

Cooljarloo Mine – Falcon Extension

Tiwest Pty Ltd

**Report and recommendations
of the Environmental Protection Authority**

**Environmental Protection Authority
Perth, Western Australia
Report 1299
August, 2008**

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
21/01/2008	Referral received	
18/02/2008	Intention to set EPS Level of Assessment advertised (no appeals)	4
30/07/2008	Proponent's Final EPS document received by EPA	23
11/08/2008	EPA report to the Minister for the Environment	2

Report Released: 11/08/08

Appeals Close: 25/08/08

ISSN 1836-0483 (Print)

ISSN 1836-0491 (Online)

Assessment No. 1749

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1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the proposal by Tiwest Pty Ltd (Tiwest) to mine approximately 3.1 million tonnes (Mt) of mineral sand ore from the 25000 and Lone deposits.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for the Environment on the outcome of its assessment of a proposal. The report must set out:

- the key environmental factors identified in the course of the assessment; and
- the EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject. The EPA may include in the report any other advice and recommendations as it sees fit.

The EPA was advised of the proposal in January 2008. Based on the information provided, the EPA considered that while the proposal had the potential to have an effect on the environment, the proposal, as described, could be managed to meet the EPA's environmental objectives. Consequently it was notified in *The West Australian* newspaper on 18 February 2008 that, subject to preparation of a suitable Environmental Protection Statement (EPS) document, the EPA intended to set the level of assessment at EPS.

The proponent has prepared the EPS document which accompanies this report (*Tiwest, 2008*). The EPS document sets out the details of the proposal, potential environmental impacts and appropriate actions to manage those impacts. The EPA notes that the proponent has consulted with relevant stakeholders.

The EPA considers that the proposal can be managed to meet the EPA's environmental objectives, subject to the EPA's recommended conditions being made legally binding.

The EPA therefore has determined, under Section 40 of the EP Act, that the level of assessment for the proposal is EPS, and this report provides the EPA advice and recommendations in accordance with Section 44 of the EP Act.

2. The proposal

The proposal is described in detail in Section 4 of the proponent's EPS document (*Tiwest, 2008*). The proposal involves mining approximately 3.1Mt of mineral sand ore from the 25000 and Lone Deposits (Falcon Extension) within the Cooljarloo State Agreement Act mine tenement M268SA. The proposal is located approximately 170km north of Perth within the Shire of Dandaragan (Figure 1). The proposed mine life is 13 months and rehabilitation works are expected to be completed approximately three years from the commencement of mining.

The key components of the proposal are summarised in Table 1 and the site layout is shown in Figure 2.



Figure 1: Regional Location

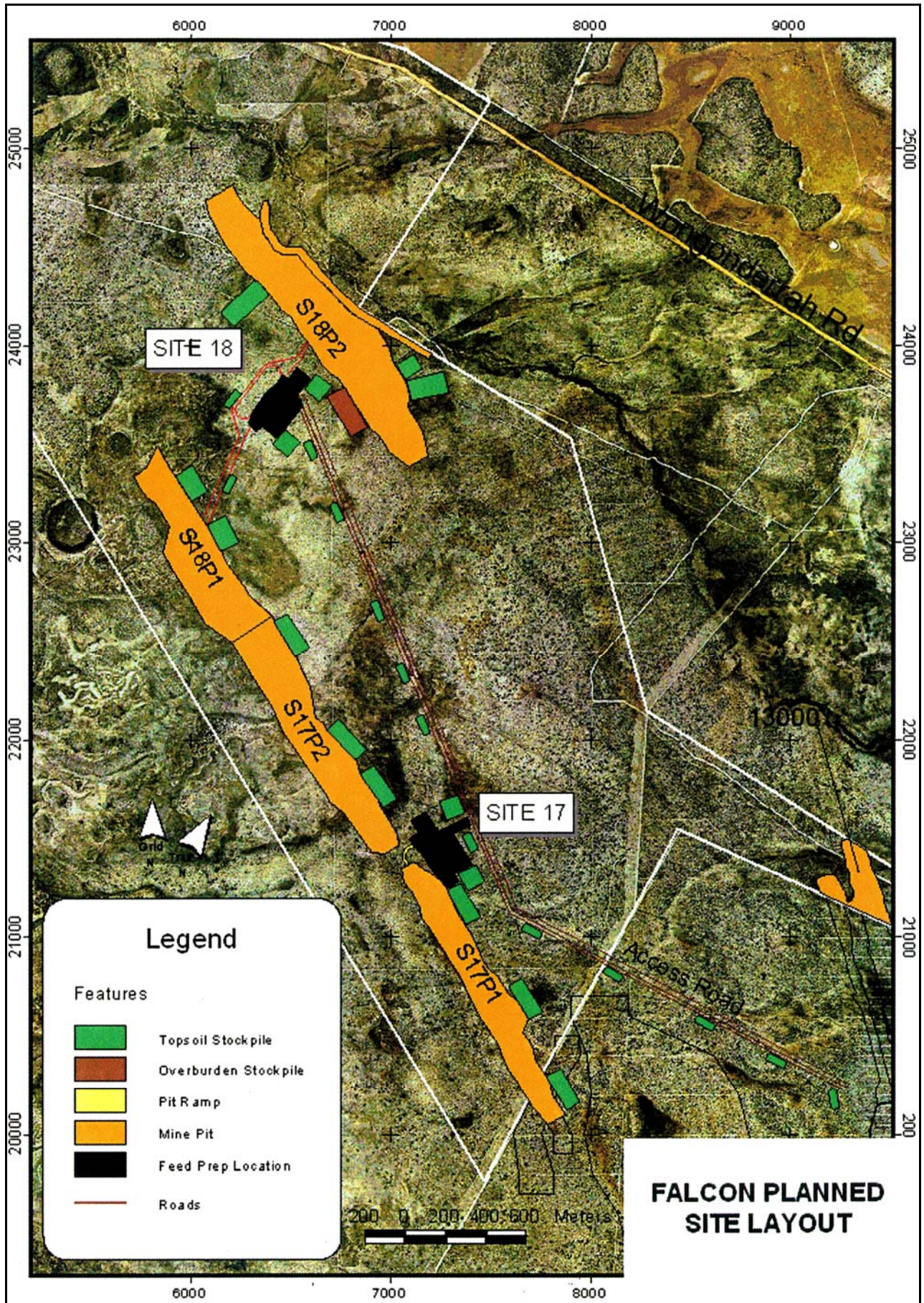


Figure 2: Proposed Site Layout

Table 1: Summary of Key Proposal Characteristics

Element	Description
Operational Life	Approximately 13 months
Ore Extracted	Approximately 3.1 million tonnes
Estimated Heavy Mineral Concentrate Produced	Approximately 0.3 million tonnes
Area to be cleared	Approximately 185 hectares
Area to be rehabilitated	All areas cleared or disturbed
Depth of Pit	Not more than 22 metres below ground level
Water Requirement	Approximately 4.5 gigalitres per year
Water Supply Sources	Yarragadee and Superficial formations

The potential impacts of the proposal are discussed by the proponent in the EPS document (*Tiwest, 2008*).

3. Consultation

During the preparation of the EPS, the proponent has undertaken consultation with government agencies and key stakeholders.

The main issues raised in consultation related to clearing conservation significant flora and vegetation, impacts of groundwater drawdown and rehabilitation and closure.

Table 10 of the EPS document (*Tiwest, 2008*) details the agencies, groups and organisations consulted, the issues raised, comments received and the proponent's responses.

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the proposed development.

4. Key environmental factors

It is the EPA's opinion that the following key environmental factors relevant to the proposal require evaluation in this report:

- (a) Flora and Vegetation
- (b) Groundwater
- (c) Rehabilitation and Closure

The key environmental factors are discussed in Sections 4.1 – 4.3. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal as indicated in Figure 2. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

4.1 Flora and Vegetation

Description

The Falcon Extension project area is 1234 hectares (ha) of uncleared unallocated Crown Land within the Swan Coastal Plain Biographical Region. Of this, approximately 185ha would be cleared for the proposal. The project area contains a diverse range of flora of conservation significance and is located immediately north of the existing Tiwest Cooljarloo mining operation. The vegetation system is described as Low Woodland; *Banksia attenuate* and *Banksia menziesii*.

Clearing

Clearing of approximately 185ha of native vegetation could impact conservation significant flora species and the biodiversity values of the project area.

The proponent completed two flora and vegetation surveys of the Falcon Extension project area in spring 2005 and 2006, in accordance with EPA Guidance Statement 51. A total of 3 Declared Rare Flora (DRF) and 24 Priority species were present within the project area. Of these, one DRF and 13 priority species (one Priority 1, three Priority 2, eight Priority 3 and one Priority 4) would be impacted by clearing activities (See Figure 3). Surveys indicated that all DRF and priority species were represented outside the project area.

The three DRF species present within or near the project area were *Andersonia gracilis*, *Anigozanthos viridus subsp. terraspectans* and *Macarthuria keigheryi*. Of these, only *Andersonia gracilis* would be impacted by clearing. A total of 9 sub-populations and 13 individual locations of *Andersonia gracilis* were found within the project area. Clearing activities would affect 4 sub-populations and 1 individual location. Approval from the Minister for the Environment would be required to take any DRF under the *Wildlife Conservation Act 1950*.

Eight floristic communities were recorded within the project area of which four were located within the proposed clearing footprint. No threatened ecological communities (TEC) were present in the project area and all floristic communities were represented outside the project area.

Groundwater drawdown

The proposed mine pits would intersect the superficial aquifer in a number of locations and would require dewatering. Dewatering would cause localised groundwater drawdown and could potentially impact phreatophytic vegetation within the drawdown zones (See Figure 4).

The extent of drawdown during the life of the project life has been extensively modelled by the proponent with the intention of providing a likely worse case scenario. It is expected that drawdown could be up to 4m within a 50m radius of the pits and approximately 1m at 500 – 600m from the pits.

Two DRF species, *Andersonia gracilis* and *Macarthuria keigheryi* occur within the predicted drawdown zone. It is considered that *Andersonia gracilis* would be at low risk of drawdown impacts as it occurs on soils of low transmissivity and is unlikely to be phreatophytic. A single occurrence of *Macarthuria keigheryi* was located approximately 700m from the proposed pit boundary in the zone of drawdown impact and is considered potentially phreatophytic.

Thirteen priority species occur within the drawdown zone. The majority of species occur within the high-severe risk area and have varying degrees of groundwater dependence.

All priority flora species are represented outside the drawdown zone. It is not expected that drawdown would impact on vegetation within the Wongonderrah Nature Reserve.

Weeds and *Phytophthora cinnamomi*

Mining activities could potentially increase weeds and introduce *Phytophthora cinnamomi* to the project area.

A survey conducted in 2007 for weeds determined that the project area was generally free of weeds and the vegetation in excellent to pristine condition. Weed taxa found were largely confined to the northern areas of the project area.

A survey of the project area for *Phytophthora cinnamomi* was completed in spring 2005. No infestations were identified.

Dust

Proposed mining activities have the potential to generate excessive dust which could have detrimental impacts on flora and vegetation.

Mining operations at Cooljarloo typically generate low levels of dust due to the wet nature of the mining operation. Sand tailings also do not generate dust due to the absence of fine particles, however, such areas can experience sand creep if not stabilised. Dust generated during mining activities is largely inert and poses little risk to vegetation if managed effectively. Analysis of the composition of the Falcon orebody does not indicate any significant divergence from that at Cooljarloo and is therefore not expected to result in any additional risk. The proponent proposes to implement dust reduction measure such as temporary cessation of operations during high winds and stabilisation of non-active operational areas through mulching and plant cover.

The proponent has proposed the following management measures to mitigate impacts to flora:

- Avoid completely removing any single population of *Andersonia gracilis*;
- *Andersonia gracilis* in the clearing footprint would be translocated using techniques that have been demonstrated to be successful for this species at the Cooljarloo mine;
- All disturbed areas would be rehabilitated;
- Restrict vehicles to established roads;
- Vehicle washdown facilities;
- Quarterly assessment of vegetation health;
- Time dewatering within the impact risk zone with winter to reduce risk of vegetation stress;
- Cessation of activities if monitoring indicates excessive drawdown;
- Artificial recharge of aquifers if drawdown causes stress on vegetation; and
- Monitoring vegetation to ensure a return to pre-impact composition.

Assessment

The area considered for assessment of this factor is the 1234ha Falcon Extension project area, of which, approximately 185ha would be cleared as shown in Figure 2.

The EPA's environmental objectives for this factor is to:

- protect DRF, Priority flora and other species of conservation significance, consistent with the provisions of the *Wildlife Conservation Act 1950*; and
- maintain the species abundance, diversity, geographic distribution and productivity of floristic communities.

The EPA notes that a Level 2 flora and vegetation survey, in accordance with EPA Guidance Statement 51, was conducted for the project area due to the presence of DRF and Priority flora. The EPA considers the level of flora and vegetation work undertaken for the project to be acceptable.

The proposal involves clearing approximately 185ha of native vegetation which would directly impact 4 sub-populations and 1 individual location of the DRF species, *Andersonia gracilis*. Additionally, 13 priority species would be impacted by the proposed clearing activities. The EPA notes that the proponent proposes to manage impacts to *Andersonia gracilis* by translocating plants located within the area of clearing, using fresh cut topsoil, onto similar target vegetation types/landforms within rehabilitation sites and then relocated back to rehabilitated sites. This technique has been demonstrated to be successful for this species at the Cooljarloo minesite. The EPA notes that approval would be required under the *Wildlife Conservation Act 1950* to 'take' any DRF.

DRF and Priority flora species that would be impacted by clearing activities are represented outside the project area. It is not expected that proposed activities would have a negative impact on the conservation status of DRF and Priority flora species. The EPA also notes that all floristic communities that would be impacted by clearing are represented outside the project area.

Mining below the water table would cause localised groundwater drawdown, potentially impacting vegetation. Groundwater modelling undertaken by the proponent indicates that two DRF species, *Andersonia gracilis* and *Macarthuria keigheryi*, occur within the predicted drawdown zone. *Andersonia gracilis* would be at low risk of drawdown impacts as it occurs on soils of low transmissivity and is unlikely to be phreatophytic. *Macarthuria keigheryi* was located approximately 700m from the proposed pit boundary in the zone of drawdown impact but outside the project area and is considered potentially phreatophytic. Vegetation health within the project area would be monitored and management measures would be implemented to avoid and mitigate impacts from groundwater drawdown. The EPA also notes that all flora species that could potentially be impacted by groundwater drawdown are represented outside the impact area.

Surveys for *Phytophthora cinnamomi* indicated that there were no infestations on site. The proponent has proposed management measures to prevent the introduction of *Phytophthora cinnamomi* on site through restricting vehicle access and providing washdown facilities. The EPA considers these management measures acceptable.

The EPA considers that with the implementation of the recommended condition 6, ensuring the protection of DRF and Priority flora within the project area, it is unlikely that the proposed clearing and dewatering activities would have a detrimental effect on the species abundance, diversity or geographic distribution of significant flora within the project area or Wongonderrah Nature Reserve.

The EPA notes that mining operations at Cooljarloo typically generate low levels of dust due to the wet nature of the mining operation. Dust generated during mining activities is largely inert and poses little risk to vegetation if managed effectively.

Summary

Having particular regard to the:

- translocation of *Andersonia gracilis* within the clearing footprint; and
- recommended condition 6 ensuring the protection and monitoring of significant flora within the project area

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor.

4.2 Groundwater

Description

The project area is underlain by an extensive and complex groundwater system comprising a largely unconfined superficial aquifer. Below the superficial aquifer lies the confined aquifer of the Yarragadee Formation. Water required for mining and mineral processing would be sourced from existing Yarragadee and superficial groundwater abstraction bores under existing abstraction allocations for the Cooljarloo mine. Water would also be sourced from dewatering the pits to supplement process feed water, reducing the demand from the Cooljarloo abstraction bores.

Groundwater drawdown due to mining below the watertable and dewatering of the pits could impact the quality of groundwater. Proposed dewatering and mining activities could potentially expose acid sulphate soils (ASS) to oxidising conditions and cause groundwater contamination through the leaching of acidic material.

The proponent undertook an assessment in relation to ASS risks within the project area which was completed in 2007. The investigation involved obtaining samples within and outside the proposed mining areas. Samples were taken to a depth exceeding the proposed mining and modelled groundwater drawdown by at least two meters. Results from 74 samples tested indicated that ASS are present within the project area but are restricted to soils more than two metres below the area to be mined. Therefore, the risk of exposing ASS to oxidising conditions due to mining is considered low. Whilst excessive groundwater drawdown could potentially expose ASS to oxidising conditions, the drawdown is to be managed to limit the depth of drawdown so that oxidising conditions are avoided and the overall extent of drawdown is limited to the immediate vicinity of the pits.

Several piezometers were installed at the site during August and September 2006. Tests carried out in May 2007 on the hydraulic conductivity of the superficial aquifer indicated that mining activities would cause groundwater drawdown that would unlikely exceed 4 m of the original groundwater level at 50 m from pit boundaries and 1 m at approximately 500 m from the pit boundary. It is expected that groundwater levels would have stabilised within 3 years after the cessation of mining.

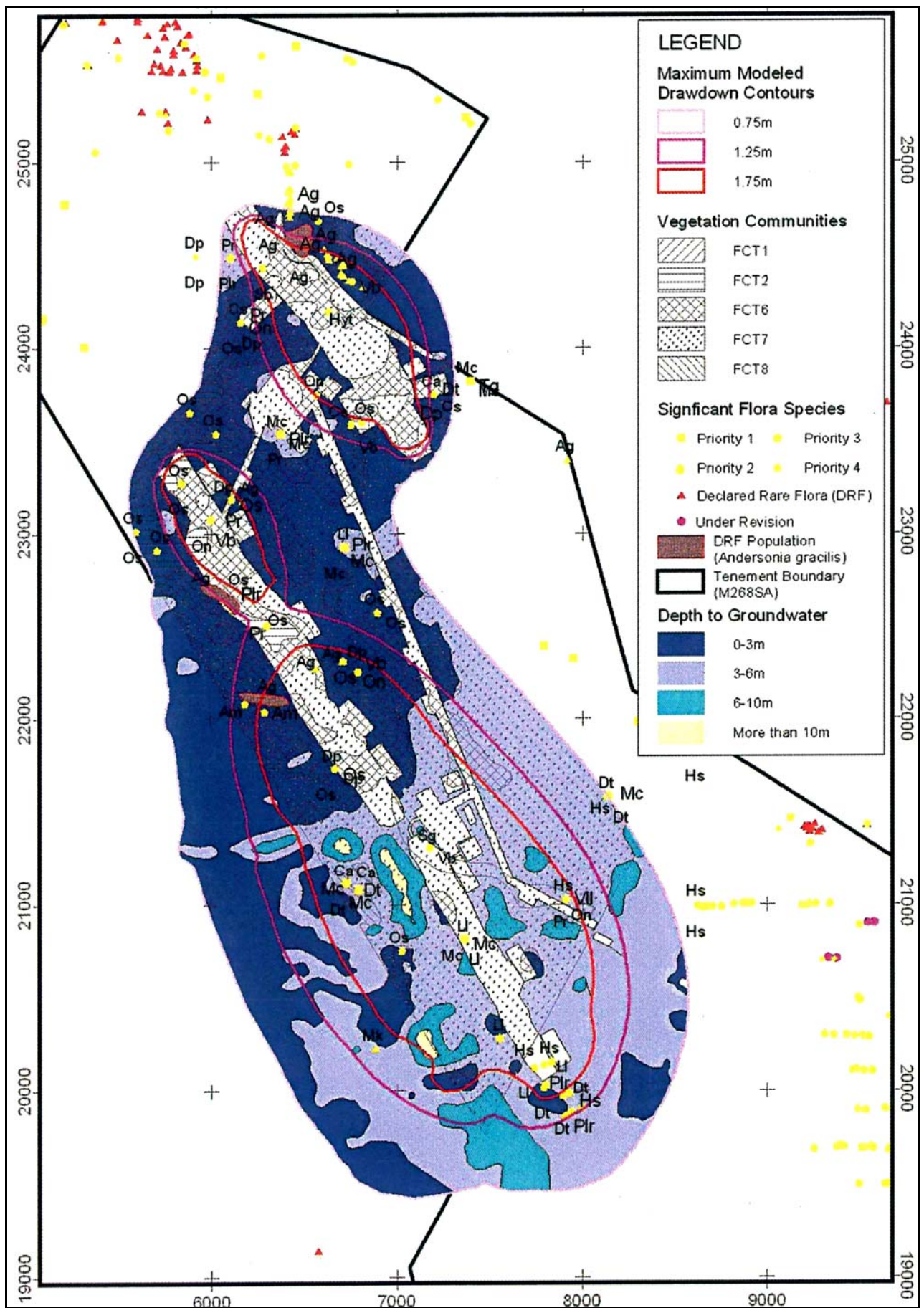


Figure 4: Predicted Groundwater Drawdown

The proposed footprint of the Falcon Extension is adjacent to the Wongonderrah Nature Reserve and in close proximity to the Mount Jetty Creek. Groundwater drawdown could potentially impact the hydrological systems within the Reserve and Mount Jetty Creek. Groundwater modelling undertaken by the proponent indicated that drawdown would not propagate to Wongonderrah Nature Reserve, thereby reducing the risk of impacts to groundwater levels. While it is not expected that drawdown would affect the hydrological flow of Mt Jetty Creek, the proponent would monitor flow rates of the creek and groundwater drawdown.

The proponent has proposed the following management measures to mitigate impacts to groundwater:

- Backfill as soon as possible to enable re-instatement of the aquifer;
- Minimise period of dewatering in each pit by alternating between pits throughout the mine period;
- Pump water to non-active mine voids to supplement aquifer recovery;
- Cessation of activities if monitoring indicates excessive drawdown;
- Plan pit limits to avoid basement lithological units which are characterised by black colour and increasing clay content;
- Return materials that are within the saturated zone to a similar depth during landform reconstruction;
- Monthly monitoring of groundwater quality in piezometers adjacent to active mining areas and in pit water. Monitoring would continue for at least 3 months post backfilling; and
- Management actions such as capping, blending, relocation or neutralisation of ASS to mitigate impacts if unearthed.

Assessment

The area considered for assessment of this factor is the superficial aquifer that would intersect the mine pits during excavation.

The EPA's environmental objective for this factor is to:

- maintain the quality and quantity of groundwater so that existing and potential uses, including ecosystem maintenance are protected.

Dewatering of the pits would cause localised drawdown of the water table which could potentially impact groundwater quality and quantity.

The EPA notes that the proponent has undertaken studies to determine the risk of ASS. The risk of disturbing ASS due to mining activities is low as these soils are 2-3m below the maximum depth of mining; however, excessive groundwater drawdown could potentially expose ASS to oxidising conditions. If the ASS were to be oxidised, they would contaminate the superficial aquifer with acid. Groundwater modelling undertaken indicated that drawdown is expected to be restricted to well above the depths where ASS are present, thus reducing the risk of ASS oxidation. The proponent has developed management procedures to mitigate impacts of ASS if disturbed. The EPA considers that, given the pit design, the presence of ASS 2-3m below the proposed depth of mining and management measures proposed, it is unlikely that groundwater quality would be impacted by the oxidation of ASS.

The proponent has undertaken modelling to predict groundwater response to dewatering of pits. The EPA notes that dewatering could result in drawdown of original groundwater levels

of up to 4 m at 50 m from active pit margins and 1 m at approximately 500 m from the pit. The EPA expects that the proponent would monitor groundwater levels to ensure that these levels are not exceeded. The proponent has developed management procedures to mitigate the potential impacts of drawdown exceeding the predicted levels stated above.

The EPA notes that it is unlikely that dewatering of pits would impact groundwater levels within the Wongonderrah Nature Reserve or the hydrology of Mount Jetty Creek. The EPA considers that the proposed management measures described in the proponent's Environmental Protection Statement document to mitigate impacts from groundwater drawdown are environmentally acceptable.

The EPA considers that with the implementation of the recommend Condition 7, requiring the protection of groundwater quality and quantity within the project area, Wongonderrah Nature Reserve and Mount Jetty Creek system, it is unlikely that groundwater quality and quantity would be significantly impacted by the proposal.

Summary

Having particular regard to the:

- low risk of disturbing ASS;
- cessation of activities if monitoring indicates excessive drawdown; and
- recommended condition 7 requiring the protection of groundwater quality and quantity

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

4.3 Rehabilitation and Closure

Description

The proposed mining activities would involve the clearing of approximately 185ha of native vegetation. Potential impacts from mine closure and rehabilitation are the unsuccessful return of vegetation and altered hydrological systems.

The proposed revegetation program would aim to establish vegetation communities and habitats equivalent to those that existed prior to mining. Topsoil and mulch would be placed into equivalent rehabilitation vegetation types and direct seeding would be undertaken. Appropriate seed mixes of local provenance would be applied to supplement propagules contained in the topsoil and mulch. The seed mixes would contain a range of native species that are selected to contain a specific composition of species that are suitable to each of the target floristic communities. Seed would be treated prior to distribution to maximise germination rates.

Four sub-populations and 1 individual location of DRF species *Andersonia gracilis* would be impacted by clearing. The proponent proposes to translocate the plants by placing fresh cut topsoil onto similar target vegetation types/landform situations within rehabilitation sites. It is estimated that translocated *Andersonia gracilis* would be translocated to equivalent areas as fresh cut topsoil within a year of removal. Ongoing monitoring would be undertaken to ensure the successful re-establishment of *A. gracilis*.

The proponent proposes to return greater than 70% of the species richness recorded in the baseline plots for each vegetation type at the completion of rehabilitation, approximately two

years after the cessation of mining, and would ensure that species of highest significance for each vegetation community in terms of structure, cover, frequency, density and habitat values would be re-established.

The proponent would progressively rehabilitate all disturbed areas back to the existing land use of native bushland. The backfilling of the mine voids would be sequenced so that the soil profiles and hydrological systems are re-established as soon as possible, minimising the potential impact on the hydrological systems in the surrounding areas.

The majority of topsoil stripping will be conducted in the drier months before the onset of winter to reduce the risk of *Phytophthora* dieback.

The proponent is currently undertaking an independent review of its rehabilitation practices and standards. The objective is to assess Tiwest's practices against industry leading practice and to provide the basis for the development of an improved signoff criteria. The outcomes of the review are expected to be reported in August 2008.

Assessment

The area considered for assessment of this factor is the 1234ha Falcon Extension project area, of which, approximately 185ha would be cleared as shown in Figure 2.

The EPA's environmental objectives for this factor are to;

- ensure that closure and rehabilitation achieves stable, non-polluting functioning landforms which are consistent with the surrounding landscapes and other environmental values; and
- ensure that self-sustaining native vegetation communities are returned after mining, which, in species composition and ecological function are close as possible to naturally occurring analogue sites.

The EPA notes that topsoil and mulch would be stockpiled into equivalent vegetation types. Specific seed mixes would be applied to the different topsoil and mulch stockpiles to best represent the floristic community of the location.

All *Andersonia gracilis* disturbed by clearing activities would be translocated onto similar vegetation types/landforms within rehabilitation sites. The EPA notes that at the cessation of mining, all translocated *Andersonia gracilis* would be re-established to equivalent areas as fresh cut topsoil. The EPA notes that ongoing monitoring would be undertaken to ensure the successful re-establishment of *A. gracilis*.

All pits would be progressively backfilled and all disturbed areas would be rehabilitated back to native bushland.

The proponent has developed a comprehensive rehabilitation and closure plan to address the issue of returning disturbed vegetation and landforms to pre-mining native bushland. The EPA considers that the proponent's proposed management measures are capable of achieving the EPA's objectives.

The EPA notes that the proponent proposes to return greater than 70% of the species richness recorded in baseline studies and would ensure that species of highest significance for each vegetation community in terms of structure, cover, frequency, density and habitat values would be re-established. The EPA considers that DRF and priority flora species disturbed by mining activities would be re-established approximate to the original location.

The EPA considers that with the implementation of the recommended Condition 8, which requires the proponent to achieve stable, self-sustaining and functioning landforms which are compatible with the surrounding landscapes, rehabilitation and closure of the mine can be managed in an environmentally acceptable manner.

The EPA notes that Tiwest has commissioned Owen Nicholls and Greg Woodman to undertake an independent review of its rehabilitation practices and standards. The objective is to assess Tiwest's practices against industry leading practice and to provide the basis for the development of an improved rehabilitation signoff criteria. The review is expected to be completed in August 2008. The EPA has recommended a condition that requires the proponent to adopt the rehabilitation criteria of the review if it is an improvement to Condition 8-3.

Summary

Having particular regard to the:

- proponent rehabilitating all disturbed areas back to native bushland;
- re-establishment of DRF and priority vegetation species to original locations; and
- recommended condition 8 which requires the proponent to achieve stable, self-sustaining and functioning landforms which are compatible with the surrounding landscapes

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor.

5. Other Advice

1. The EPA notes that approximately 4.5% of the remaining Low Woodland; *Banksia attenuate* and *Banksia menziesii* vegetation type are contained in conservation estates. This level of protection is significantly below the minimum levels outlined in EPA Position Statement 2, which states:
 - the "threshold level" below which species loss appears to accelerate exponentially at a ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type; and
 - a level of 10% of the original extent is regarded as being a level representing "endangered".

The representation of this vegetation type in protected areas, including the conservation estate, should be increased.

The EPA therefore recommends that the Department of Environment and Conservation liaise with the proponent and the Department of Industry and Resources with a view to secure, in the conservation estate, additional areas of intact significant but under represented vegetation located within the Tiwest Agreement Act area.

2. The EPA notes that the proponent is planning other mining proposals within the Northern Sandplains Region. The EPA expects that the proponent would include reference to its rehabilitation performance in relation to existing operations as part of the assessment of new proposals. The EPA will take into consideration the proponent's past performance of rehabilitation when considering these future proposals.

6. Conclusions

The EPA has considered the proposal by Tiwest to mine approximately 3.1Mt of mineral sand ore from the 25000 and Lone deposits.

Flora and Vegetation

The EPA notes that 1 DRF and 13 priority species would be impacted by clearing activities. DRF species *Andersonia gracilis* would be protected by translocating plants located within the area of clearing, using fresh cut topsoil, onto similar target vegetation types/landforms within rehabilitation sites. The EPA notes that approval would be required under the *Wildlife Conservation Act 1950* to 'take' any DRF. The EPA also notes that all Priority species and floristic communities that would be impacted by clearing are represented outside the project area.

Two DRF species, *Andersonia gracilis* and *Macarthuria keigheryi*, could potentially be impacted by groundwater drawdown. The EPA notes that *Andersonia gracilis* would be at low risk of drawdown impacts as it occurs on soils of low transmissivity and is unlikely to be phreatophytic. *Macarthuria keigheryi* was located approximately 700m from the proposed pit boundary in the zone of drawdown impact but outside the project area and is considered potentially phreatophytic. Vegetation health within the project area would be monitored and management measures would be implemented to avoid impacts to DRF and Priority vegetation. All DRF and Priority flora species that could be impacted by groundwater drawdown are represented outside the area of impact. The EPA considers that with the implementation of the recommended Condition 6, ensuring the protection of DRF and Priority flora within the project area, it is unlikely that the proposed clearing and dewatering activities would have a detrimental effect on the species abundance, diversity or geographic distribution of significant flora within the project area or Wongonderrah Nature Reserve.

Groundwater

Drawdown could potentially impact groundwater quality by the leaching of acidic material oxidised from acid sulphate soils (ASS). The risk of disturbing ASS due to mining activities is low as these soils are 2-3m below the maximum depth of mining. Excessive groundwater drawdown could potentially expose ASS to oxidising conditions which could form acidic leachate and contaminate the superficial aquifer. Groundwater modelling undertaken indicated that drawdown is expected to be restricted to well above the depths where ASS are present, thus reducing the risk of ASS oxidation. The EPA considers that, given the pit design, the presence of ASS 2-3m below the proposed depth of mining and management measures proposed, it is unlikely that groundwater quality would be impacted by the oxidation of ASS.

Dewatering of pits could result in drawdown levels of up to 4 m at 50 m from active pit margins and 1 m at approximately 500 m from the pit. The EPA expects that the proponent would monitor groundwater levels to ensure that these levels are not exceeded. The EPA considers that with the implementation of the recommend Condition 7, requiring the protection of groundwater quality and quantity within the project area, Wongonderrah Nature Reserve and Mount Jetty Creek system, it is unlikely that groundwater quality and quantity would be significantly impacted by the proposal.

Rehabilitation and Closure

All pits would be progressively backfilled and all disturbed areas would be rehabilitated back to native bushland. The proponent proposes to return greater than 70% of the species richness

recorded in baseline studies and would ensure that species of highest significance for each vegetation community in terms of structure, cover, frequency, density and habitat values would be re-established. The EPA considers that DRF and priority flora species disturbed by mining activities would be re-established approximate to the original location. The EPA considers that with the implementation of the recommended Condition 8, which requires the proponent to achieve stable, self-sustaining and functioning landforms which are compatible with the surrounding landscapes, rehabilitation and closure of the mine can be managed in an environmentally acceptable manner.

The EPA has therefore concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation of the recommended conditions set out in Appendix 2.

7. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is for Tiwest to mine approximately 3.1Mt of mineral sand ore from the 25000 and Lone deposits;
2. That the Minister considers the report on the key environmental factors as set out in Section 4;
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

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Appendix 2

Recommended Environmental Conditions

RECOMMENDED ENVIRONMENTAL CONDITIONS

Statement No.

**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

COOLJARLOO MINE – FALCON EXTENSION
APPROXIMATELY 10 KILOMETRES NORTH-WEST OF CATABY
SHIRE OF DANDARAGAN

Proposal: The extension of open pit mining of mineral sands by dredging and dry mining adjacent to existing operations. Existing dry mining and processing practices, plant and equipment will be used. Approximately 3.1 million tonnes of ore will be extracted, slurried and processed by the dry mine concentrator to extract heavy mineral concentrate for transporting to the Chandala facilities.

Proponent: Tiwest Pty Ltd

Proponent Address: 1 Brodie Hall Drive, BENTLEY WA 6152

Assessment Number: 1749

Report of the Environmental Protection Authority: Report 1299

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Implementation

1-1 The proponent shall implement the proposal as assessed by the Environmental Protection Authority and described in schedule 1 of this statement subject to the conditions and procedures of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for the Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.

2-2 The proponent shall notify the Chief Executive Officer (CEO) of the Department of Environment and Conservation of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.

3 Time Limit of Authorisation

3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void within five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.

3-2 The proponent shall provide the CEO of the Department of Environment and Conservation with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

4 Compliance Reporting

4-1 The proponent shall submit to the CEO of the Department of Environment and Conservation environmental compliance reports annually reporting on the previous twelve-month period, unless required by the CEO of the Department of Environment and Conservation to report more frequently.

4-2 The environmental compliance reports shall address each element of an audit program approved by the CEO of the Department of Environment and Conservation and shall be prepared and submitted in a format acceptable to the CEO of the Department of Environment and Conservation.

4-3 The environmental compliance reports shall:

- 1 be endorsed by signature of the proponent's chief executive officer or a person, approved in writing by the CEO of the Department of Environment and Conservation, delegated to sign on behalf of the proponent's chief executive officer;
- 2 state whether the proponent has complied with each condition and procedure contained in this statement;
- 3 provide verifiable evidence of compliance with each condition and procedure contained in this statement;
- 4 state whether the proponent has complied with each key action contained in any environmental management plan or program required by this statement;
- 5 provide verifiable evidence of conformance with each key action contained in any environmental management plan or program required by this statement;
- 6 identify all non-compliances and non-conformances and describe the corrective and preventative actions taken in relation to each non-compliance or non-conformance;
- 7 review the effectiveness of all corrective and preventative actions taken; and

8 describe the state of implementation of the proposal.

4-4 The proponent shall make the environmental compliance reports required by condition 4-1 publicly available in a manner approved by the CEO of the Department of Environment and Conservation.

5 Performance Review and Reporting

5-1 The proponent shall submit to the CEO of the Department of Environment and Conservation Performance Review Reports at the conclusion of the second and fourth years after the start of productive mining and then, at such intervals as the CEO of the Department of Environment and Conservation may regard as reasonable, which address:

1 the major environmental risks and impacts; the performance objectives, standards and criteria related to these; the success of risk reduction/impact mitigation measures and results of monitoring related to the management of the major risks and impacts;

2 the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable; and

3 significant improvements gained in environmental management which could be applied to this and other similar projects.

6 Flora and Vegetation

6-1 Prior to clearing, the proponent shall translocate Declared Rare Flora growing within areas required for clearing to suitable temporary locations for retention for rehabilitation following completion of mining as follows (See Figure 3 attached):

1 Populations of *Andersonia gracilis* from areas F and H (delineated by AMG coordinates listed in schedule 2 – Table 1); and

2 All scattered individual plants of *Andersonia gracilis* within proposed clearing areas (delineated by AMG coordinates listed in schedule 2 – Table 2).

6-2 Notwithstanding the requirements of condition 6-1, the proponent shall implement the proposal to avoid disturbance of Declared Rare Flora populations C, D, E, and G shown in Figure 3 (attached) and delineated by AMG coordinates listed in schedule 2 – Table 1, and to avoid Declared Rare Flora and Priority flora generally within the proposal area and outside the areas to be cleared.

6-3 The proponent shall monitor the health and abundance of Declared Rare Flora and Priority flora species outside the areas to be cleared to ensure that there are no adverse impacts of the proposal. This monitoring is to be carried out to the satisfaction of the CEO of the Department of Environment and Conservation.

6-4 The proponent shall submit annually the results of monitoring of the health and abundance of Declared Rare Flora and Priority flora growing outside the areas to be cleared to the CEO of the Department of Environment and Conservation.

7 Groundwater Drawdown

7-1 At all times, the proponent shall ensure that groundwater drawdown in the proposal area and in the vicinity of the proposal area does not exceed the absolute minimum magnitude and absolute minimum rate trigger levels defined in schedule 2 - Table 3.

7-2 At all times, the proponent shall ensure that the limit of groundwater drawdown in the proposal area and in the vicinity of the proposal area does not approach the potentially acid-forming substrate to the extent that acidic waters are generated and/or released.

7-3 At all times, the proponent shall ensure that groundwater drawdown from mining does not impact on the hydrology of the Mount Jetty Creek system.

7-4 The proponent shall monitor groundwater from bores indicated in Figure 4 (attached) to facilitate determination of whether the requirements of conditions 7-1, 7-2 and 7-3 are being met. This monitoring is to be carried out to the satisfaction of the CEO of the Department of Environment and Conservation.

7-5 The proponent shall submit annually the results of the monitoring of groundwater required by condition 7-4 to the CEO of the Department of Environment and Conservation.

7-6 The proponent shall provide proposed management measures to the CEO of the Department of Environment and Conservation in the event that the requirements of conditions 7-1, 7-2 and/or 7-3 are not met or are not likely to be met.

8 Closure and Rehabilitation

8-1 Prior to commencement of productive mining, the proponent shall conduct surveys of the proposal area to collect baseline information on the following:

- 1 Pre-mining soil profiles;
- 2 Groundwater levels;
- 3 Surface water flows;
- 4 Vegetation complexes; and
- 5 Landscape and landforms.

8-2 Within 12 months following cessation of productive mining, the proponent shall translocate the Declared Rare Flora plants referred to in condition 6-1 from their temporary locations back into their original areas.

8-3 As mining progresses, the proponent shall commence rehabilitation of the mined area in accordance with the following:

- 1 Re-establishment of vegetation in the rehabilitation area to be comparable with that of the pre-mining vegetation such that the following criteria are met within three years following the cessation of productive mining:
 - (1) Species diversity is not less than 70 percent of the known original species diversity;
 - (2) Declared Rare Flora and Priority flora are re-established with not less than 50 percent success after three years and 65 percent success after five years; and
 - (3) Weed coverage less than 10 percent.
 - 2 A schedule of rate of rehabilitation acceptable to the CEO of the Department of Environment and Conservation.
- 8-4 In liaison with the Department of Environment and Conservation, the proponent shall monitor progressively the performance of rehabilitation against the criteria in condition 8-3 based on annual monitoring in spring.
- 8-5 The proponent shall submit annually a report of the rehabilitation performance monitoring required by condition 8-4 to the CEO of the Department of Environment and Conservation and shall address in the report the following:
- 1 Progress towards meeting the criteria required by condition 8-3 and milestone criteria; and
 - 2 Contingency management measures in the event that criteria are unlikely to be met.
- 8-6 The proponent shall report the findings of the Nicholls-Woodman review of rehabilitation practices and standards to the CEO of the Department of Environment and Conservation. If findings indicate that rehabilitation criteria defined in condition 8-3 can be improved, then the new criteria defined in the findings shall be used.

Procedures

1. Where a condition states “on advice of the Environmental Protection Authority”, the Environmental Protection Authority will provide that advice to the Department of Environment and Conservation for the preparation of written notice to the proponent.
2. The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment and Conservation.
3. The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment and Conservation over the fulfilment of the requirements of the conditions.

4. Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environment and Conservation.
5. The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.

Schedule 1

Cooljarloo Mine – Falcon Extension (Assessment No. 1749)

General Description

The proposal is to extend open pit mining of mineral sands by dredging and dry mining adjacent to existing operations within Mining Lease M268SA. Existing dry mining and processing practices, plant and equipment will be used. Approximately 3.1 million tonnes of ore will be extracted, slurried and processed by the Dry Mine Concentrator in its existing location to produce 0.3 million tonnes of Heavy Mineral Concentrate for transporting to the Chandala facilities, approximately 110 kilometres to the south.

The proposal is described in the following document – *Cooljarloo Mine (M268SA), Falcon Extension*, Tiwest, Environmental Protection Statement (12 May 2008).

Summary Description

A summary of the key proposal characteristics is presented in Table 1.

Table 1 – Summary of Key Proposal Characteristics

Element	Description
Operational life of extension	Approximately 13 months
Total area of disturbance	Not more than 185 hectares
Area of rehabilitation	All disturbed areas
Depth of pit	Not more than 22 metres below ground level
Ore extracted	Approximately 3.1 million tonnes
Heavy mineral concentrate production	Approximately 0.3 million tonnes
Water requirements	Not more than 4.5 Gigalitres per year
Water source	Yarragadee and superficial formations - bores and pond water
Heavy mineral concentrate truck movements (whole Cooljarloo Operation)	Not more than 40 return trips per day

Figures

Figure 1 – Regional Location Map (see Figure 1 above)

Figure 2 – Proposed Site Layout (see Figure 2 above)

Figure 3 – Location of Declared Rare and Priority Flora (attached)

Figure 4 – Groundwater Bore Location Map (attached)

Tables (attached)

Table 1: GPS locations of *Andersonia gracilis* populations relevant to the Tiwest Cooljarloo Falcon Proposal.

Table 2: GPS locations of *Andersonia gracilis* individuals relevant to the Tiwest Cooljarloo Falcon Proposal.

Table 3: Groundwater drawdown management action trigger levels as mAHD and mbTOC (metres below top of casing).

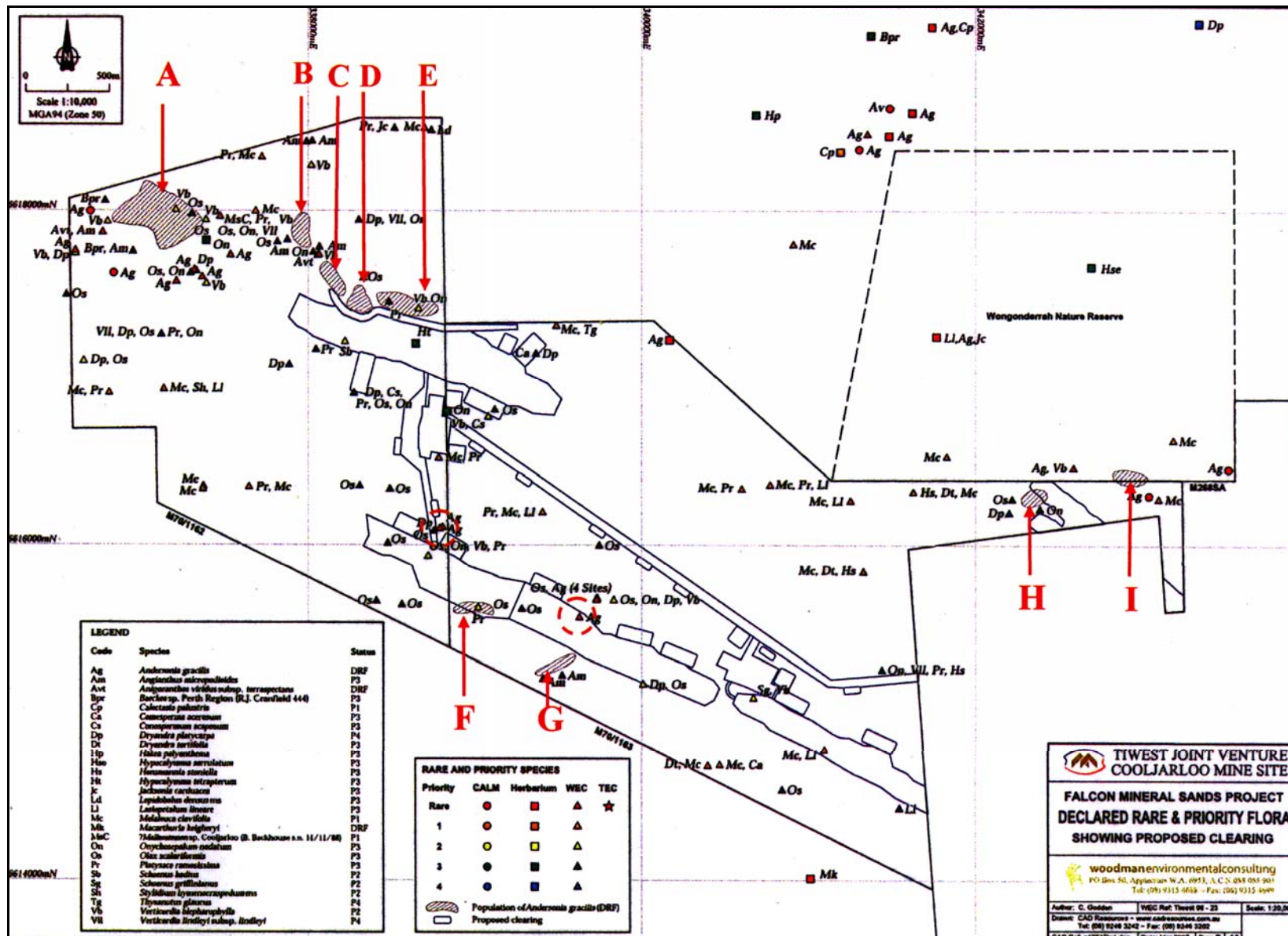


Figure 3 Location of Declared Rare and Priority Flora

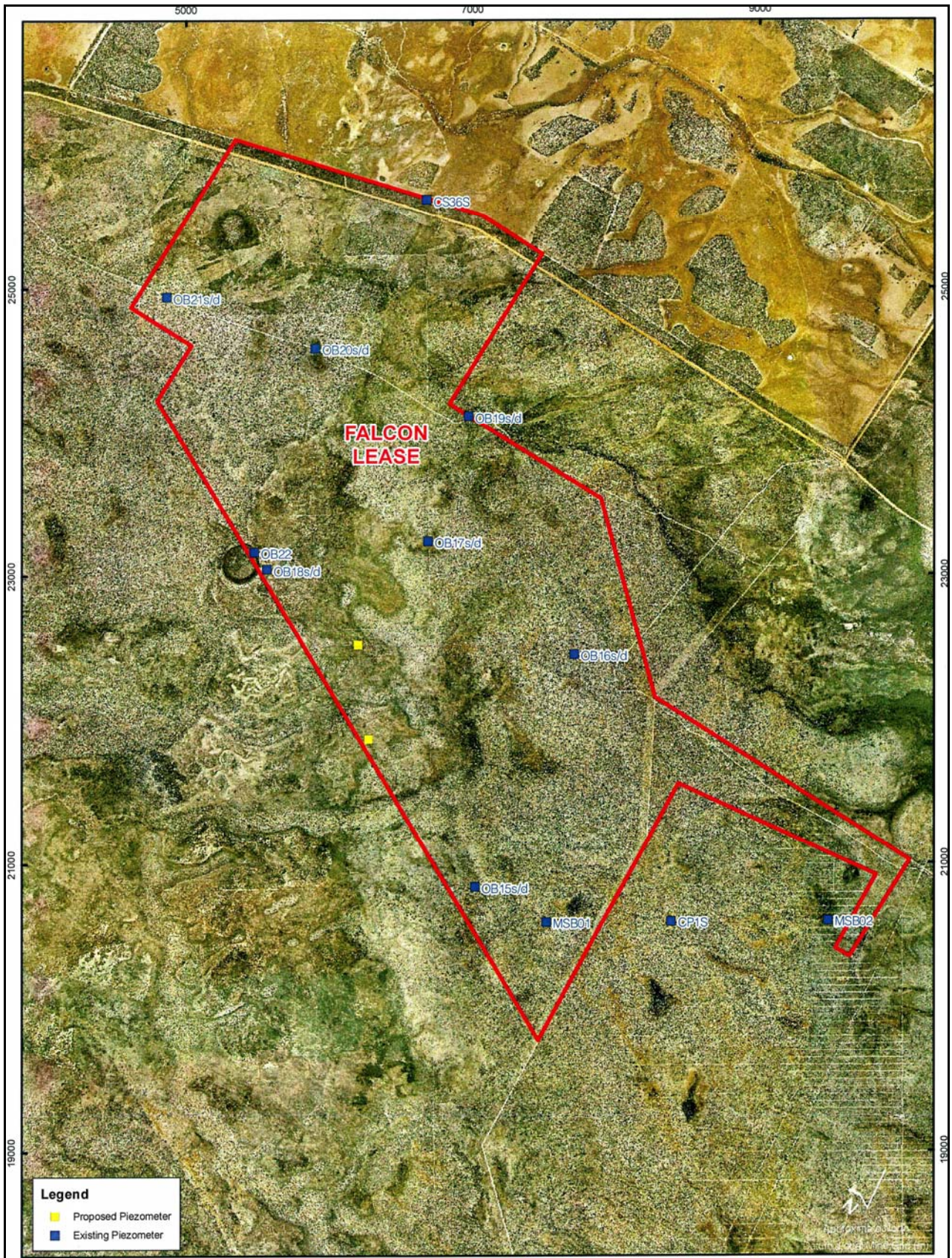


Figure 4: Groundwater Bore Location Map

Schedule 2

Cooljarloo Mine – Falcon Extension (Assessment No. 1749)

Table 1: GPS locations of *Andersonia gracilis* populations relevant to the Tiwest Cooljarloo Falcon Proposal.

Population reference in Figure 3	Spatial Reference (MGA Zone 50)		Relevance (% areas are approximate only)
	Easting (m)	Northing (m)	
C	338070	6617659	50% of area within 50m of clearing
	338119	6617692	
	338224	6617524	
	338182	6617502	
D	338290	6617548	50% or area within 50m of clearing
	338358	6617382	
	338231	6617432	
E	338448	6617542	50% of area within 50m of clearing
	338774	6617460	
	338751	6617351	
	338407	6617452	
F	338880	6615650	10% of area within 50m of clearing 90% to be cleared
	339110	6615658	
	339111	6615572	
	338892	6615572	
G	339340	6615236	5% of area within 50m of clearing
	339587	6615370	
	339626	6615317	
	339373	6615179	
H	342277	6616315	80% of area within 50m of clearing and 10% percent of area to be cleared
	342402	6616372	
	342454	6616252	
	342319	6616197	

Table 2: GPS locations of *Andersonia gracilis* individuals relevant to the Tiwest Cooljarloo Falcon Proposal.

Relevance	Spatial Reference (MGA Zone 50)		TIWEST ID
	Easting (m)	Northing (m)	
To be Cleared	339,628	6,615,561	144
Within 50m of footprint	338,807	6,616,104	282

Table 3: Groundwater drawdown management action trigger levels as mAHD and mbTOC (metres below top of casing)

Bore	¹ DTGW (m) Sept 06	DTGW category	³ Preferred minimum- magnitude		⁴ Preferred minimum- rate		⁵ Absolute minimum - magnitude		⁶ Absolute minimum - rate	
			mAHD	m bTOC	mAHD	m bTOC	mAHD	m bTOC	mAHD	m bTOC
MSBO1s	23.87	3-6 m	59.91	³ 4.87	60.81	³ 3.97	59.31	³ 5.47	60.76	³ 3.72
MSBO2s	22.72	0-3 m	69.69	³ 3.47	70.34	³ 2.82	69.19	³ 3.97	70.29	³ 2.57
OB15d	5.91	3-6 m	58.62	6.91	59.52	6.01	58.02	7.51	59.47	6.06
OB16d	4.79	3-6 m	60.70	5.79	61.60	4.89	60.10	6.39	61.55	4.94
OB16s	4.75	3-6 m	60.77	5.75	61.67	4.85	60.17	6.35	61.62	4.90
OB17d	3.00	0-3 m	55.48	3.75	56.13	3.1	54.98	4.25	56.08	3.15
OB17s	2.88	0-3 m	55.50	3.63	56.15	2.98	55.00	4.13	56.10	3.03
OB18d	2.98	0-3 m	52.90	3.73	53.55	3.08	52.40	4.23	53.50	3.13
OB18s	3.05	0-3 m	52.88	3.80	53.53	3.15	52.38	4.30	53.48	3.20
OB19d	3.05	0-3 m	54.97	3.80	55.62	3.15	54.47	4.30	55.57	3.20
OB19s	2.98	0-3 m	55.01	3.73	55.66	3.08	54.51	4.23	55.61	3.13
OB20d	3.32	3-6 m	51.94	4.32	52.84	3.42	51.34	4.92	52.79	3.47
OB20s	3.20	3-6 m	52.05	4.20	52.95	3.30	51.45	4.80	52.90	3.35
OB21d	4.40	3-6 m	49.22	5.40	50.12	4.50	48.62	6.00	50.07	4.55
OB21s	4.22	3-6 m	49.56	5.22	50.46	4.32	48.96	5.82	50.41	4.37

¹ Depth to groundwater.

² Mean min dtgw 2001-06.

³ Calculated from average annual minimum 2001-06 or Sept 06 level and max acceptable magnitude of drawdown under low risk of impact.

⁴ Calculated from average annual minimum 2001-06 or Sept 06 level and max acceptable rate of drawdown under low risk of impact after 1 year.

⁵ Calculated from average annual minimum 2001-06 or Sept 06 level and max acceptable magnitude of drawdown under moderate risk of impact.

⁶ Calculated from average annual minimum 2001-06 or Sept 06 level and max acceptable rate of drawdown under moderate risk of impact after 1 year.