

COOLJARLOO WEST PROJECT

Conservation Significant Flora Risk Assessment

TRONOX MANAGEMENT PTY LTD

OCTOBER 2015



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Cooljarloo West Project Conservation Significant Flora Taxa Risk Assessment

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DEFINITIONS

Term	Definition
Conservation Significant Flora Taxa (CS Taxa)	Listed CS flora taxa as listed under the <i>Wildlife Conservation Act</i> (1950) (WC Act) (State Act), or determined as Priority Flora by the Department of Parks and Wildlife (DPaW) (formerly known as the DEC) (DPaW 2014d), or listed under the <i>Environmental Protection and Biodiversity Conservation Act</i> (1999) (EPBC Act). Non-listed Conservation Significant flora taxa are as defined by EPA (2004) (Section 6.1)
Cooljarloo West Study Area (CWSA)	The Cooljarloo West Study Area is defined as the area mapped using Vegetation Types (VTs) by Woodman Environmental (2014)
Development Envelope (DE)	Area in which all direct impact with regards to the project will be limited to
Footprint	Proposed footprint housing mining pits, waste dumps and associated infrastructure located within the DE
Groundwater Drawdown Area (GDA)	Non-confined recharge area where drawdown is predicted to exceed 1m through the life of the operation

1. INTRODUCTION

Tronox Management Pty Ltd (Tronox) plans to develop the Cooljarloo West Titanium Minerals Mine (the Cooljarloo West Project), located approximately 175 km north of Perth. Three ore-bodies are planned to be dredge-mined as part of this project (Woolka, Harrier and Kestral). The proposal to implement the Cooljarloo West Project was referred to the Environmental Protection Authority (EPA) on 15th May 2013 under section 38 of the *Environmental Protection Act 1986*; the EPA subsequently determined that assessment of the project was to be undertaken at the level of Public Environmental Review (PER). A draft PER was submitted to the EPA by Tronox as per the Environmental Scoping Document (ESD) prepared by the EPA, as issued on 2nd September 2013.

The EPA's objective for flora and vegetation is "To maintain representation, diversity, viability and ecological function at the species, population and community level". Tronox have requested Woodman Environmental undertake a risk assessment to identify the potential for significant impact on conservation significant flora taxa as a result of the Cooljarloo West project. The risk assessment is to utilise only existing data collected for Tronox or available from public sources.

1.1. Aim and Objectives of This Report

The aim of this report is to provide a rigorous risk-based assessment of the potential impacts to conservation significant flora taxa (CS flora taxa) as a result of the proposed Cooljarloo West Project to determine whether potential impacts from the project will be at variance to the EPA's objective for flora at the species level. The main objectives are to:

1. Identify CS flora taxa (as defined by Guidance Statement 51) likely to occur in the Development Envelope (DE), and to assign a level of confidence relating to their presence and distribution within the DE;
2. Conduct an assessment of the risk of impact on CS flora taxa, including risk of impact on each taxon's regional conservation status;
3. Determine methods to increase confidence in current distribution and abundance data for CS flora taxa which are at risk of moderate to high impact;
4. Determine mitigation measures to decrease the risk of impact on these taxa.

1.2. Data Sources

Data utilised in conducting this assessment has been sourced from the following:

Listed CS flora taxa

- Taxa have been summarised and analysed from Tables 8-5 – 8-8 of the draft PER document (Tronox 2015).
- The ranking of significance of local populations to the regional conservation status of each taxon was sourced from Woodman Environmental (2014).
- Data in relation to number and extent of regional populations of each taxon is as per that presented in Woodman Environmental (2014), this data has been updated utilising data sourced from NatureMap (DPaW 2015a) as appropriate.
- Data in relation to habitat preferences of taxa is as per that presented in Appendix I of Woodman Environmental (2014), and updated with any new data present in the latest version of the Tronox conservation significant flora database.
- Data in relation to the presence and distribution of taxa within the impact areas has been obtained from a GIS query of the Tronox conservation significant flora database against the impact areas shapefile.

Non-listed CS flora taxa

- Taxa have been determined from the list of taxa known to occur within the Cooljarloo West Study Area (CWSA), as presented in Appendix E of Woodman Environmental (2014).
- Data in relation to number and extent of regional populations of each taxon has been obtained from NatureMap (DPaW 2015a).
- Data in relation to the known presence of taxa within the DE has been undertaken from data held in Vegmonitor (bespoke database housing all flora and vegetation survey data held by Woodman Environmental).
- Data in relation to the preferred habitat of each non-listed CS flora taxon has been generated from a query performed against quadrat data from the CWSA against vegetation types (VT) in which these taxa have been recorded.

1.3. Approach to Risk Assessment

The Cooljarloo West Project PER impact assessment utilises the results of historical flora and vegetation assessments across the CWSA including data collected from surveys of exploration drill lines on the project orebody areas. This includes a significant body of data relating to the potential presence and distribution of these taxa within the DE and surrounds. This data, while not constituting a comprehensive assessment of the potential impact of the project to CS flora, in combination with data from NatureMap (DPaW 2015a) regarding regional distribution and populations of taxa, provides a sound basis for determining the likelihood of the project resulting in a significant impact on the conservation status of taxa within or likely to be within the DE.

This document presents an assessment of the suitability of the existing data regarding conservation significant taxa to undertake an assessment of risk of significant impact on the conservation status of taxa within or likely to be within the DE, along with recommendations to improve data quality/suitability for impact assessment and management. It also presents an assessment of the risk of significant impact on the conservation status of taxa within or likely to be within the DE of the Cooljarloo West Project. Figure 1 presents the process used to assign the level of risk of significant impact on CS Flora. Figure 2 presents the Cooljarloo West Project impact areas.

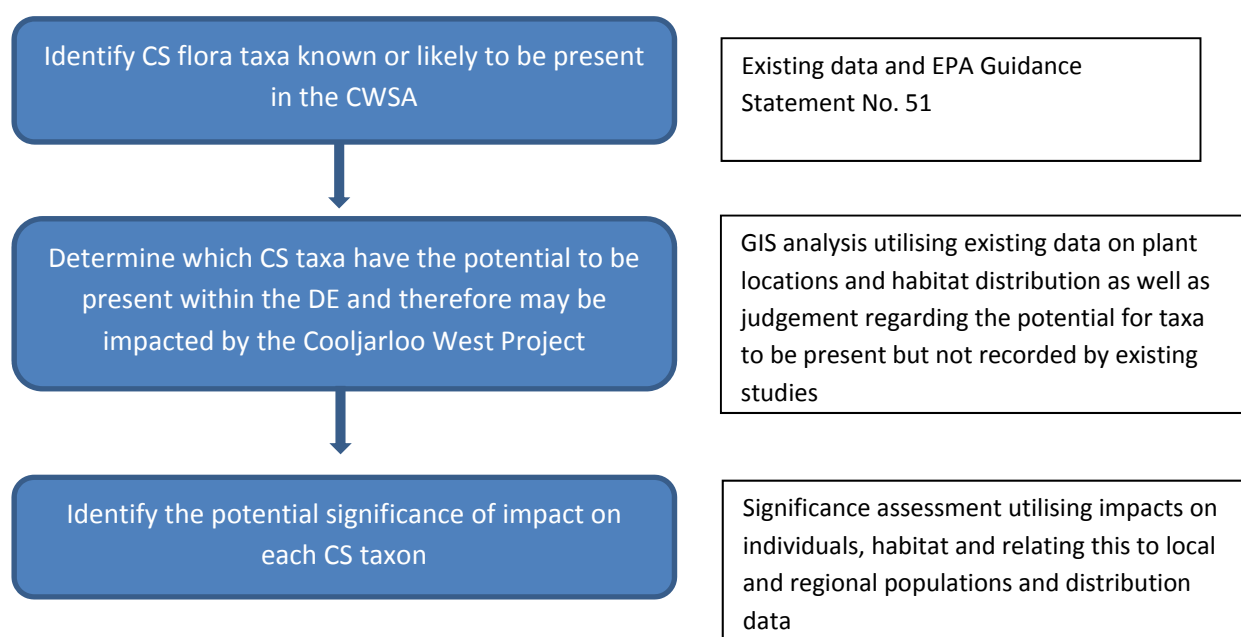
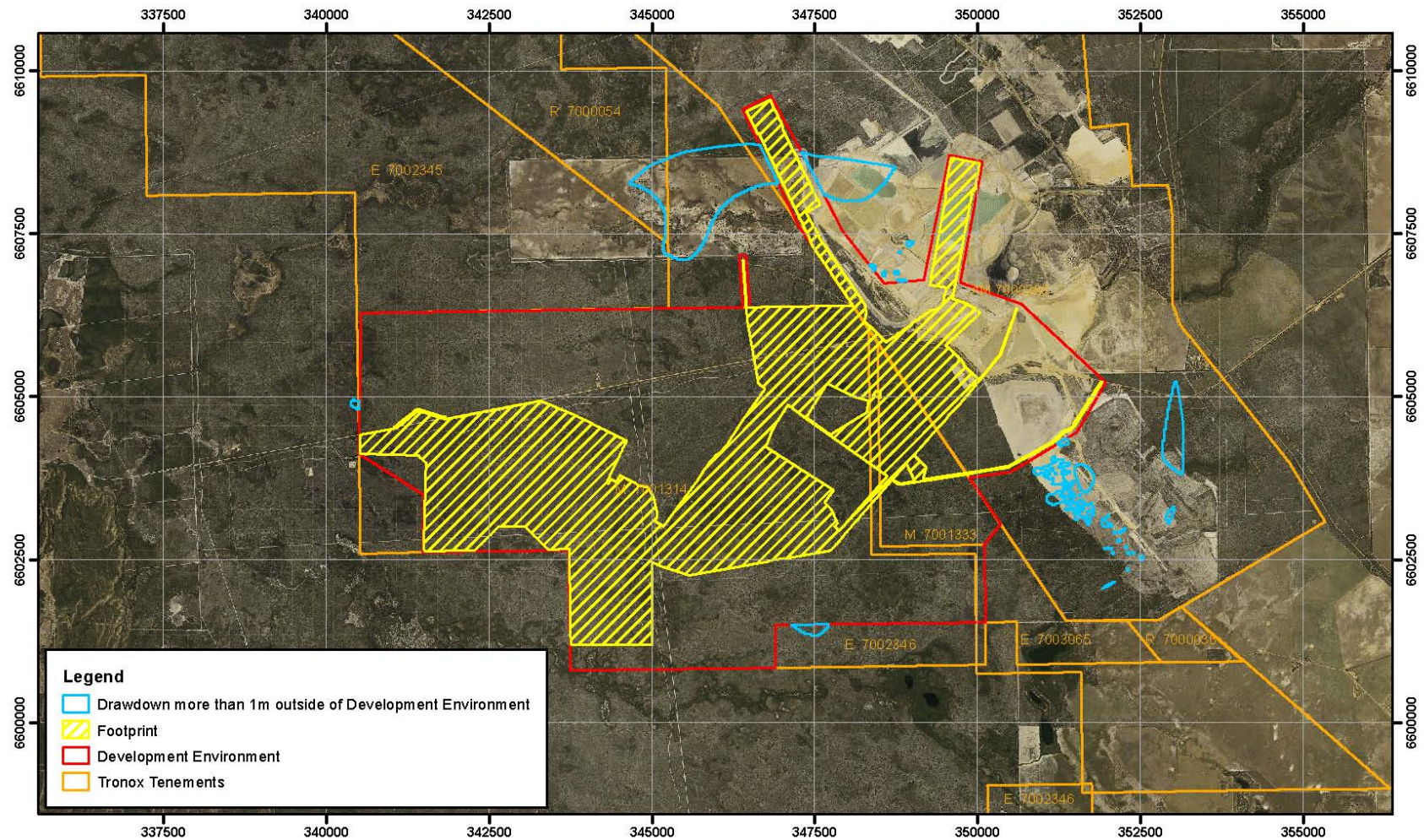


Figure 1: Risk Assessment Process



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This map should only be used in conjunction with WEC report Tronox15-26-01.

**Cooljarloo West Project Development Envelope,
Footprint and Groundwater Drawdown Areas**

Author: Cathy Godden

Filename: Tronox15-26-01-f02.mxd

WEC Ref.: Tronox15-26-01

Scale: 1:75,000 (A4)

Projection: MGA Zone 50

Revision: A - 08 September 2015

Figure
2

2. METHODS

2.1. Identification of Non-Listed Conservation Significant Flora Taxa

A list of non-listed CS flora taxa present in the CWSA has been generated from the accumulation of contemporary and historical survey records (as reported in Appendix E of Woodman Environmental (2014)), utilising criteria as stated in Guidance Statement 51 (EPA 2004), as presented in Table 1.

Table 1: Non-Listed Conservation Significant Taxa definitions (EPA 2004) and Woodman Environmental context

Definition (EPA 2004)	WEC Context
Taxa which undertake a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species	Species without which the community in which it occurs would be substantially altered
Relic status (present due to historical ranges of a taxa)	Occurs in area despite environment (i.e. climate, water regime, community) substantially altered through time
Anomalous features indicating a potential new discovery	Potentially new taxon, as yet undescribed in the literature
Representative of the range of the species (particularly, at the extremes of range; recently discovered range extensions; or isolated outliers of the main range)	Cooljarloo West area on extreme edge of known range; Cooljarloo West represents a range extension to the known range; or populations at Cooljarloo West are isolated from the main range of the taxon (i.e. at least 100 km from Cooljarloo West to nearest known location)
Presence of restricted subspecies, varieties, or natural occurring hybrids	The taxon is representative of a subspecies/variety/hybrid which is restricted in range in comparison to other subspecies/varieties/parent taxa
Local endemism/restricted distribution	Known range restricted to be within 40 km of Cooljarloo West
Poorly reserved	Known from 2 or less populations in conservation estate (does not include UCL)

The regional significance of local populations of the non-listed CS flora taxa has been determined using rankings presented in Table 2 (also used to determine the regional significance of populations of listed CS flora taxa in Woodman (2014)).

Table 2: Significance of Local Populations of Conservation Significant Flora Taxa to the Regional Conservation of each Taxon

Significance Ranking	Description
High	<ul style="list-style-type: none"> Known range of taxon either entirely located within the Cooljarloo West study area (CWSA), or within the CWSA and to a radius of <5km of the study area; or Taxon known from <5 discrete populations, including within the survey area; and Study area on boundary of known regional distribution; or Taxon listed as Threatened
Moderate	<ul style="list-style-type: none"> Known range of taxon extends <50km; and Taxon known from >5 discrete populations; and CWSA may be on boundary of known regional distribution
Low	<ul style="list-style-type: none"> Known range of taxon extends >50km; and Taxon known from >20 discrete populations; and CWSA not on boundary of known regional distribution

This ranking is used to inform the assessment of risk of significant impact as it provides the context for each taxon within which proposed impacts to the local populations of each are assessed. Only those taxa where the significance of the local populations is assessed as Moderate or High are included in additional assessments for risk of significant impact.

2.2. Likelihood of Impact on Conservation Significant Flora Taxa

An assessment of the likelihood of impact on CS taxa was undertaken utilising the assumption that presence or likely presence within the DE indicates potential for impact. The likelihood of presence of each listed CS flora taxon in the DE, Footprint and GDA was determined utilising the categories presented in Table 3.

Table 3: Ranking of Likelihood of Presence of Conservation Significant Flora Taxa within the Development Envelope

Likelihood Ranking	Listed CS flora Definition	Non-Listed CS flora Definition
Certain	Known to occur in the DE	Known to occur in the DE
High likelihood	Not known to occur in the DE; Preferred habitat VTs (strong association) mapped in the DE; Known locations in close proximity to the DE (DE buffer)	Not known to occur in the DE; Preferred habitat VTs (strong to weak association) located in the DE (Potential of occurrence)
Moderate likelihood	Not known to occur in the DE; Preferred habitat VTs (weak to moderate association) mapped in the DE; Known locations in relatively close proximity to the DE	

Likelihood Ranking	Listed CS flora Definition	Non-Listed CS flora Definition
Low likelihood	Not known from survey data within the DE; Preferred habitat (strong or weak association) is not located within the DE; No known suitable habitat in DE; Known locations not in close proximity to DE	Not known to occur in the DE; Preferred habitat VTs not located in the DE

The habitat preferences of non-listed CS flora taxa have been determined from Woodman Environmental survey (quadrat) data Woodman (2014). Non-listed CS flora taxa are either:

- Known to occur in the impact areas from quadrat data (Certain);
- Have potential to occur in the impact areas (known to occur in habitat (VTs) which are present in impact areas (Potential); or
- Unlikely to occur in the impact areas due to both lack of knowledge of their presence in the impact areas, and lack of suitable known habitat (VTs) in the impact areas.

2.3. Assessment of Risk of Significant Impact

This assessment ranks listed CS flora and non-listed CS flora separately, due to differing levels of local and regional scale data. Listed CS flora in general have data collected regarding numbers of plants at point locations at the local scale (to inform impact assessment for exploration and mining activities) and also at the regional scale with regard to populations as a result of surveys to aid in the conservation of these taxa.

In contrast, non-listed CS taxa generally are not counted during impact assessment surveys. Mechanisms of collection and management of data for these taxa such as Threatened and Priority Flora Report Forms (TPRFs) do not exist and therefore are not recorded in conservation significant flora databases. The potential for impacts on such taxa are assessed based on the number of records within the WAHerb and their distributions as presented in NatureMap (DPaW 2015a). This is then combined with an assessment of their preferred habitat and impacts to this habitat in the local context to give an assessment of risk of significant impact at both scales. This provides an appreciation of the potential risk to non-listed taxa in the absence of more comprehensive survey data.

An assessment of the risk of significant impact on CS flora taxa was undertaken utilising 2 separate factors. These factors were:

- An assessment of the level of proposed impact on preferred habitat for each taxon (Table 4a); and
- An assessment of the impact on numbers of individuals utilising available listed CS flora taxa survey records from the DE and wider CWSA (Table 4b).

The risk assessment considers the proposed impact on preferred habitat for each taxon (GIS assessment utilising vegetation mapping). The impact on individuals is also presented to provide a comparison with the known data in relation to plant numbers both within the impact areas and wider CWSA. The impact on habitat is the more reliable indicator of risk of significant impact on the CS flora taxa because of a discrepancy between survey effort within the impact areas (particularly the orebodies) compared to the rest of the CWSA. Survey effort for listed CS flora has been concentrated on the orebodies which has resulted in a bias of data collection within these areas in comparison to the rest of the CWSA. Conversely, the entire DE has not been systematically searched

and therefore the total numbers of individuals to be impacted is unknown, and actual numbers of individuals to be impacted may be higher than those presented.

Inspection of known records of CS flora in relation to survey effort (Woodman Environmental 2014) provides little evidence that CS flora locations are consistently located in and across polygons of suitable habitat, particularly in the case of Threatened, Priority 1 and 2 taxa. However, some taxa such as the Priority 2 taxa *Isopogon panduratus* subsp. *palustris* and *Stylidium hymenocraspedum* appear to occur consistently in their given habitats where survey is conducted, albeit in localised areas. This is partially an artefact of the survey types undertaken across the CWSA, with the vast majority of the area covered by isolated quadrat and relevee type sampling and only smaller portions covered by intensive recording along 10m wide transects. Significant areas of preferred habitat for the majority of listed CS taxa exist within the CWSA that have received little or no survey effort indicating the strong potential that taxa to be impacted will have additional plants located away from proposed disturbance.

Despite the above, in the absence of more comprehensive sampling, the use of preferred habitat as an indicator of potential taxon presence and hence significance of impact to taxa from the Cooljarloo West Project is considered to provide the most appropriate approach for this risk assessment.

An assessment of the impact on preferred (key) habitat has been undertaken for listed CS flora taxa, with a separate assessment to all known habitat for these flora taxa also presented for comparison. The majority of such taxa are known within key habitat Vegetation Types (as per Woodman 2014), however on occasion they have been recorded in alternate VTs (non-preferred habitat). This comparison has been undertaken to determine if the impact on habitat increases in significance if non-key habitat is also included.

The assessment included only those taxa for which the likelihood of presence in the impact areas was ranked as between Certain and Moderate (see Table 3).

Table 4a: Ranking of Impact on Preferred Habitat in the Cooljarloo West Study Area (Local)

Category of Impact	Definition
Very Low	<1% of preferred habitat in the CWSA to be impacted
Low	1 – 10% of preferred habitat in the CWSA to be impacted
Moderate	10 – 30% of preferred habitat in the CWSA to be impacted
High	>30% of preferred habitat in the CWSA to be impacted

Table 4b: Ranking of Impact on Numbers of Plants of Conservation Significant Flora Taxa in the Cooljarloo West Study Area (Local)

Category of Impact	Definition
Very Low	<1% of numbers of plants known to occur in the CWSA to be impacted
Low	1 – 10% of numbers of plants known to occur in the CWSA to be impacted
Moderate	10 – 30% of numbers of plants known to occur in the CWSA to be impacted
High	>30% of numbers of plants known to occur in the CWSA to be impacted

In order to place the risk of significant impact at the local scale into the broader regional context the risk rankings were then correlated with the ranking of significance of the local populations of each CS taxon to produce a ranking of risk of significant impact on each taxon at the regional scale (Table 5).

Table 5: Ranking of Risk of Significance of Impact on Regional Conservation Status of Conservation Significant Flora Taxa

Significance of Local Populations (Table 2)	Assessment of Local Impact (Table 4a; b)			
	Very Low	Low	Moderate	High
Low	Low	Low	Low	Moderate
Moderate	Low	Low	Moderate	High
High	Low	Moderate	High	High

3. CONSERVATION SIGNIFICANT FLORA TAXA

3.1. Listed Conservation Significant Flora Taxa

A total of 66 listed CS flora taxa are known to occur within the CWSA. Appendix A presents these taxa, with detail regarding the known presence of plants or occurrence of preferred habitat within the DE, Footprint and GDA (as per Table 3).

As a summary:

- 28 taxa are known to occur (Certain) within the combined impact areas including the Threatened flora taxa *Andersonia gracilis*, *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*;
- 7 taxa are of Moderate - High likelihood of occurrence within the combined impact areas; and
- 30 taxa are of Low likelihood of occurrence within the combined impact areas.

Of the listed CS flora taxa known from the CWSA, 35 taxa have a Moderate – Certain likelihood of occurrence in the combined impact areas (Footprint (direct impact only), DE and GDA (area of potential groundwater drawdown impact outside of the DE) due to known occurrences, or presence of habitat within these impact areas. These taxa are listed in Table 6. Assessment of the significance of impact on listed CS flora taxa is confined to these 35 taxa, as only these taxa are considered to have potential impacts that may be significant at a local or regional scale due to their higher likelihood (or Certainty) of presence in the impact areas.

Please note: there have been two changes in nomenclature that occurred on 18th September 2015:

- *Baeckea* sp. Perth (R.J. Cranfield 444) (P3) has become *Babingtonia urbana* (P3)
- *Malleostemon* sp. Cooljarloo (B. Backhouse s.n. 16/11/88) (P1) has become *Babingtonia delicata* (P1)

Table 6: Listed Conservation Significant Taxa of Certain to Moderate Likelihood of Occurrence in Impact Areas

Conservation Significant Flora Taxon	Conservation Code	Likelihood of presence in Footprint [#]	Likelihood of presence in Development Envelope	Likelihood of Presence in Groundwater Drawdown Area*
<i>Allocasuarina grevilleoides</i>	P3	Certain	Certain	Low
<i>Andersonia gracilis</i>	T (VU)	Certain	Certain	Certain
<i>Angianthus micropodioides</i>	P3	Moderate	Moderate	Moderate
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	Certain	Certain	Moderate
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	Certain	Certain	Certain
<i>Babingtonia delicata</i>	P1	Moderate	Moderate	Moderate
<i>Babingtonia urbana</i>	P3	Certain	Certain	Moderate
<i>Banksia dallanneyi</i> subsp. <i>pollostia</i>	P3	Certain	Certain	Moderate
<i>Beaufortia bicolor</i>	P3	Moderate	Moderate	Moderate
<i>Calectasia palustris</i>	P1	Moderate	Moderate	Moderate
<i>Chordifex chaunocoleus</i>	P4	Certain	Certain	Moderate
<i>Chordifex reseminans</i>	P1	Certain	Certain	Moderate
<i>Conospermum scaposum</i>	P3	Certain	Certain	Moderate
<i>Conostephium magnum</i>	P4	High	Certain	Moderate
<i>Desmocladius biformis</i>	P3	Certain	Certain	Moderate
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	Moderate-High	Moderate-High	Certain
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	High	Certain	Moderate
<i>Frankenia glomerata</i>	P3	High	High	Moderate
<i>Grevillea saccata</i>	P4	Certain	Certain	Moderate
<i>Grevillea thelemanniana</i> subsp. <i>Cooljarloo</i> (B.J. Keighery 28 B)	P1	Certain	Certain	Moderate
<i>Guichenotia alba</i>	P3	Certain	Certain	Moderate
<i>Hakea longiflora</i>	P3	Certain	Certain	Moderate
<i>Hensmania stoniella</i>	P3	High	Certain	Certain

Conservation Significant Flora Taxon	Conservation Code	Likelihood of presence in Footprint [#]	Likelihood of presence in Development Envelope	Likelihood of Presence in Groundwater Drawdown Area*
<i>Hypocalymma</i> sp. Cataby G.J. Keighery 5151)	P2	Moderate	Certain	Moderate
<i>Isopogon panduratus</i> subsp. <i>palustris</i>	P2	High	High	Moderate
<i>Jacksonia carduacea</i>	P3	Moderate	Moderate	Moderate
<i>Macarthuria keigheryi</i>	T (EN)	Certain	Certain	Moderate
<i>Onychosepalum nodatum</i>	P3	Moderate	Moderate	Moderate
<i>Paracaleana dixonii</i>	T (VU)	Moderate	Certain	Moderate
<i>Platysace ramosissima</i>	P3	Certain	Certain	Moderate
<i>Schoenus griffinianus</i>	P3	Certain	Certain	Certain
<i>Schoenus pennisetis</i>	P1	Certain	Certain	Moderate
<i>Stylidium hymenocraspedum</i>	P2	Certain	Certain	Moderate
<i>Thysanotus glaucus</i>	P4	Certain	Certain	Moderate
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	Certain	Certain	Moderate

#Note: Footprint is direct impact within footprint only

*Note: GDA is area potentially at risk of impact through groundwater drawdown outside of the DE

3.2. Non-Listed Conservation Significant Flora Taxa

An initial list of 93 non-listed significant flora taxa (as per definitions in EPA 2004) known to occur within the CWSA was further refined to 19 taxa (Appendix B) by excluding:

- Taxa for which presence in the CWSA represents a small range extension only, and are otherwise common, widespread and well-reserved;
- Taxa for which the CWSA is located on the edge of the known range and are all common, widespread and well reserved;
- Taxa for which presence in the CWSA is most likely based on questionable identification due to poor material;
- Taxa where each entity (including as aff.) does not represent a significant taxon as a result of name changes and further classification since the original time of recording. Also where poor specimen material has resulted in an incomplete identification and the fully identified entity is otherwise present and has a widespread occurrence.

Of the 19 non-listed CS flora taxa known from the CWSA, 17 taxa are either known to occur, or have the potential to occur in the DE, Footprint and/or GDA. These taxa are listed in Table 7. These 17 taxa will be further assessed for risk of impact by the project, due to their Certainty or Potential to occur within the impact areas.

Table 7: Non-Listed Conservation Significant Taxa with Potential to Occur in Impact Areas

Conservation Significant Flora Taxon	Potential of occurrence in Development Envelope	Potential of occurrence in Footprint	Potential of occurrence in Groundwater Drawdown Area
<i>Anigozanthos viridis</i> subsp. Cataby (S.D. Hopper 1786)	Potential	Potential	Potential
<i>Anigozanthos viridis</i> subsp. <i>viridis</i>	Potential	Potential	Potential
<i>Conostylis aculeata</i> subsp. <i>spinuligera</i>	Potential	Potential	Potential
<i>Conostylis festucacea</i> subsp. <i>festucacea</i>	Certain	Potential	Potential
<i>Cristonia biloba</i> (subsp. <i>pubescens</i>)	Potential	Potential	Potential
<i>Darwinia pinifolia</i>	Potential	Potential	Potential
<i>Drosera closterostigma</i>	Certain	Certain	Potential
<i>Eremophila glabra</i> subsp. ? <i>carnosa</i>	Potential	Potential	Potential
<i>Eucalyptus</i> aff. <i>incrassata</i>	Certain	Certain	Potential
<i>Haemodorum sparsiflorum</i>	Certain	Certain	Potential
<i>Hydrocotyle blepharocarpa</i>	Certain	Certain	Low potential
<i>Hypocalymma</i> sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)	Potential	Potential	Potential
<i>Lachnagrostis preissii</i>	Potential	Potential	Potential
<i>Lepidosperma</i> aff. <i>scabrum</i>	Certain	Certain	Potential
<i>Leucopogon</i> aff. <i>sprengelioides</i>	Certain	Certain	Potential
<i>Philothea spicata</i> subsp. Moore River National Park (G. & D. Woodman Op 47)	Potential	Potential	Potential
<i>Rytidosperma setaceum</i>	Certain	Certain	Potential

4. ASSESSMENT OF RISK OF SIGNIFICANT IMPACT

4.1. Listed Conservation Significant Flora Taxa

4.1.1 Impact on Local Habitat

Table 8 presents the assessment of impact on preferred habitat (key VTs within the CWSA) for the 35 listed CS flora taxa as presented in Table 6 (i.e. those of moderate or higher likelihood of occurrence) utilising the entire CWSA as the local context. The local impact on the preferred habitat of these flora taxa in relation to direct clearing of the Footprint has been assessed as being:

- High for none of these taxa;
- Moderate for 1 taxon;
- Low for 31 taxa (including Threatened taxa *Andersonia gracilis*, *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*); and
- Very low for 3 taxa.

The local impact on the preferred habitat of these flora taxa in relation to impact of the entire DE has been assessed as being:

- High for none of these taxa;
- Moderate for 22 of these taxa (including Threatened taxa *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*);
- Low for 10 of these taxa (including Threatened taxon *Andersonia gracilis*); and
- Very low for 3 of these taxa.

Assuming the worst case scenario of impact on (e.g. clearing) the entire DE and GDA (noting that Tronox do not propose this), the local impact on preferred habitat of these flora taxa has been assessed as being:

- High for none of these taxa;
- Moderate for 22 of these taxa (including Threatened taxa *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*); and
- Low for 10 taxa (including Threatened taxon *Andersonia gracilis*); and
- Very Low for 3 taxa.

The Cooljarloo West Project PER (Tronox Management 2015) presented impacts utilising an alternative regional context (Assessment Area) that takes into account an existing approval to clear native vegetation within Mining Tenement M268Sa. The premise for this was that any CS flora or habitat within the tenement could not be regarded as protected from clearing as a result of the current mining approvals and therefore should be removed from the CWSA to provide a precautionary approach to the assessment. Table 8 includes a comparison between both scenarios for clearing of the proposed footprint only. When utilising the smaller regional context 3 taxa received increased impact rankings from Low to Moderate. *Eucalyptus macrocarpa* subsp. *elachantha*, *Grevillea saccata* and *Hensmania stoniella* all experienced an increase in percentage impact on preferred habitat from 9.6 to 10.2% related to their occurrence in VT18.

Table 8: Assessment of Local Impact on Habitat of Listed Conservation Significant Taxa

Conservation Significant Flora Taxon	Conservation Code	Preferred Habitat	Percentage Impact (Footprint) CWSA/AA*	Percentage Impact (DE)	Percentage Impact (DE and GWA)	Local Impact (Footprint) CWSA/AA	Local Impact (DE)	Local Impact (DE and GDA)
<i>Allocasuarina grevilleoides</i>	P3	7	16.0/21.7	22.0	22.0	Moderate	Moderate	Moderate
<i>Andersonia gracilis</i>	T (VU)	5, 2, 1	4.0/4.5	8.4	8.5	Low	Low	Low
<i>Angianthus micropodioides</i>	P3	2	0.0/0.0	0.2	0.5	Very Low	Very Low	Very Low
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	17, 18	6.6/7.5	16.1	16.3	Low	Moderate	Moderate
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	1	4.6/4.9	10.4	10.5	Low	Moderate	Moderate
<i>Babingtonia delicata</i>	P1	5, 17	5.4/6.4	12.6	12.7	Low	Moderate	Moderate
<i>Babingtonia urbana</i>	P3	1, 2	3.7/4.0	8.4	8.5	Low	Low	Low
<i>Banksia dallanneyi</i> subsp. <i>pollostata</i>	P3	1, 5, 17, 18	6.2/7.0	14.8	15.0	Low	Moderate	Moderate
<i>Beaufortia bicolor</i>	P3	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Calectasia palustris</i>	P1	2, 7	4.5/5.4	6.3	6.5	Low	Low	Low
<i>Chordifex chaunocoleus</i>	P4	5, 2	3.3/4.0	5.5	8.7	Low	Low	Low
<i>Chordifex reseminans</i>	P1	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low
<i>Conospermum scaposum</i>	P3	1, 5, 17, 18	6.2/7.0	14.8	15.0	Low	Moderate	Moderate
<i>Conostephium magnum</i>	P4	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Desmocladius biformis</i>	P3	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	2	0.0/0.0	0.2	0.5	Very Low	Very Low	Very Low
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	18	9.6/10.2	24.0	24.4	Low / Moderate	Moderate	Moderate
<i>Frankenia glomerata</i>	P3	2	0.0/0.0	0.1	0.1	Very Low	Very Low	Very Low
<i>Grevillea saccata</i>	P4	18	9.6/10.2	24.0	24.4	Low / Moderate	Moderate	Moderate
<i>Grevillea thelemanniana</i> subsp. <i>Cooljarloo</i> (B.J. Keighery 28 B)	P1	1, 2	3.7/4.0	8.4	8.5	Low	Low	Low
<i>Guichenotia alba</i>	P3	1, 7	5.6/6.1	11.5	11.6	Low	Moderate	Moderate

Conservation Significant Flora Taxon	Conservation Code	Preferred Habitat	Percentage Impact (Footprint) CWSA/AA*	Percentage Impact (DE)	Percentage Impact (DE and GWA)	Local Impact (Footprint) CWSA/AA	Local Impact (DE)	Local Impact (DE and GDA)
<i>Hakea longiflora</i>	P3	1, 18	7.6/8.0	18.6	18.9	Low	Moderate	Moderate
<i>Hensmania stoniella</i>	P3	18	9.6/10.2	24.0	24.4	Low / Moderate	Moderate	Moderate
<i>Hypocalymma</i> sp. Cataby G.J. Keighery 5151)	P2	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Isopogon panduratus</i> subsp. <i>palustris</i>	P2	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low
<i>Jacksonia carduacea</i>	P3	1, 2, 5, 17, 18	6.0/6.8	14.3	14.5	Low	Moderate	Moderate
<i>Macarthuria keigheryi</i>	T (EN)	17, 18	6.6/7.5	16.1	16.3	Low	Moderate	Moderate
<i>Onychosepalum nodatum</i>	P3	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low
<i>Paracaleana dixonii</i>	T (VU)	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Platysace ramosissima</i>	P3	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Schoenus griffinianus</i>	P3	17, 18	6.6/7.5	16.1	16.3	Low	Moderate	Moderate
<i>Schoenus pennisetis</i>	P1	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low
<i>Stylidium hymenocraspedum</i>	P2	8, 17	3.7/6.3	12.9	13.0	Low	Moderate	Moderate
<i>Thysanotus glaucus</i>	P4	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low

*Note: AA refers to the Assessment Area presented in the Cooljarloo West Project PER (Tronox Management Pty Ltd 2015)

The proposed local impact incorporating all known habitat (preferred and other VTs where the taxon has been recorded) for each of these taxa (excluding an assessment using the AA) is presented in Appendix C. In this scenario, if the impact is limited to the Footprint the proposed local impact on habitat of these flora taxa has been assessed as:

- High for none of these taxa;
- Moderate for 1 taxon;
- Low for 32 taxa (including Threatened Taxa *Andersonia gracilis*, *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*); and
- Very Low for 2 taxa.

The local impact on all known habitat of these flora taxa in relation to impact of the entire DE has been assessed as being:

- High for none of these taxa;
- Moderate for 25 of these taxa (including Threatened taxa *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*);
- Low for 8 of these taxa (including Threatened taxon *Andersonia gracilis*); and
- Very low for 2 taxa.

Assuming a worst case scenario of impact on the entire DE and GDA, the local impact on habitat of these flora taxa has been assessed as:

- High for none of these taxa;
- Moderate for 25 taxa (including Threatened taxa *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*), and
- Low for 8 taxa (including Threatened taxon *Andersonia gracilis*); and
- Very Low for 2 taxa.

The differences in impact between preferred (key) and all known habitat for these taxa are relatively minor and occurs for:

- *Angianthus micropodioides* (P3): Very Low impact when preferred habitat is assessed in comparison to Low impact when all habitat is assessed (Footprint; DE and DE and GDA);
- *Chordifex chaunocoleus* (P4), *Chordifex resemians* (P1) and *Verticordia lindleyi* subsp. *lindleyi* (P4): Low impact when preferred habitat is assessed in comparison to Moderate impact when all potential habitat is assessed.

4.1.2 Impact on Plant Numbers

An impact assessment at the local scale in terms of impact on known numbers of CS flora taxa individuals, in the Footprint, DE and as a worst case scenario in the DE and GDA is presented in Table 9. This assessment has been undertaken for comparison to that presented for impact on preferred habitat only, and has been undertaken on the 26 listed CS flora taxa that are known to occur within the impact areas (as per Table 6).

Overall, the risk of significant impact on individuals of these taxa have been ranked higher than their equivalent impact on habitat (Table 8 and Appendix C), with High risk of significant local impact on

13 taxa including Threatened taxa (*Paracaleana dixonii* and *Macarthuria keigheryi*) if (as a worst case scenario) the entire DE and GDA were to be impacted. There would also be a High risk of significant local impact on individuals of 4 taxa if only the Footprint is impacted. This difference in risk of significant impact can be attributed to inconsistency in data collection intensity for these taxa between the Footprint, DE and the wider CWSA as detailed in Section 2.3.

Table 9 includes a comparison between impact levels using the entire CWSA versus the Assessment Area for clearing of the proposed footprint only. When utilising the smaller regional context 2 taxa received increased impact rankings; *Andersonia gracilis* (T) received an increase in impact rank from Low to Moderate and *Grevillea saccata* (P4) received an increase from Low to High. *A. gracilis* has been recorded in significant numbers in the Mining Tenement as a result of pre-clearing surveys. *GG. saccata* is associated with the laterite and clay influences of the Gingin Scarp soils along the eastern edges of the tenement. The vast majority of records for both species are in areas of the existing Cooljarloo Mine Lease that are very unlikely to be impacted by mining operations.

Table 9: Assessment of the Risk of Significant Impact on Listed Conservation Significant Flora Taxa Plant Numbers at the Local Scale

Conservation Significant Flora Taxon	Conservation Code	Individuals in the CW Study Area	Individuals in the AA	Individuals in the Footprint	Individuals in the combined DE / GDA	Percentage Impact (Footprint) CWSA/AA	Percentage Impact (DE and GDA)	Local Impact Significance (Footprint)	Local Impact Significance (DE and GWA))
<i>Allocasuarina grevilleoides</i>	P3	6	6	5	5	83.3/83.3	83.3	High	High
<i>Andersonia gracilis</i>	T (VU)	22154	10456	1689	5428	7.6/16.2	24.5	Low / Moderate	Moderate
<i>Angianthus micropodioides</i>	P3	17971	17962	0.0	0.0	0.0	0.0	Nil	Nil
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	5	5	2	5	40.0/40.0	100.0	High	High
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	3615	2773	108	136	3.0/3.9	3.8	Low	Low
<i>Babingtonia delicata</i> *	P1	45	10	0.0	0.0	0.0	0.0	Nil	Nil
<i>Babingtonia urbana</i>	P3	1915	1846	414	431	21.6/22.4	22.5	Moderate	Moderate
<i>Banksia dallanneyi</i> subsp. <i>pollosta</i>	P3	6828	5158	1051	1405	15.4/20.4	20.6	Moderate	Moderate
<i>Beaufortia bicolor</i>	P3	34	13	0.0	0.0	0.0	0.0	Nil	Nil
<i>Calectasia palustris</i>	P1	4	1	0.0	0.0	0.0	0.0	Nil	Nil
<i>Chordifex chaunocoleus</i>	P4	34	29	7	13	20.6/24.1	38.2	Moderate	High
<i>Chordifex reseinans</i>	P1	35	25	2	3	5.7/8	8.6	Low	Low
<i>Conospermum scaposum</i>	P3	10383	10366	773	2833	7.4/7.5	27.8	Low	Moderate
<i>Conostephium magnum</i>	P4	1921	1901	0.0	1056	0.0	55.8	Very Low	High
<i>Desmocladius biformis</i>	P3	1	1	1	1	100.0/100	100.0	High	High
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	55	55	0.0	1	0.0	1.8	Very Low	Low
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	25	0.0	0.0	25	0.0	100.0	Very Low	High

Conservation Significant Flora Taxon	Conservation Code	Individuals in the CW Study Area	Individuals in the AA	Individuals in the Footprint	Individuals in the combined DE / GDA	Percentage Impact (Footprint) CWSA/AA	Percentage Impact (DE and GDA)	Local Impact Significance (Footprint)	Local Impact Significance (DE and GWA))
<i>Frankenia glomerata</i>	P3	1132	1132	0.0	0.0	0.0	0.0	Nil	Nil
<i>Grevillea saccata</i>	P4	13	0	1	3	7.7/100	23.1	Low / High	Moderate
<i>Grevillea thelemanniana</i> subsp. Cooljarloo (B.J. Keighery 28 B)	P1	843	843	1	1	0.1/0.1	0.1	Very Low	Low
<i>Guichenotia alba</i>	P3	12	12	12	12	100.0/100	100.0	High	High
<i>Hakea longiflora</i>	P3	320	320	62	320	19.4/19.4	100.0	Moderate	High
<i>Hensmania stoniella</i>	P3	134	75	0.0	2	0.0	1.5	Very Low	Low
<i>Hypocalymma</i> sp. Cataby G.J. Keighery 5151)	P2	1	1	0.0	1	0.0	100.0	Very Low	High
<i>Isopogon panduratus</i> subsp. <i>palustris</i>	P2	4771	4521	0.0	0.0	0.0	0.0	Nil	Nil
<i>Jacksonia carduacea</i>	P3	250	22	0.0	0.0	0.0	0.0	Nil	Nil
<i>Macarthuria keigheryi</i>	T (EN)	859	856	99	289	11.5/11.5	33.6	Moderate	High
<i>Onychosepalum nodatum</i>	P3	53	21	0.0	0.0	0.0	0.0	Nil	Nil
<i>Paracaleana dixonii</i>	T (VU)	1	1	0.0	1	0.0	100.0	Very Low	High
<i>Platysace ramosissima</i>	P3	266	156	11	61	4.1/7.1	22.9	Low	Moderate
<i>Schoenus griffinianus</i>	P3	275	122	30	49	10.9/24.6	17.8	Moderate	Moderate
<i>Schoenus pennisetis</i>	P1	1759	1753	20	22	1.1/1.1	1.3	Low	Low
<i>Stylidium hymenocraspedum</i>	P2	654	654	152	493	23.2/23.2	78.3	Moderate	High
<i>Thysanotus glaucus</i>	P4	28	11	0.0	0.0	0.0	0.0	Nil	Nil
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	2237	2202	409	1165	18.3/18.6	52.1	Moderate	High

* Note: Plant numbers for *Babingtonia delicata* sourced from Western Botanical (2014)

4.1.3 Risk of Significant Impact at the Regional Scale

An assessment of the risk of a significant impact at the regional scale on each of these flora taxa following habitat assessment approach is presented in Table 10. In summary, for the Footprint area only (excluding an assessment using the AA), the risk of a significant impact at the regional scale has been assessed as:

- High for none of the taxa;
- Moderate-High for none of the taxa;
- Moderate for 4 taxa (including Threatened flora taxa *Andersonia gracilis*, *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*).
- Low-Moderate for 2 taxa; and
- Low for 29 taxa.

The risk of a significant impact at the regional scale on these flora taxa in relation to impact of the entire DE has been assessed as being:

- High for 3 of these taxa (including Threatened taxa *Anigozanthos viridis* subsp. *terraspectans* and *Macarthuria keigheryi* and *Paracaleana dixonii*);
- Moderate-High for 1 taxon;
- Moderate for 1 taxon (Threatened taxon *Andersonia gracilis*);
- Low-Moderate for 13 of these taxa; and
- Low for 17 taxa.

In a worst case scenario (impact on entire DE and GDA), the risk of a significant impact at the regional scale has been assessed as:

- High for 3 of these taxa (including Threatened taxa *Anigozanthos viridis* subsp. *terraspectans* and *Macarthuria keigheryi* and *Paracaleana dixonii*);
- Moderate-High for 1 taxon;
- Moderate for 1 taxon (Threatened taxon *Andersonia gracilis*);
- Low-Moderate for 13 of these taxa; and
- Low for 17 taxa.

Table 10 includes a comparison of risk of significant impact levels using the entire CWSA versus the Assessment Area for clearing of the proposed footprint only. When utilising the smaller regional context 3 taxa received increased impact rankings at the local scale; *Eucalyptus macrocarpa* subsp. *elachantha* (P4); *Grevillea saccata* (P4) and *Hensmania stoniella* (P3). All 3 taxa received changes in rankings from low to Moderate at the local scale, however only *Eucalyptus macrocarpa* subsp. *elachantha* (P4) received a minor ranking increase at the regional scale from Low to Low-Moderate.

Table 10: Assessment of Risk of a Significant Impact on Listed Conservation Significant Flora Taxa at the Regional Scale

Conservation Significant Flora Taxon	Conservation Code	Significance of Local Populations to Regional conservation	Local Impact (Footprint) CWSA/AA	Local Impact (DE)	Local Impact (DE and GDA)	Risk of Significant Impact (Footprint) CWSA/AA	Risk of Significant Impact (DE)	Risk of Significant Impact (DE and GDA)
<i>Allocasuarina grevilleoides</i>	P3	Low-Moderate	Moderate	Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
<i>Andersonia gracilis</i>	T (VU)	High	Low	Low	Low	Moderate	Moderate	Moderate
<i>Angianthus micropodioides</i>	P3	Low-Moderate	Very Low	Very Low	Very Low	Low	Low	Low
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	High	Low	Moderate	Moderate	Moderate	High	High
<i>Babingtonia delicata</i>	P1	Moderate-High	Low	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate-High
<i>Babingtonia urbana</i>	P3	Low-Moderate	Low	Low	Low	Low	Low	Low
<i>Banksia dallanneyi</i> subsp. <i>pollostia</i>	P3	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Beaufortia bicolor</i>	P3	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Calectasia palustris</i>	P1	Low-Moderate	Low	Low	Low	Low	Low	Low
<i>Chordifex chaunocoleus</i>	P4	Low-Moderate	Low	Low	Low	Low	Low	Low
<i>Chordifex reseinans</i>	P1	Low-Moderate	Low	Low	Low	Low	Low	Low
<i>Conospermum scaposum</i>	P3	Low	Low	Moderate	Moderate	Low	Low	Low
<i>Conostephium magnum</i>	P4	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Desmocladus biformis</i>	P3	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	Low-Moderate	Very Low	Very Low	Very Low	Low	Low	Low
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	Low-Moderate	Low / Moderate	Moderate	Moderate	Low / Low-Moderate	Low-Moderate	Low-Moderate
<i>Frankenia glomerata</i>	P3	Low	Very Low	Very Low	Very Low	Low	Low	Low
<i>Grevillea saccata</i>	P4	Low	Low / Moderate	Moderate	Moderate	Low	Low	Low

Conservation Significant Flora Taxon	Conservation Code	Significance of Local Populations to Regional conservation	Local Impact (Footprint) CWSA/AA	Local Impact (DE)	Local Impact (DE and GDA)	Risk of Significant Impact (Footprint) CWSA/AA	Risk of Significant Impact (DE)	Risk of Significant Impact (DE and GDA)
<i>Grevillea thelemanniana</i> subsp. Cooljarloo (B.J. Keighery 28 B)	P1	Moderate	Low	Low	Low	Low	Low	Low
<i>Guichenotia alba</i>	P3	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Hakea longiflora</i>	P3	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Hensmania stoniella</i>	P3	Low	Low / Moderate	Moderate	Moderate	Low	Low	Low
<i>Hypocalymma</i> sp. Cataby G.J. Keighery 5151)	P2	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Isopogon panduratus</i> subsp. <i>palustris</i>	P2	Moderate	Low	Low	Low	Low	Low	Low
<i>Jacksonia carduacea</i>	P3	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Macarthuria keigheryi</i>	T (EN)	High	Low	Moderate	Moderate	Moderate	High	High
<i>Onychosepalum nodatum</i>	P3	Moderate	Low	Low	Low	Low	Low	Low
<i>Paracaleana dixonii</i>	T (VU)	High	Low	Moderate	Moderate	Moderate	High	High
<i>Platysace ramosissima</i>	P3	Low	Low	Moderate	Moderate	Low	Low	Low
<i>Schoenus griffinianus</i>	P3	Low	Low	Moderate	Moderate	Low	Low	Low
<i>Schoenus pennisetis</i>	P1	Low-Moderate	Low	Low	Low	Low	Low-Moderate	Low-Moderate
<i>Stylidium hymenocraspedum</i>	P2	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Thysanotus glaucus</i>	P4	Low	Low	Moderate	Moderate	Low	Low	Low
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	Low	Low	Low	Low	Low	Low	Low

4.2. Non-Listed Conservation Significant Flora Taxa

4.2.1 Impact on Local Habitat

Table 11 presents the assessment of risk of significant impact on the 17 non-listed CS flora taxa as presented in Table 7 with respect to impact on preferred habitat (excluding an assessment using the AA). The risk of significant impact at the local scale on these flora taxa in relation to direct clearing of the Footprint has been assessed as being:

- High for none of these taxa;
- Moderate for none of these taxa;
- Low for 15 taxa; and
- Very low for 2 taxa.

The risk of significant local impact on these flora taxa in relation to impact of the entire DE has been assessed as being:

- High for none of these taxa;
- Moderate for 13 of these taxa;
- Low for 2 taxa; and
- Very Low for 2 taxa.

Assuming the worst case scenario of impact on the entire DE and GDA, the risk of significant local impact on these flora taxa has been assessed as being:

- High for none of these taxa;
- Moderate for 13 of these taxa;
- Low for 2 taxa; and
- Very Low for 2 taxa.

No assessment of potential risk of impact utilising the Assessment Area has been conducted for these taxa.

Table 11: Assessment of Local Impact on Habitat of Non-Listed Conservation Significant Taxa and Associated Risk of Significant Impact on each Taxon

Conservation Significant Flora Taxon	Preferred Habitat (Core)	Percentage Impact (Footprint)	Percentage Impact (DE)	Percentage Impact (DE and GWA)	Local Risk of Impact (Footprint)	Local Risk of Impact (DE)	Local Risk of Impact (DE and GDA)
<i>Anigozanthos viridis</i> subsp. Cataby (S.D. Hopper 1786)	2	0.0	0.2	0.5	Very Low	Very Low	Very Low
<i>Anigozanthos viridis</i> subsp. <i>viridis</i>	1, 2, 3, 6, 9a, 9b	3.6	8.0	8.1	Low	Low	Low
<i>Conostylis aculeata</i> subsp. <i>spinuligera</i>	1, 2, 5, 6, 9b, 17, 18	6.0	14.1	14.3	Low	Moderate	Moderate
<i>Conostylis festuacea</i> subsp. <i>festuacea</i>	1, 2, 5, 6, 7, 17	5.2	11.8	11.9	Low	Moderate	Moderate
<i>Cristonia biloba</i> (subsp. <i>pubescens</i>)	17, 18	6.6	16.1	16.3	Low	Moderate	Moderate
<i>Darwinia pinifolia</i>	1, 2, 5, 7	4.7	9.1	9.2	Low	Low	Low
<i>Drosera closterostigma</i>	1, 5, 9b	4.7	9.7	9.8	Low	Low	Low
<i>Eremophila glabra</i> subsp. ? <i>carnosa</i>	2	0.0	0.2	0.5	Very Low	Very Low	Very Low
<i>Eucalyptus</i> aff. <i>incrassata</i>	1, 17, 18	6.3	15.2	15.4	Low	Moderate	Moderate
<i>Haemodorum sparsiflorum</i>	18	9.6	24.0	24.4	Low	Moderate	Moderate
<i>Hydrocotyle blepharocarpa</i>	17, 18	6.6	16.1	16.3	Low	Moderate	Moderate
<i>Hypocalymma</i> sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)	17, 18	6.6	16.1	16.3	Low	Moderate	Moderate
<i>Lachnagrostis preissii</i>	17, 18	6.6	16.1	16.3	Low	Moderate	Moderate
<i>Lepidosperma</i> aff. <i>scabrum</i>	5, 17, 18	6.5	15.5	15.7	Low	Moderate	Moderate
<i>Leucopogon</i> aff. <i>sprengelioides</i>	17, 18	6.6	16.1	16.3	Low	Moderate	Moderate
<i>Philothea spicata</i> subsp. Moore River National Park (G. & D. Woodman Op 47)	17	5.4	13.1	13.2	Low	Moderate	Moderate
<i>Rytidosperma setaceum</i>	1, 2, 18	6.9	17.0	17.2	Low	Moderate	Moderate

4.2.2 Risk of a Significant Impact at the Regional Scale

An assessment of the significance of the local populations to the overall regional conservation of each taxon is presented in Appendix D. Of the 4 taxa where the local populations have been assessed as being of Moderate to High regional significance, 3 taxa have been recorded as occurring within the DE (*Drosera closterostigma*; *Eucalyptus* aff. *incrassata* and *Leucopogon* aff. *sprengelioides*), with *Cristonia biloba* subsp. *pubescens* not known to occur in the DE. All of these taxa have locations outside of the DE (*Drosera closterostigma* (10); *Eucalyptus* aff. *incrassata* (1); *Leucopogon* aff. *sprengelioides* (7); and *Cristonia biloba* (not identified to subspecies level) (2)).

An assessment of the risk of significant impact on each of these flora taxa at the regional level is presented in Table 12. In summary, for clearing of the Footprint area only the risk of significant impact on the conservation status of the taxa has been assessed as:

- High for none of the taxa;
- Moderate for 4 taxa;
- Low for 13 taxa.

The risk of significant of these flora taxa in relation to impact of clearing of the entire DE has been assessed as being:

- High for 3 taxa;
- Moderate for 2 taxa;
- Low-Moderate for 5 taxa; and
- Low for 7 taxa.

In a worst case scenario (impact on entire DE and GDA), the risk of significant impact on the regional conservation for these flora taxa has been assessed as:

- High for 3 taxa;
- Moderate for 2 taxa;
- Low-Moderate for 5 taxa; and
- Low for 7 taxa.

Table 12: Assessment of Risk of Significant Impact on Non-Listed Conservation Significant Flora Taxa at the Regional Scale

Taxon	Regional Significance of Local Populations	Risk of Impact (Local) (Footprint)	Risk of Impact (Local) (DE)	Risk of Impact (Local) (DE and GDA)	Risk of Impact (Regional) (Footprint)	Risk of Impact (Regional) (DE)	Risk of Impact (Regional) (DE and GDA)
<i>Anigozanthos viridis</i> subsp. <i>Cataby</i> (S.D. Hopper 1786)	Low	Very Low	Very Low	Very Low	Low	Low	Low
<i>Anigozanthos viridis</i> subsp. <i>viridis</i>	Low	Low	Low	Low	Low	Low	Low
<i>Conostylis aculeata</i> subsp. <i>spinuligera</i>	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Conostylis festucacea</i> subsp. <i>festucacea</i>	Low	Low	Moderate	Moderate	Low	Low	Low
<i>Cristonia biloba</i> (subsp. <i>pubescens</i>)	High	Low	Moderate	Moderate	Moderate	High	High
<i>Darwinia pinifolia</i>	Low	Low	Low	Low	Low	Low	Low
<i>Drosera closterostigma</i>	High	Low	Low	Low	Moderate	Moderate	Moderate
<i>Eremophila glabra</i> subsp. <i>?carnosa</i>	High	Very Low	Very Low	Very Low	Low	Low	Low
<i>Eucalyptus</i> aff. <i>incrassata</i>	High	Low	Moderate	Moderate	Moderate	High	High
<i>Haemodorum sparsiflorum</i>	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Hydrocotyle blepharocarpa</i>	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate
<i>Hypocalymma</i> sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)	Low-Moderate	Low	Moderate	Moderate	Low-	Low-Moderate	Low-Moderate
<i>Lachnagrostis preissii</i>	Low	Low	Moderate	Moderate	Low	Low	Low
<i>Lepidosperma</i> aff. <i>scabrum</i>	Low-Moderate	Low	Moderate	Moderate	Low	Low-Moderate	Low-Moderate

Taxon	Regional Significance of Local Populations	Risk of Impact (Local) (Footprint)	Risk of Impact (Local) (DE)	Risk of Impact (Local) (DE and GDA)	Risk of Impact (Regional) (Footprint)	Risk of Impact (Regional) (DE)	Risk of Impact (Regional) (DE and GDA)
<i>Leucopogon</i> aff. <i>sprengelioides</i>	High	Low	Moderate	Moderate	Moderate	High	High
<i>Philotheca spicata</i> subsp. Moore River National Park (G. & D. Woodman Op 47)	Moderate	Low	Moderate	Moderate	Low	Moderate	Moderate
<i>Rytidosperma setaceum</i>	Low	Low	Moderate	Moderate	Low	Low	Low

5. SUMMARY OF RISK OF SIGNIFICANT IMPACT

5.1 Listed Conservation Significant Flora Taxa

A total of 35 taxa have Moderate to Certain likelihood of occurrence in the combined impact areas:

- 28 taxa are known to occur (Certain) within the combined impact areas (including the Threatened flora taxa *Andersonia gracilis*, *Anigozanthos viridis* subsp. *terraspectans*, *Macarthuria keigheryi* and *Paracaleana dixonii*); and
- 7 are of Moderate-High likelihood of occurrence within the combined impact areas.

Table 13 presents the 24 listed CS flora taxa where the local impact has been ranked Moderate and/or the risk of regional impact has been ranked Moderate or High, assuming the entire DE and GDA are impacted. Of these, 21 taxa are known to occur within the impact areas (as per Table 6, and shaded in Table 13), and 3 are currently not known to occur within the impact areas.

Table 13: Summary of Risk of Significant Impact on Listed Conservation Significant Flora Likely to Occur within the Combined Impact Areas

Conservation Significant Flora Taxon	Conservation Code	Local Impact Ranking (DE and GDA)	Regional Risk of Impact (DE and GDA)
<i>Allocasuarina grevilleoides</i>	P3	Moderate	Low-Moderate
<i>Andersonia gracilis</i>	T (VU)	Low	Moderate
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	Moderate	Low-Moderate
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	Moderate	High
<i>Babingtonia delicata</i>	P1	Moderate	Moderate-High
<i>Banksia dallanneyi</i> subsp. <i>pollostia</i>	P3	Moderate	Low-Moderate
<i>Beaufortia bicolor</i>	P3	Moderate	Low-Moderate
<i>Conospermum scaposum</i>	P3	Moderate	Low
<i>Conostephium magnum</i>	P4	Moderate	Low-Moderate
<i>Desmocladius biformis</i>	P3	Moderate	Low-Moderate
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	Moderate	Low-Moderate
<i>Grevillea saccata</i>	P4	Moderate	Low
<i>Guichenotia alba</i>	P3	Moderate	Low-Moderate
<i>Hakea longiflora</i>	P3	Moderate	Low-Moderate
<i>Hensmania stoniella</i>	P3	Moderate	Low
<i>Hypocalymma</i> sp. Cataby G.J. Keighery 5151)	P2	Moderate	Low-Moderate
<i>Jacksonia carduacea</i>	P3	Moderate	Low-Moderate
<i>Macarthuria keigheryi</i>	T (EN)	Moderate	High
<i>Paracaleana dixonii</i>	T (VU)	Moderate	High
<i>Platysace ramosissima</i>	P3	Moderate	Low
<i>Schoenus griffinianus</i>	P3	Moderate	Low
<i>Schoenus pennisetis</i>	P1	Low	Low-Moderate
<i>Stylidium hymenocraspedum</i>	P2	Moderate	Low-Moderate
<i>Thysanotus glaucus</i>	P4	Moderate	Low

Note: shaded taxa are known to occur within the impact areas.

The local impact on habitat of 22 listed CS flora taxa as presented above have been ranked as Moderate, with impacts to habitat within the CWSA assessed at between 10 and 30% of the mapped preferred habitat within the CWSA. Although significant numbers of individuals of the majority of these taxa within the CWSA are also known to occur outside of the impact areas (>50% of the total known individuals in the CWSA), there are 9 taxa where the current known distributions within the CWSA are virtually restricted to the impact areas (Table 9), including:

- *Allocasuarina grevilleoides* (P3): of 6 individuals known in the CWSA, 5 are known within the Footprint;
- *Anigozanthos humilis* subsp. *chrysanthus* (P4): of 5 individuals known in the CWSA, 5 are known in the DE (of which 2 are known in the Footprint);
- *Desmocladius biformis* (P3): the only known individual in the CWSA is located in the Footprint;
- *Eucalyptus macrocarpa* subsp. *elachantha* (P4): all known individuals in the CWSA are located in the DE;
- *Guichenotia alba* (3): all 12 known individuals in the CWSA are located within the Footprint;
- *Hakea longiflora* (3): all 320 known individuals in the CWSA are located within the combined impact areas;
- *Hypocalymma* sp. Cataby G.J. Keighery 5151) (P2): the only known individual in the CWSA is located within the combined impact area;
- *Paracaleana dixonii* (T): the only known location within the CWSA is located within the combined impact area; and
- *Stylidium hymenocraspedum* (P2): 78% (492 of 630) individuals known within the CWSA are located within the combined impact area.

Section 2.3 discusses the relationship between survey effort/intensity and how utilising plant numbers for impact assessment utilising the available data potentially increases the significance of impact to taxa. For the 9 taxa listed above, additional survey outside of the combined impact areas may identify additional plants/populations that will significantly alter the local impact ranking and it is considered that assessment of impact significance should utilise habitat data until more comprehensive data on plant numbers and distribution for these taxa are available. However when considering only the footprint impacts (Table 9) 3 of the 9 taxa have local impact rankings based on plant numbers of Very Low including the Threatened taxon *P. dixonii*.

The significance of the local populations of each of the four Threatened flora taxa known from the CWSA were ranked High (Woodman Environmental 2014) due to their Threatened status (see Table 2). If the other criteria as per Table 2 are applied to these taxa (disregarding their listing as Threatened), the resulting significance of the local populations to their regional conservation are reduced as presented in Table 14. Each of these taxa have relatively large known regional distributions and known numbers of populations. The regional risk of significant impact ranking likewise changes as outlined in Table 14.

Table 14: Risk of Regional Impact on Threatened Flora with Re-Assessed Significance of Local Populations

Taxon	Significance of Local Populations	Local Impact Ranking (DE and GDA) (Table 8)	Revised Regional Ranking (DE and GDA)
<i>Andersonia gracilis</i>	Low-Moderate	Low	Low
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	Low-Moderate	Moderate	Low-Moderate
<i>Macarthuria keigheryi</i>	Low-Moderate	Moderate	Low-Moderate
<i>Paracaleana dixonii</i>	Low-Moderate	Moderate	Low-Moderate

The risk of significant regional impact on *Babingtonia delicata* (P1) has also been assessed as Moderate-High; this is due to the combination of Moderate-High significance of the local populations in combination with Moderate impact on known habitat of this taxon. The known regional distribution of this taxon is relatively restricted, confirmed populations known to occur from the vicinity of Salt Lake Road near Lake Guruga (south of the CWSA) (2, possibly 3 populations) and east of the South Mine (1 population). However, this taxon has not been recorded as occurring within the DE itself. Historical unconfirmed records of this taxon in the DE were surveyed for by Western Botanical, who did not record this entity at this location and that it may have been mistaken for *Babingtonia urbana* (P3) (Western Botanical 2014).

5.2 Non Listed Conservation Significant Flora Taxa

If the Footprint only is impacted there will be no significant impact on local habitat of any of the taxa identified in this assessment. There will be a Moderate risk of significant impact at the regional scale for 3 taxa; *Cristonia biloba* (subsp. *pubescens*) and *Drosera closterostigma* have only 2 recorded populations each across their respective ranges and therefore the significance of the local population is Moderate to High resulting in an elevated potential impact on these taxa. *Eucalyptus* aff. *incrassata* currently has only the single recorded population, however additional review of this taxon has the potential to identify additional populations based on specimens held at the State Herbarium.

If the entire DE, or DE and GDA are impacted there will be a Moderate risk of significant impact on habitat of 12 taxa at the local scale, which would equate to a Moderate to High risk of significant impact at the regional scale to 5 taxa (Table 15).

Table 15: Summary of Risk of Impact on Non-Listed Conservation Significant Flora at the Regional Scale

Taxa	Risk of Significant Impact (Local Scale) (DE and GDA)	Risk of Significant Impact (Regional Scale) (DE and GDA)
<i>Conostylis aculeata</i> subsp. <i>spinuligera</i>	Moderate	Low-Moderate
<i>Conostylis festucacea</i> subsp. <i>festucacea</i>	Moderate	Low
<i>Cristonia biloba</i> (subsp. <i>pubescens</i>)	Moderate	High
<i>Drosera closterostigma</i>	Low	Moderate
<i>Eucalyptus</i> aff. <i>incrassata</i>	Moderate	High
<i>Haemodorum sparsiflorum</i>	Moderate	Low-Moderate
<i>Hydrocotyle blepharocarpa</i>	Moderate	Low-Moderate
<i>Hypocalymma</i> sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)	Moderate	Low-Moderate
<i>Lachnagrostis preissii</i>	Moderate	Low
<i>Lepidosperma</i> aff. <i>scabrum</i>	Moderate	Low-Moderate
<i>Leucopogon</i> aff. <i>sprengelioides</i>	Moderate	High
<i>Philothea spicata</i> subsp. Moore River National Park (G. & D. Woodman Op 47)	Moderate	Moderate
<i>Rytidosperma setaceum</i>	Moderate	Low

The taxa at most risk in terms of impact on local habitat and regional impact on the taxa at all scales of impact (Footprint only, entire DE and combined DE and GDA) are:

- *Cristonia biloba* subsp. *pubescens*
- *Eucalyptus* aff. *incrassata*

- *Leucopogon* aff. *sprengelioides*

Of the two subspecies classified for *Cristonia biloba* (as recorded in the CWSA), the distribution of *C. biloba* subsp. *pubescens* is the closest known to Cooljarloo. It is known from four specimens extending from just south of Eneabba to 15 km west north-west of Dandaragan. However, there are several specimens at the WAHerb which have been identified to species level only and therefore further work into classification of this species is necessary. It is likely that this taxon is poorly collected and its distribution is potentially wider than information that is currently available suggests.

Two specimens of *Eucalyptus* aff. *incrassata* have been submitted to WAHerb, however no determination on this group is yet available. Malcolm French is currently reviewing this group and its full distribution and population numbers are as yet unknown due to a lack of survey. Malcolm has indicated that the entity *Eucalyptus* aff. *incrassata* is potentially a new taxon and has affinity to *E. incrassata* and is the most westerly located entity within the group. The *E. incrassata* group is quite complex with a large distribution and it will be some time before the required research is completed. This entity is currently thought to occur from 4 known populations from Cataby to Eneabba south.

There are four records of *Leucopogon* aff. *sprengelioides* in the Cooljarloo area. Although a specimen of this entity was submitted to M. Hislop (WAHerb) for review at the time of the surveys, a final determination is not yet available. It is possible that on investigation this entity will be retained within the *L. sprengelioides*, however until the specimens are investigated and the reasons for listing as an aff. taxon are understood this entity remains a putative new taxon with little information regarding its distribution and conservation status available.

The risk of impact on the regional distribution of *Drosera closterostigma* and *Philothea spicata* subsp. Moore River National Park (G. & D. Woodman Op 47) have both been assessed as Moderate. The known regional distribution of both of these taxa is currently not well understood and both are poorly collected.

The distribution of *Drosera closterostigma* is known from only two other publically available records (specimens held at the WAHerb). The specimen collected at Cooljarloo and submitted by Woodman Environmental to M. Hislop (WAHerb) does not yet appear on the WAHerb database. Woodman Environmental has also previously recorded this taxon occurring in the vicinity of Eneabba. It is known to occur on sandy soils on the margins of wet depressions (DPaW 2015b), and was recorded in VTs 1, 5 and 9b in the CWSA which are all located in water gaining areas (Woodman Environmental 2014). As this taxon is Poorly Collected its distribution is likely to be more widespread than recorded. This taxon is known to occur in the Footprint and DE.

Philothea spicata subsp. Moore River National Park (G. & D. Woodman Op 47) is also poorly collected, with only six specimens lodged at the WAHerb (DPaW 2015b). All of these records are from approximately 40km to the south-east of the CWSA within the Moore River National Park. This taxon is not known from within the impact areas, and has been recorded only once previously at one location near the existing Cooljarloo North Mine, not in the vicinity of the impact areas. It is therefore considered of low likelihood of occurrence in the DE.

6. CONCLUSIONS

This risk assessment has identified that 35 of 66 listed conservation significant flora taxa have the potential to be impacted by the Cooljarloo West Project.

The assessment of risk of impact to taxa utilising plant numbers is considered an overestimate based on the current dataset and therefore robust and representing a worst case scenario. However, potential impact on known plant numbers indicates a potentially High impact on 4 taxa (*Allocasuarina grevilleoides*, *Anigozanthos humilis* subsp. *chrysanthus* (P3), *Desmocladius biformis* (P4) and *Guichenotia alba* (P3) at the local scale (Footprint only). At the regional scale, the impact of clearing the Footprint on each of these taxa is reduced to Low-Moderate to Low.

Utilising the impact to habitat assessment method the habitat for only one taxon (*Allocasuarina grevilleoides*) (P3) will experience a Moderate level of impact from clearing of the Footprint at the local scale.

When the significance of impact of clearing the Footprint is assessed using the habitat assessment method at the regional scale, the four listed Threatened taxa known from the CWSA all receive risk rankings of Moderate for a significant impact. All other taxa receive rankings below this level. The rankings used to determine the significance of local populations to the regional conservation of each taxon include a requirement for all taxa with the conservation status of Threatened to receive a ranking of High. When this requirement is removed and only number of populations and regional distribution data is taken into account, the risk of a significant impact on these Threatened taxa at the regional scale is reduced to Low-Moderate for all 4 taxa, reflecting the broader distribution and regional population status of each. As all 4 Threatened taxa have large distributions, as well as additional local populations outside of the combined impact areas (excluding *P. dixonii*), impacts from the Cooljarloo West Project should not be significant.

P. dixonii has only recently been identified at Cooljarloo despite significant survey effort over many years. It was recorded at a single location, with several follow-up targeted surveys failing to re-locate this individual, or locate any other individuals in the area. At Cooljarloo this taxon is represented by a single plant within the DE, however not within the proposed Footprint. It is possible that the location of only a single plant at Cooljarloo represents an outlier individual within habitat that is marginal and that this recording does not represent a viable population. Significant populations (>100 plants in some) of this taxon have been identified in recent years associated with sandsheets adjacent to lateritic escarpments and on plains in the vicinity of Eneabba and Mt Adams, with additional recordings between these locations indicating a strong correlation of this taxon with these areas. Additional populations have been recorded historically south of Eneabba in the Lesueur National Park and Coomallo Nature Reserve indicating a southward extension of habitat toward Cooljarloo but with no recent survey data to confirm this distribution other than the single plant recorded at Cooljarloo. Given that additional investigation into the full range and population numbers of this taxon is still required, the proposed impact on this single plant, though representing a potentially significant impact on the range of the taxon, does not pose any significant risk to the conservation status of the taxon.

The assessment outcomes change as you consider the larger area represented within the DE and the combined DE and GDA, however as impacts to these larger areas are not certain, for the purposes of this assessment impacts within the Footprint represent the most likely scenario. Impacts to the larger area/s are provided in this document to provide information regarding potential impacts should the proposed footprint position alter within the DE and also should potential impacts from groundwater drawdown be realised as a worst case scenario. In reality movement of the Footprint will result in both positive and negative changes to impacts depending on species distributions with

some taxa experiencing greater impacts and others less than currently estimated for clearing of the Footprint, with no taxon likely to experience impacts over and above what has been reported for the combined impact areas. Similarly impacts from groundwater drawdown are unlikely to impact on all taxa within the zone of drawdown risk. Previous experience at Cooljarloo has shown that drawdown can have significant short term impacts on the vegetation without killing all taxa present, the greatest impacts experienced by tree and larger shrub species with some rush/sedge species and smaller taxa affected in wetland habitats not underlain by impeding layers.

The assessment of non-listed CS flora identified 19 taxa that may potentially occur within the CWSA of which 17 may occur in the combined impact areas. Assessment of the proposed impact of Footprint clearing on these taxa indicated that the local impact represents a Low- to Very low impact on habitat for each taxon, with 4 taxa identified as having a Moderate risk of significant impact at the regional scale based on available data regarding their habitat requirements. Investigation of these 4 taxa has indicated that two taxa may represent new taxa to science and therefore current rankings are potentially misleading and the taxa may require additional investigation to determine local impacts and also their broader conservation significance (*Eucalyptus* aff. *incrassata*; *Leucopogon* aff. *sprengelioides*). Of the remaining 2 taxa, *Drosera closterostigma* is a small plant that is recorded as occurring on the margins of wet depressions. Based on its size and the lack of regional survey of appropriate habitat this taxon is probably under-recorded in the CWSA and is likely to have a broader regional distribution than currently thought. *Philotheca spicata* subsp. Moore River National Park (G. & D. Woodman Op 47) is a variant of the common taxon *Philotheca spicata* in that it has a white flower colour and is recorded as having a wispy form in contrast to the common taxon's flower colour recorded as "pink-purple-blue/white" with a slender form. Based on known records for this taxon it is unlikely to occur in the impact areas.

The data utilised in this assessment has been sourced from various authors and locations, each with an associated level of confidence attached and therefore the conclusions drawn have an associated reduced level of confidence attached to them. However the risk assessment process has clearly identified that for all listed CS flora and those non-listed flora taxa with confirmed taxonomic identities, the proposed impacts from the Cooljarloo West Project are unlikely to be at variance to the EPA's objective for flora and vegetation: "To maintain representation, diversity, viability and ecological function at the species, population and community level".

Several recommendations arising from this risk assessment are given to facilitate the further clarification of the significance of impact on flora taxa as per Section 4.3 below.

Data Collection to Refine Impact Assessment

Survey within the DE for all Threatened flora taxa is recommended prior to impact so that impacts to these taxa at the local and regional scales can be more accurately quantified to inform Permit to Take application under the *Wildlife Conservation Act 1950*. Results of the surveys should be utilised in a GIS environment to calculate impacts on plant numbers utilising the final project Footprint polygon. This will allow Tronox to alter the final project layout to minimise impacts on these taxa where it is feasible to do so.

Survey for each taxon should target their preferred habitat areas within the project areas at a maximum grid spacing of 50m in order to be certain to identify populations. Although a spacing of 50m will incorporate some uncertainty that all plants will be found, this spacing has been found in the past by Woodman Environmental to be efficient at identifying the presence of populations of conservation significant flora, even those very small in stature such as *P. dixonii*, where they occupy an area of at least 30m in diameter. Once a population is encountered during surveys additional high intensity searching to census each population at each location should be undertaken.

An exception to the above would be *M. keigheryi* which is a prodigious fire response organism within its habitat, but which quickly withdraws its presence to the topsoil seedbank in early years following fire. This taxon, though known to inhabit Banksia woodlands in the CWSA is unlikely to be recorded unless another fire is experienced by the vegetation. Therefore detailed searching for this taxon in the absence of fire should not be required. Should fire occur within the DE or immediate surrounds this taxon will become visible in those areas for survey following significant rainfall, with flowering material present during spring for identification purposes. It is highly unlikely that plants will be visible during 2015 should a fire occur, however spring 2016 would provide a suitable survey window. Given the difficulty in performing quantitative impact assessment on this taxon as a result of its fire response driven reproductive strategy, post fire surveys should focus on identifying additional local populations of the taxon not to be impacted by mining where possible, and to aid in refining the understanding of the taxon's distribution in the vicinity of the mine to improve long term management of impacts to the taxon's habitat.

Babingtonia delicata (P1), though not strictly within the group of taxa receiving a Moderate and above risk of significant impact from clearing of the Footprint, occurs within the same habitats as the Threatened taxa *Andersonia gracilis* and *Anigozanthos viridis* subsp. *terraspectans* and as such will be recorded while searching these habitats. Confirmation of the presence or otherwise of this relatively unknown and potentially rare taxon in the Footprint and in surrounding areas will provide additional data concerning the range and number of populations of the taxon which would be beneficial to the long term management of the taxon.

Management Actions

The confirmation of the taxonomic and conservation status of the entities *Eucalyptus* aff. *incrassata* and *Leucopogon* aff. *sprengelioides*, and the confirmation of the subspecies of *Cristonia biloba* at Cooljarloo West are recommended to determine if further survey for these entities is required. It is recommended that further collections of both these entities are taken during Spring 2015 if possible to assist in this task.

It is recommended that the known location of *Paracaleana dixonii* (T) and a surrounding 50m buffer is avoided by any future moving of the Footprint if possible.

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Appendix A: Listed Conservation Significant Taxa of the Cooljarloo West Study Area

Conservation Significant Flora Taxon	Cons. Code	Preferred Habitat (VTs)	Confidence in Association to Preferred habitat	Known within Development Envelope Buffer [^]	Known within the Footprint [#]	Preferred habitat Present in Footprint [#]	Known within the Development Envelope	Preferred habitat Present in Development Envelope	Known within the Groundwater Drawdown Area*	Preferred habitat Present in Groundwater Drawdown Area*	Likelihood of presence in Development Envelope	Likelihood of presence in Footprint	Likelihood of Presence in Groundwater Drawdown Area
<i>Allocasuarina grevilleoides</i>	P3	7	Low	Yes	Yes	Yes	Yes	Yes	No	No	Certain	Certain	Low
<i>Andersonia gracilis</i>	T (VU)	5, 2, 1	High	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Certain	Certain	Certain
<i>Angianthus micropodioides</i>	P3	2 (5, 13)	Moderate-High	Yes	No	Yes	No	Yes	No	Yes	Moderate	Moderate	Moderate
<i>Anigozanthos humilis</i> subsp.	P4	17, 18	Low	No	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	1	Moderate-High	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Certain	Certain	Certain
<i>Arnocrinum gracillimum</i>	P2	17	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Babingtonia cherticola</i>	P3	1	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Babingtonia delicata</i>	P1	17	Low	Yes	No	Yes	No	Yes	No	Yes	Moderate	Moderate	Moderate
<i>Babingtonia urbana</i>	P3	1 (2)	Moderate-High	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Banksia dallanneyi</i> subsp. <i>pollostata</i>	P3	1, 5, 17, 18	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Beaufortia bicolor</i>	P3	17 (7)	Moderate	Yes	No	Yes	No	Yes	No	Yes	Moderate	Moderate	Moderate
<i>Beaufortia eriocephala</i>	P3	7	Low	Yes	No	Yes	No	Yes	No	No	Low	Low	Low
<i>Beyeria cinerea</i> subsp. <i>cinerea</i>	P3	8	Low	No	No	No	No	No	No	No	Low	Low	Low
<i>Boronia tenuis</i>	P4	1, 17	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Byblis gigantea</i>	P3	2	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Calandrinia oraria</i>	P3	9b	Low	Yes	No	Yes	No	Yes	No	No	Low	Low	Low
<i>Calectasia palustris</i>	P1	2, 7 (5)	Moderate	Yes	No	Yes	No	Yes	No	Yes	Moderate	Moderate	Moderate
<i>Chordifex chaunocoleus</i>	P4	5, 2 (6, 7, 17, 18)	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Chordifex reseminans</i>	P1	1, 5 (2, 17, 18)	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Conospermum scaposum</i>	P3	1, 17, 5, 18	Moderate-High	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Conostephium magnum</i>	P4	17	High	Yes	No	Yes	Yes	Yes	No	Yes	Certain	High	Moderate
<i>Desmocladus biformis</i>	P3	17	Low	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Diuris ?eburnea</i>	P1	10	Low	No	No	No	No	No	No	No	Low	Low	Low
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	2	Moderate	Yes	No	Yes	No	Yes	Yes	Yes	Moderate-High	Moderate-High	Certain
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	18	Low	Yes	No	Yes	Yes	Yes	No	Yes	Certain	High	Moderate
<i>Frankenia glomerata</i>	P3	2	Low	Yes	No	Yes	No	Yes	No	Yes	High	High	Moderate
<i>Goodenia perryi</i>	P3	17, 18	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Grevillea saccata</i>	P4	18	Low	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Grevillea thelemanniana</i> subsp. <i>Cooljarloo</i> (B.J. Keighery 28 B)	P1	1, 2	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Guichenotia alba</i>	P3	1, 7	Low	No	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Hakea longiflora</i>	P3	1, 18	Low	No	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Haloragis foliosa</i>	P3	2	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Hensmania stoniella</i>	P3	18	Moderate	Yes	No	Yes	Yes	Yes	Yes	Yes	Certain	High	Certain
<i>Hibbertia helianthemoides</i>	P4	2, 5	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Hibbertia spicata</i> subsp. <i>leptotheca</i>	P3	8	Low	No	No	No	No	No	No	No	Low	Low	Low
<i>Hypolaena robusta</i>	P4	-	Low	No	No	Unknown	No	Unknown	No	Unknown	Low	Low	Low
<i>Hypocalymma serrulatum</i>	P3	7, 10	Low	No	No	Yes	No	Yes	No	No	Low	Low	Low
<i>Hypocalymma</i> sp. <i>Cataby</i> G.J. Keighery 5151)	P2	17	Low	No	No	Yes	Yes	Yes	No	Yes	Certain	Moderate	Moderate

Appendix A: Listed Conservation Significant Taxa of the Cooljarloo West Study Area

Conservation Significant Flora Taxon	Cons. Code	Preferred Habitat (VTs)	Confidence in Association to Preferred habitat	Known within Development Envelope Buffer [^]	Known within the Footprint [#]	Preferred habitat Present in Footprint [#]	Known within the Development Envelope	Preferred habitat Present in Development Envelope	Known within the Groundwater Drawdown Area*	Preferred habitat Present in Groundwater Drawdown Area*	Likelihood of presence in Development Envelope	Likelihood of presence in Footprint	Likelihood of Presence in Groundwater Drawdown Area
<i>Isopogon panduratus</i> subsp. <i>palustris</i>	P2	1, 5	High	Yes	No	Yes	No	Yes	No	Yes	High	High	Moderate
<i>Jacksonia carduacea</i>	P3	1, 2, 5,17, 18	Low - Moderate	Yes	No	Yes	No	Yes	No	Yes	Moderate	Moderate	Moderate
<i>Lepidobolus densus</i>	P3	1, 18	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Lepyrodia curvescens</i>	P2	?		No	No	Unknown	No	Unknown	No	Unknown	Low	Low	Low
<i>Leucopogon</i> sp. Yanchep (M. Hislop 1986)	P3	1	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Lyginia excelsa</i>	P1	1	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Macarthuria keigheryi</i>	T (EN)	17, 18	High	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Meionectes tenuifolia</i>	P3	1	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Onychosepalum microcarpum</i>	P2	1, 5 (17)	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Onychosepalum nodatum</i>	P3	1, 5 (2)	Moderate	Yes	No	Yes	No	Yes	No	Yes	Moderate	Moderate	Moderate
<i>Ornduffia submersa</i>	P4	9a	Low	No	No	No	No	Yes	No	No	Low	Low	Low
<i>Paracaleana dixonii</i>	T (VU)	17 (7, 18)	Low	No	No	Yes	Yes	Yes	No	Yes	Certain	Moderate	Moderate
<i>Persoonia rudis</i>	P3	17	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Platysace ramosissima</i>	P3	17	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Schoenus griffinianus</i>	P3	17, 18	Moderate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Certain	Certain	Certain
<i>Schoenus natans</i>	P4	9a	Low	Yes	No	No	No	Yes	No	No	Low	Low	Low
<i>Schoenus pennisetis</i>	P1	1, 5	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Stenanthemum sublineare</i>	P2	17	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Stylidium aceratum</i>	P2	2, 6	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Stylidium aeonioides</i>	P4	Escarpment only	Unknown	Yes	No	No	No	No	No	No	Low	Low	Low
<i>Stylidium carnosum</i> subsp. ?Narrow leaves (J.A. Wege 490)	P1	18	Low	Yes	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Stylidium hymenocraspedum</i>	P2	8, 17	Moderate-High	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Stylidium longitubum</i>	P3	1, 9a, 3	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Stylidium maritimum</i>	P3	17	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Thysanotus glaucus</i>	P4	17 (18)	Low	Yes	No	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate
<i>Verticordia amphigia</i>	P3	18	Low	No	No	Yes	No	Yes	No	Yes	Low	Low	Low
<i>Verticordia huegelii</i> var. <i>tridens</i>	P3	7	Low	Yes	No	Yes	No	Yes	No	No	Low	Low	Low
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	1, 5 (17, 18)	Moderate	Yes	Yes	Yes	Yes	Yes	No	Yes	Certain	Certain	Moderate

[^]Note: Envelope buffer is 5km buffer surrounding DE
[#]Note: Footprint is direct impact within footprint only
^{*}Note: GDA is area potentially at risk of impact through groundwater drawdown outside of the DE

Appendix B: Non-Listed Conservation Significant Taxa of the Cooljarloo West Study Area

Conservation Significant Flora Taxon	Preferred habitat VTs (less preferred habitat)	Confidence in Association to Preferred habitat	Known within the Footprint	Preferred habitat Present in Footprint*	Known within the DE	Preferred Habitat Present in DE *	Preferred Habitat Present in GDA*
<i>Anigozanthos viridis</i> subsp. Cataby (S.D. Hopper 1786)	2	Moderate	No	Yes	No	Yes	Yes
<i>Anigozanthos viridis</i> subsp. <i>viridis</i>	1, 2, 3, 6, 9a, 9b	Moderate	No	Yes	No	Yes	Yes
<i>Conostylis aculeata</i> subsp. <i>spinuligera</i>	1, 2, 5, 6, 9b, 17, 18	Moderate	No	Yes	No	Yes	Yes
<i>Conostylis festuacea</i> subsp. <i>festuacea</i>	1 (2, 5, 6, 7, 17)	Moderate	No	Yes	Yes	Yes (1)	Yes
<i>Cristonia biloba</i>	17, 18	Low	No	Yes	No	Yes	Yes
<i>Darwinia pinifolia</i>	VT 1, 2, 5, 7	Low	No	Yes	No	Yes	Yes
<i>Drosera closterostigma</i>	1, 5, 9b #	High	Yes	Yes (5)	Yes	Yes (1, 5, 9b)	Yes
<i>Eremophila glabra</i> subsp. ? <i>carnosa</i>	2	Low	No	Yes	No	Yes	Yes
<i>Eucalyptus</i> aff. <i>incrassata</i>	1, 17, 18	Moderate	Yes	Yes (18)	Yes	Yes (18)	Yes
<i>Haemodorum sparsiflorum</i>	18	Moderate	Yes	Yes (18)	Yes	Yes (18)	Yes
<i>Hydrocotyle blepharocarpa</i>	9b	Moderate	Yes	Yes (9b)	Yes	Yes (9b)	No
<i>Hypocalymma</i> sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)	17, 18	Low	No	Yes	No	Yes	Yes
<i>Lachnagrostis preissii</i>	2	Low	No	Yes	No	Yes	Yes
<i>Lepidosperma</i> aff. <i>pubisquameum</i>	8; 15	Moderate	No	No	No	No	No
<i>Lepidosperma</i> aff. <i>scabrum</i>	5, 17, 18	Moderate	Yes	Yes (18)	Yes	Yes (18)	Yes
<i>Leucopogon</i> aff. <i>sprengelioides</i>	17, 18	Moderate	Yes	Yes (18)	Yes	Yes (18)	Yes
<i>Philothea spicata</i> subsp. Moore River National Park (G. & D. Woodman Op 47)	17	Low	No	Yes	No	Yes	Yes
<i>Rytidosperma setaceum</i>	1, 2, 18	Moderate	Yes	Yes (18)	Yes	Yes (18)	Yes
<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>	8, 15	Moderate	No	No	No	No	No

*Note VTs in brackets are VTs of known locations of taxon in the relevant area

#Note: *D. closterostigma* also has been recorded in VT 18 but is not preferred habitat

Appendix C: Assessment of Risk of Significance of Local Impact to All Known Habitat of Listed Conservation Significant Taxa

Conservation Significant Flora Taxon	Conservation Code	All Preferred Habitat	Percentage Impact (Footprint) CWSA/AA*	Percentage Impact (DE)	Percentage Impact (DE and GWA)	Local Risk Ranking (Footprint) CWSA/AA*	Local Risk Ranking (DE)	Local Risk Ranking (DE and GWA)
<i>Allocasuarina grevilleoides</i>	P3	7	16.0/21.7	22.0	22.0	Moderate	Moderate	Moderate
<i>Andersonia gracilis</i>	T (VU)	5, 2, 1, 6, 7, 9b	4.0/4.5	9.0	9.1	Low	Low	Low
<i>Angianthus micropodioides</i>	P3	2, 5, 13	0.0/0.0	5.2	5.3	Very Low	Low	Low
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	17, 18	6.6/7.5	16.1	16.3	Low	Moderate	Moderate
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T (VU)	1	4.6/4.9	10.4	10.5	Low	Moderate	Moderate
<i>Babingtonia delicata</i>	P1	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Babingtonia urbana</i>	P3	1, 2	3.7/4.0	8.4	8.5	Low	Low	Low
<i>Banksia dallanneyi</i> subsp. <i>pollostata</i>	P3	1, 5, 17, 18	6.2/7.0	14.8	15.0	Low	Moderate	Moderate
<i>Beaufortia bicolor</i>	P3	7, 17	5.4/6.4	13.3	13.4	Low	Moderate	Moderate
<i>Calectasia palustris</i>	P1	2, 5, 7	4.5/5.4	7.5	7.6	Low	Low	Low
<i>Chordifex chaunocoleus</i>	P4	5, 2, 6, 7, 17, 18	3.3/4.0	14.9	15.1	Low	Moderate	Moderate
<i>Chordifex resemians</i>	P1	1, 5, 2, 17, 18	4.7/5.3	14.3	14.5	Low	Moderate	Moderate
<i>Conospermum scaposum</i>	P3	1, 17, 5, 18	6.2/7.0	14.8	15.0	Low	Moderate	Moderate
<i>Conostephium magnum</i>	P4	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Desmocladius biformis</i>	P3	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	2	0.0/0.0	0.2	0.5	Very Low	Very Low	Very Low
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4	18	9.6/10.2	24.0	24.4	Low / Moderate	Moderate	Moderate
<i>Frankenia glomerata</i>	P3	2	0.0/0.0	0.2	0.5	Very Low	Very Low	Very Low
<i>Grevillea saccata</i>	P4	18	9.6/10.2	24.0	24.4	Low / Moderate	Moderate	Moderate
<i>Grevillea thelemanniana</i> subsp. <i>Cooljarloo</i> (B.J. Keighery 28 B)	P1	1, 2	3.7/4.0	8.4	8.5	Low	Low	Low
<i>Guichenotia alba</i>	P3	1,7	5.6/6.1	11.5	11.6	Low	Moderate	Moderate
<i>Hakea longiflora</i>	P3	1, 18	7.6/8.0	18.6	18.9	Low	Moderate	Moderate

Appendix C: Assessment of Risk of Significance of Local Impact to All Known Habitat of Listed Conservation Significant Taxa

Conservation Significant Flora Taxon	Conservation Code	All Preferred Habitat	Percentage Impact (Footprint) CWSA/AA*	Percentage Impact (DE)	Percentage Impact (DE and GWA)	Local Risk Ranking (Footprint) CWSA/AA*	Local Risk Ranking (DE)	Local Risk Ranking (DE and GWA)
<i>Hensmania stoniella</i>	P3	18	9.6/10.2	24.0	24.4	Low / Moderate	Moderate	Moderate
<i>Hypocalymma</i> sp. Cataby G.J. Keighery 5151)	P2	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Isopogon panduratus</i> subsp. <i>palustris</i>	P2	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low
<i>Jacksonia carduacea</i>	P3	1, 2, 5, 17, 18	6.0/6.8	14.3	14.5	Low	Moderate	Moderate
<i>Macarthuria keigheryi</i>	T (EN)	17, 18	6.6/7.5	16.1	16.3	Low	Moderate	Moderate
<i>Onychosepalum nodatum</i>	P3	1, 5 (2)	4.7/5.3	8.4	8.5	Low	Low	Low
<i>Paracaleana dixonii</i>	T (VU)	17, 7, 18	5.4/6.4	15.8	16.4	Low	Moderate	Moderate
<i>Platysace ramosissima</i>	P3	17	5.4/6.4	13.1	13.2	Low	Moderate	Moderate
<i>Schoenus griffinianus</i>	P3	17, 18	6.6/7.5	16.1	16.3	Low	Moderate	Moderate
<i>Schoenus pennisetis</i>	P1	1, 5	4.7/5.3	9.8	9.9	Low	Low	Low
<i>Stylidium hymenocraspedum</i>	P2	8, 17	3.7/6.3	12.9	13.0	Low	Moderate	Moderate
<i>Thysanotus glaucus</i>	P4	17, 18	5.4/6.4	16.1	16.3	Low	Moderate	Moderate
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	1, 5, 17, 18	4.7/5.3	14.8	15.0	Low	Moderate	Moderate

*Note: AA refers to the Assessment Area presented in the Cooljarloo West Project PER (Tronox Management Pty Ltd 2015)

Appendix D: Regional Significance of Local Populations of Non-Listed Conservation Flora Taxa

Taxon	Number of Regional Populations	Range of Taxon (km)	Location of CW in relation to range
<i>Anigozanthos viridis</i> subsp. <i>Cataby</i> (S.D. Hopper 1786)	12	150	Not near edge of range
<i>Anigozanthos viridis</i> subsp. <i>viridis</i>	>30	491	Range extension to north
<i>Conostylis aculeata</i> subsp. <i>spinuligera</i>	8	92	Not near edge of range
<i>Conostylis festucea</i> subsp. <i>festucea</i>	15	190	Not near edge of range
<i>Cristonia biloba</i> (subsp. <i>pubescens</i>)	2	90	On edge of range
<i>Darwinia pinifolia</i>	>20	215	Not near edge of range
<i>Drosera closterostigma</i>	2	20	Range extension
<i>Eremophila glabra</i> subsp. ? <i>carnosa</i>	2	2	Not near edge of range
<i>Eucalyptus</i> aff. <i>incrassata</i>	1	<10	Within range
<i>Haemodorum sparsiflorum</i>	>20	500	Disjunct record
<i>Hydrocotyle blepharocarpa</i>	>20	450	Disjunct record
<i>Hypocalymma</i> sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)	6	100	Not near edge of range
<i>Lachnagrostis preissii</i>	11	1000	Not near edge of range
<i>Lepidosperma</i> aff. <i>scabrum</i>	>10	>10	Not on edge of range
<i>Leucopogon</i> aff. <i>sprengelioides</i>	<4	<10	Within range
<i>Philothea spicata</i> subsp. Moore River National Park (G. & D. Woodman Op 47)	4	30	Edge of range
<i>Rytidosperma setaceum</i>	>20	1000	Disjunct record

Regional Significance of Local Populations
Low
Low
Low-Moderate
Low
Moderate-High
Low
High
High
High
Low-Moderate
Low-Moderate
Low-Moderate
Low
Low-Moderate
High
Moderate
Low