8					4.8	0.5	4.5	0.6	4.0	0.0
Bm	1					16.0	na	16.0	na	16.0	na					4.0	na	4.0	na	4.0	na
BNR13	8					15.0	2.4	15.1	1.7	16.5	2.1					4.6	0.5	4.6	0.5	4.6	0.5
Ba	4					15.3	2.1	15.8	1.5	16.5	2.1					4.5	0.6	4.5	0.6	4.5	0.6
Bm	4					14.8	3.0	14.5	1.9	16.5	2.5					4.8	0.5	4.8	0.5	4.8	0.5

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2021		Spring 2022								Spring 2021		Spring 2022							
		Mean	SD	Mean	SD							Mean	SD	Mean	SD						
BNR08	8	10.9	3.2	12.6	2.8							5.0	0.0	5.0	0.0						
Ba	4	9.5	2.5	11.5	2.1							5.0	0.0	5.0	0.0						
Bm	4	12.3	3.5	13.8	3.3							5.0	0.0	5.0	0.0						
BNR09	7	15.0	2.8	15.4	3.0							5.0	0.0	5.0	0.0						
Ba	4	14.5	3.4	15.0	3.8							5.0	0.0	5.0	0.0						
Bm	3	15.7	2.1	16.0	2.0							5.0	0.0	5.0	0.0						
BNR10	11	13.1	5.6	13.4	5.6							4.3	1.6	4.5	1.5						
Ba	8	11.6	5.9	12.0	5.9							4.0	1.8	4.4	1.8						
Bm	3	17.0	2.0	17.0	2.0							5.0	0.0	5.0	0.0						
BNR11	9	16.6	6.3	16.8	6.4							4.4	1.7	4.4	1.7						
Ba	3	13.3	11.6	13.3	11.6							3.3	2.9	3.3	2.9						
Bm	6	18.2	0.8	18.5	0.5							5.0	0.0	5.0	0.0						
BNR12	5	14.6	2.3	16.8	2.5							4.4	1.3	4.8	0.4						
Ba	4	15.3	2.1	17.8	1.5							5.0	0.0	5.0	0.0						
Bm	1	12.0	na	13.0	na							2.0	na	4.0	na						
BNR13	8	9.8	8.3	10.6	9.0							3.1	2.6	3.0	2.5						
Ba	4	12.5	8.3	13.3	8.9							3.8	2.5	3.8	2.5						
Bm	4	7.0	8.4	8.0	9.6							2.5	2.9	2.3	2.6						

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CW01	8			19.5	1.8			18.9	1.7	18.5	1.6			5.0	0			5.0	0	4.9	0.4
Mp	8			19.5	1.8			18.9	1.7	18.5	1.6			5.0	0			5.0	0	4.9	0.4
CW02	8			15.9	3.1			15.3	3.3	16.6	2.2			4.8	0.5			4.8	0.5	5.0	0.0
Er	3			13.3	4.0			11.7	2.5	14.7	2.3			4.3	0.6			4.3	0.6	5.0	0.0
Mr	5			17.4	0.9			17.4	0.9	17.8	1.1			5.0	0			5.0	0	5.0	0.0
CW03	8			13.3	5.2			13.0	5.5	14.0	5.7			4.5	1.1			4.5	1.1	4.9	0.4
Er	3			7.3	2.1			7.0	3.5	8.0	3.6			3.7	1.5			3.7	1.5	4.7	0.6
Mr	5			16.8	1.8			16.6	1.8	17.6	2.6			5.0	0			5.0	0	5.0	0.0
CW04	11			13.1	2.6			10.9	3.2	11.5	3.2			4.6	0.5			4.5	0.5	4.6	0.5
Er	5			12.4	3.0			8.0	2.2	9.4	2.7			4.2	0.4			4.2	0.4	5.0	0.0
Mp	5			13.6	2.5			13.2	1.3	12.6	1.8			5.0	0			4.8	0.4	4.2	0.4
Mr	1			14.0	na			14.0	na	17.0	na			5.0	na			5.0	na	5.0	na
CW05	7			12.3	4.2			11.9	4.9	11.6	5.1			4.9	0.4			4.6	0.5	4.6	0.5
Cc	4			10.5	3.7			9.8	4.9	9.0	4.2			4.8	0.5			4.3	0.5	4.3	0.5
Mp	3			14.7	4.2			14.7	4.2	15.0	4.4			5.0	0			5.0	0	5.0	0.0
CW06	5			17.8	1.1			17.8	1.1	18.6	0.9			4.8	0.4			5.0	0	5.0	0.0
Mr	5			17.8	1.1			17.8	1.1	18.6	0.9			4.8	0.4			5.0	0	5.0	0.0

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2021		Spring 2022								Spring 2021		Spring 2022							
		Mean	SD	Mean	SD							Mean	SD	Mean	SD						
CW01	8	18.1	1.8	18.4	1.4							4.8	0.5	4.9	0.4						
Mp	8	18.1	1.8	18.4	1.4							4.8	0.5	4.9	0.4						
CW02	8	17.5	1.7	17.9	1.4							5.0	0.0	5.0	0.0						
Er	3	16.0	1.7	16.3	0.6							5.0	0.0	5.0	0.0						
Mr	5	18.4	0.9	18.8	0.4							5.0	0.0	5.0	0.0						
CW03	8	13.9	6.8	14.0	7.0							4.4	1.8	4.4	1.8						
Er	3	7.3	6.4	7.0	6.2							3.3	2.9	3.3	2.9						
Mr	5	17.8	3.0	18.2	2.8							5.0	0.0	5.0	0.0						
CW04	11	12.2	2.3	12.8	2.3							4.5	0.5	4.8	0.4						
Er	5	10.8	1.8	11.8	2.6							4.2	0.4	5.0	0.0						
Mp	5	12.6	1.1	13.0	0.7							4.8	0.4	4.6	0.5						
Mr	1	17.0	na	17.0	na							5.0	na	5.0	na						
CW05	7	10.4	3.9	11.6	4.9							4.6	0.5	4.4	0.5						
Cc	4	8.5	4.0	9.3	5.2							4.3	0.5	4.3	0.5						
Mp	3	13.0	1.7	14.7	2.3							5.0	0.0	4.7	0.6						
CW06	5	18.4	0.9	18.8	0.4							4.6	0.5	5.0	0.0						
Mr	5	18.4	0.9	18.8	0.4							4.6	0.5	5.0	0.0						

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020		Spring 2015		Spring 2017		Spring 2018		Spring 2019		Spring 2020	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CW07	7			16.4	1.6			16.9	1.9	17.4	1.8			4.9	0.4			4.9	0.4	5.0	0.0
Er	1			14.0	na			15.0	na	17.0	na			4.0	na			4.0	na	5.0	na
Mr	6			16.8	1.3			17.2	1.8	17.5	2.0			5.0	0			5.0	0	5.0	0.0
CW08	10			15.7	1.8			13.6	2.2	12.7	2.9			5.0	0			4.8	0.4	5.0	0.0
Er	5			16.4	0.5			13.6	1.8	14.6	1.3			5.0	0			4.6	0.5	5.0	0.0
Mp	5			15.0	2.4			13.6	2.7	10.8	2.9			5.0	0			5.0	0	5.0	0.0
CW09	8			12.4	2.6			11.8	2.3	11.8	1.7			4.1	0.4			4.4	0.5	4.4	0.5
Cc	3			13.0	2.6			13.0	2.6	12.0	1.7			4.0	0			4.7	0.6	4.7	0.6
Er	1			15.0	na			14.0	na	14.0	na			5.0	na			4.0	na	5.0	na
Mp	4			11.3	2.5			10.3	1.0	11.0	1.4			4.0	0			4.3	0.5	4.0	0.0
CW10	6			15.8	1.2			12.3	4.9	12.8	4.0			4.5	0.5			4.0	1.1	4.8	0.4
Er	3			15.3	1.5			8.3	3.5	9.7	3.1			4.0	0			3.0	0	4.7	0.6
Mr	3			16.3	0.6			16.3	0.6	16.0	0.0			5.0	0			5.0	0	5.0	0.0
CW11	10			13.2	2.1			10.3	3.9	9.7	4.1			4.3	0.8			3.9	0.7	3.8	1.5
Er	5			13.2	1.9			7.6	3.1	7.2	4.3			4.6	0.5			3.6	0.9	3.6	2.1
Mp	5			13.2	2.6			13.0	2.5	12.2	1.9			4.0	1.0			4.2	0.4	4.0	0.7
CW12	8			11.5	3.8			10.4	4.1	10.5	3.9			4.1	0.6			4.1	1.0	3.9	0.8
Cc	2			15.0	0			10.0	2.8	13.0	1.4			4.0	0			4.5	0.7	4.0	0.0
Mp	6			10.3	3.7			10.5	4.6	9.7	4.1			4.2	0.8			4.0	1.1	3.8	1.0
TOTAL trees	303																				

APPENDIX FIVE (cont). Tree crown assessment index and foliar health index values (mean and standard deviation), by site by tree species

Site[a] / Tree species[b]	Tree Count	Crown Assessment Index										Foliage Health Index (FHI)									
		Spring 2021		Spring 2022								Spring 2021		Spring 2022							
		Mean	SD	Mean	SD							Mean	SD	Mean	SD						
CW07	7	16.6	2.4	17.7	1.7							4.6	0.5	4.9	0.4						
Er	1	13.0	na	16.0	na							4.0	na	4.0	na						
Mr	6	17.2	1.9	18.0	1.7							4.7	0.5	5.0	0.0						
CW08	10	12.4	2.3	12.6	3.8							4.4	0.7	5.0	0.0						
Er	5	13.6	1.1	15.0	2.4							5.0	0.0	5.0	0.0						
Mp	5	11.2	2.7	10.2	3.6							3.8	0.4	5.0	0.0						
CW09	8	12.6	1.7	12.3	4.6							4.5	0.5	4.9	0.4						
Cc	3	13.7	0.6	16.0	1.0							5.0	0.0	4.7	0.6						
Er	1	15.0	na	17.0	na							5.0	na	5.0	na						
Mp	4	11.3	1.0	8.3	2.4							4.0	0.0	5.0	0.0						
CW10	6	12.7	3.1	14.3	4.3							4.7	0.5	4.7	0.5						
Er	3	11.0	3.6	12.7	6.1							4.3	0.6	4.3	0.6						
Mr	3	14.3	1.5	16.0	0.0							5.0	0.0	5.0	0.0						
CW11	10	10.1	3.6	10.4	4.1							3.7	1.3	4.1	1.5						
Er	5	8.4	4.7	8.0	4.7							3.2	1.8	3.2	1.8						
Mp	5	11.8	0.4	12.8	1.1							4.2	0.4	5.0	0.0						
CW12	8	10.9	3.6	10.6	3.5							4.0	0.5	4.3	0.9						
Cc	2	12.0	1.4	11.5	2.1							4.0	0.0	4.0	0.0						
Mp	6	10.5	4.1	10.3	3.9							4.0	0.6	4.3	1.0						
TOTAL trees	303																				