South Capel Remediation Project, WA

EPBC 2018/8250

Annual Compliance Report

23 September 2021 – 22 September 2022

Revision: 0

Date: 5 October, 2022

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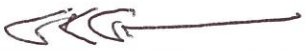
Document control

Revision	Details of review or changes	Prepared by	Date created
Rev A	Draft prepared for internal review	TD	23/09/2022
Rev 0	Final for submission	TD	5/10/2022

Declaration of accuracy

In making this declaration, I am aware that sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: 

Garry Green

Southwest Operations Manager

Iluka Resources Limited

Date: 12-10-2022.

Table of contents

List of tables

List of figures

List of plates

1 Introduction

The South Capel Remediation Project (SCRP) being undertaken by Iluka Resources Ltd (Iluka) is remediating point sources of groundwater contamination associated with historic by-product storage. In July 2018, Iluka referred the SCRP to the Department of Agriculture, Water and the Environment[1] (the Department) under the *Environmental Protection and Biodiversity Conservation Act 1999*. In October 2018, Iluka received formal notification that the SCRP was a controlled action likely to have significant impact on Matters of National Environmental Significance including listed flora species and the Western Ringtail Possum (WRP) (*Pseudocheirus occidentalis*). On the 19 September 2019 approval was granted for the controlled action (EPBC 2018/8250) as per details in Section 1.1.

Works under Phase 1 of the SCRP were completed in June 2020, with completion reporting submitted to the Department of Water and Environmental Regulation (DWER) in August 2020.

1.1 EPBC Approval Details

Approval Number:	EPBC 2018/8250
Approval Holder:	Iluka Resources Limited
Duration:	This approval has effect until 31st December 2045
Action:	To undertake remediation works at Capel Dry Plant and South Capel mineral sands mining and processing site [see EPBC Act referral 2018/8250].

1.2 Purpose

The purpose of this report is to document compliance with conditions under EPBC 2018/8250 as required by Condition 11 which states:

> *"The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must:*
>
> *a. publish each compliance report on the website within 20 business days following the relevant 12 month period;*
>
> *b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication, and provide a link to the location of the published report;*
>
> *c. keep all compliance reports publicly available on the website until this approval expires;*
>
> *d. exclude or redact sensitive ecological data from compliance reports published on the website; and*
>
> *e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication."*

Iluka have nominated the 12 month period as being from the 23rd of September – the date the action commenced. The compliance status and updates are provided in Table 1.

[1] Known as the Department of Climate Change, Energy, the Environment and Water since 23 June 2022

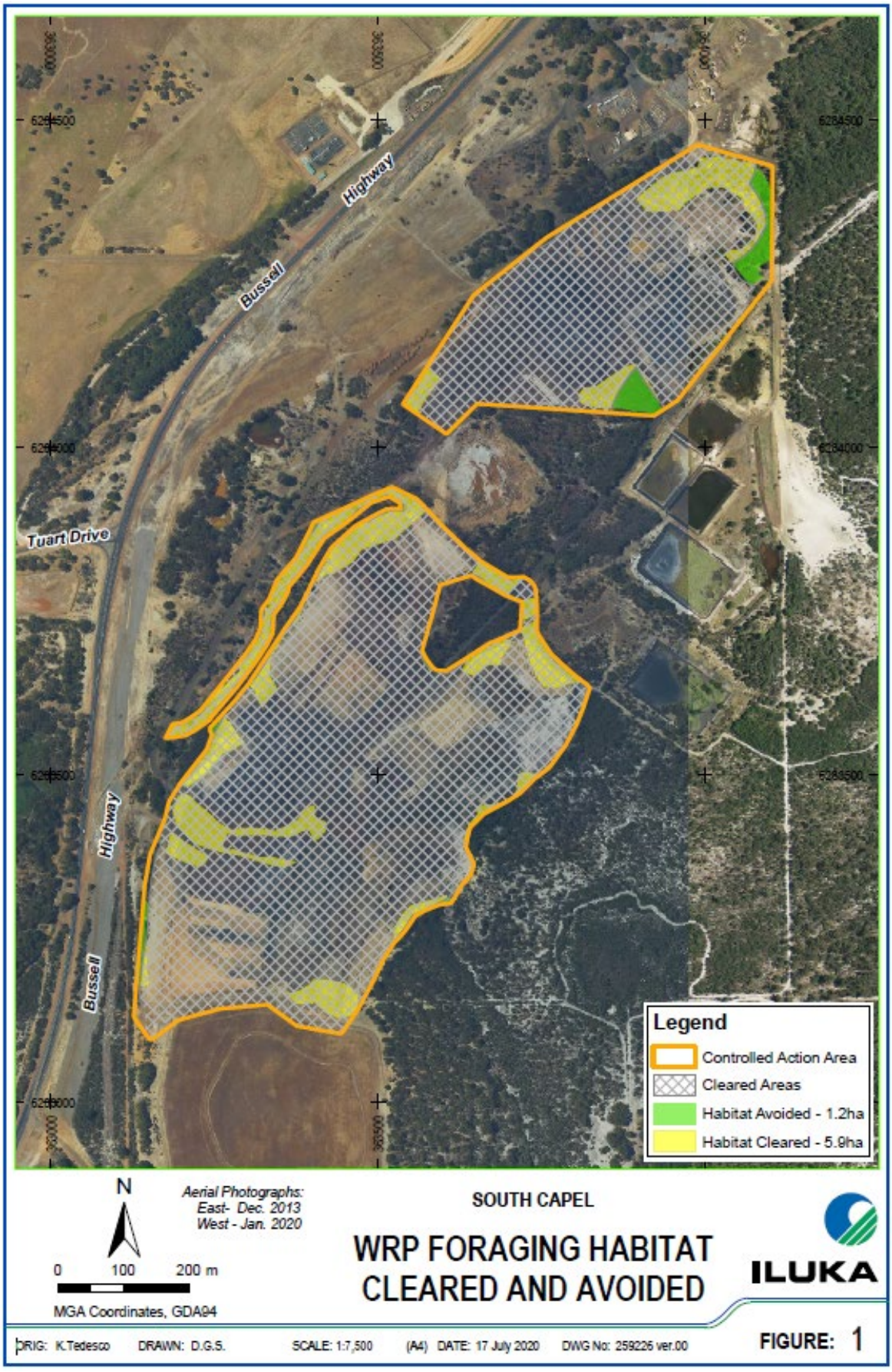


Figure 1 – South Capel WRP Disturbance Area

Figure 2 – Capel Dry Plant WRP Disturbance Area

1.3 Project Status

For the period 23 September 2021 to 22 September 2022, the following works were completed for the Western Ringtail Possum Habitat area:

- Year 1 monitoring; and
- Weed control works.

RPS Group Australia (RPS) have been appointed to undertake the monitoring program with Year 1 monitoring completed in October 2021. The Revegetation Monitoring Report (RPS, 2022) is provided within Appendix A.

Weed control occurred via spot spray application over Western Ringtail Possum Habitat area in June and July 2022. Application was targeting annual weeds germinating post autumn rainfall.

Woody weeds made up of eastern states Acacias (namely *Acacia iteaphylla* and *Acacia longifolia*) were recorded as part of the RPS Monitoring Report. Woody weed germinants within the planting area were hand pulled, however there were numerous mature plants in the adjacent established vegetation. A woody weed control program targeting these established plants will commence in October 2022.

Activities planned for 2023 within the offset area will be guided by the actions detailed within the RPS monitoring report. Work may include infill planting, weed control or other remedial works as per the Revegetation Management Plan. The second round of monitoring post planting will be conducted in spring 2022.

2 Compliance Audit

Table 1 Compliance with conditions of EPBC 2018/8250 for the 2021 / 2022 reporting period

Condition	Summary of Condition	Compliance	Comments
1	The approval holder must not clear more than 8.44 hectares of Western Ringtail Possum habitat, designated as 'WRP Habitat' on the maps at Appendices B and C, within the project area.	Compliant	A total of 6.68 ha of Western Ringtail Possum habitat was cleared as part of the SCRP as shown in Figures 1 and 2. No further clearing has occurred during the reporting period.
2	For the protection of Western Ringtail Possum, the approval holder must: a. implement the Revegetation Management Plan b. undertake rehabilitation work in accordance with the Revegetation Management Plan c. ensure that a suitably qualified fauna ecologist undertakes preclearance surveying for Western Ringtail Possum prior to all clearing and is present during all clearing. If Western Ringtail Possums are present in the area to be cleared, then translocation is required and all translocation must be overseen on site by a suitably qualified field ecologist. The approval holder must continue rehabilitation work until the completion criteria are met for all areas that are subject to the Revegetation Management Plan.	Compliant	Revegetation activites were undertaken in accordance with the Revegetation Management Plan. No further clearing has occurred during the reporting period.
3	For the protection of Western Ringtail Possum, the approval holder must engage a suitably qualified ecologist to assess the level of success of rehabilitation and undertake the following tasks: a. By the ten year anniversary of the commencement of planting, assess the success of rehabilitation to determine the extent to which the completion criteria have been met b. Produce and submit to the Department a report evaluating the success of rehabilitation (Rehabilitation Report), within three months of the ten year anniversary of the commencement of planting. If required by the Department, the approval holder must undertake additional ecological assessments and works that contribute to the achievement of completion criteria, as directed by the Department, until the completion criteria have been achieved.	N/A	Revegetation activites were completed in winter of 2021. RPS Group Australia have been appointed to undertake the rehabilitation monitoring program. Year 1 monitoring was completed in October 2021. Year 2 monitoring is scheduled for October 2022.

Condition	Summary of Condition	Compliance	Comments
4	To compensate for the loss of 8.44 hectares of Western Ringtail Possum habitat, the approval holder must, by 31 January 2030, secure the offset site in perpetuity by registering on title a conservation covenant established under section 30B of the *Soil and Land Conservation Act 1945* (WA), or by an alternative approach to legally securing the offset site as agreed in advance by the Department in writing.	N/A	Covenant will be sought once the revegetation site is established.
5	The approval holder must notify the Department in writing of the date of commencement of the action within 10 business days after the date of commencement of the action.	Compliant	Action commenced 23/09/2019. The Department was notified by letter, dated 25/09/2019.
6	If the commencement of the action does not occur within 5 years from the date of this approval, then the approval holder must not commence the action without the prior written agreement of the Minister.	N/A	Not relevant. The action commenced within 5 years of the date of approval.
7	The approval holder must maintain accurate and complete compliance records.	Compliant	Records are maintained with Iluka's document control system.
8	If the Department makes a request in writing, the approval holder must provide electronic copies of compliance records to the Department within the timeframe specified in the request.	N/A	No request received during reporting period.
9	The approval holder must: a. submit plans electronically to the Department for approval by the Minister; b. publish each plan on the website within 10 business days of the date the plan is approved by the Minister or of the date a revised action management plan is submitted to the Minister or Department, unless otherwise agreed to in writing by the Minister; c. exclude or redact sensitive ecological data from plans published on the website or provided to a member of the public; and d. keep plans published on the website until the end date of this approval.	N/A	No plans or revised plans developed during reporting period.
10	The approval holder must ensure that any monitoring data (including sensitive ecological data), surveys, maps, and other spatial and metadata required under a plan is prepared in accordance with the Department's Guidelines for biological survey and mapped data (2018) and submitted electronically to the Department in accordance with the requirements of the plan within 3 months of each monitoring event.	N/A	No relevant monitoring data captured during reporting period.

Condition	Summary of Condition	Compliance	Comments
11	The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must: a. publish each compliance report on the website within 20 business days following the relevant 12 month period; b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication, and provide a link to the location of the published report; c. keep all compliance reports publicly available on the website until this approval expires; d. exclude or redact sensitive ecological data from compliance reports published on the website; and e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication.	Compliant	This report satisfies this condition. Available on the Iluka website at: https://iluka.com/sustainability/transparency-hub There is no information deemed ecologically sensitive in this report.
12	The approval holder must notify the Department in writing of any: incident; non-compliance with the conditions; or non-compliance with the commitments made in plans. The notification must be given as soon as practicable, and no later than two business days after becoming aware of the incident or non-compliance. The notification must specify: a. any condition which is or may be in breach; b. a short description of the incident and/or non-compliance; and c. the location (including coordinates), date and time, to the extent that these can be determined, of the incident and/or non-compliance.	N/A	No incidents or non-compliances with conditions or plans occurred during reporting period.
13	The approval holder must provide to the Department the details of any incident or non-compliance with the conditions or commitments made in plans as soon as practicable and no later than 10 business days after becoming aware of the incident or non-compliance, specifying: a. any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future; b. the potential impacts of the incident or non-compliance; and c. the method and timing of any remedial action that will be undertaken by the approval holder.	N/A	No incidents or non-compliances with conditions or plans occurred during reporting period.
14	The approval holder must ensure that independent audits of compliance with the conditions are conducted as requested in writing by the Minister.	N/A	No request for independent audits was made by the Minister.

Condition	Summary of Condition	Compliance	Comments
15	For each independent audit, the approval holder must: a. provide the name and qualifications of the independent auditor and the draft audit criteria to the Department; b. only commence the independent audit once the auditor and audit criteria have been approved in writing by the Department; and c. submit an audit report to the Department within the timeframe specified in the approved audit criteria.	N/A	No request for independent audits was made by the Minister.
16	The approval holder must publish the audit report on the website within 10 business days of receiving the Department's approval of the audit report and keep the audit report published on the website until the end date of this approval.	N/A	No request for independent audits was made by the Minister.
17	The approval holder may, at any time, apply to the Minister for a variation to an action management plan approved by the Minister under condition 2, or as subsequently revised in accordance with these conditions, by submitting an application in accordance with the requirements of section 143A of the EPBC Act. If the Minister approves a revised action management plan (RAMP) then, from the date specified, the approval holder must implement the RAMP in place of the previous action management plan	N/A	No variation was requested.
18	The approval holder may choose to revise an action management plan approved by the Minister under condition 2, or as subsequently revised in accordance with these conditions, without submitting it for approval under section 143A of the EPBC Act, if the taking of the action in accordance with the RAMP would not be likely to have a new or increased impact.	N/A	No revision was requested.

Condition	Summary of Condition	Compliance	Comments
19	If the approval holder makes the choice under condition 18 to revise an action management plan without submitting it for approval, the approval holder must: a. notify the Department in writing that the approved action management plan has been revised and provide the Department with: i. an electronic copy of the RAMP; ii. an electronic copy of the RAMP marked up with track changes to show the differences between the approved action management plan and the RAMP; iii. an explanation of the differences between the approved action management plan and the RAMP; iv. the reasons the approval holder considers that taking the action in accordance with the RAMP would not be likely to have a new or increased impact; and v. written notice of the date on which the approval holder will implement the RAMP (RAMP implementation date), being at least 60 business days after the date of providing notice of the revision of the action management plan, or a date agreed to in writing with the Department. b. subject to condition 21, implement the RAMP from the RAMP implementation date.	N/A	No revision was requested.
20	The approval holder may revoke their choice to implement a RAMP under condition 18 at any time by giving written notice to the Department. If the approval holder revokes the choice under condition 18, the approval holder must implement the action management plan in force immediately prior to the revision undertaken under condition 18.	N/A	No revision was requested.
21	If the Minister gives a notice to the approval holder that the Minister is satisfied that the taking of the action in accordance with the RAMP would be likely to have a new or increased impact, then: a. condition 18 does not apply, or ceases to apply, in relation to the RAMP; and b. the approval holder must implement the action management plan specified by the Minister in the notice.	N/A	No revision was requested.
22	At the time of giving the notice under condition 21, the Minister may also notify that for a specified period of time, condition 18 does not apply for one or more specified action management plans.	N/A	No revision was requested.

Condition	Summary of Condition	Compliance	Comments
23	Within 10 days after the completion of the action, the approval holder must notify the Department in writing and provide completion data.	N/A	The action is not yet complete.

3 Revegetation Management Plan Compliance Review

3.1 Status of Revegetation

Remediation activities were completed in June 2020 and revegetation activities were completed in Winter of 2021. To date, revegetation and monitoring activities have been completed in line with the timeline of revegetation works detailed in Table 2.

Table 2 Timeline of revegetation activities

Activity	2019		2020				2021				2022	2023	2024	2025	2026	2027	2028	2029	2030
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4									
Remediation	X	X	X	X															
Final landform development				X															
Installation of interceptor and water harvesting banks				X				*											
Deep ripping								X											
Mulching								X											
Fencing								X											
Weed control								X	*		X								
Planting								X			*	*	*		*		*		*
Monitoring									X										

X = Completed; * If required

Plate 1 and Plate 2 illustrates the development within one quadrat over a twelve month period. Plate 3 provides a broader view of plant establishment across the site.

Plate 1 – WRP Offset Area Monitoring Quadrat October 2021

Plate 2 – WRP Offset Area Monitoring Quadrat October 2022

Plate 3 – Plant Establishment October 2022

4 References

Iluka Resources Limited (2019). South Capel Remediation Project Revegetation Management Plan. EPBC 2018/8250, July 2019.

RPS Australia (2022). Revegetation Monitoring Report, South Capel Remediation Project. May 2022.

Appendix A: Year 1 Revegetation Monitoring Report

REVEGETATION MONITORING REPORT

South Capel Remediation Project

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Rev 0
02 May 2022

rpsgroup.com

Document status

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G. Yeatman 02 May 2022

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Contents

Tables

Figures

Appendices

1 INTRODUCTION & PROJECT BACKGROUND

1.1 Introduction & Purpose

Iluka Resources Ltd (Iluka) have commenced the South Capel Remediation Project (SCRP) as part of their commitment to obligations under the Western Australian (WA) *Contaminated Sites Act 2003* by remediating point sources of underground water contamination associated with the historic by-product storage at the Capel Dry Plant (CDP) and the South Capel Site.

RPS AAP Consulting Pty Ltd (RPS) contracted Ecosystem Solutions Pty Ltd to:

1) survey revegetation works for Iluka Resources Ltd's (Iluka) South Capel Remediation Project (SCRP, Figure 1) and report results,
2) to assess progress towards achieving the completion criteria defined in Table 5 of the SCRP Revegetation Management Plan (RMP) and Condition 4 of Native Vegetation Clearing Permits CPS 8066/1 and 8092/1). It should be noted that this aspect is not formally required under the RMP until Year 5, 7 and 10 of revegetation works (Section 3.9 of RMP).

This report supports the monitoring and reporting requirements outlined in the South Capel Remediation Project Revegetation Management Plan (July 2019) and the 'CPS 8066/1 and CPS 8092/1 Offset proposal and associated attachments', which are requirements under the following SCRP approvals:

Table 1 SCRP Revegetation/Offset Management Plan Approvals

Act	Approval/ Permit	Assessing Agency	Condition
Environment Protection and Biodiversity Conservation Act 1999 (Cth).	**EPBC 2018/8250**	Dept of Agriculture, Water and Environment.	Condition 2: *For the protection of Western Ringtail Possum, the approval holder must:* *a. implement the Revegetation Management Plan* *b. undertake rehabilitation work in accordance with the Revegetation Management Plan* *c. ensure that a suitably qualified fauna ecologist undertakes preclearance surveying for Western Ringtail Possum prior to all clearing and is present during all clearing.* *If Western Ringtail Possums are present in the area to be cleared, then translocation is required and all translocation must be overseen on site by a suitably qualified fauna ecologist.* *The approval holder must continue rehabilitation work until the completion criteria are met for all areas that are subject to the Revegetation Management Plan.*
Part V of the *Environmental Protection Act 1986* (WA)	(**CPS 8066/1**)	Department of Water and Environmental Regulation (DWER)	Condition 4. *Offset – Revegetation Within 12 months of completion of remediation works as required under the Contaminated Sites Act 2003 and no later than April 2022, the Permit Holder shall implement and adhere to the revegetation commitments in 'CPS 8066/1 and CPS 8092/1 Offset proposal and associated attachments', including but not limited to the following actions…*
Part V of the *Environmental Protection Act 1986* (WA)	(**CPS 8092/1**)	Department of Mines, Industry Regulation and Safety (DMIRS)	

1.2 Background

In the mid-1950s the CDP began operation to process mineral sands and is no longer operational. South Capel also commenced mining and mineral separation in the mid-1950's and began processing Synthetic Rutile (SR) in 1968. The South Capel mining and processing areas ceased operations in 1999 and have not supported production activities since. Management of mineral sands processing undertaken at the CDP and at South Capel have historically resulted in the storage of by-products on site.

Groundwater monitoring completed by Iluka indicated that there are levels of manganese and sulfate in the shallow groundwater directly underneath and adjacent to the by-product storage areas at both CDP and South Capel, which are above environmental standards. The levels pose a potential risk to the environment if left unabated and may impact water quality in respect to the aesthetics (taste/odour) but do not pose a risk to human health. To minimise the potential for further contamination and allow a natural reduction of the currently elevated levels Iluka has commenced activities to consolidate and contain the material impacting the shallow groundwater.

An extension to the purpose-designed by-product storage facility at South Capel, which resulted in the clearing of vegetation that provided habitat for the critically endangered Western Ringtail Possum (*Pseudocherirus occidentalis*) (WRP), has been completed as part of the remediation work. Approximately 60,000m^3 of historic by-product previously stored at CDP and approximately 407,000m^3 from South Capel have been relocated to the purpose built consolidated storage facility at South Capel. Uncontaminated fill was sourced from South Capel and the Capel Mine Northern Extension.

In July 2018, prior to remedial works, Iluka referred the SCRP to the Department of Environment and Energy (DoEE) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). In October 2018 it was determined that the project was a controlled action. The controlling provisions were listed threatened species and ecological communities, with the WRP being the Matter of National Environmental Significance (MNES). Two clearing permit applications were lodged for the SCRP, one with DWER (CPS 8066/1) for the CDP and the other with the Department of Mines, Industry Regulation and Safety (DMIRS, CPS 8092/1) for South Capel.

It was determined that the residual impacts to habitat for WRP were likely to be significant and that offsets would be required. In response, the South Capel Remediation Project Revegetation Management Plan (SCRP RMP) was prepared (Iluka Resources Ltd, 2019). The Revegetation Management Plan committed to the creation of 14.6 hectares of WRP habitat, with the aim of achieving a quality habitat score of "6" within ten years of revegetation. This plan set out the methods to be used for the implementation of the objective, including species to be planted (Section 2), monitoring, and the completion criteria (Table 2) which the revegetation success would be evaluated against by 10 years post planting.

Revegetation earthworks commenced in 2020 and native vegetation establishment was completed in July 2021. As per the requirement of the SCRP RMP (Table 2), RPS has been engaged to undertake the 'Spring Survey Year 1' post vegetation establishment and associated reporting.

Figure 1: South Capel Remediation Project rehabilitation site (including quadrat placement)

Table 2: SCRP RMP monitoring requirements and completion criteria for the South Capel Offset area

Completion criteria	Monitoring (method, frequency)	Timing	Threshold triggers and remedial actions	Reporting
CC01: No declared weeds present in revegetation	Visual inspection for weeds bi-annually to identify declared weeds	By 10 years post planting	Any declared weeds will be removed or treated	Visual inspection at completion to verify absence of declared weeds. Third-party report by suitably qualified professional verifying completion criteria have been met.
CC02: Weed cover is less than 20% at completion	Spring survey year 1, 2, 3, 5, 7 and 10 after planting. A minimum of ten 10 m × 10 m quadrats will be established	By 10 years post planting	Weeds will be sprayed annually irrespective of percentage cover observed in monitoring	Third party report by suitably qualified professional verifying completion criteria have been met.
CC03: Minimum of 15 species will be selected from WRP habitat/foraging species and established in revegetation prior to completion and will include at least: • Five species that provide foraging value • Five species that provide canopy value • Five species that provide understorey value *(note that one species can provide more than one value)*	Spring survey year 1, 2, 3, 5, 7 and 10 after planting. A minimum of ten 10 m × 10 m quadrats will be established	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows completion criterion has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC04: A density of 800 stems per hectare of species contributing to canopy (trees and shrubs) will be established at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 after planting. A minimum of ten 10 m × 10 m quadrats will be established	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows completion criterion has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC05: No areas greater than 250 m^2 without a developing understorey (foliage cover between 1–50 cm height) at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 after planting. A minimum of ten 10 m × 10 m quadrats will be established	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows completion criterion has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC06: A minimum of 30%[1] cover by species contributing to canopy (trees and shrubs) will be established in revegetation at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 after planting. A minimum of ten 10 m × 10 m quadrats will be established	By 10 years post planting	Infill planting will be conducted from 5 years post planting if scheduled monitoring shows completion criterion is unlikely to be met by 10 years post planting (as assessed by suitably qualified professional)	Third party report by suitably qualified professional verifying completion criteria have been met.

Completion criteria	Monitoring (method, frequency)	Timing	Threshold triggers and remedial actions	Reporting
CC07: A perpetual covenant will be established two years prior to completion	n/a	By 8 years post planting	n/a	Conservation covenant will be registered on the freehold title at time of completion.

[1] "30% cover by species contributing to canopy" is taken to mean any species that is contributing to canopy cover and is not limited to "canopy species" as identified in Table 3. Many shrubs in Table 3 can contribute to canopy cover once they reach maturity.

2 REVEGETATION SPECIES

The SCRMP provided a species list from which revegetation species were to be drawn. The list was comprised of endemic species known to provide habitat and foraging for Western Ringtail Possum. A minimum of 15 species were required to be used as per the completion criteria. A total of 16 species were selected.

One species, *Anigozanthos manglesii*, was unavailable at the time of species selection and was replaced with the comparable species *Anigozanthos flavidus*. *Anigozanthos flavidus* is a south-western species that is found locally. It is usually found in damp situations along drainage lines or fringing wetlands where it can form dense stands and it is likely to be more suited to the Capel site than the *A. manglesii.*

Table 3: Revegetation Species List and Planting Density

Genus and Species	Density (Plants/ha)	Total Number of Plants	WRP Value
Acacia cyclops	75	1,095	Foraging, Ground Protection, Canopy
Acacia pulchella	150	2,190	Ground Protection
Acacia saligna	75	1,095	Foraging, Ground Protection, Canopy
Agonis flexuosa	150	2,190	Foraging, Canopy
Allocasuarina fraseriana	75	1,095	Foraging, Canopy
Anigozanthos flavidus	75	1,095	Ground Protection
Calothamnus quadrifidus	75	1,095	Ground Protection
Corymbia calophylla	200	2,920	Foraging, Canopy
Eucalyptus rudis	200	2,920	Foraging, Canopy
Hardenbergia comptoniana	100	1,460	Foraging, Ground Protection
Kunzea glabrescens	75	1,095	Foraging, Ground Protection, Canopy
Melaleuca preissiana	75	1,095	Foraging, Ground Protection, Canopy
Paraserianthes lophantha	150	2,190	Foraging, Ground Protection, Canopy
Patersonia occidentalis	35	511	Ground Protection
Spyridium globulosum	150	2,190	Foraging, Ground Protection, Canopy
Viminaria juncea.	75	1,095	Ground Protection
TOTALS	**1,735**	**25,331**	

Tube stock was utilised in the revegetation works, which were completed June/July 2021, with a total of 25,331 plants planted over an area of approximately 14.6 ha out of a total of approximately 19.634 ha fenced by Iluka.

3 METHODOLOGY

The SCRP RMP defines the monitoring requirements after native vegetation establishment to measure the successful achievement of the completion criteria for the offset area by 10 years post planting, and is presented below.

As required by the RMP, ten 10 m x 10 m quadrats will be established across the WRP site. Each quadrat will be monitored to demonstrate achievement of the completion criteria (Table 2), including the following parameters:

- Species richness
- Stem density
- Weeds
- Percentage canopy cover
- Size of bare area.

In addition to the above, general observations including vegetation condition, mulch cover, erosion and signs of dieback will also be recorded.

Monitoring of the quadrats in will occur during spring, in accordance with the requirements set out in Section 3.8 of the SCRP RMP at the following intervals;

- Year 1 – first spring following planting (this report).
- Year 2 after planting
- Year 3 after planting
- Year 5 after planting
- Year 7 after planting
- Year 10 after planting.

At Year 5, 7 and 10 a reporting will occur assessing the progress against completion criteria and implementation of remedial actions as per Table 5 of the RMP.

4 SITE SURVEY (YEAR 1 - AFTER PLANTING)

The site was surveyed on 26 and 27 October 2021 by Gary McMahon (BSc, M Mgmt, PG Dip Bushfire Protection); Kelly Paterson (BSc Hons. (Nat Rs Mgmt)); Danae Plowman (BSc Pst Grad Dip. Engy & Env); Lorraine Duffy (BSc (Env Biology), BA Geo); and Dani Cuthbert (Dip Bus & Dip TM) from Ecosystem Solutions. Kelly Paterson holds a Flora Taking (Biological Assessment) Licence (FB62000182).

Ten 10 m × 10 m quadrats were established at the locations provided by RPS using a global positioning system (GPS). RPS chose sites for quadrat placement based on existing soil mapping and previous land use, to capture site variability potentially leading to differences in plant establishment. Consideration was also given to locating quadrats in areas where traversing vegetation works was minimised so as to prevent incidental damage. Each quadrat was marked with a labelled metal fence dropper at each corner. A GPS waypoint was taken at each dropper, allowing for reestablishment of quadrats in future years if required.

A georeferenced photograph of each quadrat was taken from the north-west corner of the quadrat, and this will be repeated at each monitoring event to provide a photographic record of changes.

All quadrats were surveyed, for the parameters listed in Section 3:

- Species richness
  - Each revegetation species that is observed within each quadrat was recorded. Any other native species that had germinated within each quadrat were also recorded. The species richness will be determined on the total number of native species occurring within each quadrat, both from revegetation and natural recruitment.
- Stem density
  - The individual plants of each revegetation species that are observed within each quadrat were counted and recorded, and classified according to habitat value provided (foraging, ground protection, canopy). The stems of any other native species that had germinated within each quadrat will also be recorded. The stem density will be determined as the total number of native species individuals occurring within each quadrat, both from revegetation and natural recruitment.
- Weeds
  - Each quadrat was inspected for the presence of any Declared plants (DPIRD, 2021) and Weeds of National Significance (Weeds Australia, 2021).
  - Weed species within each quadrat were recorded.
  - The percentage cover of weeds within each quadrat was determined via a visual assessment, and recorded.
- Percentage canopy cover
  - The percentage of canopy cover for each quadrat was determined via a visual assessment, and recorded.
- Size of bare area.
  - The percentage of bare area for each quadrat was determined via a visual assessment, and recorded. This measurement will be modified in future years to focus on areas bare of understorey species.

In addition to the above, general observations including vegetation condition, mulch cover, erosion and signs of dieback were also recorded.

A Nearmap satellite image from September 2021 was used in the initial project establishment.

A georeferenced orthomosaic image was stitched together based on imagery from a Mavic 2 Pro drone, which was flown over the site at 50 m. This resulted in an GeoTIFF image of the site with a pixel resolution of 2 cm per pixel. This process will be conducted at each monitoring event to enable comparisons. This has been provided as a separate file but has also been used for the close-up satellite imagery of each quadrat in Appendix B.

5 RESULTS

This section describes the revegetation monitoring results for each quadrat. Table 4 assesses each quadrat against the completion criteria. Recruitment of native species was also included in the assessment against the completion criteria. Appendix A presents the field data collected. Figure 2 shows the quadrat locations and associated photo points at the north-western corner of each quadrat and a close-up aerial image from the November 2021 drone orthomosaic. While this will not show much detail in the initial year, it is included for comparison for future years' analysis.

Shading within a Table denotes that the species is not part of the initial planting and therefore self-sown or, in the case of an undetermined species, not considered one of the initial species planted until a positive identification can be made, These species may still be assessable for their contribution to canopy and other values in a generic context.

5.1 Quadrat 1

Quadrat 1 was surveyed on 26 October 2021

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
5 species	7 Stems/100m^2	0.5%	25%	20%

Quadrat 1 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia pulchella	1			✓
Acacia sp.	*1*	**?**	**?**	**?**
Agonis flexuosa	2	✓	✓	
Calothamnus quadrifidus	2			✓
Eucalyptus rudis	1	✓	✓	
Number of Species		**2**	**2**	**1**
Number of Stems		**3**	**3**	**2**
Number of Stems/hectare		**300**	**300**	**200**

Weed Species	Mulch	Erosion
17	70%	Nil

The number of species and stems in this quadrat is lower than in other quadrats.

5.2 Quadrat 2

Quadrat 2 was surveyed on 26 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
14 species	117 Stems/100m^2	15%	20%	10%

Quadrat 2 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia saligna	28	✓	✓	✓
Acacia sp.	*1*	**?**	**?**	**?**
Agonis flexuosa	1	✓	✓	
Allocasuarina sp.	2	**?**	**?**	
Astartea sp.	2		✓	✓
Bossiaea ornata	13		✓	✓
Calothamnus quadrifidus	1			✓

Eucalyptus rudis	60*	✓	✓	
Hibbertia cuneiformis	2			✓
Hibbertia hypericoides	1			✓
Kunzea glabrescens	2		✓	✓
Paraserianthes lophantha	2	✓	✓	✓
Rytidosperma sp.	1			✓
Spyridium globulosum	1			✓
Number of Species		**5**	**8**	**10**
Number of Stems		**91***	**108**	**53**
Number of Stems/hectare		**9100**	**10,800**	**5300**

Weed Species	Mulch	Erosion
19	70%	Nil

*Most of the *E. rudis* is recruitment from the neighbouring vegetation, however it was not possible to separate those germinated from seed and those planted, therefore all *E. rudis* have been included within this total.

5.3 Quadrat 3

Quadrat 3 was surveyed on 26 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
3 species	33 stems/100m^2	0.5%	40%	10%

Quadrat 3 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Anigozanthos flavidus	1			✓
Eucalyptus rudis	2	✓	✓	
Juncus pallidus	~30			✓
Number of Species		**1**	**1**	**2**
Number of Stems		**2**	**2**	**31**
Number of Stems/hectare		**200**	**200**	**3100**

Weed Species	Mulch	Erosion
11	50%	Nil

5.4 Quadrat 4

Quadrat 4 was surveyed on 26 October 2021

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
14 species	72 stems/100m^2	0.5%	4%	7%

Quadrat 4 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia saligna	1	✓	✓	✓
Acacia sp.	*1*	**?**	**?**	**?**
Agonis flexuosa	4	✓	✓	
Allocasuarina sp.	2	**?**	**?**	**?**
Anigozanthos flavidus	3			✓
Calothamnus quadrifidus	1			✓
Corymbia calophylla	1	✓	✓	
Eucalyptus rudis	1	✓	✓	
Hibbertia cuneiformis	5			✓

Juncus pallidus	3			✓
Kunzea glabrescens	1		✓	✓
Myrtaceae sp.	45	?	?	?
Paraserianthes lophantha	3	✓	✓	✓
Spyridium globulosum	1			✓
Number of Species		**5**	**6**	**8**
Number of Stems		**10**	**11**	**18**
Number of Stems/hectare		**1,000**	**1,100**	**1,800**

Weed Species	Mulch	Erosion
10	90%	Nil

5.5 Quadrat 5

Quadrat 5 was surveyed on 26 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
8 species	22 Stems/100m^2	1%	10%	20%

Quadrat 5 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia saligna	2	✓	✓	✓
Agonis flexuosa	2	✓	✓	
Allocasuarina sp.	3	?	?	?
Astartea sp.	2		✓	✓
Corymbia calophylla	5	✓	✓	
Eucalyptus rudis	6	✓	✓	
Kunzea glabrescens	2		✓	✓
Rytidosperma sp.	>100			✓
Number of Species		**4**	**6**	**4**
Number of Stems		**15**	**19**	**6 (+>100)**
Number of Stems/hectare		**1,500**	**1,900**	**600**

Weed Species	Mulch	Erosion
9 (incl >100 *Vulpia* sp.)	75%	Nil

The *Rytidosperma* sp. has not been included in the overall stem count due to the difficulty of assessing the number of individuals present. This will be rectified in future monitoring events as they grow larger.

5.6 Quadrat 6

Quadrat 6 was surveyed on 27 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
9 species	19 Stems/100m^2	1%	5%	10%

Quadrat 6 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia saligna	1	✓	✓	✓
Acacia sp.	*3*	?	?	?
Anigozanthos flavidus	1			✓
Calothamnus quadrifidus	4			✓
Corymbia calophylla	2	✓	✓	
Eucalyptus rudis	3	✓	✓	
Kunzea glabrescens	1		✓	✓

Melaleuca preissiana	3	✓	✓	✓
Paraserianthes lophantha	1	✓	✓	✓
Number of Species		**5**	**6**	**6**
Number of Stems		**10**	**11**	**11**
Number of Stems/hectare		**1,000**	**1,100**	**1,100**

Weed Species	Mulch	Erosion
19	90%	Nil

5.7 Quadrat 7

Quadrat 7 was surveyed on 27 October 2021

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
10 species	31 Stems/100m^2	1%	1%	1%

Quadrat 7 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia pulchella	1			✓
Agonis flexuosa	2	✓	✓	
Allocasuarina fraseriana	11	✓	✓	
Anigozanthos flavidus	1			✓
Calothamnus quadrifidus	2			✓
Corymbia calophylla	3	✓	✓	
Eucalyptus rudis	4	✓	✓	
Hardenbergia comptoniana	1			✓
Melaleuca preissiana	3	✓	✓	✓
Spyridium globulosum	3			✓
Number of Species		**5**	**5**	**6**
Number of Stems		**23**	**23**	**11**
Number of Stems/hectare		**2,300**	**2,300**	**1,100**

Weed Species	Mulch	Erosion
19	90%	Nil

5.8 Quadrat 8

Quadrat 8 was surveyed on 27 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
10 species	21 Stems/100m^2	2%	20%	35%

Quadrat 8 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia pulchella	*1(dead)*	-	-	-
Acacia saligna	1	✓	✓	✓
Agonis flexuosa	1	✓	✓	
Corymbia calophylla	4	✓	✓	
Eucalyptus rudis	7	✓	✓	
Hibbertia cuneiformis	1			✓
Juncus pallidus	3			✓

Kunzea glabrescens	1		✓	✓
Paraserianthes lophantha	1	✓	✓	✓
Taxandria sp.	2		?	?
Number of Species		**5**	**6**	**5**
Number of Stems		**14**	**15**	**7**
Number of Stems/hectare		**1,400**	**1,500**	**700**

Weed Species	Mulch	Erosion
11	60%	Nil

The *Acacia pulchella* present within the quadrat was dead, and the *Paraserianthes lophantha* was in poor health. The reasons for this are unknown, and future monitoring events may provide more details.

5.9 Quadrat 9

Quadrat 9 was surveyed on 27 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
14 species	28 Stems/100m^2	2%	1%	15%

Quadrat 9 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia pulchella	2			✓
Agonis flexuosa	1	✓	✓	
Allocasuarina sp.	7	?	?	?
Anigozanthos flavidus	1			✓
Astartea sp. *(?)*	1			?
Corymbia calophylla	3	✓	✓	
Eucalyptus rudis	2	✓	✓	
Fabaceae sp. *(?)*	1	?	?	?
Hakea sp. *(?)*	1	?	?	?
Hardenbergia comptoniana	2			✓
Hibbertia cuneiformis	3			✓
Spyridium globulosum	3	✓	✓	✓
Taxandria sp.	1			✓
Number of Species		**4**	**4**	**6**
Number of Stems		**9**	**9**	**12**
Number of Stems/hectare		**900**	**900**	**1,200**

Weed Species	Mulch	Erosion
12	80%	Nil

5.10 Quadrat 10

Quadrat 10 was surveyed on 27 October 2021.

Species Richness	Stem Density	Canopy Cover	Weed Cover (%)	Bare Earth (%)
10 species	37 stems/100m^2	2%	1%	40%

Quadrat 10 - Summary

Species	Number	Canopy Value	Forage Value	Ground Protection Value
Acacia saligna	2	✓	✓	✓
Agonis flexuosa	4	✓	✓	
Allocasuarina sp.	16	?	?	?
Astartea sp. *(?)*	2			?

Corymbia calophylla	4	✓	✓	
Eucalyptus rudis	2	✓	✓	
Hardenbergia comptoniana	1			✓
Hibbertia cuneiformis	3			✓
Kunzea glabrescens (?)	1	**?**	**?**	**?**
Spyridium globulosum	2	✓	✓	✓
Number of Species		**5**	**5**	**4**
Number of Stems		**14**	**14**	**8**
Number of Stems/hectare		**1,400**	**1,400**	**800**

Weed Species	**Mulch**	**Erosion**
7	60%	Nil

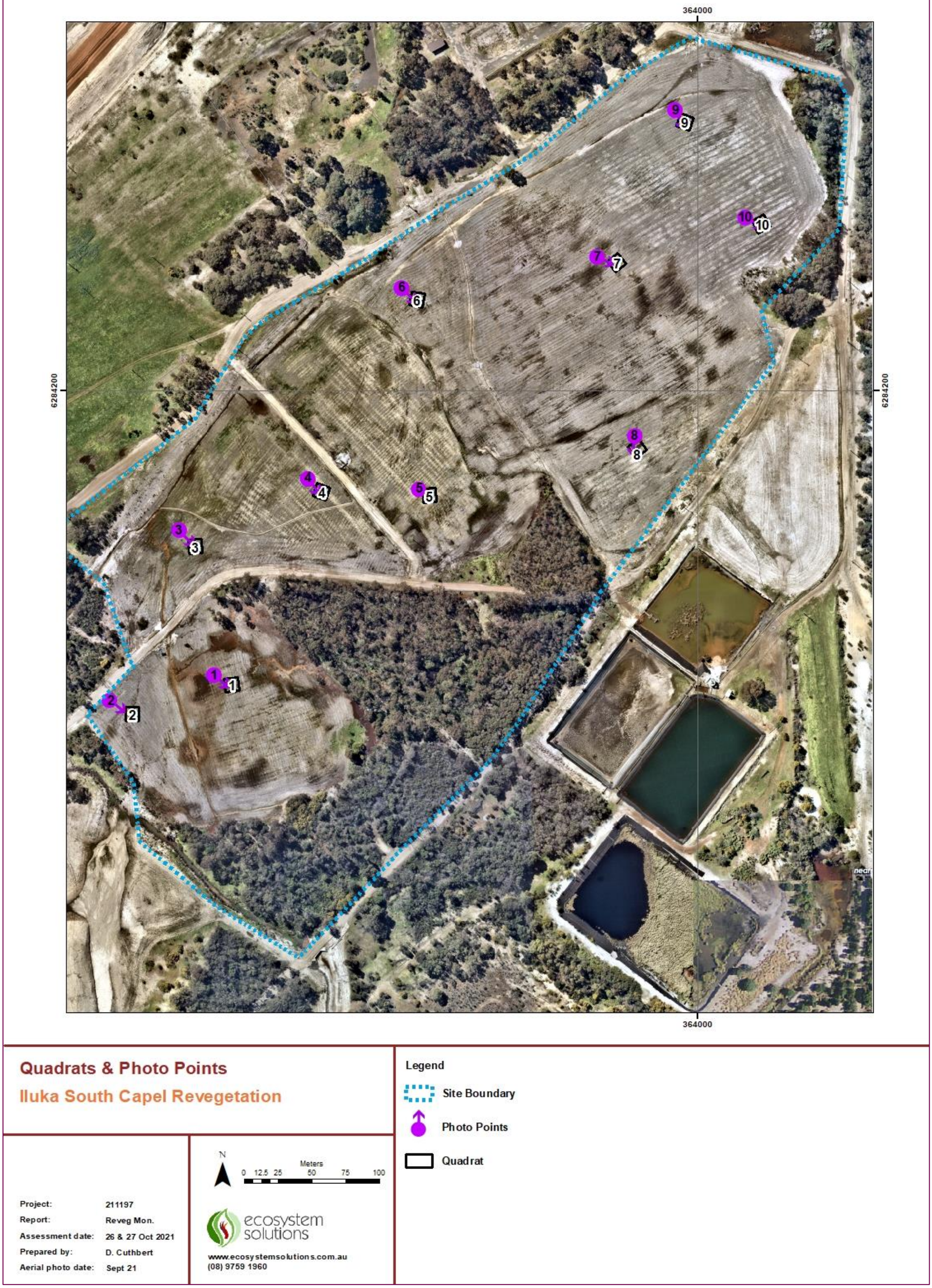

Figure 2: Site showing photo points and quadrats

6 NATURALLY RECRUITED SPECIES

A total of 12 native species not included in the species list and planted were observed germinating from seed within the quadrats. Many of these were too small to accurately identify the species, and it is possible that a later monitoring event will decide that some taxa are actually from the species list, in particular the *Acacia* sp., *Allocasuarina* sp., and members of the Myrtaceae and Fabaceae families. The addition of these self-sown species increases the diversity on the WRP site, and volunteer recruitment is expected to continue due to the proximity of remnant vegetation to the rehabilitation area.

Table 4 Naturally recruited taxa

TAXON
Acacia sp.
Allocasuarina sp.
Astartea sp.
Bossiaea ornata
Eucalyptus rudis
Fabaceae sp.
Hakea sp.
Hibbertia cuneiformis
Hibbertia hypericoides
Juncus pallidus
Myrtaceae sp.
Taxandria sp.

7 WEED SPECIES

A total of 30 weed species were observed within the quadrats. None of these species are known Declared plants (DPIRD, 2021) or Weeds of National Significance (WoNS) (Weeds Australia, 2021).

Of the undetermined taxa it is possible that one, *Vicia* sp., may be a Declared plant. One species of this genus introduced to Western Australia is classified as Prohibited (C1 Exclusion) on the Western Australian Organism List (DPIRD, 2021). *Vicia tetrasperma* is known from one record in the Perth region (WAH, 1998-). While it is possible that the Capel specimen is of this species, it does not appear likely as there are several species of *Vicia* naturalised in the Capel area.

Table 5 Weed species identified in quadrats

SPECIES	SPECIES	SPECIES
Acacia iteaphylla	*Elytrigia repens*	*Monopsis debilis*
Acacia longifolia	*Hypochaeris* sp.	*Oxalis* sp.
Arctotheca calendula	*Isolepis prolifera*	*Phalaris* sp.
Avena sp.	*Juncus microcephalus*	*Romulea rosea*
Briza maxima	*Juncus* sp.	*Solanum* sp.
Briza minor	*Lolium* sp.	*Sonchus* sp.
Erigeron sp.	*Lotus angustissimus*	*Trifolium* sp.
Cotula sp.	*Lotus subbiflorus*	*Vicia* sp.
Cyperaceae sp.	*Lysimachia arvensis*	*Vulpia* sp.
Cyperus tenellus	*Lythrum hyssopifolia*	*Zantedeschia aethiopica*

8 DISCUSSION AND SUMMARY

Table 4 assesses the progress of each quadrat against the Completion Criteria described in Table 2 and has been included in this section for ease of reference to the results from Section 5. Each Completion Criterion is discussed below.

Table 6 Progress against completion criteria

Completion criteria	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
CC01: No declared weeds present in revegetation	Absent ✓	Absent ✓	Absent ✓	Absent ✓	Absent ✓	Absent ✓	Absent ✓	Absent ✓	Absent ✓	Absent ✓
CC02: Weed cover is less than 20% at completion	25% x	20% x	40% x	4% ✓	10% ✓	5% ✓	1% ✓	20% x	1% ✓	1% ✓
CC03: A minimum of 15 species will be selected from the revegetation species table (WRP habitat/foraging species) and established in revegetation prior to completion and will include at least: • Five species that provide foraging value • Five species that provide canopy value • Five species that provide ground protection value	✓ **Eleven species have been selected that provide foraging value.** 10 of the 11 species selected for foraging value were present within quadrats, being *Acacia saligna, Agonis flexuosa, Allocasuarina fraseriana, Corymbia calophylla, Eucalyptus rudis, Hardenbergia comptoniana, Kunzea glabrescens, Melaleuca preissiana, Paraserianthes lophantha* and *Spyridium globulosum.* ✓ **Ten species have been selected that provide canopy value.** 9 of the 10 species selected to provide canopy value were present within quadrats, being *Acacia saligna, Agonis flexuosa, Allocasuarina fraseriana, Corymbia calophylla, Eucalyptus rudis, Kunzea glabrescens, Melaleuca preissiana, Paraserianthes lophantha* and *Spyridium globulosum.* ✓ **Twelve species have been selected that provide ground protection value.** 9 of the 12 species selected to provide ground protection were present within the quadrats, being *Acacia pulchella, Acacia saligna, Anigozanthos flavidus, Calothamnus quadrifidus, Hardenbergia comptoniana, Kunzea glabrescens, Melaleuca preissiana, Paraserianthes lophantha* and *Spyridium globulosum.* **X** Thirteen species have been recorded in quadrats from the 16 planted. *Acacia cyclops, Patersonia occidentalis* and *Viminaria juncea* were not recorded.									
CC04: A density of 800 stems per hectare of species contributing to canopy will be established at completion (equal to 8 stems per quadrat)	3 stems x	88 stems ✓	2 stems x	10 stems ✓	15 stems ✓	10 stems ✓	23 stems ✓	14 stems ✓	9 stems ✓	14 stems ✓
CC05: No areas greater than 250 m^2 without a developing understory at completion.	U	U	U	U	U	U	U	U	U	U
CC06: A minimum of 30% cover by species contributing to canopy will be established in revegetation at completion.	0.5% U	15% U	0.5% U	1% U	1% U	1% U	1% U	2% U	2% U	2% U
CC07: A perpetual covenant will be established two years prior to completion.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

✓ currently meets criterion

X does not currently meet criterion

U Currently unassessable

CC01 and CC02 - Weeds

A total of 30 introduced species were recorded across the site. None of these are Declared plants or WoNS requiring immediate treatment.

Weed cover in Quadrats 1, 2, 3 and 8 was 20% or greater, which is higher than *CC02* of the SCRP RMP, which states: *Weed cover is less than 20% at completion.* Due to the fact that revegetation works were conducted less than six months prior to the initial survey this is not a statistic to be necessarily concerned about. As the perennial native species grow and become established there will be a certain amount of out-competition of the annual weed species. *CC02* also states that: *Weeds will be sprayed annually irrespective*

of percentage cover observed in monitoring. As the native species are still small and more likely vulnerable to spray drift this may be better left until the second year when seedlings have become more established.

If there are areas or weed species of concern chemical weed control could still be conducted using a hand held Weed Wiper which would minimise any chances of desirable species being affected. This method may not be practical for all weed species, however, as it is not effective for all herbicides. Weed species that could be initially targeted are: **Acacia iteaphylla* and **A. longifolia* while they are small before they become woody and harder to kill; **Zantedeschia aethiopica* because it may take several years and repeat applications of pesticide to kill a bulb; and **Avena* sp. and **Lythrum hyssopifolia* because of their ability to set large quantities of seed and quickly invade disturbed areas. Each will require a different treatment.

CC03 – Species selection and establishment

Sixteen revegetation species from the list presented in the SCRP RMP were chosen for planting, with one substitution made due to lack of availability at the time. The substitution was of *Anigozanthos flavidus for Anigozanthos manglesii*. While generally similar, if more robust, to *A. manglesii*, the *A. flavidus* prefers damper habitats and its success here may be helped by this preference. These 16 species provide habitat and foraging values for Western Ringtail Possums.

Of the 16 revegetation species selected only 13 were found to be established in quadrats during monitoring. Three species planted were not observed within the quadrats, these being *Acacia cyclops, Patersonia occidentalis* and *Viminaria juncea,* all of which provide understory value, with *A. cyclops* also providing foraging and canopy values. It is noted that *A. cyclops* has a habitat preference for coastal locations, often with limestone, and the SCRP site may not meet the pH requirements of the species. Further, it normally grows in sands that are very well drained and the SCRP site may be too damp (as evidenced by the presence and germination of *Eucalyptus rudis* commonly known as flooded gum). *P. occidentalis* and *V. juncea* appear to prefer habitats that are winter-wet and therefore the SCRP site appears suitable. However, it should also be noted that the absence of these species from quadrats may merely reflect the randomness of the planting effort and the subsequent placement of the quadrats. This may also be said for quadrats 1 and 3, which have low numbers of species and individuals. The questions arising from these observations may be answered by a walkover of the site to see if they are repeated elsewhere.

With the nature of the species chosen for planting being that several provide more than one value (canopy, foraging, ground protection) for WRP, the quadrat records are showing that the *CC03* requirement for five species of each value is being met even though the total number of species is lower than required. Infill planting with the three missing species may be worthwhile, although the opportunity also exists to increase the species richness of the site by choosing other species from the original revegetation species list. *Callistemon phoeniceus* and *C. glaucus* could be tried, along with the *Gahnia trifida.* The *Callistemon* have multiple WRP values while the *Gahnia* provides ground protection and nest material. Introduction of different species to the revegetation will contribute to the target of establishment of 15 species being exceeded.

CC04 – Density of canopy value species

CC04 states that there will be a density of 800 stems/hectare of species contributing to canopy at completion. Currently, Quadrats 1 and 3 are under this threshold.

Natural recruitment was observed across almost all quadrats (Quadrat 7 excluded), and this has contributed to the total stems/hectare counts of canopy species that exceed the 800 in the majority. While this contribution is pleasing it should be noted that, as seedlings get older and larger, competition will reduce these numbers, for example the *Eucalyptus rudis* in Quadrat 2 will thin out as plants grow, and approach a natural density.

Given that this monitoring event occurred less than six months following planting, and the occurrence of natural recruitment, the statistic embodied by stem densities is not necessarily meaningful at this stage. It is likely more recruitment will occur, and there will be deaths, as the individuals become established. While the occurrence of less than 800 stems/hectare of canopy species is a threshold trigger for infill planting in *CC04*, it is recommended that this action is postponed until after the 2nd year monitoring event to allow more establishment of individuals to occur. This next monitoring event will establish the beginnings of trends and will not appreciably delay progress towards the completion criterion.

CC05 – No areas greater than 250m^2 without a developing understorey

CC05 states that there will *be No areas greater than 250m^2 without a developing understorey (foliage cover between 1-50cm height) at completion*. The limiting factor in assessing this criterion is that quadrats of 100m^2 are being used to monitor the revegetation, and these are inadequate for addressing an area over twice their size. Ten metre by ten metre quadrats (100m^2) are the standard size recommended by the

Environmental Protection Authority when undertaking botanical surveys on the Swan Coastal Plain and are adequate for addressing the vegetation monitoring requirements of the SCRP RMP. This criterion is possibly better addressed by modifying the monitoring program and installing 50 metre by 50 metre quadrats (2500m^2) as are used during Pilbara and Kimberley botanical surveys. These will capture a greater sample area and be better placed to detect gaps in the species composition, although this is a criterion that will be better monitored when plants have grown to a greater size. It is not being suggested that these should also be monitored in the same manner as the smaller quadrats. Alternatively, as the vegetation grows it may be possible to identify areas using GIS that appear to be lagging and follow this with a ground-truthing visit to areas of concern. As the SCRP RMP intends to use aerial photography over the offset site to assess canopy cover at 5 and 10 years post planting, this may be a task best left until then.

CC06 – A minimum of 30% cover by species contributing to canopy will be established in revegetation at completion

Canopy cover was estimated at 2% at its highest during the initial monitoring event. A low percentage is to be expected given that the monitoring occurred less than six months following the planting of the revegetation species, and this statistic is not meaningful in the context of progress towards completion. As yet the planted individuals have not had the time to establish themselves and provide canopy cover. This measurement will be better understood in the second and third years of monitoring.

CC07 A perpetual covenant will be established two years prior to completion

This criterion is only relevant during the latter period of the monitoring program.

In summary

- Weed control is recommended to be deferred until at least after the second monitoring event
- If weed control is undertaken a number of more invasive species are recommended for targeting
- Planting has been successful in establishing 5 species from each WRP value, however the criterion to have 15 species established appears to be lagging. This may be an artefact of planting density and/or quadrat placement, this could be examined with a site walkover
- The low number of individuals in quadrats 1 & 3, and the missing species, may be an artefact of quadrat placement and/or planting effort. A site walkover is recommended to check whether these observations apply elsewhere. If they don't there may be a case for infill planting with these species or others
- Most quadrats are above the 800 stems/hectare threshold, but given the short period between planting and monitoring (and the incidence of natural recruitment) no infill planting is recommended as yet on this account
- It is recommended that consideration be given to implementing a modification to the monitoring program to enable larger underperforming areas to be recognised.
- The SCRP RMP makes reference to the measurement of bare areas as one of the parameters for the monitoring program. Comments received indicate that Iluka considers this to refer to CC05 and areas bare of understorey species, although the SCRP RMP does not make this differentiation. This will entail a change in the monitoring method from the second year onwards once the quadrat size issue is resolved.
- Canopy cover can not be expected to be high so soon after planting. Infill planting will only be conducted from 5 years post planting, the time to assess the progress against this criterion is around the 4 year mark

6 REFERENCES

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Appendix A
Quadrat data sheets

APPENDIX A: Quadrat data sheets

Quadrat No:	1	**Date:**	26/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL / LD	**m E**	115.5309	**m S**	33.57515
Quadrat Monitoring parameters					
Weed Cover (%)	25%		**Declared weeds**	Absent	
Revegetation Species canopy cover	0.5%		**Size of bare areas:**	5%	
Field Observations					
Vegetation Condition	Completely Degraded		**Mulch Cover**	80%	
Disturbance Level	High		**Erosion evidence**	Nil	
Dieback Evidence	Nil				

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Agonis	*flexuosa*	2
Calothamnus	*quadrifidus*	2
Eucalyptus	*rudis*	1
Acacia	*pulchella*	1
Additional Comments – Native Vegetation Recruitment species		
Acacia	*sp.*	1

Additional Comments – Weed Species			
Lotus angustissimus	Phalaris	Juncus sp.	Isolepis prolifera
Lotus subbiflorus	Juncus microcephalus	Briza maxima	Rye Grass
Cyperaceae sp.	Vulpia sp.	Arctotheca calendula	Clover
Cyperus tenellus	Briza minor	Lysimachia arvensis	Yellow Dandelion

Additional Comments – General	**Reference Photo from NW Quadrat Corner**
	

Quadrat No:	2	**Date:**	26/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL / LD	**m E**	33.57533	**m S**	115.5301

Quadrat Monitoring parameters			
Weed Cover (%)	20%	**Declared weeds**	Absent
Revegetation Species canopy cover	15%	**Size of bare areas:**	10%
Field Observations			
Vegetation Condition	Completely degraded	**Mulch Cover**	70%
Disturbance Level	High	**Erosion evidence**	Nil
Dieback Evidence	Nil		

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Eucalyptus	*rudis*	60**
Acacia	*saligna*	28
Paraserianthes	*lophantha*	2
Calothamnus	*quadrifidus*	1
Kunzea	*glabrescens*	2
Agonis	*flexuosa*	1
Spyridium	*globulsum*	1
Additional Comments – Native Vegetation Recruitment species		
Bossiaea	*ornate*	13
Hibbertia	*cuneiformis*	2
Astartea	*sp.*	1
Hibbertia	*hypercoides*	1
Allocasuarina	*sp.*	2
Acacia	*sp.*	1

Additional Comments – Weed Species			
Vulpia sp.	*Lotus angustissimus*	*Elymus repens*	*Avena sp.*
Cyperaceae sp.	*Lotus subbiflorus*	*Romulea rosea*	*Oxalis sp.*
Cyperus tenellus	*Lysimachia arvensis*	*Clover*	*Juncus sp.*
Briza maxima	*Arctotheca calendula*	*Isolepis prolifera*	*Lythrum hyssopifolia*
Cotula sp.	*Rhodium sp.*	*Yellow dandelion*	

Additional Comments – General	**Reference Photo from NW Quadrat Corner**
**Recruitment of *Eucalyptus rudis* from the neighbouring property within the quadrat were included in this total.	

Quadrat No:	3	**Date:**	26/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL/LD	**m E**	-33.57422	**m S**	115.5306
Quadrat Monitoring parameters					
Weed Cover (%)	40%		**Declared weeds**	Absent	
Revegetation Species canopy cover	0.5%		**Size of bare areas:**	10%	
Field Observations					
Vegetation Condition	Completely Degraded		**Mulch Cover**	35%	
Disturbance Level	High		**Erosion evidence**	Nil	
Dieback Evidence	Nil				
Species List – Revegetation Species					
Genus	***Species***		**Stem Density**		
Eucalyptus	*rudis*		2		
Anigozanthos	*flavidus*		1		
Additional Comments – Native Vegetation Recruitment species					
Juncus	*Pallidus*		30		
Additional Comments – Weed Species					
Isolepis prolifera *Juncus microcephalus* *Lotus angustissimus*	*Lotus subbiflorus* *Cyperaceae sp.(x2)* *Cyperus tenellus*		*Lysimachia arvensis* *Avena sp.*	*Briza maxima* *Yellow dandelion*	
Additional Comments – General		**Reference Photo from NW Quadrat Corner**			

Quadrat No:	4	**Date:**	26/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL/LD	**m E**	33.57387	**m S**	115.5316

Quadrat Monitoring parameters			
Weed Cover (%)	4%	**Declared weeds**	Absent
Revegetation Species canopy cover	1%	**Size of bare areas:**	7%
Field Observations			
Vegetation Condition	Completely Degraded	**Mulch Cover**	90%
Disturbance Level	High	**Erosion evidence**	Nil
Dieback Evidence	Nil		

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Agonis	*flexuosa*	4
Calothamnus	*quadrifidus*	1
Corymbia	*calophylla*	1
Paraserianthes	*lophantha*	3
Eucalyptus	*rudis*	1
Kunzea	*glabrescens*	1
Spyridium	*globulsum*	1
Acacia	*saligna*	1
Additional Comments – Native Vegetation Recruitment species		
Myrtaceae	*sp.*	45
Anigozanthos	*sp.*	3
Allocasuaina	*sp.*	8
Hibbertia	*cuneformis*	5
Acacia	*sp.*	1
Juncus	*pallidus*	3

Additional Comments – Weed Species			
Lotus angustissimus	*Arctotheca calendula*	*Solanum*	*Oxalis sp.*
Lotus subbiflorus	*Juncus microcephalus*	*Rye grass*	*Juncus sp.*
Cyperaceae sp	*Conyza sp.*		

Additional Comments – General	**Reference Photo from NW Quadrat Corner**

Quadrat No:	5	**Date:**	26/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KP/LD	**m E**	33.57237	**m S**	115.534

Quadrat Monitoring parameters			
Weed Cover (%)	10%	**Declared weeds**	Absent
Revegetation Species canopy cover	1%	**Size of bare areas:**	20%
Field Observations			
Vegetation Condition	Completely Degraded	**Mulch Cover**	75%
Disturbance Level	High	**Erosion evidence**	Nil
Dieback Evidence	Nil		

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Corymbia	*calophylla*	5
Agonis	*flexuosa*	2
Acacia	*saligna*	2
Kunzea	*glabrescens*	2
Eucalyptus	*rudis*	6
Additional Comments – Native Vegetation Recruitment species		
Allocasuarina	*sp.*	3
Astartea	*sp.*	2

Additional Comments – Weed Species			
Vulpia sp.	*Lotus angustissimus*	*Cyperus tenellus*	*Monopsis debilis*
Arctotheca calendula	*Lotus subbiflorus*	*Cotula sp.*	*Lythrum hyssopifolia*

Additional Comments – General	**Reference Photo from NW Quadrat Corner**

Quadrat No:	6	**Date:**	27/10/2021	**Quadrat Size**	10m x 10m
Recorder:	LD/DC	**m E**	33.5739	**m S**	115.5325

Quadrat Monitoring parameters			
Weed Cover (%)	5%	**Declared weeds**	Absent
Revegetation Species canopy cover	1%	**Size of bare areas:**	10%
Field Observations			
Vegetation Condition	Completely Degraded	**Mulch Cover**	75%
Disturbance Level	High	**Erosion evidence**	Nil
Dieback Evidence	Nil		

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Calothamnus	*quadrifidus*	4
Paraserianthes	*lophantha*	1
Acacia	*saligna*	1
Kunzea	*glabrescens*	1
Corymbia	*calophylla*	2
Eucalyptus	*rudis*	3
Anigozanthos	*flavidus*	1
Melaleuca	*preissiana*	3
Additional Comments – Native Vegetation Recruitment species		
Acacia	*sp.*	3

Additional Comments – Weed Species			
Vicia sativa	*Cyperaceae sp.*	*Lotus angustissimus*	*Vulpia sp.*
Briza maxima	*Cyperus tenellus*	*Lotus subbiflorus*	*Hypochaeris*
Phalaris sp.	*Anagalis sp.*	*Avena sp.*	*Juncus sp.*
Arctotheca calendula			

Additional Comments – General	**Reference Photo from NW Quadrat Corner**
	

Quadrat No:	7	**Date:**	27/10/2021	**Quadrat Size**	10m x 10m
Recorder:	LD/DC	**m E**	33.57259	**m S**	115.5324
Quadrat Monitoring parameters					
Weed Cover (%)	1%	**Declared weeds**		Absent	
Revegetation Species canopy cover	1%	**Size of bare areas:**		1%	
Field Observations					
Vegetation Condition	Completely Degraded	**Mulch Cover**		90%	
Disturbance Level	Low	**Erosion evidence**		Nil	
Dieback Evidence	Nil				

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Agonis	*flexuosa*	2
Corymbia	*calophylla*	3
Calothamnus	*quadrifidus*	2
Hardenbergia	*comptoniana*	1
Anigozanthos	*flavidus*	1
Eucalyptus	*rudis*	4
Allocasuarina	*fraseriana*	3
Melaleuca	*pressiana*	3
Spyridium	*globulsum*	3
Acacia	*pulchella*	1
Additional Comments – Native Vegetation Recruitment species		
Allocasuarina	*sp.*	8

Additional Comments – Weed Species			
Briza maxima *Briza minor* *Anagallis arvensis var caerulea*	*Anagallis arvensis var arvensis* *Arctotheca calendula* *Lotus angustissimus*	*Lotus subbiflorus* *Vulpia sp.* *Acacia iteaphylla*	*Avena sp.* *Vicia sativa*

Additional Comments – General	**Reference Photo from NW Quadrat Corner**
	

Quadrat No:	8	**Date:**	27/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL/DP	**m E**	33.5361	**m S**	115.5342
Quadrat Monitoring parameters					
Weed Cover (%)		20%	**Declared weeds**		Absent
Revegetation Species canopy cover		2%	**Size of bare areas:**		35%
Field Observations					
Vegetation Condition		Completely degraded	**Mulch Cover**		60%
Disturbance Level		High	**Erosion evidence**		Nil
Dieback Evidence		Nil			
Species List – Revegetation Species					
Genus		***Species***	**Stem Density**		
Corymbia		*calophylla*	4		
Eucalyptus		*rudis*	7		
Acacia		*saligna*	1		
Agonis		*flexuosa*	1		
Acacia		*pulchella*	1 (dead)		
Paraserianthes		*lophantha*	1 (poor condition)		
Kunzea		*glabrescens*	1		
Additional Comments – Native Vegetation Recruitment species					
Taxandria		*sp.*	2		
Hibbertia		*cuneiformis*	1		
Juncus		*pallidus*	3		
Additional Comments – Weed Species					
Juncus sp. (x2)	*Arctotheca calendula*	*Lotus subbiflorus*	*Monopsis debilis*		
Cyperaceae sp.	*Isolepis prolifera*	*Lysimachia arvensis*	*Rye Grass*		
Cyperus tenellus	*Lotus angustissimus*				
Additional Comments – General		**Reference Photo from NW Quadrat Corner**			

Quadrat No:	9	**Date:**	27/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL/DP	**m E**	33.57143	**m S**	115.5346

Quadrat Monitoring parameters			
Weed Cover (%)	1%	**Declared weeds**	Absent
Revegetation Species canopy cover	2%	**Size of bare areas:**	15%
Field Observations			
Vegetation Condition	Completely Degraded	**Mulch Cover**	80%
Disturbance Level	High	**Erosion evidence**	Nil
Dieback Evidence	Nil		

Species List – Revegetation Species		
Genus	***Species***	**Stem Density**
Eucalyptus	*rudis*	2
Agonis	*flexuosa*	1
Anigozanthos	*flavidus*	1
Acacia	*pulchella*	2
Syridium	*globulosum*	3
Hardenbergia	*comptoniana*	2
Corymbia	*calophylla*	2
Additional Comments – Native Vegetation Recruitment species		
Eucalyptus	*sp*	1
Hibbertia	*cuneiformis*	4
Taxandria	*sp.*	1
Allocasuarina	*sp.*	7
Fabaceae	*sp.*	1
Astartea	*sp.*	1
Hakea	*sp.*	1

Additional Comments – Weed Species			
Zantedeschia aethiopica	*Oxalis sp.*	*Arctotheca calendula*	*Isolepis prolifera*
Solanum	*Lotus angustissimus*	*Lysimachia arvensis*	*Cyperus tenellus*
Veitch	*Lotus subbiflorus*	*Briza maxima*	

Additional Comments – General	**Reference Photo from NW Quadrat Corner**
	

Quadrat No:	10	**Date:**	27/10/2021	**Quadrat Size**	10m x 10m
Recorder:	KL/DP	**m E**	33.57212	**m S**	115.5352
Quadrat Monitoring parameters					
Weed Cover (%)	1%		**Declared weeds**	Absent	
Revegetation Species canopy cover	2%		**Size of bare areas:**	40%	
Field Observations					
Vegetation Condition	Completely Degraded		**Mulch Cover**	60%	
Disturbance Level	High		**Erosion evidence**	Nil	
Dieback Evidence	Nil				
Species List – Revegetation Species					
Genus	***Species***		**Stem Density**		
Corymbia	*calophylla*		4		
Spyridium	*globulosum*		2		
Acacia	*saligna*		2		
Hardenbergia	*comptoniana*		1		
Agonis	*flexuosa*		4		
Eucalyptus	*rudis*		2		
Additional Comments – Native Vegetation Recruitment species					
Allocasuarina	*sp.*		16		
Kunzea	*glabrescens*		1		
Hibbertia	*cunniformus*		3		
Astartea	*sp.*		2		
Additional Comments – Weed Species					
Acacia iteaphylla	*Lotus subbiflorus*	*Juncus sp.*	*Zantedeschia aethiopica*		
Lotus angustissimus	*Lysimachia arvensis*	*Acacia longafolia*			
Additional Comments – General		**Reference Photo from NW Quadrat Corner**			
Acacia iteaphylla, Zantedeschia aethiopica and Solanum nigrianes were observed near the quadrat.					

Appendix B
Quadrat aerial imagery

Quadrat 1

Iluka South Capel Revegetation

Legend

Quadrat

Map included Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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Quadrat 2

Iluka South Capel Revegetation

Legend

Quadrat

Map included Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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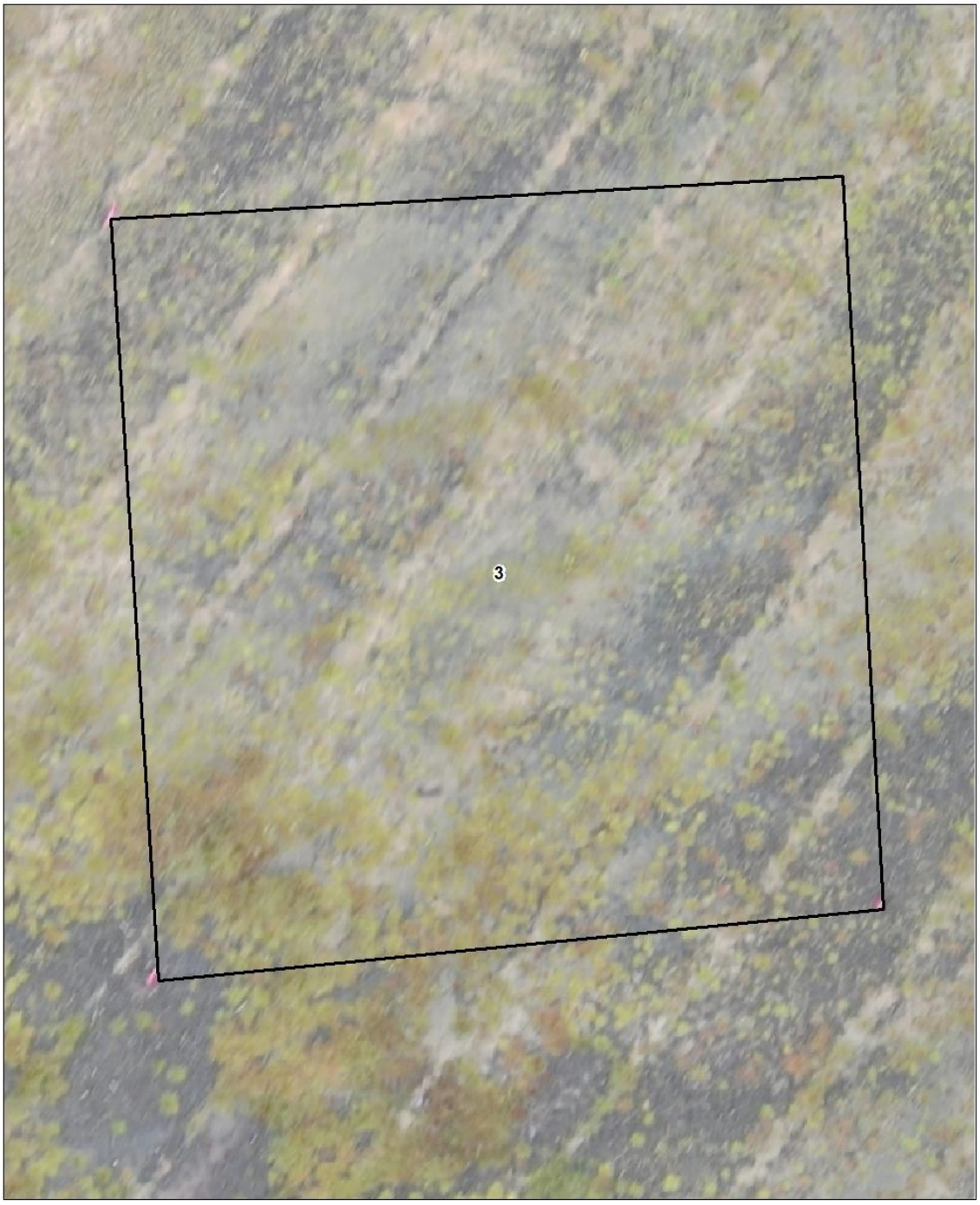

Quadrat 3

Iluka South Capel Revegetation

Legend

Quadrat

Map included Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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Quadrat 4

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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Quadrat 5

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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Quadrat 6

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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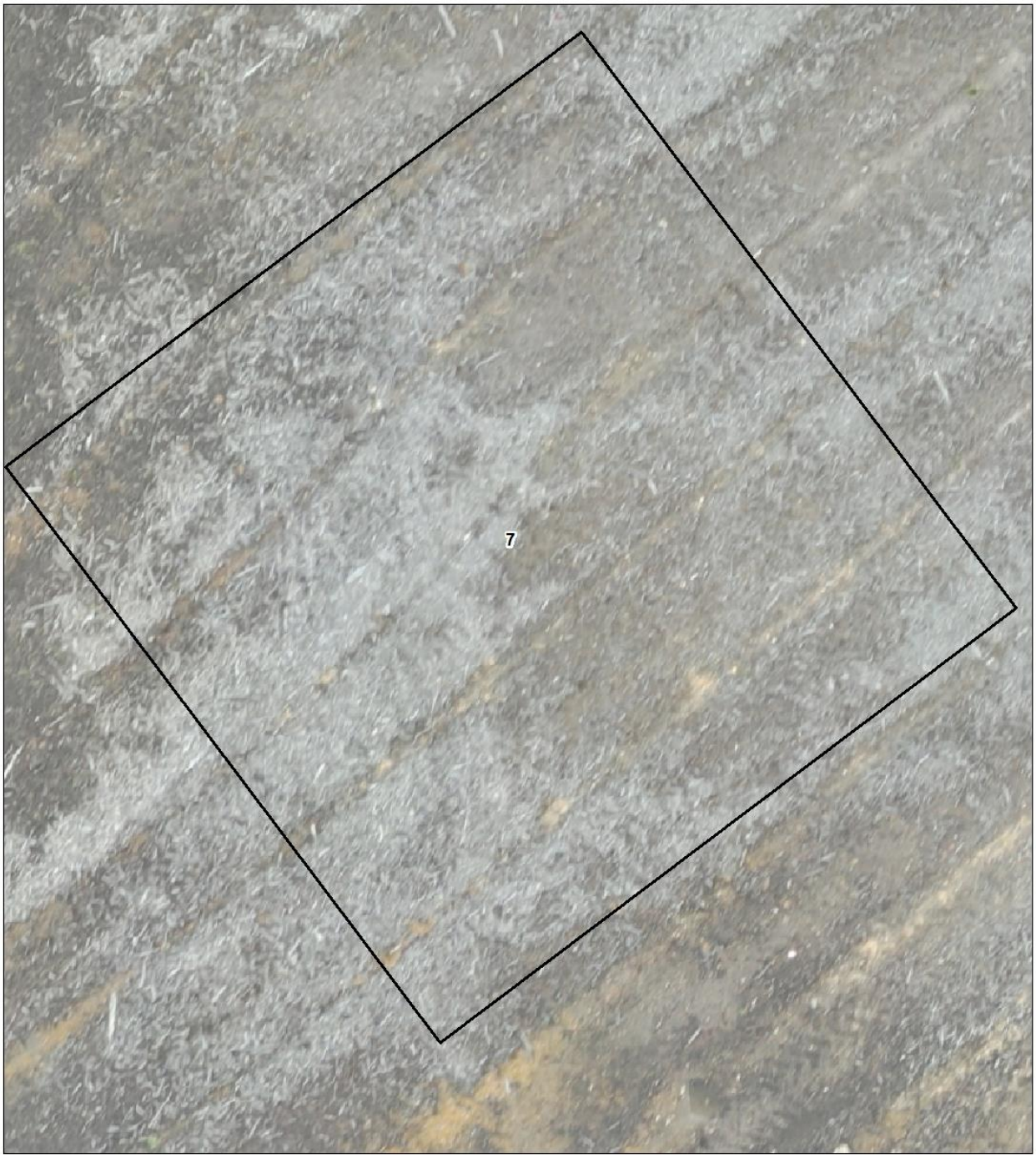

Quadrat 7

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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Quadrat 8

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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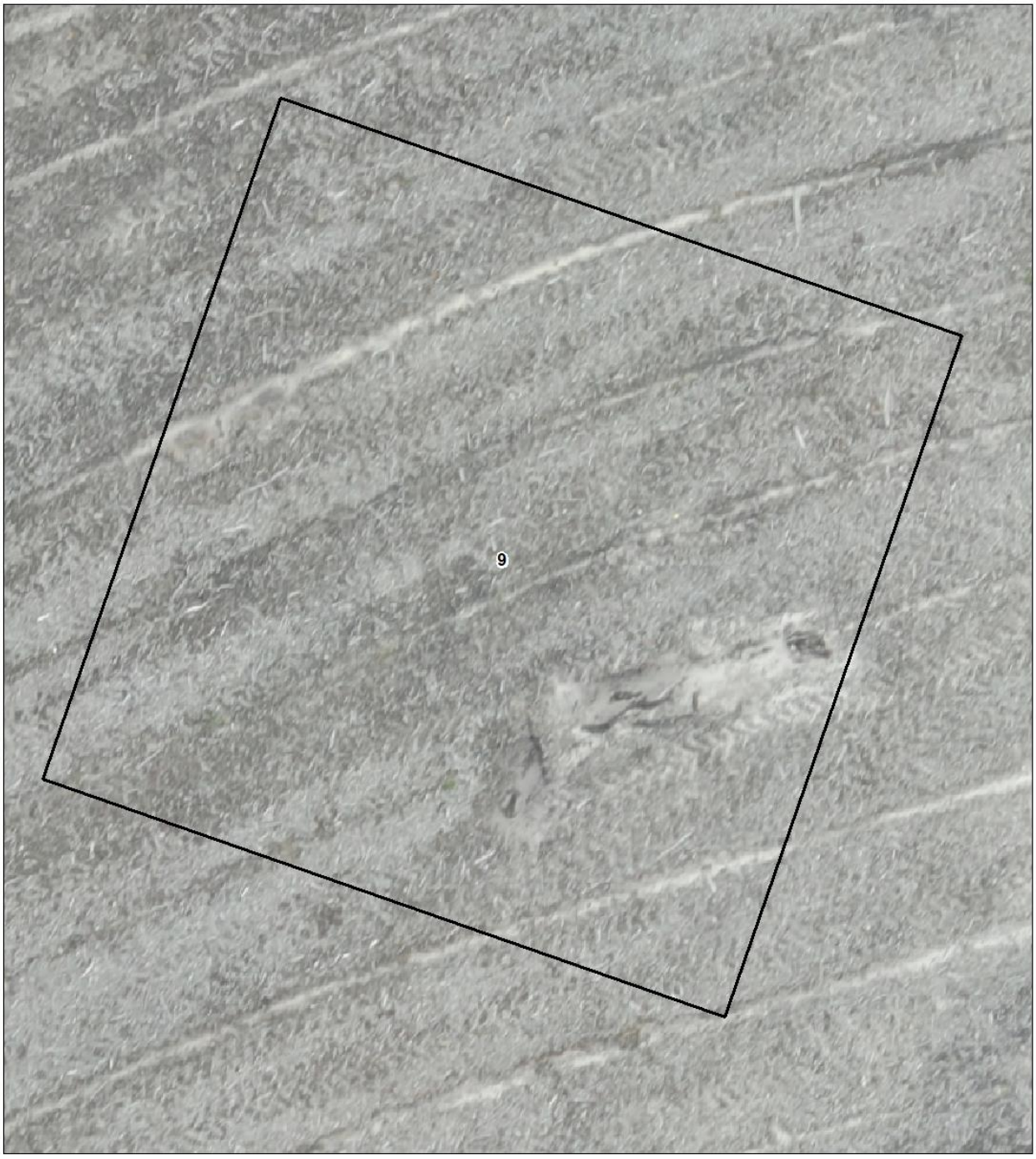

Quadrat 9

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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Quadrat 10

Iluka South Capel Revegetation

Legend

Quadrat

Maps include Drone image overlay
November 2021 (2cm/pixel)

N

Meters
0 0.250.5 1 1.5 2

Project:	211197
Report:	Reveg Mon.
Assessment date:	26 & 27 Oct 2021
Prepared by:	D. Cuthbert
Aerial photo date:	Sept 21

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