

*Kunzea similis* subsp. *mediterranea*  
HEALTH MONITORING PROGRAM  
2014

FQM AUSTRALIA NICKEL PTY LTD

MARCH 2015



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**DOCUMENT REVISION HISTORY**

| Revision | Description  | Originator | Internal Reviewer | Internal Review Date | Client Reviewer | Client Review Date |
|----------|--------------|------------|-------------------|----------------------|-----------------|--------------------|
| Rev A    | Draft report | BL         | CG/GW             | 5/3/2015             | Tony Petersen   | 6/03/2015          |
| Rev 0    | Final report | BL         | GW                |                      |                 |                    |
|          |              |            |                   |                      |                 |                    |
|          |              |            |                   |                      |                 |                    |
|          |              |            |                   |                      |                 |                    |

Report Reference: FQM14-33-01

Cover Photographs: Clockwise from top left – *Kunzea similis* subsp. *mediterranea* monitoring quadrat; flowers; typical yellowing of leaves on growing tip; fruit (Woodman Environmental Consulting Pty Ltd)

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## 1. INTRODUCTION AND BACKGROUND

FQM Nickel Australia Pty Ltd's (FQM) Ravensthorpe Nickel Operations have approval under Part IV of the *Environmental Protection Act 1986* (EP Act) for their lateritic nickel mining operations near Ravensthorpe. A condition of operation is to monitor the health of populations of the Threatened - Declared Rare Flora (T-DRF) taxon *Kunzea similis* subsp. *mediterranea*. The operation currently has an agreed monitoring program for this taxon focusing on transect based sampling conducted on a quarterly basis.

Woodman Environmental Consulting Pty Ltd (Woodman Environmental) were commissioned to design a less intensive and intrusive monitoring program to monitor the health of the naturally occurring population of *Kunzea similis* subsp. *mediterranea* (Kunzea) within the Kunzea Conservation Area, that could be used in conjunction with remote sensing multispectral imagery (flown annually in October) to track vegetation health on an annual basis.

Following a review of the existing monitoring program parameters and historical results (Western Botanical 2008), a revised method utilising a quadrat based sampling regime with parameters designed to be repeatable, reduce observer variation during monitoring, limit errors in interpretation of parameters by different recorders, and take into account the form of the taxon, was proposed (Woodman Environmental 2014). This report details the new methods and 2014 monitoring results (baseline sampling) for the program.

### 1.1 Objectives

The objectives required to fulfil the condition of monitoring the health of *Kunzea similis* subsp. *mediterranea* include:

- Establish a new monitoring method to reduce variations and errors in results due to human sampling, and to increase time effectiveness;
- Conduct baseline monitoring of the population during Spring 2014 utilising the new method; and
- Prepare a report documenting the methods and results of the initial sampling, and recommendations for additional investigations if deemed appropriate.

## 2. MONITORING PROGRAM

The monitoring program incorporates 2 distinct aspects (interpretation of remotely sensed multispectral imagery / field observation of vegetation and plant health) that are compared to each other. The program is designed to provide correlation of multispectral data with field observations which will allow the use of the multispectral data as a monitoring tool in the absence of annual field monitoring. Field monitoring would therefore become a regular (every 3 to 5 years) check on the multispectral data and also a response to observed significant change in vegetation health when indicated by the remote sensing imagery.

The first aspect (multispectral imagery) is utilised to provide an overview of the Kunzea Conservation Zone, focussing on general vegetation health. The vegetation health is

interpreted from data presented in the imagery on photosynthesising plant cell density, with changes in health identified from comparison of digital images collected over time.

The second aspect (field observation) involves the use of a plant and vegetation health ranking system applied to a set of small portions (subsamples/quadrats) of the Kunzea population to assess visual symptoms of vegetation health/stress.

The monitoring program design was initially provided to FQM in a separate report (Woodman Environmental 2014) that described the approach and proposed data collection and analysis methods. Some aspects of the proposed design have been modified to reflect field conditions and these revised methods are described below.

### **3. METHODS**

#### **3.1 Quadrat Establishment**

Identification of potential sampling locations (quadrats) within the Conservation Area involved inspection of existing remote sensing data at 0.2m pixels (the 2013 pseudo-colour image showing changes in vegetation from 2012 to 2013, specifically plant cell density (loss/gain of leaves)) in conjunction with previously prepared Kunzea population polygons (Western Botanical 2008). Proposed sampling locations were chosen to incorporate areas that appeared to be healthy and also areas that appeared to be distressed (as per the 2013 pseudo-colour image) to provide an overview of the population health and also to help calibrate the monitoring method. Another parameter utilised in the selection of sampling sites was proximity to areas of mine activity in order to monitor or gauge the effects of mining activities, both direct and indirect on the community and the Kunzea itself (i.e. dust, spread of Dieback, altered hydrological regimes, disturbance).

Quadrats locations were spread across the Kunzea population to measure variation and incorporated some of the original transect locations (Western Botanical 2008). Six quadrats were initially proposed, three placed in vegetation showing signs of foliage loss and three in vegetation in good health (foliage gain) based on the vegetation change detection (VCD) multispectral image, with one of each in proximity to the original monitoring transects. Final selection of quadrat locations was determined on-site following a reconnaissance of the Kunzea Conservation Area in conjunction with the 2013 0.5m pixel VCD pseudo-colour image which gave the impression of more drastic change from 2012 to 2013 (see Section 2.2.4).

A total of eight quadrats measuring 10m x 10m were established during the field assessment, with 30 individual plants tagged and monitored within each quadrat. Table 1 presents quadrat location information and justification for site selection. Figure 1 presents the quadrat locations in conjunction with the 2013 0.5m pixel VCD pseudo-colour image.

**Table 1: Site Selection of Quadrats**

| Quadrat | Original Transect | Vegetation Health*   | Other Parameter  |
|---------|-------------------|--|--|
| Q1      |                   | Potentially distressed - Intense area of red on imagery indicating reduction of foliage)       | Located on northern edge of population adjacent to cleared area; potentially prone to dust, altered hydrology and future ground disturbance/excavation |
| Q2      | X                 | Possibly slightly stressed - Area with yellow patches on imagery                               | Located on northern edge of population adjacent to cleared area; potentially prone to dust, altered hydrology and future ground disturbance/excavation |
| Q3      |                   | Probably healthy vegetation - Area of green with little to no yellow or red present on imagery | Objective to observe any differences in vegetation health between Q3 and Q4 given distinction in imagery along track (i.e. N versus S)                 |
| Q4      | X                 | Possibly slightly stressed - Area with yellow patches on imagery                               | Located towards eastern edge of the population and located adjacent to a haul road   |
| Q5      |                   | Possibly slightly stressed - Area with yellow patches on imagery                               | Located on western slope/change of slope; near northern edge of the population with potential of future ground disturbance adjacent                    |
| Q6      | X                 | Probably healthy vegetation - Area of green with little to no yellow or red present on imagery | Located near northern edge of the population with potential of future ground disturbance adjacent  |
| Q7      | X                 | Probably healthy vegetation - Area of green with little to no yellow or red present on imagery | Located on southern slope; to the south of potential future ground disturbance   |
| Q8      |                   | Probably healthy vegetation - Area of green with little to no yellow or red present on imagery | Located towards the centre of Conservation Area away from any potential direct impacts of mining   |

\* - Based on the 2013 0.5m pixel VCD pseudo colour image

Initially, quadrat dimensions of 20m x 20m were proposed in order to capture a suitable sample size of at least 5-10 plants/quadrat (Woodman Environmental 2014). However, once in the field the density of plants was found to be extremely high, with plant numbers within a 20m x 20m quadrat too large (100+) to effectively monitor all plants present. Monitoring of individuals was therefore restricted to 30 plants per quadrat, regardless of the total number of plants in the quadrat, to establish consistency between quadrats for comparative purposes and limit monitoring time. The smaller quadrat dimensions will also assist with relocating plants in subsequent monitoring periods given the extremely dense nature of the vegetation.

The quadrats were orientated along cardinal points with a pink pin dropper placed in each corner and pink flagging tape tied above the location of each pin dropper. A quadrat

identifier (unique number) was labelled on the north-west pin dropper, with a photograph of the quadrat and its vegetation taken from this corner towards the south-east corner. A structural description of the vegetation, with identification of dominant taxa, was recorded to describe and characterise the vegetation associated with the Kunzea in each quadrat.

Each Kunzea to be monitored was demarcated with pink flagging tape and a labelled ear tag (with unique identifier number) attached to an upright stem. A number of existing tagged plants (with ear tags) from the original monitoring transects were utilised. The GPS location of each plant was also recorded, utilising a hand-held GPS. A total of 240 Kunzea individuals were demarcated for monitoring.

### 3.2 Plant Collection, Licensing and Nomenclature

Specimens of dominant taxa were collected for positive identification under scientific licence pursuant to the *Wildlife Conservation Act* 1950 Section 23C and Section 23F as listed in Table 2. Taxon nomenclature generally follows *Florabase* (DPaW 2015b) with all names checked against the current DPaW Max database to ensure their validity. However, in cases where names of plant taxa have been published recently in scientific literature but have not been adopted on *Florabase* (DPaW 2015), nomenclature in the published literature is followed. The conservation status of each taxon was checked against *Florabase*, which provides the most up-to-date information regarding the conservation status of flora taxa in Western Australia.

**Table 2: Personnel and Licensing Information**

| Personnel     | Licence to Take Flora for Scientific or Other Prescribed Purposes | Permit to Take Declared Rare Flora (Herbarium Specimens for Identification Purposes) |
|---------------|---|--|
| Bethea Loudon | SL010956  | 108-1314   |

### 3.3 Monitoring

The 2014 monitoring presents the baseline results for the new methods against which future results will be compared.

#### 3.3.1 Health Ranking

A scale of health ranking was developed for both the quadrat (assessing general vegetation health), and the health of each Kunzea plant. These are presented in Table 3 and Table 4 respectively.

**Table 3: Quadrat Vegetation Health Ranking Scale**

| Score | Definition  | Context   |
|-------|---|---|
| 0     | Healthy, no signs of recent stress/chlorosis or death (within past 12 months) | Very old limb or plant deaths may be present but no evidence of response to a recent change in conditions; Vegetation generally green and vigorous with no visible deleterious change since previous monitoring |



| Score | Definition   | Context   |
|-------|--|---|
| 1     | Healthy, with signs of recovery/response to previous stress/death (within past 12 months)          | Signs of recovery (i.e. resprouting/new growth) after previous stress/chlorosis or death of limbs/plants;<br>Recruitment of seedlings;<br>Assigned to a quadrat that was previously ranked as '2' or higher the previous monitoring period and showing quite obvious signs of recovery response following the cessation of causal/stress factor/s |
| 2     | Signs of recent stress/chlorosis of/in individuals, scattered plants (within past 12 months)       | Yellowing of limbs or foliage, minor death of parts of leaves/tip deaths, with affected plants scattered within quadrat;<br>Responding to stress triggers of either minor/low intensity causal factor or in early stages of response to causal factor   |
| 3     | Signs of recent deaths of/in individuals, scattered plants (within past 12 months)                 | Death of limbs or whole plants, with affected plants scattered within quadrat;<br>Responding to stress triggers of either slightly more significant causal factor or in mid stages of response  |
| 4     | Signs of significant chlorosis and/or deaths of numerous plants, extensive (within past 12 months) | Death of limbs or whole plants, with affected plants numerous/abundant within quadrat;<br>Responding to significant causal factor with extensive effects and/or late stages of response to causal factor  |
| 5     | Death of many plants or substantial area of quadrat (within past 12 months)                        | Severe response to change in conditions, deaths/defoliation abundant within quadrat and of broadscale nature  |

**Table 4: Individual Plant Health Ranking Scale**

| Score | Definition  | Context  |
|-------|---|--|
| 0     | Healthy, no signs of recent stress/chlorosis or death (within past 12 months)             | Very old limb deaths may be present but no evidence of response to a recent change in conditions;<br>Plant healthy with green foliage and good vigour with no visible deleterious change since previous monitoring   |
| 1     | Healthy, with signs of recovery/response to previous stress/death (within past 12 months) | Signs of recovery (i.e. resprouting/new growth) after previous stress/chlorosis or death of limbs/plant;<br>Assigned to a plant that was previously ranked as '2' or higher the previous monitoring period and showing quite obvious signs of recovery response following the cessation of causal factor/s |
| 2     | Signs of recent stress/chlorosis (within past 12 months)                                  | Minor (affecting <50% of plant) yellowing of limbs or foliage;<br>Minor/insignificant death of parts of leaves/tip deaths  |
| 3     | Signs of recent death (within past 12 months)   | Minor (affecting <50% of plant) recent death of limbs/tips of limbs/parts of plant   |
| 4     | Signs of significant chlorosis and/or death (within past 12 months)                       | Major (affecting >50% of plant) recent death of limbs/parts of plants  |
| 5     | Dead  | Plant completely dead  |

The ranking scale enables the capture of current changes in the health of the vegetation and Kunzea plants between monitoring periods only and ignores historical events/periods that have resulted in changes. For example, old dead branches of foliage are not taken into

account in consecutive monitoring periods as they are the result of a past causal factor and do not reflect the current environmental conditions. The scores, ranging from 0 to 5, take into account plants which are healthy with no visible change, plants that are showing signs of recovery from the previous year's stress, plants that are stressed and showing signs of chlorosis, plants that are stressed and showing signs of death, and plants that have died.

The health scale for the individual Kunzea plants addresses the form of the plant as a whole and was not applied separately to the upright stem and basal portions, as basal portions were only observed in a few plants and appeared to be dependent on age of plant and available space.

### 3.3.2 Quadrat Health

The health of the quadrat vegetation was assigned a rank using the system detailed in Section 3.3.1, with notes taken to describe the general condition of the quadrat, the species affected and quantities of plant deaths of dominant taxa if present, and any signs of disturbance. A photograph of the quadrat and its vegetation, to be repeated annually, was captured from the northwest corner looking towards the southeast corner. General observations relating to soil type and condition (i.e. moist, dry) were also recorded.

### 3.3.3 Plant Health

The parameters outlined in the method statement (Woodman Environmental 2014) were applied during the field assessment with some minor variations adopted to account for observed plant morphology during the field assessment. Table 5 details these parameters with adopted modifications. Appendix A presents representative photographs of fecundity classifications, including aborted forms, and what constitutes an upright stem for future field reference.

**Table 5: Plant Health Monitoring Parameters**

| Parameter     | Measurement  | Modification / Comment   |
|---------------|--|--|
| Health Score  | Defines the health/condition of each plant based on the scale described in Section 2.2.1           | Proposed health rankings worked well and were simple to apply consistently – no changes required   |
| Height        | Measured from ground level to the highest living point of the plant                                | Measured using a graduated broomstick to the nearest approximate centimetre; use of a 5m tape measure difficult in windy conditions and on tall plants   |
| Width         | Measured along two living axis' (north/south and east/west) to capture changes in plant dimensions | The previous method of widest axis and perpendicular width does not present an accurate representation of changes to plant dimensions; by measuring the same axis' each time observations will be consistent); measured using a graduated broomstick to the nearest approximate centimetre |
| Upright Stems | Number of alive/dead   | Easy to discern in larger plants with more space, but more difficult for smaller, younger plants; Presence/Absence removed as all plants (young or old) can be considered to have at least one upright stem, older/larger plants have a more definitive basal                              |

| Parameter          | Measurement   | Modification / Comment   |
|--------------------|---|--|
|                    |   | portion and distinctive upright stems; seedlings would perhaps be the only case where uprights might not be seen; based on field observations an upright stem was determined as being a definite stem that was no longer a branch (see Appendix A) |
| Age                | General age of plant, whether young (healthy, robust, lush) or old (straggly/gnarly, perhaps more sparse foliage)   | Simplified to reflect life status i.e. whether in reproductive state (mature) or sapling/seedling phase (juvenile), as density of Kunzea plants and vegetation appear to affect the size of individuals  |
| Fecundity          | Presence/absence of buds, flowers and new fruit (i.e. from the current season), notes may be recorded relating to abundance or if aborted                       | Extra descriptives added e.g. 'ab' to indicate aborted buds, flowers or fruit and vegetative   |
| Foliage Percentage | Percentage of plant that is alive, dead or chlorotic  | Only record if significant/definitive, disregard occasional yellow leaves particularly at base of growing tip of branchlets (appeared to be common to all plants)  |
| Comments           | Record of any additional observations relating to Kunzea plant health (Apex Death, Basal Death, presence of Cassytha, Insect Damage, Recruitment within quadrat | Notes relating to old dead tips and general overall observation of occasional yellow leaves at base of growing tip recorded  |

Each Kunzea individual was assessed as per the above parameters with notes relating to population dynamics, age range of Kunzea within quadrats, whether recruitment is occurring or presence of basal foliage death recorded. If individual plants are found to be deceased during future monitoring, the health score of '5' will be assigned and no further data recorded.

In addition to those outlined in Table 5, the following modification to the methods was undertaken. The method statement stated that if seedlings were observed that may potentially be *Kunzea similis* propagules, these would be demarcated with a labelled pin dropper and their GPS location recorded, with these seedlings revisited and assessed in the following monitoring period when positive identification may be more readily made. Due to the large potential sample size of mature individuals and a lack of seedlings, it was decided that evidence of recruitment will simply be recorded/noted with select seedling/s demarcated and location recorded to track survival.

### 3.3.4 Multispectral Imagery Interpretation

Individuals of the Kunzea are not distinguishable on multispectral imagery due to plant form and overall vegetation conditions. However following several years monitoring it is expected that linkage between general vegetation condition as shown on the imagery and

condition/health of the Kunzea population will become clear should a correlation exist, and on-ground assessment frequency may be reduced.

During the 2014 monitoring period, particular areas were visited to ground-truth and characterise observations from the 2013 0.5m pixel VCD image to gain an understanding of the correlation between the colour scale of the imagery and observations in the field. Photographic points, vegetation descriptions and field observations were recorded to provide visual context to the correlation. Appendix B presents the scale range of the pseudo-colour image. Correlations between the 2013 0.5m pixel VCD imagery and on-ground observations are summarised in section 4.

Using this understanding of the multispectral imagery colour range, the monitoring results and observations of the Kunzea and vegetation were compared with the most recent (2014) VCD multispectral imagery which compares changes in conditions between 2013 and 2014. These comparisons are summarised in the results and incorporate possible relationships to rainfall. The 0.2m pixel pseudo-colour VCD image will be used in the comparison of Kunzea and vegetation health with the imagery, as the 0.2m pixel product provides more (finer) detail and greater information, particularly when it comes to targeting areas to ground-truth that have shown significant change.

As mentioned in Section 3.1, the level of change or colour differential between the 2013 0.5m and 0.2m pixel images appears to be more enhanced in the 0.5m image. Following the fieldwork and the 2014 image capture, it was found that a sensor based issue from the 2013 flight had resulted in an anomaly, causing the colour scheme to be greatly enhanced in the 0.5m image (pers. comm. Andrew Malcolm 2015). This issue will not present any further problems with interpretation of the imagery in subsequent years as the error has been rectified.

### **3.4 Rainfall Data**

Total monthly rainfall records sourced from the Bureau of Meteorology for Ravensthorpe is presented for 2012-2014 in the form of charts. Comparisons were made between health conditions observed during the current monitoring period and climate observations, both annually and in the months preceding the monitoring, to provide possible correlations between health and rainfall conditions. In future reporting, only the year of rainfall preceding and the year of the current image capture will be presented.

Daily rainfall data captured by the minesite's weather station was not used due to missing data, resulting in substantial variations between the minesite and Ravensthorpe's annual rainfall totals.

## 4. RESULTS

The field assessment and initial monitoring was conducted by Bethea Loudon (Woodman Environmental Senior Botanist) and Cheyne Jowett (FQM Environmental Advisor) during the period 13<sup>th</sup> to 17<sup>th</sup> October 2014.

The raw data for each quadrat is presented in Appendix C, with the results and observations summarised in Section 4.1 to 4.4, and correlations discussed in Section 5.

### 4.1 Quadrat Health

The health scores for each quadrat for the 2014 baseline monitoring period are presented in Table 6, with photographs of each quadrat presented in Appendix D.

**Table 6: Quadrat Health Scores**

| Quadrat | 2014 | Observations   |
|---------|------|--|
| 1       | 0    | Vegetation generally healthy with occasional dead Banksia shrubs and occasional old chlorotic/mottled leaves on older (lower) foliage of <i>Eucalyptus pleurocarpa</i> and <i>Hakea pandanica</i> subsp. <i>pandanica</i> ; new growth on shrubs and mallees; no recent/new deaths or stressed foliage   |
| 2       | 0    | Vegetation generally healthy with occasional dead Banksia shrubs outside quadrat, occasional old mottled leaves on older (lower) foliage of <i>Eucalyptus pleurocarpa</i> and <i>Hakea pandanica</i> subsp. <i>pandanica</i> ; lower leaf death on <i>Banksia heliantha</i> ; new growth on shrubs and mallees; no recent/new deaths or stressed foliage   |
| 3       | 0    | Vegetation healthy with some old dead leaves on <i>Banksia lemmaniana</i> , dead lower leaves on <i>Banksia heliantha</i> and <i>Isopogon trilobus</i> , occasional mottled leaves on older (lower) foliage of <i>Eucalyptus pleurocarpa</i> , occasional old dead shrubs of <i>Banksia lemmaniana</i> and alive <i>Banksia lemmaniana</i> with old dead branches (on shrubs around 2.5m high); new growth on shrubs and mallees; no recent/new deaths or stressed foliage |
| 4       | 0    | Vegetation healthy with occasional old chlorotic/mottled leaves on older (lower) foliage of <i>Eucalyptus pleurocarpa</i> , <i>Eucalyptus ecostata</i> and <i>Banksia lemmaniana</i> , old dead mottled lower leaves on <i>Banksia heliantha</i> ; new growth on shrubs and mallees; no recent/new deaths or stressed foliage  |
| 5       | 0    | Vegetation generally healthy with occasional dead <i>Banksia lemmaniana</i> , occasional old dead and mottled leaves on older (lower) foliage of <i>Eucalyptus pleurocarpa</i> ; new growth on shrubs and mallees; no recent/new deaths or stressed foliage  |
| 6       | 0    | Vegetation healthy with no dead <i>Banksia lemmaniana</i> in vicinity, old dead and mottled leaves on older (lower) foliage of <i>Eucalyptus sporadica</i> , <i>Banksia lemmaniana</i> and <i>Eucalyptus pleurocarpa</i> ; old dead lower leaves of <i>Banksia heliantha</i> , occasional straggly/poor <i>Eucalyptus ?sporadica</i> sapling – possibly diseased; new growth on shrubs and mallees; no recent/new deaths or stressed foliage                               |
| 7       | 0    | Vegetation healthy with occasional old dead or chlorotic leaves on older (lower) foliage of <i>Eucalyptus pleurocarpa</i> and <i>Banksia lemmaniana</i> ; old dead leaves on lower parts of <i>Banksia heliantha</i> ; occasional dead <i>B. lemmaniana</i> inside and outside quadrat (ranging in height from 1.6-2.5m); new growth on shrubs and mallees; no recent/new deaths or stressed foliage   |
| 8       | 0    | Vegetation healthy with occasional old dead <i>Banksia lemmaniana</i> outside quadrat (1 inside quadrat); occasional old dead limbs on <i>Eucalyptus pleurocarpa</i> and occasional old dead or chlorotic leaf on older foliage of <i>Eucalyptus pleurocarpa</i> and <i>Banksia lemmaniana</i> ; old dead lower leaves on <i>Banksia heliantha</i> ; new growth on shrubs and mallees; no recent/new deaths or stressed foliage  |

All eight quadrats received a health ranking of '0'. The vegetation of the Kunzea Conservation Area and the quadrats was healthy, with only occasional scattered deaths of individual plants of mainly *Banksia lemniiana*. There were no signs of extensive areas of recent or old death, and no current signs of stress. Appendix E presents photographs of examples of plant and foliage death outlined in Table 6.

## 4.2 Plant Health

Table 7 presents the results of the 2014 baseline monitoring of *Kunzea similis* subsp. *mediterranea*.

The density of *Kunzea similis* subsp. *mediterranea* ranged from approximately 40-60 plants in quadrats Q1, Q5, Q7 and Q8, to 400-600 plants in quadrats Q2, Q3 and Q6.

Overall plants were generally very healthy with no whole plant deaths observed, either recent or old, or substantial signs of current stress within the population. The majority of plants recorded a health score of '0'. Only one plant (Quadrat 7) out of the total 240 plants monitored had a health score of '2'. This plant was displaying slight symptoms of stress having lighter green/more yellowish foliage than other plants, with 10% chlorotic foliage and no dead foliage. This may be due to its position on a rocky substrate (boulder outcropping with exposed soil) rather than external factors, as the rest of the plants within the quadrat were all healthy.

Plants commonly had occasional yellowing leaves present at the base of foliated branchlets (growing tip of branchlets) (see Appendix A) however this was considered a normal process of defoliation and extension of growth, and was not recorded as indicating stress. Of the 240 plants recorded, 171 plants (71%) possessed this character. Very old dead tips and recently old dead tips (see Appendix A) that were long defoliated, were recorded on 8 plants across four quadrats (Quadrat 1 = 2, Quadrat 2 = 1, Quadrat 5 = 4, Quadrat 7 = 1).

A range of plant ages are possibly present within the population, from very young (1m high, generally single stemmed and no discernible basal portion) to very mature (2+m high with definitive upright stems and basal portions). However this is possibly more of a reflection of space and substrate type rather than age, for example:

- Where there was a higher density of the Kunzea, plants were more narrow and upright;
- Where the Kunzea was low in density, the substrate lateritic and the vegetation was slightly more open, the plants had wider dimensions, basal portions and possessed two or more upright stems but were of medium height; and
- Where the Kunzea was low in density, the substrate silcrete and the vegetation very open, plants were very tall with wide dimensions, basal portions and two or more upright stems of reasonable diameter.

Plants with separate distinctive basal tufts of foliage and multiple upright stems were observed infrequently. These were generally only observed where plants were more sparsely distributed in more open vegetation (e.g. Quadrat 5 and 7). There was no marked difference in health between the basal foliage and the upright stems of these plants.

**Table 7: Summary of *Kunzea similis* subsp. *mediterranea* Health 2014**

| Quadrat | Health Score Range | % of Plants of Each Health Score | Height Range |          | Height Av. (m) | N-S Width Range |          | N-S Width Av. (m) | E-W Width Range |          | E-W Width Av. (m) | Alive Upright Stem Range (No.) | No. of Dead Upright Stems | Dead Foliage Av. (%)* | Alive Foliage Av. (%) | Chlorotic Foliage Av. (%)* |
|---------|--------------------|----------------------------------|--------------|----------|----------------|-----------------|----------|-------------------|-----------------|----------|-------------------|--------------------------------|---------------------------|-----------------------|-----------------------|----------------------------|
|         |                    |                                  | Min. (m)     | Max. (m) |                | Min. (m)        | Max. (m) |                   | Min. (m)        | Max. (m) |                   |                                |                           |                       |                       |                            |
| 1       | 0                  | 0 = 100                          | 1.04         | 1.71     | 1.33           | 0.12            | 0.85     | 0.40              | 0.16            | 0.83     | 0.38              | 1                              | 0                         | 100                   | 0                     | 0                          |
| 2       | 0                  | 0 = 100                          | 1.13         | 2.85     | 1.92           | 0.18            | 1.15     | 0.53              | 0.18            | 0.82     | 0.46              | 1                              | 0                         | 100                   | 0                     | 0                          |
| 3       | 0                  | 0 = 100                          | 1.23         | 2.32     | 1.57           | 0.24            | 0.89     | 0.42              | 0.10            | 0.77     | 0.40              | 1 - 2                          | 0                         | 100                   | 0                     | 0                          |
| 4       | 0                  | 0 = 100                          | 1.30         | 3.40     | 2.34           | 0.26            | 1.05     | 0.57              | 0.14            | 1.00     | 0.57              | 1 - 2                          | 0                         | 100                   | 0                     | 0                          |
| 5       | 0                  | 0 = 100                          | 1.06         | 2.25     | 1.50           | 0.16            | 2.25     | 0.51              | 0.15            | 1.20     | 0.59              | 1 - 3                          | 0                         | 100                   | 0                     | 0                          |
| 6       | 0                  | 0 = 100                          | 1.17         | 2.44     | 1.61           | 0.22            | 1.02     | 0.46              | 0.20            | 1.00     | 0.49              | 1 - 3                          | 0                         | 100                   | 0                     | 0                          |
| 7       | 0 - 2              | 0 = 99.66<br>2 = 0.33            | 1.62         | 3.19     | 2.31           | 0.41            | 1.80     | 0.87              | 0.41            | 1.93     | 0.90              | 1 - 3                          | 1                         | 99.66<br>(90 - 100)   | 0                     | 0.33<br>(0 - 10)           |
| 8       | 0                  | 0 = 100                          | 1.33         | 2.55     | 1.93           | 0.21            | 1.58     | 0.62              | 0.18            | 1.24     | 0.60              | 1 - 3                          | 0                         | 100                   | 0                     | 0                          |

\*Range of values recorded in brackets

All *Kunzea similis* subsp. *mediterranea* assessed were classified as reproductively mature however 9 plants were found to be vegetative at the time of the monitoring (Quadrats 1, 2, 3 and 6). Fecundity ranged from buds through to new fruit, with the level of aborted features varying between quadrats and between plants. There was no particular pattern to the occurrence of aborted features (no relation to plant age or height) and no apparent correlation to plant health.

A range of heights were recorded, the shortest plant measuring 1.04m (Quadrat 1) and the tallest plant 3.4m (Quadrat 4). The N-S width ranged from 0.12m in Quadrat 1 to 2.25m in Quadrat 5, and the E-W width ranged from 0.10m in Quadrat 3 to 1.93m in Quadrat 7. Overall plants were generally largest in Quadrat 7.

The number of upright stems per individual ranged from one to three, with only one plant (Quadrat 7) having an old dead upright stem. The number of upright stems is easier to determine in larger plants but more difficult in smaller younger plants as they are not always easy to discern from branches.

No other detrimental factors, such as insect damage or presence of *Cassytha* on plants, were recorded.

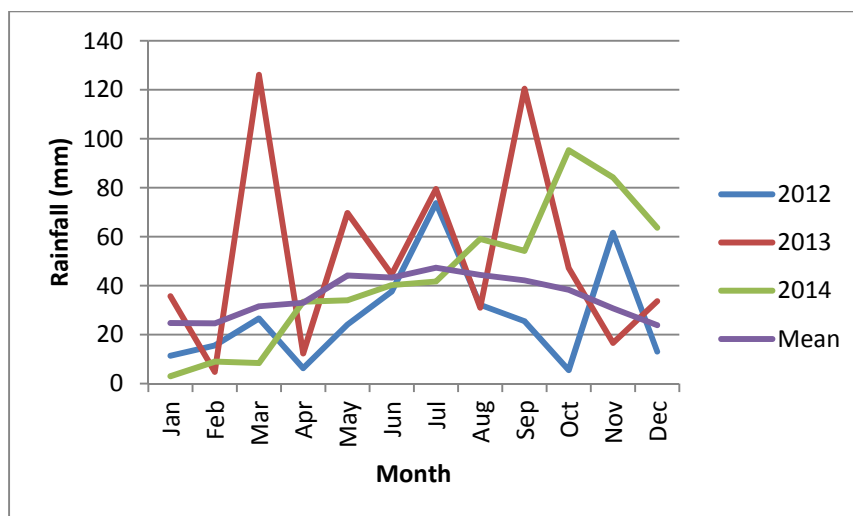
### **4.3 Rainfall**

The monthly rainfall for the years 2012 to 2014 and the mean annual rainfall, calculated for the years 1901 to 2015, for Ravensthorpe are presented in Chart 1.

The mean annual rainfall for Ravensthorpe is 428mm. Annual rainfall reached 333.2mm, 621.6mm and 526.2mm in 2012, 2013 and 2014 respectively, with only 2012 being below average.

In the four months prior to and including the month of the image capture (November), monthly rainfall totalled 136.9mm in 2012, 278.1mm in 2013 and 250.3mm in 2014 (Bureau of Meteorology 2015).





**Chart 1: Monthly and Mean Annual Rainfall for Ravensthorpe (Bureau of Meteorology 2015)**

## 4.4 Multispectral Imagery Results

### 4.4.1 Interpretation of 2013 VCD Image

Interpretation of the 2013 0.2m pixel image (Figure 2) indicated that the vegetation of the Kunzea Conservation Area was in reasonably healthy condition with no significant deleterious changes in the vegetation between 2012 and 2013. The image indicated:

- Minor losses of plant cell density across the area (indicated by spattering of yellow pixels);
- Very occasional maximum loss of plant cell density (indicated by scattered red pixels);
- Significant areas of low plant cell density gain (indicated by broad patches of light blue pixels); and
- Significant areas of no change in cell density (indicated by large areas of green pixels).

In relation to the 2013 0.2m pixel image (Figure 2), areas of light blue (foliage gain) occurred in association with the silcrete soils (vegetation type Sandy Silcrete Thicket (Western Botanical 2008)), which may potentially be relatively free-draining and gain moisture more freely allowing fluctuations or increases in growth more readily. In comparison, the yellow patterning (plant cell density loss) in the western half adjacent to the north-south track, is a western facing slope in association with laterite caprock (vegetation type Laterite Mallee Shrubland (Western Botanical 2008)), with the potential of impeded vertical drainage, high wind and sun exposure and steep incidence leading to stress of vegetation. Following the reconnaissance and ground-truthing a generalised observation was determined that areas of plant cell density loss were usually associated with a clayey lateritic soil, rather than the silcrete association.

The 2013 0.5m pixel pseudo-colour image, depicting vegetation change between 2012 and 2013, indicated areas of reduced foliage vigour along the northern and eastern portions of the Kunzea Conservation Area, shown as yellow through to red colouring in Figure 1 (now known to be enhanced due to an error in capture).

Table 8 presents the particular areas and points that were ground-truthed to determine the sensitivity of the imagery. These locations are shown in Figure 1 with related photographic representation presented in Appendix F.

**Table 8: Multispectral Imagery Ground-truthing Results**

| Photo Point | Feature Verified (Pseudo-colour change detection scale (Figure 1; Appendices B; F))                     | Observations   |
|-------------|---|--|
| 1           | Dense orange/red pixels in north in vicinity of Quadrat 1   | Loss or death of foliage on alive plants stress in understorey of small-leaved species such as <i>Beaufortia</i> and <i>Melaleuca</i> ; no deaths of or current stress evident in mid or overstorey shrubs or trees – vegetation healthy */**  |
| 2           | Distinct line of change from orange/red pixels to yellow/green pixels in north in vicinity of Quadrat 1 | Change in slope and change in vegetation type at this point, possibly loss of or death of foliage in understorey of small-leaved species such as <i>Beaufortia</i> and <i>Melaleuca</i> ; occasional old dead small shrubs and old dead sticks/limbs on mallees; no deaths of or current stress evident in mid or overstorey shrubs or trees – vegetation healthy */**   |
| 3           | Area of orange/yellow pixels in southeast corner near haul road   | Possibly previous stress of foliage in dense understorey of small-leaved dense foliage species of <i>Melaleuca</i> ; minor change/little long-term effect and/or has since recovered; fine/heavy cracking clay soil compared to rest of Conservation Area; lower in landscape/depression; area of potential water capture moisture gain; potential for altered regime; potential effect of dust cover from road ** |
| 4           | Area of orange/yellow pixels in southeast corner near haul road   | As for Photo Point 3   |
| 5           | Small area of yellow pixels (with <i>Kunzea</i> point in centre)  | Healthy <i>Kunzea similis</i> subsp. <i>mediterranea</i> plant (#496 of original transect) beneath large <i>Hakea pandanicarpa</i> with chlorotic, unhealthy foliage   |
| 6           | Small area of yellow pixels amongst green   | Small dead <i>Banksia lemanniana</i> shrub   |
| 7           | Large red area of red pixels with yellow pixel halo near Quadrat 7                                      | Red blob = 4 dead <i>Banksia lemanniana</i> shrubs (2-2.5m tall) with alive <i>B. lemanniana</i> shrubs adjacent   |
| 8           | Small area of orange pixels with yellow pixel halo  | Small <i>Banksia lemanniana</i> shrub now dead   |
| 9           | Large blue pixel area   | Patch of <i>Eucalyptus ecostata</i> 8m x 8m with an abundance of new growth and lots of flowers and nuts; a dead <i>Banksia lemanniana</i> to 2.5m high observed on west side of clump   |

| Photo Point | Feature Verified (Pseudo-colour change detection scale (Figure 1; Appendices B; F)) | Observations   |
|-------------|---|--|
| 10          | Large blue pixel area   | Patch of <i>Eucalyptus ecostata</i> 7m x 8m with an abundance of new growth and lots of flowers and nuts; not quite as dense as clump at Photo Point 7   |
| 11          | Distinct line of change from green pixels to yellow/green pixels in east            | Essentially the same vegetation each side of track; more, possible variation due to understorey composition/foilage types and density of mallees - <i>Melaleuca rigidifolia</i> on west side than east side; <i>Melaleuca pomphostoma</i> present on east side and not west side; higher density of mallees on east side** |
| 12          | Distinct line of change from green/orange/yellow pixels to green pixels in centre   | Essentially the same vegetation each side of track; more, possible variation due to differing densities of mid stratum – dense mid stratum south side of track, open mid stratum north side of track **  |

\* Area of anomaly in image capture; \*\* Subject to enhanced colour range

Keeping in mind the capture of the image and subsequent ground-truthing was one year apart, the following correlations between vegetation health and the colour scale were ascertained:

- Areas of red (on imagery) indicate that the vegetation, more so the understorey and typically species of small foliage size, has suffered stress and one year on has dead foliage still attached to alive and healthy plants (this is in the area of the anomaly in the image capture and is therefore potentially not related to the observations deduced);
- Individual large red areas with a halo of yellow indicate a large single plant that at the time of the image capture was possibly moderately stressed and one year on is completely dead (commonly *Banksia lemniiana*);
- Individual yellow areas indicate a single shrub (typically *Banksia lemniiana* or *B. heliantha*) that have been slightly stressed and presently have small amounts of dead foliage below or amongst new growth and healthy foliage (i.e. have since recovered) or are now completely dead;
- Yellow areas indicate possible previous slight stress of *Melaleuca* or effects of dust from the adjacent haul road (minor change with no long-term effects; has since recovered) (this is in an area of possibly enhanced colour range due to the anomaly in the image capture and is therefore potentially not related to the observations deduced);
- Blue areas mainly relate to clumps of mallees that have had a significant flush of new growth or increase in healthy foliage; and
- Green is healthy unaffected vegetation.

The results of the ground-truthing supported the representation of the 0.2m pixel image and verified the enhancement caused by the anomaly that was detected in the 0.5m pixel image. No obvious visible correlations were observed in the areas of high or maximum plant cell density loss as indicated in the 2013 0.5m pixel image (Figure 1). The vegetation in general throughout the Conservation Area appeared to be in good condition with no evidence of

mass plant stress or death and only the occasional death of *Banksia lemanniana* or very occasionally *B. heliantha* observed.

Individuals of the *Kunzea* were not distinguishable on multispectral imagery.

#### **4.4.1.1 Correlation with Rainfall**

The slight increase (areas of light blue), minor areas of loss (areas of yellow) and limited maximum loss in plant cell density between 2012 and 2013 as indicated by the 2013 0.2m pixel image may be attributable to the increased rainfall received in 2013. Below average rainfall was experienced in 2012 (333.2mm) but was followed by good rainfall in 2013 (621.6mm), a difference of 288.4mm. Substantial rainfall occurred prior to the image capture in 2013 with 120mm recorded in September and 47mm in October, compared to 25mm and 5mm in 2012 (Bureau of Meteorology 2015).

#### **4.4.2 Interpretation of 2014 VCD Image**

The 2014 vegetation change detection imagery was flown on 1st November 2014. The 0.2m pixel pseudo-colour VCD image is presented in Figure 3.

Review of the 2014 image (Figure 3) indicates that overall there is a higher proportion of foliage with little to no change (green scale) in conjunction with a reduction of low plant cell density gain (light blue) compared to the 2013 image (Figure 2). Although sparsely distributed, increases in higher levels of plant cell density gain (dark blue) are apparent, with an increased incidence of low (yellow) and high (red) plant cell density loss.

Review of the 0.2m pixel image depicting vegetation change between 2012 to 2014 (Figure 4) indicates that there was a loss of low levels of plant cell density across the *Kunzea* Conservation Area, with maximum loss of plant cell density and possible deaths of individual large shrubs on mid to lower slopes (indicated by red pixels). A number of large areas indicate moderate levels of plant cell density gain in the general vegetation (smudges of light to mid blue) with maximum gain observed in individual plants most likely to be clumps of mallees (dark blue areas). The changes are less significant over the longer period (in terms of both gain and loss) when compared to the change that occurred between 2013 and 2014.

In both Figure 2 and Figure 3 the loss of plant cell density shown in the 2014 images has been minor, relating to individual plants (usually *Banksia lemanniana*) rather than expanses of vegetation, and indicates that no significant loss of vegetation or causes of stress are present.

#### **4.4.2.1 Correlation with Health Monitoring**

The 2014 pseudo-colour VCD imagery (Figure 3 and Figure 4) was compared with the 2014 health monitoring results.

The vegetation of Quadrats 1, 2 and 5 was considered as being 'generally healthy' and containing dead *Banksia* shrubs. These quadrats are located in vegetation with a higher incidence of plant cell density loss. Quadrats 3, 4, 6, 7 and 8 which were considered to be 'healthy' and not containing dead *Banksia* shrubs (with the exception of Quadrat 7 and 8), are located in areas of no change with some minor loss and gain of plant cell density.

The apparent loss of plant cell density observed in Figure 3 (change from 2013 to 2014) was not overly evident in Quadrats 2 or 7 during the 2014 monitoring period. It would seem that the yellow of the colour scale does not present as a significant visual result on-ground.

Given the healthy status of vegetation recorded in the field, the minor loss of plant cell density of larger shrubs and surrounding vegetation in the vicinity of the quadrats as depicted in the VCD imagery by the presence of minor scattered pixels of yellow and red amongst green, would indicate a healthy habitat that is not subject to significant causal factors of stress and this has correlated with healthy plants of *Kunzea similis* subsp. *mediterranea*.

The changes in plant cell density have not been significant, affecting individual plants (i.e. most commonly *Banksia lehmanniana* or *B. heliantha*) rather than the general vegetation as a whole, with no deleterious effect observed on the Kunzea.

#### 4.4.2.2 Correlation with Rainfall

The slight increase in loss of plant cell density (yellow and red) and limited gain (blue) in plant cell density between 2013 and 2014 as indicated by the 2014 0.2m pixel image (Figure 2) may be attributable to the decreased rainfall received in 2014. Slightly lower rainfall was received in 2014 (526.2mm) compared to the good rainfall experienced in 2013 (621.6mm), a difference of 95.4mm. Reasonable rainfall was experienced in September and October of 2014 (54.2 and 38.3mm respectively), however rainfall earlier in the year (January to March) was much lower than in previous years (Bureau of Meteorology 2015).

## 5. DISCUSSION AND CONCLUSIONS

The baseline monitoring of 240 plants of *Kunzea similis* subsp. *mediterranea* was conducted through the establishment of eight quadrats measuring 10m x 10m within the Kunzea Conservation Zone, with some minor modifications to the previously proposed methods based on field observations. Overall the monitoring method worked well and the health rankings were found to be appropriate and easy to apply consistently. The parameters will capture significant changes to the health of the Kunzea population.

The reconnaissance of the Kunzea Conservation Area and monitoring of newly established quadrats found the vegetation to be in good condition with no obvious signs of mass vegetation stress or death (current or historical). Occasional scattered plant deaths of *Banksia lemmaniana*, death of older foliage of *B. heliantha* and *Isopogon trilobus* or loss of foliage of small leaved plants such as *Beaufortia schaueri* where they grow in high densities, were the only signs observed of previous stress.

There was no apparent pattern to the *Banksia lemmaniana* deaths, nor the death or presence of old chlorotic or mottled foliage on other species, that would indicate the presence of Dieback (*Phytophthora cinnamomi*) or detrimental effects of adjacent operations and ground disturbance activities. A number of dead *B. lemmaniana* shrubs that had fallen over were observed to have a shallow root system mainly consisting of several lateral roots and lacking a substantial tap root. This possibly inadequate root system may

explain the higher incidence of death in this species as a result of drought during periods of lower rainfall.

Overall the Kunzea plants were generally very healthy with no whole plant deaths observed, either recent or old, or substantial signs of current stress within the population. Only one plant appeared to be in poorer health, displaying slight symptoms of stress, and the condition of this plant may be attributable to its position on a rocky substrate. Plants commonly had occasional yellowing leaves present at the base of foliated branchlets (growing tip of branchlets) however this was considered a normal process of defoliation and extension of growth, and was not recorded as indicating stress.

Plant measurements and densities varied between quadrats, with variations between density of vegetation; amount of available space; and vegetation, substrate and soil type possibly accounting for these differences.

The 2014 0.2m pixel pseudo-colour VCD image, depicting changes from 2013 to 2014, indicates an overall higher proportion of foliage with little to no change in conjunction with a reduction of low plant cell density gain compared to the 2013 image. Small areas of higher levels of plant cell density gain are apparent, along with an increase in low and high plant cell density loss. The increased incidence of low and high plant cell density loss may possibly be attributed to the lower rainfall (and dry start to the year) experienced in 2014 compared to 2013.

The minor loss of plant cell density (yellow) as depicted in the 2014 image would indicate minor changes in the form of mottled or old chlorotic leaves but otherwise healthy vegetation. Maximum loss of plant cell density (red) would tend to indicate the presence of dead foliage on, or completely dead individual shrubs amongst healthy vegetation.

The changes in plant cell density have not been significant, affecting individuals rather than the general vegetation as a whole, with no deleterious effect on the Kunzea. It is presumed that a broad extent of a maximum loss of plant cell density (extensive areas of red) in the vicinity of the Kunzea would be required before significant impact to plant health is observed. Overall there has been no significant negative change over the past two years (from 2012 to 2014) or within the past year (2013 to 2014), to the broader vegetation or the Kunzea.

Based on the comparison of the VCD imagery with the monitoring results, it is therefore considered that vegetation with no change or showing minor loss of plant cell density with occasional dead shrubs is a healthy habitat with no significant causal factors of stress, containing healthy plants of *Kunzea similis* subsp. *mediterranea*.

At present changes appear to relate to variations in topography, slope, vegetation and soil associations, and rainfall rather than external factors associated with mining operations. More significant vegetation changes may become apparent in the future when the area immediately to the north of the Kunzea Conservation Area is mined. Currently this area has only been cleared with some surface extraction/movement of soil.

## 6. RECOMMENDATIONS

Based on the results presented in this report, the following recommendations are made:

- The assessment of vegetation and individual Kunzea plant health should continue to be monitored to observe any changes and enable direct correlation between plant and vegetation condition with respect to changes observed in the multispectral imagery depicting vegetation change;
- Monitoring should be undertaken annually during the taxon's flowering period (September to November), preferably in October as close as possible to the time of the multispectral imagery capture to enable comparisons between changes in vegetation health and observations of the Kunzea;
- Each quadrat should be revisited in consecutive years with the same parameters measured and health scores assigned;
- Review ease of repetition and comprehension of parameters if different recorders are used in the 2015 monitoring period; and
- Review the monitoring frequency following analysis of the 2016 monitoring results to determine whether on-ground monitoring frequency can be reduced. Multispectral image capture and analysis should continue on an annual basis but on-ground verification may be conducted every 2 or 3 years if a clear correlation between the imagery and field observations is established.

## 7. REFERENCES

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**Appendix A: Photographic Representation of Fecundity Classifications and Upright Stems**



**Plate 1: Flowers (Fls) of *Kunzea similis* subsp. *mediterranea***



**Plate 2: Aborted flowers (Fls-ab) of *Kunzea similis* subsp. *mediterranea***



**Plate 3: Buds (B) of *Kunzea similis* subsp. *mediterranea***



**Plate 4:** Aborted buds (B-ab) of *Kunzea similis* subsp. *mediterranea*



**Plate 5:** New fruit (Fr) of *Kunzea similis* subsp. *mediterranea*



**Plate 6:** Aborted fruit (Fr-ab) of *Kunzea similis* subsp. *mediterranea*



**Plate 7:** New fruit (Fr) and aborted fruit (Fr-ab) of *Kunzea similis* subsp. *mediterranea*



**Plate 8:** Old fruit (not recorded) of *Kunzea similis* subsp. *mediterranea*



**Plate 9:** Occasional yellow foliage at base of growing tip of *Kunzea similis* subsp. *mediterranea*



**Plate 10:** Very old dead tips of *Kunzea similis* subsp. *mediterranea*

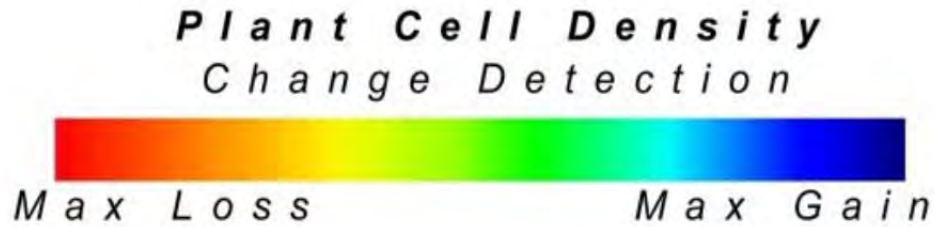


**Plate 11:** Recent old dead tips of *Kunzea similis* subsp. *mediterranea*



**Plate 12:** Healthy, upright stems of *Kunzea similis* subsp. *mediterranea*

## Appendix B: Pseudo-colour Change Detection Scale Range



- Red = below the point of being photosynthetically active
- Yellow = has lost leaf cover (but may have gone from high leaf cover to moderate, may not necessarily be a complete loss of foliage)
- Green = no change
- Blue = gained leaves

|   |  |                   |   |                  |          |
|---|--|-------------------|---|------------------|----------|
| <b>Location</b>   | North side of CZ, north of track in 'hot spot' |                   |   | <b>Personnel</b> | BL/CJ    |
| <b>Quadrat #</b>  | Q1   | <b>Easting</b> NW | 258364  | <b>Northing</b>  | 6272572  |
| <b>Date</b>   | 14/10/2014                                     | <b>Datum</b>      | GDA94   | <b>Photo #</b>   | 101-0506 |
| <b>Vegetation Description (Dominant Taxa)</b>   |  |                   |   |                  |          |
| Mid isolated clumps of mallee shrub of Eucalyptus pleurocarpa and Eucalyptus ecostata over tall open shrubland of Banksia lemanniana over mid closed shrubland of Taxandria spathulata, Beaufortia schaueri, Beaufortia micrantha var. micrantha and Jacksonia elongata.  |  |                   |   |                  |          |
| <b>Vegetation Health Ranking</b>  |  | 0                 | <b>Soil / Conditions</b>                                |                  |          |
|   |  |                   | Dry grey-brown sandy clay with laterite surface pebbles |                  |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>  |  |                   |   |                  |          |
| Plants - metal tags & pin droppers, corners - flag pins   |  |                   |   |                  |          |
| Approx. 50 Kunzea plants in quadrat in southern, none in northern half. NW corner of quadrat in ecotone with Melaleuca rigidifolia vegetation. Occasional dead Banksia lemanniana, open understorey with Occasional sedges (bare ground), dense lower shrub layer, Occasional chlorotic/mottled leaves on Eucalyptus pleurocarpa (of lower leaves on old growth), new/fresh growth on tips; vegetation generally healthy, Occasional old chlorosis in Hakea pandanica subsp. pandanica. |  |                   |   |                  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B / Fl / Fr / V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)   |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-----------------------------|---------|--------|-------------|--|
| 001     | 258369  | 6272568  | 0              | 1.38       | 0.24      | 0.23      | 1A               | M         | Fl                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 002     | 258369  | 6272567  | 0              | 1.54       | 0.35      | 0.29      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 003     | 258368  | 6272567  | 0              | 1.32       | 0.12      | 0.17      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 004     | 258368  | 6272566  | 0              | 1.16       | 0.24      | 0.23      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 005     | 258370  | 6272569  | 0              | 1.55       | 0.38      | 0.45      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | -  |
| 006     | 258368  | 6272565  | 0              | 1.25       | 0.35      | 0.26      | 1A               | M         | B, Fl, Fr                   | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 007     | 258369  | 6272568  | 0              | 1.53       | 0.29      | 0.29      | 1A               | M         | B-ab                        | 100     | 0      | 0           | Only 1 inflorescence   |
| 008     | 258368  | 6272567  | 0              | 1.62       | 0.36      | 0.50      | 1A               | M         | B, Fl, Fr                   | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 009     | 258369  | 6272564  | 0              | 1.04       | 0.28      | 0.20      | 1A               | M         | B, Fl, Fr                   | 100     | 0      | 0           | -  |
| 010     | 258366  | 6272567  | 0              | 1.71       | 0.30      | 0.30      | 1A               | M         | B-ab                        | 100     | 0      | 0           | B-ab on older stem   |
| 011     | 258368  | 6272568  | 0              | 1.50       | 0.55      | 0.50      | 1A               | M         | Fl, Fr, Fr-ab               | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip; recently old dead tip |
| 012     | 258371  | 6272571  | 0              | 1.23       | 0.85      | 0.72      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | -  |
| 013     | 258368  | 6272570  | 0              | 1.59       | 0.76      | 0.83      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip; recently old dead tip |
| 014     | 258368  | 6272569  | 0              | 1.21       | 0.22      | 0.30      | 1A               | M         | V                           | 100     | 0      | 0           | -  |
| 015     | 258366  | 6272569  | 0              | 1.34       | 0.45      | 0.40      | 1A               | M         | B, Fr                       | 100     | 0      | 0           | -  |
| 016     | 258369  | 6272568  | 0              | 1.19       | 0.40      | 0.38      | 1A               | M         | B-ab, Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 017     | 258368  | 6272569  | 0              | 1.10       | 0.40      | 0.29      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 018     | 258364  | 6272569  | 0              | 1.06       | 0.13      | 0.24      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 019     | 258364  | 6272564  | 0              | 1.31       | 0.38      | 0.16      | 1A               | M         | B-ab, Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 020     | 258366  | 6272566  | 0              | 1.24       | 0.35      | 0.62      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 021     | 258366  | 6272565  | 0              | 1.15       | 0.21      | 0.20      | 1A               | M         | B-ab                        | 100     | 0      | 0           | -  |
| 022     | 258365  | 6272562  | 0              | 1.22       | 0.45      | 0.24      | 1A               | M         | V                           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 023     | 258363  | 6272564  | 0              | 1.47       | 0.45      | 0.25      | 1A               | M         | V                           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 024     | 258364  | 6272565  | 0              | 1.68       | 0.38      | 0.35      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 025     | 258364  | 6272565  | 0              | 1.12       | 0.40      | 0.43      | 1A               | M         | B-ab                        | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 026     | 258365  | 6272569  | 0              | 1.55       | 0.45      | 0.48      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 027     | 258369  | 6272568  | 0              | 1.23       | 0.35      | 0.35      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 028     | 258364  | 6272568  | 0              | 1.27       | 0.62      | 0.70      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip                        |
| 029     | 258364  | 6272568  | 0              | 1.11       | 0.67      | 0.39      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 030     | 258365  | 6272570  | 0              | 1.20       | 0.60      | 0.53      | 1A               | M         | B-ab                        | 100     | 0      | 0           | -  |

|   |   |                   |   |                  |          |
|---|---|-------------------|---|------------------|----------|
| <b>Location</b>   | North side of CZ, south of track near KsCA1 |                   |   | <b>Personnel</b> | BL/CJ    |
| <b>Quadrat #</b>  | Q2  | <b>Easting</b> NW | 258365  | <b>Northing</b>  | 6272536  |
| <b>Date</b>   | 14/10/2014                                  | <b>Datum</b>      | GDA94   | <b>Photo #</b>   | 101-0507 |
| <b>Vegetation Description (Dominant Taxa)</b>   |   |                   |   |                  |          |
| Mid isolated clumps of mallee shrub of Eucalyptus pleurocarpa and Eucalyptus ecostata over tall open shrubland of Banksia lemanniana over mid closed shrubland of Taxandria spathulata, Jacksonia elongata, Melaleuca striata and Kunzea similis.   |   |                   |   |                  |          |
| <b>Vegetation Health Ranking</b>  |   | 0                 | <b>Soil / Conditions</b>                                |                  |          |
|   |   |                   | Dry, grey sandy clay with grey surface silcrete pebbles |                  |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>  |   |                   |   |                  |          |
| Plants - metal tags & ear tags, corners - flag pins   |   |                   |   |                  |          |
| Approx. 600 Kunzea plants in quadrat. Occasional dead Banksia lemanniana outside quadrat, lower leaf death on Banksia heliantha, old dead mottled older leaves on lower growth of Eucalyptus pleurocarpa with new fresh growth on tips, open understorey (bare ground); vegetation generally healthy; occasional chlorosis (old) leaves on Hakea pandanicarpa subsp. pandanicarpa; an abundance of Kunzea plants in quadrat and surrounding vegetation, all healthy, flowers and fruits, relatively tall. |   |                   |   |                  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B/Fl/Fr/V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)                  |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-----------------------|---------|--------|-------------|---|
| 031     | 258367  | 6272534  | 0              | 2.02       | 0.90      | 0.65      | 1A               | M         | Fr, Fr-ab             | 100     | 0      | 0           | -   |
| 032     | 258366  | 6272531  | 0              | 1.90       | 0.44      | 0.25      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | -   |
| 033     | 258367  | 6272527  | 0              | 1.42       | 0.56      | 0.40      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 034     | 258367  | 6272526  | 0              | 1.72       | 0.65      | 0.30      | 1A               | M         | Fl, Fr, Fr-ab         | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 035     | 258369  | 6272525  | 0              | 1.13       | 0.24      | 0.35      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | -   |
| 036     | 258366  | 6272526  | 0              | 1.77       | 0.68      | 0.55      | 1A               | M         | Fl, Fr, Fr-ab         | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 037     | 258366  | 6272530  | 0              | 1.74       | 0.18      | 0.33      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 038     | 258368  | 6272534  | 0              | 1.83       | 0.24      | 0.39      | 1A               | M         | Fr-ab                 | 100     | 0      | 0           | -   |
| 039     | 258366  | 6272536  | 0              | 1.95       | 0.70      | 0.80      | 1A               | M         | Fr                    | 100     | 0      | 0           | -   |
| 040     | 258368  | 6272535  | 0              | 1.80       | 0.32      | 0.35      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | -   |
| 041     | 258371  | 6272534  | 0              | 1.68       | 0.39      | 0.20      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | -   |
| 042     | 258369  | 6272530  | 0              | 1.34       | 0.36      | 0.41      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 043     | 258369  | 6272528  | 0              | 1.58       | 0.34      | 0.30      | 1A               | M         | V                     | 100     | 0      | 0           | -   |
| 044     | 258370  | 6272526  | 0              | 1.42       | 0.22      | 0.18      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | -   |
| 045     | 258370  | 6272523  | 0              | 2.42       | 0.45      | 0.40      | 1A               | M         | Fr                    | 100     | 0      | 0           | -   |
| 046     | 258370  | 6272528  | 0              | 1.85       | 0.46      | 0.40      | 1A               | M         | Fr-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 047     | 258370  | 6272530  | 0              | 2.07       | 0.36      | 0.48      | 1A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | -   |
| 048     | 258368  | 6272533  | 0              | 1.98       | 0.48      | 0.36      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 049     | 258371  | 6272536  | 0              | 1.92       | 0.78      | 0.35      | 1A               | M         | Fl, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 050     | 258373  | 6272535  | 0              | 2.30       | 0.93      | 0.48      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 051     | 258372  | 6272532  | 0              | 1.78       | 0.48      | 0.62      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 052     | 258374  | 6272531  | 0              | 2.35       | 0.50      | 0.40      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 053     | 258372  | 6272532  | 0              | 2.40       | 1.15      | 0.73      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 054     | 258371  | 6272527  | 0              | 1.80       | 0.54      | 0.50      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 055     | 258374  | 6272529  | 0              | 2.32       | 0.85      | 0.60      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 056     | 258371  | 6272523  | 0              | 1.92       | 0.30      | 0.45      | 1A               | M         | Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 057     | 258374  | 6272526  | 0              | 2.85       | 0.50      | 0.43      | 1A               | M         | Fr-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 058     | 258374  | 6272530  | 0              | 1.90       | 0.60      | 0.53      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 0204    | 258365  | 6272538  | 0              | 2.22       | 0.70      | 0.65      | 1A               | M         | B                     | 100     | 0      | 0           | Ear tag                                       |
| 0286    | 258376  | 6272531  | 0              | 2.10       | 0.70      | 0.82      | 1A               | M         | Fl, Fr, B-ab          | 100     | 0      | 0           | Terminal dead tips (old). Ear tag             |



|   |                |                             |        |  |          |
|---|----------------|-----------------------------|--------|--|----------|
| <b>Location</b>   | North of KsCA3 |                             |        | <b>Personnel</b>   | BL/CJ    |
| <b>Quadrat #</b>  | Q3             | <b>Easting<sub>NW</sub></b> | 258196 | <b>Northing</b>  | 6272224  |
| <b>Date</b>   | 15/10/2014     | <b>Datum</b>                | GDA94  | <b>Photo #</b>   | 101-0508 |
| <b>Vegetation Description (Dominant Taxa)</b>   |                |                             |        |  |          |
| Mid isolated clumps of mallee shrubs of Eucalyptus pleurocarpa and Eucalyptus ecostata over tall open shrubland of Banksia lemanniana over mid closed shrubland of Taxandria spathulata, Banksia heliantha, Melaleuca striata and Kunzea similis, and occasional Lepidosperma in understorey. Kunzea abundant within and outside quadrat.   |                |                             |        |  |          |
| <b>Vegetation Health Ranking</b>  | 0              | <b>Soil/Conditions</b>      |        | Dry grey sandy clay, silcrete & laterite surface pebbles, occasional laterite boulder. |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>  |                |                             |        |  |          |
| Plants - ear tags, corners - pin droppers   |                |                             |        |  |          |
| Approx. 400-500 Kunzea plants in quadrat. Vegetation healthy; some old dead chlorotic leaves on Banksia lemanniana, dead lower leaves on Banksia heliantha, occasional mottled leaves on Eucalyptus pleurocarpa, occasional old dead Banksia lemanniana and alive Banksia lemanniana with old dead branches (~2.5m high), occasional old dead lower leaf on Isopogon trilobus, open understorey/bare ground with leaf litter; new growth on trees and shrubs. |                |                             |        |  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B/Fl/Fr/V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)                  |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-----------------------|---------|--------|-------------|---|
| 001     | 258198  | 6272212  | 0              | 1.70       | 0.40      | 0.77      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 002     | 258199  | 6272214  | 0              | 1.67       | 0.58      | 0.50      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 003     | 258200  | 6272212  | 0              | 1.84       | 0.33      | 0.50      | 1A               | M         | V                     | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 004     | 258202  | 6272210  | 0              | 1.82       | 0.38      | 0.51      | 1A               | M         | Fl, Fr, B-ab          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 005     | 258203  | 6272212  | 0              | 1.26       | 0.34      | 0.18      | 1A               | M         | Fr                    | 100     | 0      | 0           | -   |
| 006     | 258203  | 6272213  | 0              | 2.32       | 0.81      | 0.59      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 007     | 258205  | 6272214  | 0              | 1.55       | 0.28      | 0.45      | 1A               | M         | V                     | 100     | 0      | 0           | -   |
| 008     | 258203  | 6272214  | 0              | 1.60       | 0.34      | 0.54      | 1A               | M         | Fr                    | 100     | 0      | 0           | -   |
| 009     | 258202  | 6272215  | 0              | 1.26       | 0.54      | 0.17      | 1A               | M         | Fl-ab                 | 100     | 0      | 0           | -   |
| 010     | 258202  | 6272213  | 0              | 1.49       | 0.28      | 0.27      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 011     | 258199  | 6272216  | 0              | 1.23       | 0.30      | 0.10      | 1A               | M         | V                     | 100     | 0      | 0           | -   |
| 012     | 258198  | 6272215  | 0              | 1.51       | 0.32      | 0.27      | 1A               | M         | V                     | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 013     | 258199  | 6272218  | 0              | 1.54       | 0.55      | 0.34      | 1A               | M         | B-ab                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 014     | 258200  | 6272217  | 0              | 1.35       | 0.28      | 0.60      | 1A               | M         | Fr                    | 100     | 0      | 0           | -   |
| 015     | 258200  | 6272214  | 0              | 1.65       | 0.78      | 0.59      | 1A               | M         | Fr, Fl                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 016     | 258205  | 6272218  | 0              | 1.35       | 0.53      | 0.26      | 1A               | M         | Fr                    | 100     | 0      | 0           | -   |
| 017     | 258205  | 6272216  | 0              | 1.34       | 0.42      | 0.35      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 018     | 258207  | 6272218  | 0              | 1.32       | 0.32      | 0.40      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 019     | 258205  | 6272219  | 0              | 1.43       | 0.43      | 0.50      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 020     | 258205  | 6272220  | 0              | 1.71       | 0.89      | 0.52      | 2A               | M         | Fl-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 021     | 258204  | 6272220  | 0              | 1.83       | 0.25      | 0.34      | 1A               | M         | Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 022     | 258201  | 6272220  | 0              | 1.54       | 0.37      | 0.35      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 023     | 258200  | 6272218  | 0              | 1.98       | 0.40      | 0.39      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 024     | 258199  | 6272218  | 0              | 1.30       | 0.35      | 0.46      | 1A               | M         | Fl                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 025     | 258198  | 6272223  | 0              | 1.61       | 0.44      | 0.45      | 1A               | M         | Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 026     | 258200  | 6272220  | 0              | 1.74       | 0.24      | 0.25      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 027     | 258201  | 6272222  | 0              | 1.59       | 0.34      | 0.42      | 1A               | M         | Fr, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 028     | 258203  | 6272221  | 0              | 1.74       | 0.55      | 0.25      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 029     | 258206  | 6272221  | 0              | 1.36       | 0.34      | 0.25      | 1A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |
| 030     | 258205  | 6272221  | 0              | 1.38       | 0.34      | 0.34      | 2A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip |

|   |            |                             |   |                  |          |
|---|------------|-----------------------------|---|------------------|----------|
| <b>Location</b>   | KSCA3      |                             |   | <b>Personnel</b> | BL/CJ    |
| <b>Quadrat #</b>  | Q4         | <b>Easting<sub>NW</sub></b> | 258215  | <b>Northing</b>  | 6272141  |
| <b>Date</b>   | 15/10/2014 | <b>Datum</b>                | GDA94   | <b>Photo #</b>   | 101-0547 |
| <b>Vegetation Description (Dominant Taxa)</b>   |            |                             |   |                  |          |
| Mid open mallee shrubland of Eucalyptus pleurocarpa and Eucalyptus ecostata over tall open shrubland of Banksia lemanniana over mid shrubland of Taxandria spathulata, Isopogon trilobus, Banksia heliantha, Melaleuca striata, Kunzea similis and occasional Xanthorrhoea.   |            |                             |   |                  |          |
| <b>Vegetation Health Ranking</b>  |            | 0                           | <b>Soil / Conditions</b>                                  |                  |          |
|   |            |                             | Dry grey sandy clay, occasional silcrete surface pebbles. |                  |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>  |            |                             |   |                  |          |
| Plants - ear tags, corners - pin droppers   |            |                             |   |                  |          |
| 80-100 Kunzea plants in quadrat. Vegetation healthy with occasional old chlorotic/mottled lower leaves on Eucalyptus pleurocarpa, Eucalyptus ecostata and Banksia lemanniana; old dead mottled lower leaves on Banksia heliantha; bare understorey/open with leaf litter; new growth on trees and shrubs. Kunzea abundant inside and outside quadrat, some very tall plants. Lower in landscape, depression?! |            |                             |   |                  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B /Fl /Fr/V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)                   |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-------------------------|---------|--------|-------------|--|
| 0455    | 258212  | 6272141  | 0              | 2.10       | 1.05      | 1.00      | 1A               | M         | Fr, Fl                  | 100     | 0      | 0           | -  |
| 031     | 258215  | 6272141  | 0              | 2.35       | 0.30      | 0.40      | 1A               | M         | Fr, Fr-ab               | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 032     | 258211  | 6272134  | 0              | 2.26       | 0.62      | 0.61      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 033     | 258211  | 6272133  | 0              | 3.25       | 0.88      | 0.81      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 034     | 258213  | 6272130  | 0              | 1.80       | 0.69      | 0.80      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 035     | 258211  | 6272130  | 0              | 2.08       | 0.60      | 0.35      | 1A               | M         | Fl                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 036     | 258213  | 6272128  | 0              | 2.43       | 0.37      | 0.58      | 1A               | M         | Fr, Fr-ab               | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 037     | 258214  | 6272129  | 0              | 2.27       | 0.50      | 0.37      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 038     | 258216  | 6272131  | 0              | 2.84       | 0.75      | 0.65      | 1A               | M         | Fr, Fl                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 039     | 258215  | 6272134  | 0              | 2.13       | 0.82      | 0.14      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 040     | 258212  | 6272136  | 0              | 1.82       | 0.95      | 0.65      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 041     | 258212  | 6272138  | 0              | 2.10       | 0.41      | 0.34      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 042     | 258214  | 6272137  | 0              | 2.07       | 0.35      | 0.35      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 043     | 258217  | 6272138  | 0              | 1.80       | 0.51      | 0.88      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 044     | 258219  | 6272137  | 0              | 2.44       | 0.84      | 0.82      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 045     | 258219  | 6272137  | 0              | 2.95       | 0.65      | 0.51      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 046     | 258216  | 6272138  | 0              | 2.98       | 0.56      | 0.42      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 047     | 258215  | 6272138  | 0              | 2.33       | 0.62      | 0.52      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 048     | 258212  | 6272134  | 0              | 2.80       | 0.51      | 0.85      | 1A               | M         | Fr                      | 100     | 0      | 0           | -  |
| 049     | 258214  | 6272133  | 0              | 2.05       | 0.26      | 0.27      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | -  |
| 050     | 258211  | 6272136  | 0              | 3.10       | 0.54      | 0.69      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 051     | 258211  | 6272137  | 0              | 2.15       | 0.38      | 0.41      | 1A               | M         | Fr, B-ab                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 052     | 258214  | 6272129  | 0              | 2.38       | 0.67      | 0.58      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 053     | 258214  | 6272132  | 0              | 2.51       | 0.65      | 0.97      | 1A               | M         | Fr, Fl                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 054     | 258213  | 6272132  | 0              | 2.00       | 0.44      | 0.49      | 1A               | M         | Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 055     | 258212  | 6272132  | 0              | 1.78       | 0.59      | 0.70      | 2A               | M         | Fl                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 056     | 258211  | 6272132  | 0              | 2.80       | 0.64      | 0.66      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 057     | 258211  | 6272134  | 0              | 3.40       | 0.43      | 0.55      | 1A               | M         | Fl, Fr                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip  |
| 058     | 258210  | 6272131  | 0              | 1.30       | 0.30      | 0.15      | 1A               | M         | Fl                      | 100     | 0      | 0           | -  |
| 059     | 258212  | 6272139  | 0              | 1.95       | 0.29      | 0.52      | 1A               | M         | Fr                      | 100     | 0      | 0           | -  |

|  |               |                             |        |   |          |
|--|---------------|-----------------------------|--------|---|----------|
| <b>Location</b>  | West of KsCA4 |                             |        | <b>Personnel</b>  | BL/CJ    |
| <b>Quadrat #</b>   | Q5            | <b>Easting<sub>NW</sub></b> | 257689 | <b>Northing</b>   | 6272544  |
| <b>Date</b>  | 15/10/2014    | <b>Datum</b>                | GDA94  | <b>Photo #</b>  | 101-0554 |
| <b>Vegetation Description (Dominant Taxa)</b>  |               |                             |        |   |          |
| Mid open mallee shrubland of Eucalyptus pleurocarpa, Eucalyptus ecostata, Eucalyptus kessellii subsp. eugnota and Eucalyptus tetraptera over tall open shrubland of Banksia lemmaniana over mid isolated clumps of shrubs of Jacksonia elongata over low shrubland of Beaufortia schaueri.               |               |                             |        |   |          |
| <b>Vegetation Health Ranking</b>   |               | 0                           |        | <b>Soil/Conditions</b>  |          |
|  |               |                             |        | Dry, pink brown sandy clay, laterite surface pebbles & stones |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>   |               |                             |        |   |          |
| Plants - ear tags, corners - pin droppers  |               |                             |        |   |          |
| Approx. 50-60 Kunzea plants in quadrat. Vegetation generally healthy, occasional dead Banksia lemmaniana, occasional old dead and mottled leaves on Eucalyptus pleurocarpa, open/bare ground/patchy understorey with leaf litter; new growth on trees/Banksia. Photo 101-0555 of quadrat from NE corner. |               |                             |        |   |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B / Fl / Fr / V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)                                       |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-----------------------------|---------|--------|-------------|--|
| 060     | 257691  | 6272533  | 0              | 2.12       | 0.51      | 0.78      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | -  |
| 061     | 257696  | 6272543  | 0              | 1.57       | 0.89      | 0.50      | 1A               | M         | Fl, Fr, Fl-ab, B-ab         | 100     | 0      | 0           | Recent old dead tip. Photo: 101-0556                               |
| 062     | 257698  | 6272539  | 0              | 1.90       | 0.63      | 0.77      | 2A               | M         | Fr, Fl-ab, B-ab             | 100     | 0      | 0           | Old tip deaths, lots of old fruit                                  |
| 063     | 257695  | 6272538  | 0              | 1.32       | 0.79      | 0.78      | 2A               | M         | Fl, Fl-ab, Fr, B-ab         | 100     | 0      | 0           | Old tip deaths. Photo: 101-0561                                    |
| 064     | 257694  | 6272535  | 0              | 1.14       | 0.38      | 0.63      | 1A               | M         | B-ab                        | 100     | 0      | 0           | -  |
| 065     | 257694  | 6272534  | 0              | 1.19       | 0.26      | 0.73      | 1A               | M         | B-ab, Fl-ab, Fl             | 100     | 0      | 0           | -  |
| 066     | 257694  | 6272538  | 0              | 1.49       | 0.45      | 0.58      | 2A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 067     | 257694  | 6272534  | 0              | 1.06       | 0.16      | 0.15      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | -  |
| 068     | 257690  | 6272535  | 0              | 1.10       | 0.34      | 0.48      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 069     | 257691  | 6272536  | 0              | 1.39       | 0.40      | 0.35      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 070     | 257690  | 6272535  | 0              | 1.53       | 0.52      | 0.56      | 1A               | M         | B-ab, Fl                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 071     | 257690  | 6272538  | 0              | 1.99       | 0.53      | 0.82      | 1A               | M         | Fl, Fr, B-ab, Fl-ab         | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 072     | 257690  | 6272537  | 0              | 1.70       | 0.42      | 0.52      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | -  |
| 074     | 257691  | 6272538  | 0              | 2.25       | 0.45      | 0.68      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | -  |
| 088     | 257694  | 6272534  | 0              | 1.10       | 0.36      | 0.44      | 1A               | M         | B-ab, Fr-ab                 | 100     | 0      | 0           | -  |
| 089     | 257693  | 6272535  | 0              | 1.28       | 0.51      | 0.49      | 1A               | M         | Fr, B-ab, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 086     | 257693  | 6272538  | 0              | 1.20       | 0.48      | 0.40      | 1A               | M         | Fr, Fl-ab                   | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 087     | 257694  | 6272538  | 0              | 1.22       | 0.49      | 0.45      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 090     | 257693  | 6272538  | 0              | 1.43       | 0.44      | 0.62      | 1A               | M         | Fr, B, B-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 075     | 257691  | 6272540  | 0              | 1.98       | 0.50      | 0.58      | 1A               | M         | B-ab                        | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 076     | 257694  | 6272540  | 0              | 1.31       | 0.38      | 0.39      | 1A               | M         | B-ab                        | 100     | 0      | 0           | -  |
| 077     | 257684  | 6272540  | 0              | 1.23       | 0.95      | 0.57      | 2A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 078     | 257687  | 6272541  | 0              | 1.40       | 0.64      | 0.70      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 079     | 257685  | 6272542  | 0              | 1.09       | 0.48      | 0.58      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 080     | 257684  | 6272540  | 0              | 1.32       | 0.50      | 0.45      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 081     | 257687  | 6272542  | 0              | 1.55       | 0.39      | 0.45      | 1A               | M         | Fr, Fr-ab                   | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 073/082 | 257689  | 6272539  | 0              | 1.75       | 0.45      | 1.20      | 3A               | M         | Fr, Fl                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip, plant has 2 tags.   |
| 083     | 257691  | 6272540  | 0              | 1.61       | 0.62      | 0.94      | 1A               | M         | B-ab                        | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip, occasional dead tip |
| 084     | 257691  | 6272539  | 0              | 1.65       | 0.50      | 0.48      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |
| 085     | 257691  | 6272538  | 0              | 1.99       | 0.77      | 0.66      | 2A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.                     |

|  |            |                             |        |  |          |
|--|------------|-----------------------------|--------|--|----------|
| <b>Location</b>  | KsCA4      |                             |        | <b>Personnel</b>                                   | BL/CJ    |
| <b>Quadrat #</b>   | Q6         | <b>Easting<sub>NW</sub></b> | 257789 | <b>Northing</b>                                    | 6272546  |
| <b>Date</b>  | 15/10/2014 | <b>Datum</b>                | GDA94  | <b>Photo #</b>                                     | 101-0565 |
| <b>Vegetation Description (Dominant Taxa)</b>  |            |                             |        |  |          |
| Mid isolated clumps of shrub mallee shrubland of Eucalyptus pleurocarpa and Eucalyptus sporadica over tall open shrubland of Banksia lemanniana over mid shrubland of Taxandria spathulata, Kunzea similis and Banksia heliantha over low shrubland of Beaufortia micrantha var. micrantha.  |            |                             |        |  |          |
| <b>Vegetation Health Ranking</b>   |            | 0                           |        | <b>Soil/Conditions</b>                             |          |
|  |            |                             |        | Dry, grey sandy clay with silcrete surface pebbles |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>   |            |                             |        |  |          |
| Plants - ear tags, corners - pin droppers  |            |                             |        |  |          |
| Approx. 400-500 Kunzea plants in quadrat. Vegetation healthy, no dead Banksia lemanniana in vicinity, occasional old dead/mottled leaf on Eucalyptus sporadica, Banksia lemanniana and Eucalyptus pleurocarpa; old dead lower leaves of Banksia heliantha, fresh growth on all, understorey open/patchy with bare ground and occasional Lepidosperma, occasional straggly/poor Eucalyptus ?sporadica sapling - diseased. |            |                             |        |  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B / Fl / Fr / V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)                   |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-----------------------------|---------|--------|-------------|--|
| 091     | 257790  | 6272545  | 0              | 1.29       | 0.32      | 0.49      | 1A               | M         | B, Fl, Fr                   | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 092     | 257793  | 6272544  | 0              | 1.68       | 0.47      | 0.30      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 093     | 257795  | 6272545  | 0              | 2.40       | 0.58      | 0.64      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 094     | 257795  | 6272546  | 0              | 1.90       | 0.70      | 0.56      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 095     | 257798  | 6272547  | 0              | 1.17       | 0.45      | 0.42      | 3A               | M         | Fr-ab                       | 100     | 0      | 0           | -  |
| 096     | 257796  | 6272545  | 0              | 1.35       | 0.41      | 0.75      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | -  |
| 097     | 257796  | 6272543  | 0              | 1.70       | 1.02      | 1.00      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 098     | 257793  | 6272544  | 0              | 1.41       | 0.33      | 0.48      | 1A               | M         | B, Fr                       | 100     | 0      | 0           | -  |
| 099     | 257789  | 6272544  | 0              | 1.32       | 0.40      | 0.35      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 100     | 257788  | 6272541  | 0              | 1.26       | 0.27      | 0.35      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 101     | 257791  | 6272542  | 0              | 1.62       | 0.74      | 0.55      | 1A               | M         | Fr, Fl-ab, B-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 102     | 257791  | 6272543  | 0              | 1.54       | 0.30      | 0.42      | 1A               | M         | Fr, Fr-ab                   | 100     | 0      | 0           | -  |
| 103     | 257795  | 6272541  | 0              | 1.67       | 0.41      | 0.40      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 104     | 257796  | 6272542  | 0              | 1.72       | 0.51      | 0.50      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 105     | 257796  | 6272541  | 0              | 2.44       | 0.40      | 0.46      | 2A               | M         | Fl-ab, Fr                   | 100     | 0      | 0           | -  |
| 106     | 257797  | 6272539  | 0              | 1.45       | 0.36      | 0.23      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 107     | 257795  | 6272540  | 0              | 1.19       | 0.33      | 0.31      | 1A               | M         | Fl-ab                       | 100     | 0      | 0           | -  |
| 108     | 257793  | 6272540  | 0              | 1.36       | 0.58      | 0.34      | 1A               | M         | Fr-ab                       | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 109     | 257789  | 6272539  | 0              | 1.74       | 0.32      | 0.30      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 110     | 257793  | 6272540  | 0              | 1.34       | 0.61      | 0.64      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 111     | 257790  | 6272537  | 0              | 1.39       | 0.30      | 0.36      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 112     | 257790  | 6272536  | 0              | 1.32       | 0.22      | 0.20      | 1A               | M         | Fr                          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 113     | 257791  | 6272537  | 0              | 1.48       | 0.24      | 0.25      | 2A               | M         | Fr-ab                       | 100     | 0      | 0           | -  |
| 114     | 257792  | 6272536  | 0              | 1.35       | 0.32      | 0.78      | 1A               | M         | Fr                          | 100     | 0      | 0           | -  |
| 115     | 257791  | 6272539  | 0              | 1.41       | 0.57      | 0.49      | 1A               | M         | Fr, Fl-ab, B-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 116     | 257793  | 6272536  | 0              | 1.85       | 0.38      | 0.60      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | -  |
| 117     | 257797  | 6272537  | 0              | 2.22       | 0.70      | 0.68      | 1A               | M         | Fr, Fl-ab, B-ab             | 100     | 0      | 0           | -  |
| 118     | 257795  | 6272537  | 0              | 2.10       | 0.35      | 0.60      | 1A               | M         | Fl, Fr                      | 100     | 0      | 0           | -  |
| 119     | 257798  | 6272536  | 0              | 2.24       | 0.93      | 0.72      | 1A               | M         | Fr, B-ab                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 319     | 257791  | 6272542  | 0              | 1.36       | 0.26      | 0.42      | 1A               | M         | V                           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |

|  |            |                              |   |                  |          |
|--|------------|------------------------------|---|------------------|----------|
| <b>Location</b>  | KsCA2      |                              |   | <b>Personnel</b> | BL/CJ    |
| <b>Quadrat #</b>   | Q7         | <b>Eastings<sup>NW</sup></b> | 257764  | <b>Northings</b> | 6272127  |
| <b>Date</b>  | 16/10/2014 | <b>Datum</b>                 | GDA94   | <b>Photo #</b>   | 101-0582 |
| <b>Vegetation Description (Dominant Taxa)</b>  |            |                              |   |                  |          |
| Mid sparse mallee shrubland of Eucalyptus pleurocarpa and Eucalyptus ecostata over tall sparse shrubland of Banksia lemanniana and Banksia heliantha over mid shrubland of Taxandria spathulata, Jacksonia elongata, Kunzea similis and Melaleuca striata.   |            |                              |   |                  |          |
| <b>Vegetation Health Ranking</b>   | 0          | <b>Soil/Condition</b>        | Dry, grey sandy clay, silcrete surface pebbles & stones, silcrete/granite boulder outcropping |                  |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>   |            |                              |   |                  |          |
| Plants - ear tags, corners - pin droppers  |            |                              |   |                  |          |
| Approx. 40-50 Kunzea plants in quadrat. Tall vegetation; older/taller & larger diameter stems of Kunzea similis. Vegetation healthy; occasional old dead or chlorotic leaf on Eucalyptus pleurocarpa (older growth) and Banksia lemanniana; old dead leaves on lower parts of B. heliantha; all showing good fresh growth (20-30cm on E. pleoro); understorey open/bare patches with leaf litter; occasional Xanthorrhoea, Lomandra and Schoenus; occasional dead B. lemanniana inside and outside quadrat (1.6-2.5m). Very windy from north, no visible dust. |            |                              |   |                  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Eastings | Northings | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B / Fl / Fr/V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)   |
|---------|----------|-----------|----------------|------------|-----------|-----------|------------------|-----------|---------------------------|---------|--------|-------------|--|
| 321     | 257774   | 6272120   | 0              | 2.58       | 0.69      | 0.60      | 3A               | M         | Fr, Fr-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 120     | 257770   | 6272118   | 0              | 1.64       | 1.05      | 0.94      | 2A, 1D           | M         | Fl, Fr                    | 100     | 0      | 0           | -  |
| 121     | 257774   | 6272122   | 0              | 2.21       | 0.43      | 0.63      | 1A               | M         | Fr, Fl, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 122     | 257770   | 6272122   | 0              | 2.22       | 0.83      | 1.32      | 4A               | M         | Fr, Fl-ab, B-ab           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 123     | 257768   | 6272123   | 0              | 2.00       | 0.75      | 0.70      | 2A               | M         | Fl, Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 124     | 257768   | 6272120   | 0              | 2.75       | 0.97      | 1.15      | 2A               | M         | Fl, Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip, old dead tips   |
| 352     | 257768   | 6272121   | 0              | 2.65       | 0.80      | 0.83      | 3A               | M         | Fr, Fr-ab, B-ab           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 125     | 257787   | 6272120   | 0              | 2.33       | 0.70      | 0.57      | 2A               | M         | Fr, Fr-ab, Fl-ab          | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 126     | 257765   | 6272121   | 0              | 2.24       | 0.41      | 0.41      | 1A               | M         | Fr                        | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 127     | 257766   | 6272125   | 0              | 1.70       | 0.41      | 0.52      | 2A               | M         | Fr, B-ab                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 128     | 257768   | 6272123   | 0              | 2.03       | 0.79      | 0.80      | 2A               | M         | Fr, Fl, B-ab              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 129     | 257772   | 6272122   | 0              | 2.60       | 1.14      | 1.11      | 2A               | M         | Fl, Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 130     | 257772   | 6272122   | 0              | 1.92       | 0.55      | 0.48      | ? (not rec)      | M         | Fl, Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 131     | 257766   | 6272126   | 0              | 3.19       | 1.05      | 0.92      | 2A               | M         | Fr, B-ab, Fl-ab           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 132     | 257766   | 6272126   | 0              | 2.40       | 1.00      | 0.60      | 1A               | M         | B-ab, Fl-ab, Fr           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 133     | 257770   | 6272126   | 0              | 2.95       | 0.90      | 0.84      | 2A               | M         | Fr, Fr-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 134     | 257773   | 6272128   | 0              | 2.45       | 1.28      | 0.77      | 1A               | M         | Fl, Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 135     | 257771   | 6272126   | 0              | 2.75       | 0.67      | 1.93      | 2A               | M         | Fr, Fl-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 136     | 257773   | 6272126   | 0              | 2.12       | 1.80      | 0.90      | 2A               | M         | Fr                        | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 137     | 257774   | 6272123   | 0              | 1.92       | 0.91      | 1.46      | 2A               | M         | Fr, B-ab, Fl              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 138     | 257773   | 6272123   | 0              | 2.80       | 1.40      | 1.13      | 3A               | M         | Fr, B-ab, Fl              | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 139     | 257773   | 6272120   | 0              | 2.70       | 1.12      | 0.88      | 3A               | M         | Fr, Fl-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 140     | 257768   | 6272125   | 0              | 1.80       | 0.60      | 0.80      | 3A               | M         | Fl, Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 141     | 257774   | 6272123   | 2              | 2.21       | 0.75      | 0.81      | 3A               | M         | Fr, Fl-ab, B-ab           | 90      | 0      | 10          | Occasional yellow leaf at base of growing tip, all foliage lime green/yellowish, not as green as all other plants. |
| 142     | 257774   | 6272124   | 0              | 1.86       | 0.78      | 0.90      | 1A               | M         | Fl, Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 143     | 257773   | 6272124   | 0              | 2.58       | 1.03      | 0.89      | 2A               | M         | Fr-ab, Fr                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 144     | 257769   | 6272125   | 0              | 2.50       | 0.95      | 0.68      | 1A               | M         | Fl-ab, Fr                 | 100     | 0      | 0           | -  |
| 145     | 257768   | 6272124   | 0              | 2.15       | 0.70      | 0.80      | 2A               | M         | Fl, Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 146     | 257768   | 6272126   | 0              | 1.62       | 0.82      | 1.43      | 2A               | M         | Fl, Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |
| 147     | 257765   | 6272127   | 0              | 2.43       | 0.83      | 1.24      | 2A               | M         | Fl-ab                     | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip.   |

|  |              |                             |        |  |          |
|--|--------------|-----------------------------|--------|--|----------|
| <b>Location</b>  | Centre of CZ |                             |        | <b>Personnel</b>   | BL/CJ    |
| <b>Quadrat #</b>   | Q8           | <b>Easting<sub>NW</sub></b> | 257894 | <b>Northing</b>  | 6272347  |
| <b>Date</b>  | 16/10/2014   | <b>Datum</b>                | GDA94  | <b>Photo #</b>   | 101-0603 |
| <b>Vegetation Description (Dominant Taxa)</b>  |              |                             |        |  |          |
| Mid sparse mallee shrubland of Eucalyptus pleurocarpa, Eucalyptus ecostata and Eucalyptus kessellii subsp. eugnota over tall open shrubland of Banksia lemanniana over mid closed shrubland of Taxandria spathulata, Jacksonia elongata, Kunzea similis, Melaleuca striata and Adenanthos oreophilus.  |              |                             |        |  |          |
| <b>Vegetation Health Ranking</b>   |              | 0                           |        | <b>Soil/Conditions</b>   |          |
|  |              |                             |        | Dry, grey sandy clay, silcrete surface pebbles & laterite stones |          |
| <b>Comments (Veg Condition, Deaths, Weeds, Dieback, Disturbance, Pop'n Dynamics)</b>   |              |                             |        |  |          |
| Plants - ear tags, corners - pin droppers  |              |                             |        |  |          |
| Approx. 40-60 Kunzea plants in quadrat. Occasional old dead Banksia lemanniana - outside (1 inside the quadrat); occasional old dead limbs on Eucalyptus pleurocarpa; occasional old dead or chlorotic leaf on Eucalyptus pleurocarpa and Banksia lemanniana; old dead lower leaves on Banksia heliantha; otherwise vegetation healthy; open understorey/bare areas with leaf litter and occasional Lepidosperma and Xanthorrhoea. |              |                             |        |  |          |

|          |   |
|----------|---|
| <b>0</b> | Healthy, no change                      |
| <b>1</b> | Healthy, recovering                     |
| <b>2</b> | Recent chlorosis, minor/scattered, <50% |
| <b>3</b> | Recent death, minor/scattered, <50%     |
| <b>4</b> | Significant chloris/death, >50%         |
| <b>5</b> | Severe deaths/plant dead                |

|               |               |
|---------------|---------------|
| <b>Health</b> | 0 1 2 3 4 5   |
| <b>A</b>      | Alive         |
| <b>D</b>      | Dead          |
| <b>J</b>      | Juvenile      |
| <b>M</b>      | Mature        |
| <b>B</b>      | Buds          |
| <b>Fl</b>     | Flowers       |
| <b>Fr</b>     | Fruit (new)   |
| <b>V</b>      | Vegetative    |
| <b>-ab</b>    | Aborted       |
| <b>AD</b>     | Apex Death    |
| <b>BD</b>     | Basal Death   |
| <b>C</b>      | Cassytha      |
| <b>I</b>      | Insect Damage |
| <b>R</b>      | Recruitment   |

| Plant # | Easting | Northing | Health Ranking | Height (m) | Width N-S | Width E-W | Uprights (#A/#D) | Age (J/M) | Fecundity (B/Fl/Fr/V) | Alive % | Dead % | Chlorotic % | Other/Comments (AD/BD/C/I/R)                   |
|---------|---------|----------|----------------|------------|-----------|-----------|------------------|-----------|-----------------------|---------|--------|-------------|--|
| 148     | 257893  | 6272343  | 0              | 2.12       | 0.60      | 0.73      | 1A               | M         | Fr-ab                 | 100     | 0      | 0           | -  |
| 149     | 257894  | 6272342  | 0              | 2.35       | 0.61      | 0.82      | 2A               | M         | Fr-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 150     | 257893  | 6272342  | 0              | 1.91       | 0.62      | 0.54      | 2A               | M         | Fr, B-ab, Fr-ab       | 100     | 0      | 0           | -  |
| 151     | 257894  | 6272339  | 0              | 2.45       | 0.81      | 1.24      | 3A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 152     | 257897  | 6272340  | 0              | 2.03       | 0.35      | 0.52      | 1A               | M         | Fr, Fl, Fr-ab         | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 153     | 257897  | 6272337  | 0              | 1.95       | 1.58      | 1.22      | 2A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 154     | 257899  | 6272337  | 0              | 1.93       | 0.68      | 0.56      | 2A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 155     | 257899  | 6272338  | 0              | 1.72       | 0.44      | 0.34      | 1A               | M         | B-ab                  | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 156     | 257899  | 6272341  | 0              | 1.75       | 0.48      | 0.66      | 1A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 157     | 257898  | 6272343  | 0              | 2.39       | 0.80      | 0.55      | 2A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 158     | 257898  | 6272345  | 0              | 2.55       | 0.59      | 0.56      | 1A               | M         | B-ab, Fr              | 100     | 0      | 0           | -  |
| 159     | 257899  | 6272347  | 0              | 1.69       | 0.25      | 0.47      | 2A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 160     | 257900  | 6272346  | 0              | 2.00       | 0.59      | 0.40      | 2A               | M         | Fr                    | 100     | 0      | 0           | -  |
| 161     | 257900  | 6272345  | 0              | 1.45       | 0.44      | 0.35      | 1A               | M         | Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 162     | 257903  | 6272343  | 0              | 1.63       | 0.21      | 0.20      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 163     | 257899  | 6272343  | 0              | 1.70       | 0.63      | 1.14      | 2A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 164     | 257900  | 6272341  | 0              | 1.69       | 1.17      | 0.51      | 1A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 165     | 257898  | 6272337  | 0              | 2.25       | 0.60      | 1.12      | 2A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 166     | 257901  | 6272336  | 0              | 2.45       | 0.33      | 0.50      | 1A               | M         | Fl-ab                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 167     | 257903  | 6272338  | 0              | 2.32       | 1.00      | 0.33      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 168     | 257902  | 6272341  | 0              | 1.64       | 0.90      | 0.60      | 1A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 169     | 257900  | 6272342  | 0              | 1.65       | 0.64      | 0.45      | 2A               | M         | Fr, Fr-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 170     | 257902  | 6272343  | 0              | 1.33       | 0.70      | 0.38      | 2A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 171     | 257903  | 6272347  | 0              | 1.90       | 0.46      | 0.46      | 1A               | M         | Fl, B                 | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 172     | 257907  | 6272343  | 0              | 1.77       | 0.46      | 0.42      | 1A               | M         | Fl-ab, B-ab           | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 173     | 257903  | 6272341  | 0              | 1.49       | 0.27      | 0.18      | 1A               | M         | Fr, Fl                | 100     | 0      | 0           | -  |
| 174     | 257904  | 6272337  | 0              | 2.50       | 0.54      | 0.73      | 2A               | M         | Fr, Fl-ab             | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 175     | 257900  | 6272338  | 0              | 2.18       | 0.80      | 0.82      | 1A               | M         | Fr, Fl-ab, Fl         | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 176     | 257897  | 6272344  | 0              | 1.56       | 0.55      | 0.82      | 2A               | M         | Fl, Fr                | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |
| 177     | 257904  | 6272347  | 0              | 1.64       | 0.38      | 0.25      | 1A               | M         | Fr                    | 100     | 0      | 0           | Occasional yellow leaf at base of growing tip. |

**Appendix D: Photographic Record of Quadrats 2014**



**Plate 1: Quadrat 1**



**Plate 2: Quadrat 2**



**Plate 3:      Quadrat 3**



**Plate 4:      Quadrat 4**





**Plate 5:      Quadrat 5 - from north-west corner (left); from north-east corner (right)**



**Plate 6:      Quadrat 6**



**Plate 7:      Quadrat 7**



**Plate 8:      Quadrat 8**

**Appendix E: Photographic Representation of Plant and Foliage Death**



**Plate 1: Whole dead *Banksia lemanniana* amongst *Kunzea similis* subsp. *mediterranea* (T-DRF)**



**Plate 2: Dead lower foliage on *Banksia heliantha* amongst *Kunzea similis* subsp. *mediterranea* (T-DRF)**



**Plate 3:** Dead lower foliage on *Banksia heliantha*



**Plate 4:** Dead lower foliage on *Isopogon trilobus* amongst *Kunzea similis* subsp. *mediterranea* (T-DRF)

## Appendix F: Photographic Representation of Ground-truthed Points



**Photo Point 1:** Area of orange/red pixels in north (Figure 1): Bearing of 140° (left) - Mid isolated clumps of shrub mallees of *Eucalyptus pleurocarpa* and *Eucalyptus ecostata* over tall open shrubland of *Banksia lemanniana* and *Hakea pandanica* subsp. *pandanica* over mid sparse shrubland of *Taxandria spathulata* and *Jacksonia elongata*; Bearing of 285° (right) - Low open mallee shrubland of *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus* sp. Southern Wheatbelt (D. Nicolle & M. French DN 5507) over low closed shrubland of *Melaleuca rigidifolia* over low isolated clumps of *Gahnia ancistrophylla*; orange-brown sandy clay of approximately 2 cm in depth over fine grey sand with occasional silcrete pebbles (refer to Table 8).



**Photo Point 2:** On line of distinct change from orange/red pixels to yellow/green in north (Figure 1) (area of sensor error): Bearing of 310° (left) and 140° (right) - Low mallees over mid shrubland of *Melaleuca undulata* and *Daviesia articulata* over *Gahnia ancistrophylla*; orange-brown clay of approximately 5 cm in depth over fine grey silcrete sand with ironstone and silcrete pebbles and stones (refer to Table 8).



**Photo Point 2 continued:** Bearing of 90° - Tall isolated clumps of shrubs of *Hakea laurina* over low open to low sparse mallee shrubland of *Eucalyptus suggrandis* subsp. *suggrandis*, *Eucalyptus conglobata* subsp. *perata*, *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus pileata* over mid shrubland of *Melaleuca undulata*, *Daviesia articulata* and *Melaleuca ulicoides*.



**Photo Point 3:** Area of orange/yellow pixels in southeast corner (Figure 1) - Bearing of 280° (left) and 300° (right) taken from edge of haul road; Low open mallee shrubland of *Eucalyptus conglobata* subsp. *perata*, *Eucalyptus suggrandis* subsp. *suggrandis*, *Eucalyptus flocktoniae* subsp. *flocktoniae* and *Eucalyptus calycogona* subsp. *calycogona* over mid shrubland of *Daviesia articulata*, *Melaleuca cucullata*, *Melaleuca hamata*, *Melaleuca societatis* and *Melaleuca calycina* over low sparse *Gahnia ancistrophylla*; orange-brown clay with ironstone pebbles (refer to Table 8).



**Photo Point 4:** Bearing of 330°; see comment for Photo Point 3.



**Photo Point 5:** Small patch of yellow pixels (Figure 1): Bearing of 270° - *Kunzea similis* subsp. *mediterranea* (T-DRF) beneath large *Hakea pandanicarpa* with chlorotic, unhealthy foliage (refer to Table 8).



**Photo Point 6:** Small patch of yellow pixels amongst green (Figure 1): Dead *Banksia lemmaniana* shrub (refer to Table 8).



**Photo Point 7:** Large patch of red pixels with yellow halo (Figure 1): Four dead *Banksia lemmaniana* shrubs (2 - 2.5 m tall) with alive *B. lemmaniana* shrubs adjacent (refer to Table 8).





**Photo Point 8:** Small patch of orange pixels with yellow halo (Figure 1): Small dead *Banksia lemniiana* shrub (refer to Table 8).



**Photo Point 9:** Large patch of blue (Figure 1): Bearing of 50° - 8m x 8m patch of *Eucalyptus ecostata* (to 3.2m) with an abundance of dense new growth, flowers and fruit. A singular *Banksia lemniiana* shrub (2.5 m) occurs near west edge of *E. ecostata* patch (refer to Table 8).



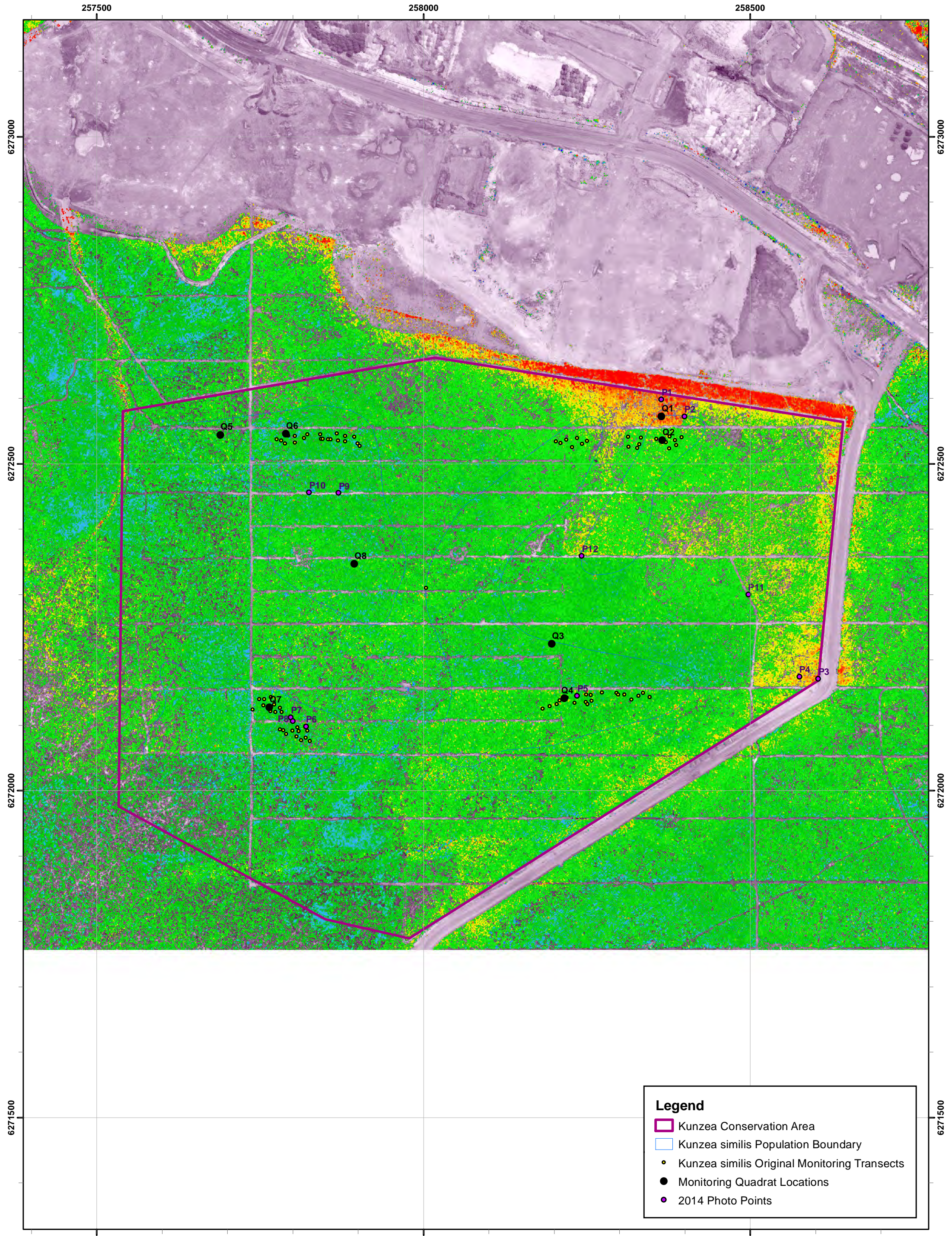
**Photo Point 10:** Large patch of blue (Figure 1): Bearing of 60° - 7m x 8m patch of *Eucalyptus ecostata* with an abundance of dense new growth, flowers and fruit; comparatively not as dense at Photo Point 9 (refer to Table 8).



**Photo Point 11:** On line of distinct change from green to yellow/green in east (Figure 1): Bearing of 245° (left) and 65° (right) - Low mallees over mid Melaleuca shrubland, with scattered *Eucalyptus pleurocarpa* and *Banksia lemanniana* (refer to Table 8).

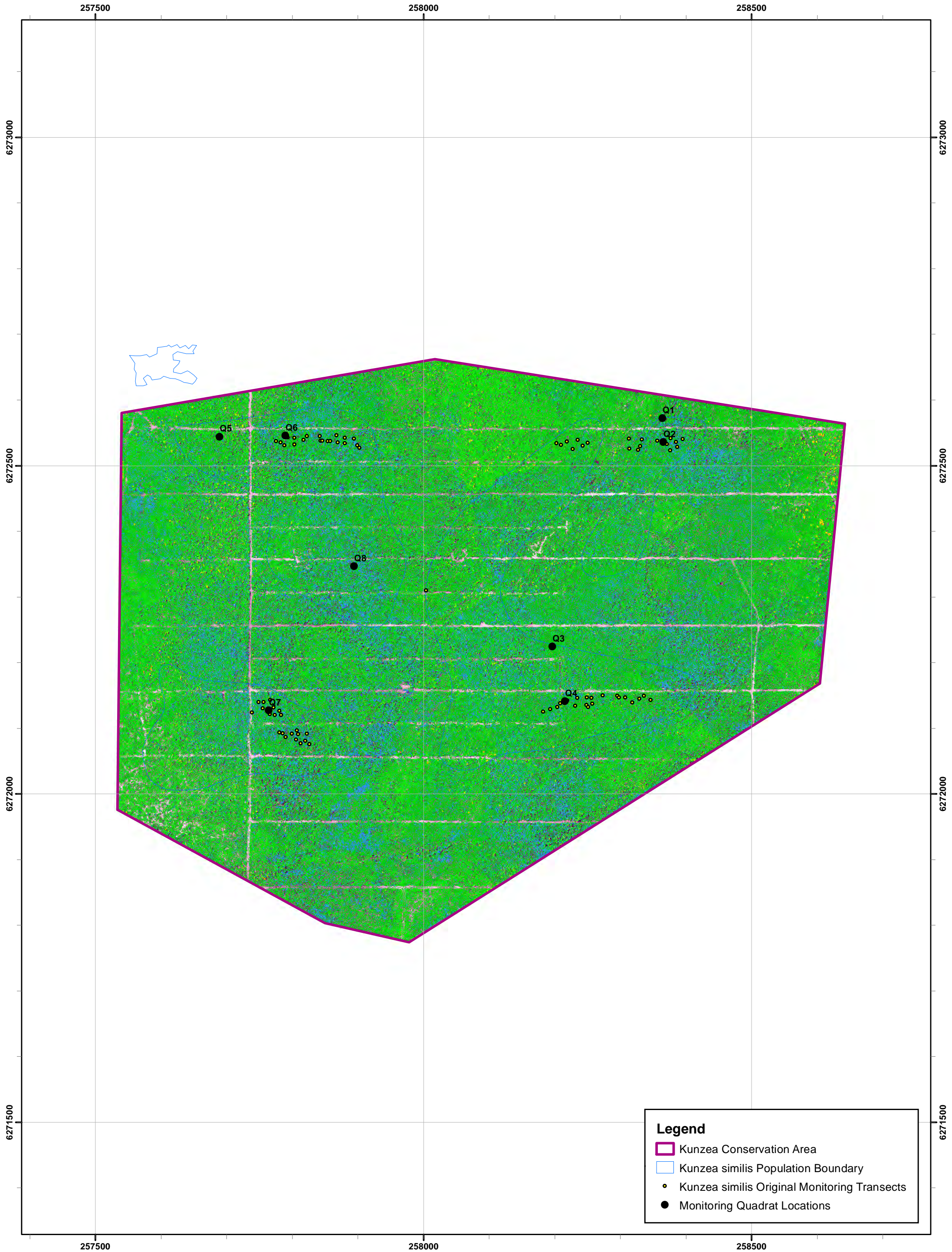


**Photo Point 12:** On line of distinct change from green/orange/yellow pixels to green in centre (Figure 1): Bearing of 185° (left) - Tall closed shrubland; Bearing of 345° (right) - Tall sparse to tall open shrubland over mid shrubland to mid closed shrubland of *Melaleuca striata* and *Kunzea similis* subsp. *mediterranea* (refer to Table 8).



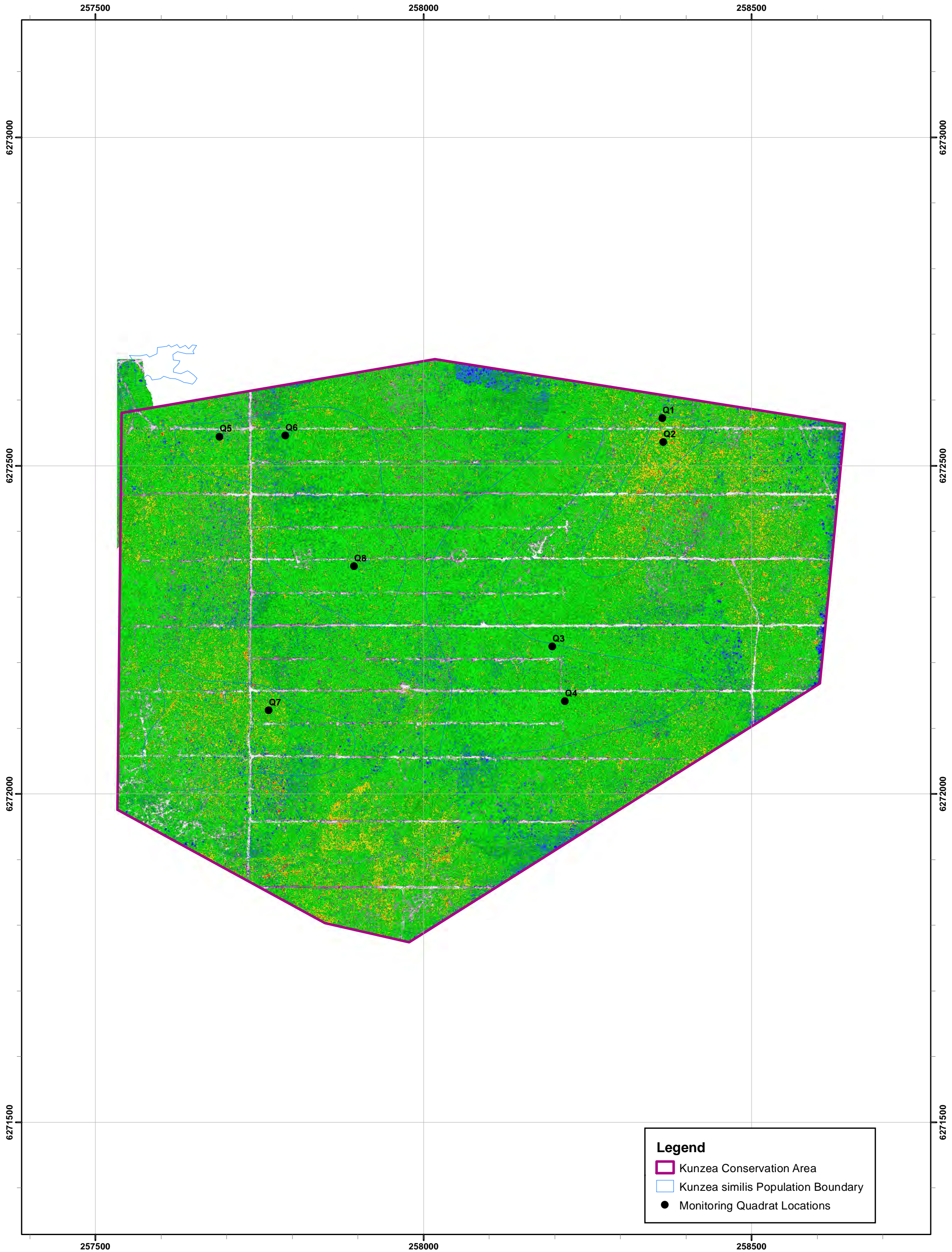
**Legend**

- Kunzea Conservation Area
- Kunzea similis Population Boundary
- Kunzea similis Original Monitoring Transects
- Monitoring Quadrat Locations
- 2014 Photo Points



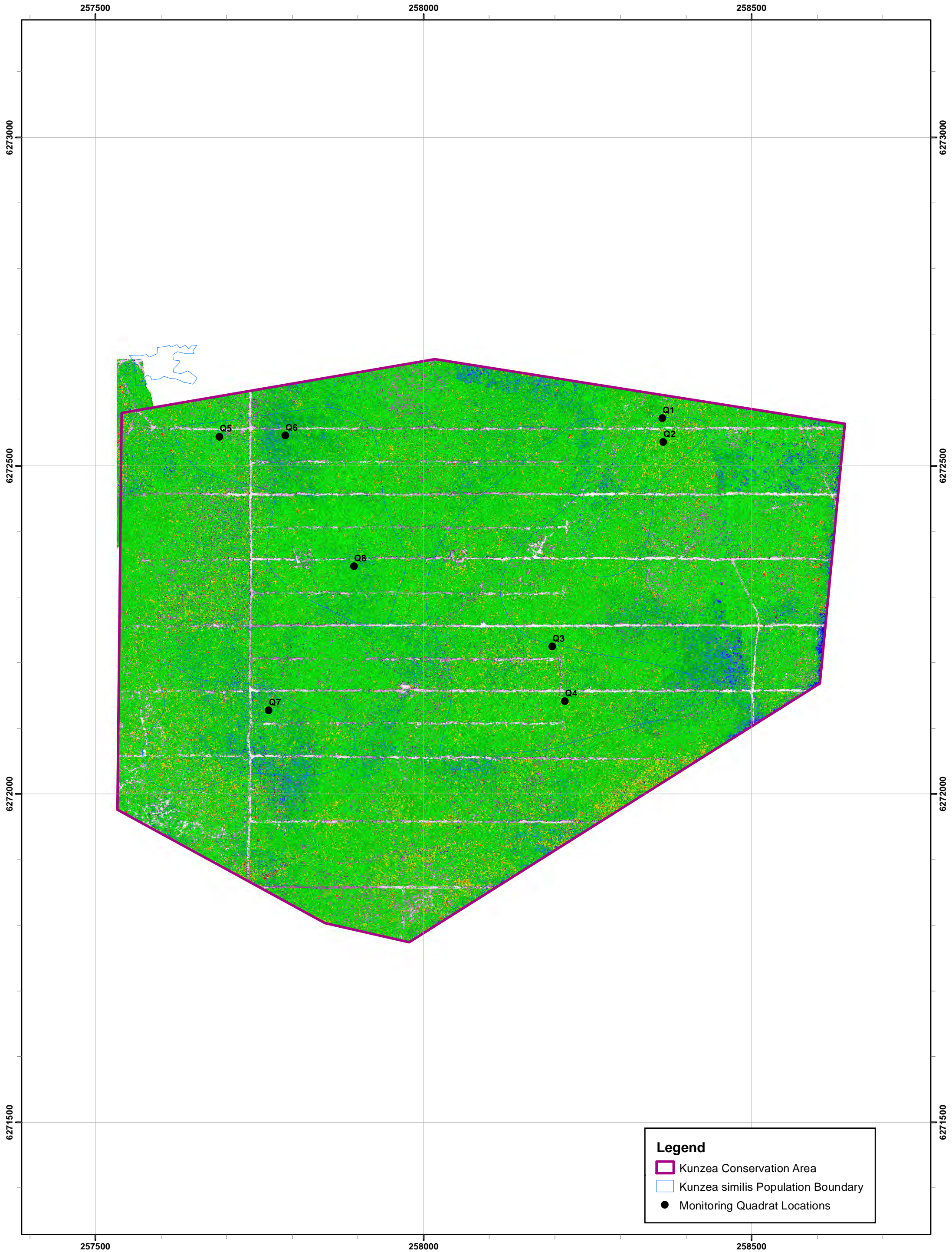
**Legend**

- Kunzea Conservation Area
- Kunzea similis Population Boundary
- Kunzea similis Original Monitoring Transects
- Monitoring Quadrat Locations



**Legend**

- Kunzea Conservation Area
- Kunzea similis Population Boundary
- Monitoring Quadrat Locations



**Legend**

- Kunzea Conservation Area
- Kunzea similis Population Boundary
- Monitoring Quadrat Locations